

Technical Memo 3 – Strategy

The Blueprint: Guelph's One Water Plan

City of Guelph

Prepared for: City of Guelph

Prepared by: Onterris Canada Inc.

August 2026

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Executive Summary

The City of Guelph is advancing a new integrated approach to water management through The Blueprint: Guelph's One Water Plan (The Blueprint). Building on its nationally recognized leadership in water conservation and efficiency, the City is transitioning toward a One Water framework, an approach that manages drinking water, wastewater, and stormwater as a single, interconnected system. This evolutionary step is essential to maintaining Guelph's culture of environmental sustainability and water security.

A Unified Vision for Water

The One Water Plan establishes a shared vision: to safeguard water resources, support sustainable growth and build community resilience while maintaining water demand at the lowest achievable and economically sustainable levels. Guided by principles of water resources planning and protection, efficiency, innovation, collaboration and equity, the Blueprint places people, policy and infrastructure into one cohesive structure.

Guelph's Proven Foundation

Guelph has achieved notable success in reducing per capita water use, positioning itself among the lowest in Canada. Remarkably, even with a 25 per cent increase in population since 2006, total water consumption has remained relatively stable. This achievement reflects the City's leadership in conservation and efficiency, aligning with the broader trend toward sustainability and the adoption of water-efficient technologies. Moving forward, however, further reductions in water demand and the maintenance of lower per capita usage will rely on data-driven decision making, integrated planning and strategic engagement among all water users.

Stormwater and Wastewater Integration

Guelph's transition to a One Water framework recognizes that water supply, wastewater and stormwater are interconnected systems that influence one another across the urban water cycle. While historic program success has focused primarily on reducing potable water use, wastewater treatment performance and stormwater management also contribute significantly to system-wide sustainability, climate resilience and long-term capacity.

Stormwater runoff volumes affect infiltration, groundwater recharge and pollutant loading, while wastewater flows are directly linked to consumption trends, inflow and infiltration (I&I), and opportunities for reuse. Integrating these systems allows the City to realize co-benefits such as reduced wastewater treatment loads, reduced stormwater runoff and flooding risk through green infrastructure, and promoting local groundwater recharge. This holistic view strengthens the City's ability to manage water resources together as unified cycle-optimizing supply, treatment, conveyance and environmental protection, rather than through isolated approaches.

The Case for Change

Guelph is entering a new era of water demand management, where conservation and efficiency are not just the focus but part of a city-wide management principal. Growth pressures, climate uncertainty and aging infrastructure require a broader, more integrated approach that treats water as a finite resource underpinning growth, equity and environmental health.

Strategic Direction

The One Water Plan organizes the City's future actions under four integrated themes:

1. **Data Management and Integrity.** Build a digital foundation for smart water management through Advanced Metering Infrastructure and Meter Reading (AMI/AMR), real-time analytics and a shared water data platform. These tools will enable proactive leak detection at both the customer and system level, accurate demand forecasting and system optimization across all water services.
2. **Customer Engagement.** Modernize relationships with residents, businesses and institutions. Provide a single-entry point for all water-related programs, fostering collaboration, awareness and measurable reductions in water use. Customer engagement will be tailored to individual sectors, particularly among high-volume users and new developments.
3. **System Optimization.** Strengthen operational efficiency through continued leak detection, non-revenue water reduction, and infrastructure optimization, that can leverage existing assets and investments such as the District Metered Area (DMA) system with emerging tools such as a virtual DMA.
4. **One Water Governance and Planning.** Align the City's organizational structure, policies and master plans under a unified One Water framework. This will enable integrated financial planning, coordinated asset management and cross-departmental decision making that values water as a shared community asset.

Transforming Data into Decisions

A central recommendation is the phased implementation of AMI/AMR, first for high-volume users and new developments, followed by city-wide deployment. Combined with a unified data and analytics platform, this will provide the intelligence needed to manage water demand dynamically, detect anomalies in real-time, and support the evolution of the City's various water modelling and decision support tools relating to climate and weather, groundwater, stormwater and wastewater.

Selected Scenario and Financial Case

The Blueprint evaluated five strategic scenarios ranging from a scaled-down conservation program to full district water reuse. Scenario D, the AMI/AMR-Enabled System, was selected as the recommended path forward. It builds on the One Water organizational structure by introducing universal advanced metering infrastructure, enhanced data analytics and system optimization

through tools such as virtual district metered areas. The selection was informed by water savings modelling, initiative rankings by the Core Project Team, input from City staff workshops, and a review of comparable programs in other jurisdictions.

The assessment of water demand savings provides the financial justification for the recommended strategy. Guelph's current per capita consumption already trends below the 2022 Water Supply Master Plan Scenario 5 conservation baseline; achieving that trend line is not the most ambitious target available. The Blueprint is designed to go further. The projected value of water demand reductions above the Scenario 5 baseline, measured against the long-run cost of incremental water supply and treatment capacity, is expected to offset the full cost of implementing the build out of the One Water structure with a water conservation program over the planning horizon to 2051. Scenario D is therefore not only the optimal path forward but also a financially sound strategy that integrates water supply, wastewater and stormwater initiatives.

Ten Strategic Actions and Their Indirect Benefits

The Blueprint is organized into ten implementation actions, labelled Actions A through J, spanning governance reform, residential and ICI conservation programs, advanced metering, water loss management, systems planning, data infrastructure and feasibility studies. Each action generates direct benefits through measured reductions in water demand and multiple indirect benefits to water management significant to the long-term value of the program. The following summarizes those indirect benefits by action.

- **Action A: Implement One Water Organizational Structure and Oversight.** The governance and oversight structures created by Action A are the organizational foundation upon which all other indirect benefits depend. The primary indirect benefits are improved organizational efficiency through reduced duplication and streamlined cross-departmental coordination; enhanced staff engagement and retention through a well-managed change process; and political and reputational benefit from establishing Guelph as a leader in integrated water management. The KPI framework produces an adaptive management capability that allows early course correction, an indirect financial benefit that is difficult to quantify but could be significant over a 25-year horizon.
- **Action B: Refresh Direct Residential Water Use Programs.** Action B produces equity and social benefits by extending water efficiency program access to lower-income households. It also produces direct benefits through home residential audits that identify leaks and opportunities for water efficiency.
- **Action C: Refresh and Integrate Healthy Landscapes Program.** Action C delivers some of the most diverse indirect benefits in the plan. Rain gardens, rain barrels and tree planting collectively reduce stormwater runoff volumes and peak flow rates, contribute to groundwater recharge, reduce urban heat island effects, enhance biodiversity and ecological connectivity, and build climate resilience against more intense precipitation events. Community participation in outdoor landscape programs also builds public awareness of and affinity for the One Water concept.

- **Action D: Refresh and Expand Water Smart Business Program.** Action D produces competitive advantages for participating ICI customers and stimulates peer learning through the recognition program. Stormwater credits directly reduce runoff volumes entering the municipal drainage system. ICI water use and wastewater effluent reductions translate directly into reduced municipal wastewater volumes, lowering treatment costs at the Water Resource Recovery Centre. The program also contributes to economic development signalling by demonstrating Guelph's commitment to business sustainability.
- **Action E: Refresh Indirect Residential Programs.** Action E creates long-term cultural change by building water conservation values through the education system, reaching all socioeconomic groups. Outreach events catalyze direct program participation, functioning as a low-cost conversion channel for audits and rebates. Community-based programs build local adaptive capacity and create a network of stewardship advocates distributed across Guelph neighbourhoods.
- **Action F: Implement Advanced Metering Infrastructure (AMI) and Automated Meter Reading (AMR) City-Wide.** AMI produces substantial indirect benefits beyond direct demand reductions. Customer empowerment through consumption portals supports voluntary demand reduction, with evidence from comparable deployments suggesting 3 to 8 per cent water demand reductions independently of other programs. AMI improves billing accuracy, protects utility revenue from apparent losses, supports emergency response during water main events, and substantially improves the accuracy and timeliness of regulatory reporting and long-range demand forecasting.
- **Action G: Maintain and Expand Water Loss Strategy and Leak Detection Program.** Active leak detection extends the service life of water main assets, reduces public health risk from leaking pipe contamination pathways, improves customer service by reducing main breaks, and generates system knowledge that supports better capital investment decisions. The virtual DMA program adds a continuously improving understanding of hydraulic system behaviour that benefits multiple downstream planning and operational functions. Energy savings from reduced pumping volumes are a further co-benefit.
- **Action H: Build Systems Optimization and Planning Function.** Action H produces capital deferral benefits through accurate, integrated demand projections that can demonstrate to Council and regulators that supply expansion is not immediately necessary. Integrated master planning ensures policy coherence across the City's regulated infrastructure obligations. Climate resilience integration protects long-term capital investment decisions from being overtaken by adaptation requirements. Integrating energy and GHG emission reporting activities contributes to corporate carbon reduction commitments.
- **Action I: Design and Build Common Data Platform.** The data platform creates the technological pathway for advancing the management of Guelph's water-related assets and operations. It reduces staff time in data reconciliation and reporting, improves the quality and speed of both operational and strategic decision making, supports transparent external reporting to Council and regulators, and breaks down data silos that currently impede cross-departmental collaboration. The stormwater, wastewater and groundwater monitoring expansions specifically support better management decisions, earlier detection of data quality issues, and reduced regulatory compliance risk.

- **Action J: Complete One Water Studies.** The One Water Studies produce policy optionality, allowing the City to evaluate and develop the most effective, equitable and financially sound policy instruments before committing to implementation. Rigorous feasibility studies build interest-holder credibility and demonstrate evidence-based governance. The regulatory pathway work for tiered pricing and water reuse may open opportunities for Guelph to influence provincial policy and position itself as a pilot municipality for innovative water management approaches. The non-potable ICI reuse study may identify public-private partnership opportunities with large industrial water users.

The Path Forward

Implementing The Blueprint will require commitment, collaboration and sustained investment. The One Water framework positions Guelph to:

- integrate water, wastewater, and stormwater master plans for holistic resource management;
- align growth and water capacity planning to ensure reliable service and environmental protection;
- engage customers and businesses as active partners in achieving long-term sustainability; and
- demonstrate national leadership in climate-ready, water-secure urban development.

Conclusion

The Blueprint: Guelph's One Water Plan marks a transformative step from water conservation and efficiency to comprehensive management of water-related functions. It represents a shift from incremental savings to strategic integration, and from individual programs to a coordinated, calibrated system. By implementing The Blueprint, Guelph will not only extend the life of its water supplies and water-related assets, but also strengthen its economic, environmental and social equity foundation for future generations. The ten strategic actions that comprise the plan will deliver not only measurable direct water savings but a portfolio of other organizational, environmental and community benefits that compound over the 25-year planning horizon, making The Blueprint a key water management investment for the City.

Table of Contents

1	Introduction	1
1.1	Purpose of Task 3 Strategic Direction.....	1
1.2	Relationship to Technical Memo 4 Implementation Plan.....	2
2	Strategic Context and Objectives	2
2.1	Current State.....	2
2.1.1	Current Organizational Structure.....	3
2.1.2	Performance of Water Conservation and Efficiency (WC&E) Programs.....	5
2.1.3	Historical Water Demand Trends	7
2.1.4	Existing Water Related Strategies and Plans.....	10
2.1.5	Water Demand Management Challenges.....	10
2.1.6	Stormwater Management Challenges	12
2.1.7	Wastewater Treatment Challenges	13
2.2	Future Trends.....	14
2.2.1	Water Demand	14
2.2.2	Stormwater	18
2.2.3	Wastewater	19
2.3	One Water Vision	20
2.3.1	One Water Strategic Direction	21
3	One Water Scenarios	23
3.1	Direct Water Demand Reduction Projections	25
3.1.1	Residential Programs	27
3.1.2	ICI Water Programs	29
3.1.3	Non-Revenue Water	29
3.1.4	AMI / AMR.....	30
3.1.5	Residential District Reuse / Purple Pipe.....	30
3.2	One Water Scenario Descriptions	30
3.2.1	Scenario A – Scaled Down Program	31
3.2.2	Scenario B – Modified Business as Usual.....	31
3.2.3	Scenario C – One Water Structure	32
3.2.4	Scenario D – AMI / AMR Enabled System.....	33
3.2.5	Scenario E – Residential District Water Reuse	33
3.3	One Water Scenario Evaluation	34
3.3.1	Scenario A – Scaled Down Program	38
3.3.2	Scenario B – Modified Business as Usual.....	38
3.3.3	Scenario C – One Water Organizational Structure	39
3.3.4	Scenario D – AMI / AMR Enabled System.....	39
3.3.5	Scenario E – Residential District Water Reuse	40
3.3.6	Implications to Guelph’s One Water Plan.....	40

3.4	Scenario Evaluation and Rationale	42
3.4.1	Interest-holder Engagement	42
3.4.2	Scenario Evaluation Framework.....	43
3.4.3	Interpretation of Results.....	44
3.4.4	The Financial Case	45
3.4.5	Conclusion.....	46
3.5	Recommended One Water Actions and Tasks.....	46
3.5.1	Indirect Benefits of the One Water Strategy.....	52
4	Key Performance Indicators and Monitoring Framework.....	54
4.1	Water Demand KPIs	55
4.2	Non-Revenue Water KPIs	57
4.3	Stormwater KPIs	57
4.4	Wastewater KPIs	58
4.5	Data Management KPIs.....	59
4.6	Customer Engagement KPIs.....	59
4.7	Financial and Revenue Metrics	60
5	Strategic Risks and Implementation Considerations	61
5.1	Organizational and Structural Considerations.....	61
5.2	Data Integration and Technology Considerations	62
5.3	Resource, Capacity and Funding Constraints	63
5.4	Policy, Regulatory and Compliance Considerations	63
5.5	Customer Engagement and Public Adoption Considerations.....	64
5.6	Financial and Revenue Stability Considerations	64
5.7	Implementation Complexity and Phasing Considerations	65
6	Summary and Next Steps	66
7	References	67

In-Text Figures

Figure 1	City of Guelph Organizational Structure (Infrastructure, Development and Environment).....	4
Figure 2	Historical Average Day Demand (ADD), City of Guelph.....	8
Figure 3	Per Capita Historical Day Demand, City of Guelph	9
Figure 4	One Water Functional Structure	22

In-Text Tables

Table 1	Historical Performance of WC&E Strategy	6
Table 2	2051 Water Demand Projections	15
Table 3	Summary of One Water Scenarios	24
Table 4	Summary of Direct Water Consumption Initiatives	26
Table 5	Scenario A - Scaled Down Program Initiatives	31
Table 6	Scenario B – Modified Business as Usual Initiatives	32
Table 7	Scenario C – One Water Structure Initiatives	32
Table 8	Scenario D – AMI/AMR Enabled System Initiatives	33
Table 9	Scenario E - Residential District Water Reuse Initiatives	34
Table 10	Evaluation of Water Savings Benefits and Costs	35
Table 11	Scenario Comparison Table.....	41
Table 12	One Water Scenario Decision Matrix (1 = does not advance criterion, 5 = advances criterion strongly).....	44
Table 13	Summary of Implementation Actions and Tasks.....	47
Table 14	KPI Themes	55
Table 15	Water Demand KPIs	56
Table 16	Non-Revenue Demand KPIs	57
Table 17	Stormwater KPIs	58
Table 18	Wastewater KPIs.....	58
Table 19	Data Management KPIs	59
Table 20	Customer Engagement KPIs	60
Table 21	Financial and Revenue KPIs	61
Table 22	Organizational and Structural Risks	61
Table 23	Data Integration and Technology Risks	62
Table 24	Resource, Capacity and Funding Constraints	63
Table 25	Policy, Regulatory and Compliance Risks	63
Table 26	Customer Engagement and Public Adoption Risks	64
Table 27	Financial and Revenue Stability Risks.....	65
Table 28	Financial and Revenue Stability Risks.....	65

Appendices

Appendix A	Water Demand Reduction Projections
Appendix B	One Water Scenarios

1 Introduction

The City of Guelph (the City) is advancing a comprehensive One Water Plan that builds on its long-standing leadership in water conservation, sustainable growth and integrated resource management. This approach recognizes water as a shared and finite resource, connecting drinking water supply, water conservation and efficiency, wastewater and stormwater management under a unified vision that supports community well-being, environmental stewardship and long-term resilience.

This report highlights the strategic direction for The Blueprint: Guelph's One Water Plan (The Blueprint), structured around key elements that together define the City's pathway toward a more efficient, innovative, and coordinated approach to managing water:

- **One Water Vision and Principles:** An updated vision statement and guiding principles that frame a sustainable and aspirational future for water management in Guelph. These principles articulate the values of stewardship, integration, equity, innovation and collaboration that underpin the City's approach.
- **Current State Snapshot:** An overview of Guelph's water demand trends, system performance, and program achievements to date, providing the baseline against which future progress will be measured.
- **Elements of a One Water Direction:** A set of thematic areas that capture the City's priorities, including strengthening data management and integrity, engaging customers in municipal water management, optimizing system performance and advancing integrated governance and planning.
- **Priority Initiatives:** A portfolio of near- and medium-term initiatives that translate the strategic themes into action, such as advanced metering infrastructure (AMI), refreshing customer incentive programs, enhancing leak detection and reuse opportunities, and consolidating One Water governance structures.
- **Next Steps:** The path forward for implementation, including resourcing, financial planning, and integration with broader City master plans to ensure Guelph can reliably meet future water needs while supporting growth and sustainability objectives.

Together, these elements establish a clear and actionable framework for Guelph's transition to a fully integrated One Water future. The Blueprint is designed not only to safeguard water resources but also to position the City as a leader in innovative urban water management, aligning infrastructure investment, policy and community action toward shared outcomes.

1.1 Purpose of Task 3 Strategic Direction

The purpose of The Blueprint is to guide future decision making across water, wastewater and stormwater services. This process followed for the development of the strategic direction is structured into three main tasks:

- Task 1 - Review of existing conditions, programs and initiatives in Guelph.
- Task 2 - Review and summary of best practices and initiatives from other jurisdictions.
- Task 3 - Setting the strategic direction for The Blueprint by identifying goals, targets and priority actions.

1.2 Relationship to Technical Memo 4 Implementation Plan

Technical Memo 3 (Strategic Direction) defines the vision, goals, objectives, and strategic themes and initiatives for The Blueprint providing the overall strategy to move the City toward One Water. It establishes the strategic intent, identifies priority actions across short-, medium-, and long-term horizons, and identifies achievable water demand reductions and high-level key performance indicators (KPIs) to guide decision making. Technical Memorandum 4 (Implementation Plan) builds directly upon this defined foundation.

The Strategic Direction articulated in Tech Memo 3 “sets the table” for implementation by clearly defining what the City aims to achieve and why. Tech Memo 4 translates this strategic direction into how the City will deliver The Blueprint. Specifically, it expands and operationalizes the recommended actions identified in Tech Memo 3 by developing detailed implementation plans, including tasks, schedules, resource requirements, budgets, monitoring and evaluation frameworks and business cases. In doing so, Tech Memo 4 ensures that the strategic themes and initiatives established in Tech Memo 3 are actionable, measurable, financially sound and aligned with capital planning, development charge considerations and rate impacts.

2 Strategic Context and Objectives

Section 2 provides the strategic context for Guelph’s transition from traditional water conservation toward an integrated One Water approach. It summarizes the current state of water, wastewater and stormwater management, highlights the historical success of the City’s long-standing leadership in water conservation and efficiency, and outlines the challenges faced by the City with its current structure created by growth, climate uncertainty, aging infrastructure and evolving customer needs. This section summarizes the baseline around the current state of water-related functions relating to the One Water strategy and the trends and assumptions considered in building this strategy.

2.1 Current State

Section 2.1 outlines the current organizational structure relating to Guelph’s water, wastewater and stormwater systems. This section also summarizes recent water demand trends, program performance and emerging pressures such as population growth, aging infrastructure, data and reporting limitations and evolving customer needs. Together, these elements form the starting point from which future challenges and opportunities are assessed and from which the strategic direction for The Blueprint is developed.

2.1.1 Current Organizational Structure

The City of Guelph's organizational functions that are directly associated to water-related assets and services are managed within the City's Infrastructure, Development and Environment (IDE) service area. Departments within this service area plan, operate, regulate and renew the Guelph's water, wastewater and stormwater systems. This Service Area (IDE) provides strategic leadership, sets service expectations, and aligns water-related operations with broader municipal objectives such as growth management, environmental protection and asset sustainability.

Figure 1 illustrates the structure of the City's departments having some responsibility for managing water-related assets or operations.

Water Services is responsible for the full delivery of the drinking water program. This division manages operational water treatment, water distribution and preventative maintenance to ensure reliable, safe delivery of drinking water throughout the city. Technical services coordinates system planning for vertical assets to access groundwater supply.

Wastewater Services has a parallel structure that manages the city's collection system and treatment operations. This division manages operational treatment plant, pumping stations, vertical asset expansion and ongoing preventative maintenance to ensure safe treatment of the City's wastewater. The technical services oversees regulatory sampling, condition assessments and technical standards for the wastewater network.

Engineering and Transportation Services play a central role in designing, constructing and renewing municipal water infrastructure. Development Engineering reviews development applications, ensuring that new growth can be serviced sustainably and that private infrastructure meets City standards. Environmental Engineering oversees stormwater management facility rehabilitation and repairs, select new stormwater management facility design and construction, select linear infrastructure repair and maintenance, and works with the Operations Stormwater group to inspect culverts, ditches and outfalls. The Operations Stormwater group also performs maintenance and replacement of stormwater infrastructure.

Facilities and Energy Management supports water and wastewater operations by maintaining buildings, equipment and plant systems that house critical water infrastructure. This division also leads energy optimization, water efficiency upgrades and climate-related initiatives across all City facilities, helping reduce costs and greenhouse gas emissions. These functions are increasingly important as treatment plants evolve into more energy-intensive operations. Facilities and Energy Management also manage the maintenance of stormwater management facilities located on City-owned lands, which are not included as part of the City's Stormwater Consolidated Linear Infrastructure Environmental Compliance Approval (CLI ECA).

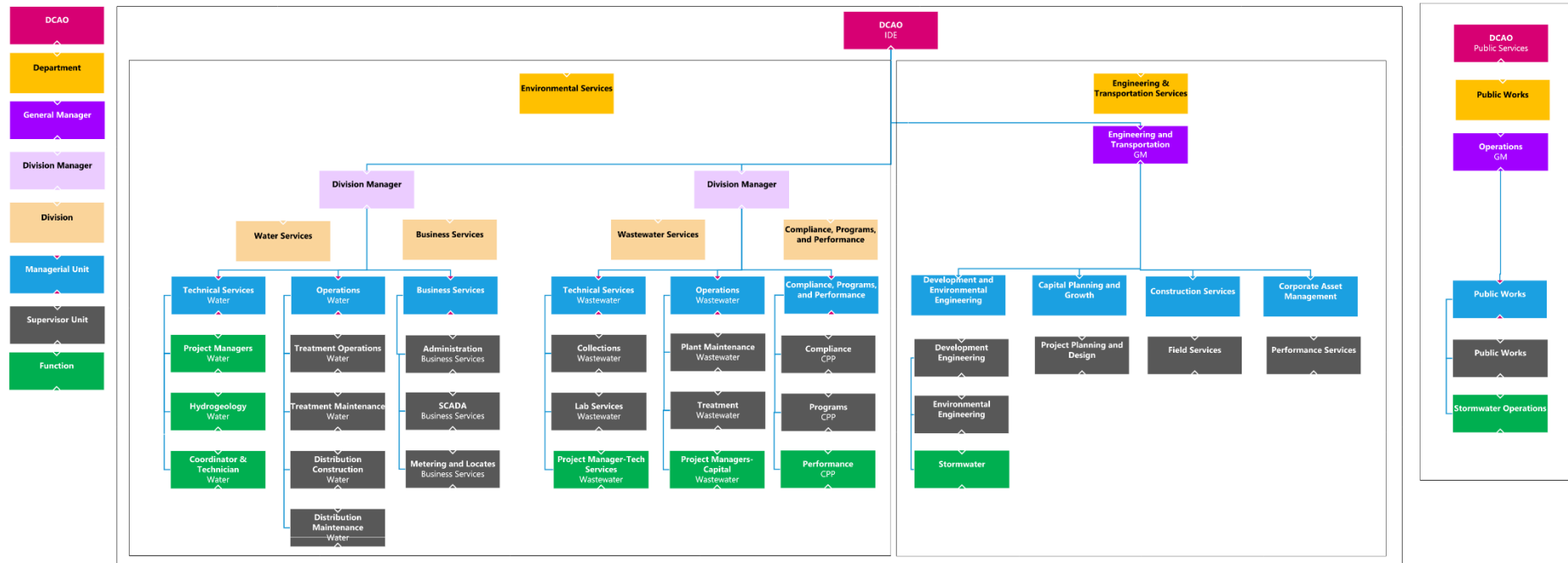


Figure 1 City of Guelph Organizational Structure (Infrastructure, Development and Environment)

Partnership support from Business Services and Compliance and Performance strengthens governance, monitoring and environmental performance. Planning and Building Services shapes long-term policy frameworks that influence water demand, land-use patterns, and servicing strategies. Compliance, SCADA and Environmental Programs provide centralized monitoring, reporting, control-system oversight, and community-focused initiatives such as water efficiency and environmental stewardship. Together, these shared services ensure that the City maintains strong regulatory compliance, operational resilience and public accountability.

Overall, the City's organizational structure integrates operations, engineering, planning, compliance and sustainability to provide a reliable, safe and environmentally responsible water, wastewater and stormwater system for the community. It ensures that long-term planning aligns with daily operational needs, while capital investment, regulatory oversight and growth management are coordinated across multiple divisions. The One Water strategy provides an opportunity better integrate stormwater activities with all other water-related functions with a goal of better overall One Water alignment.

2.1.2 Performance of Water Conservation and Efficiency (WC&E) Programs

The City currently manages numerous water- and environmental programs spanning the water conservation and efficiency, stormwater, water supply and wastewater functions. Technical Memo 1 (Situational Analysis) and Technical Memo 2 (Review of Initiatives) describe the direct and indirect WC&E programs, as well as the City's Non-Revenue Water programs that have resulted in continual reductions of per capita water demand as the City grows.

Table 1 summarizes the City's historical investment into the WC&E program and its performance measured in terms of cubic metres of water per day saved, the net present value of the water saved, and the benefit-cost ratio of each program and the overall WC&E portfolio. A benefit-cost ratio is an indicator, used in cost-benefit analysis, that attempts to summarize the overall value for money of a project, program or initiative. A benefit-cost ratio is the ratio of the benefits of the program or project, expressed in monetary terms, relative to its costs. In other words, a benefit-cost ratio takes into account the monetary gain experienced by the program or project versus the amount it costs to execute the project. A benefit-cost ratio greater than one implies that a project or program delivers more benefits than the investment. A benefit-cost ratio less than one implies that the benefits experienced by a project are less than the value of the investment. For the evaluation of One Water scenarios in this document, many of the indirect or co-benefits of a program are not expressed in monetary terms, and therefore the benefit-cost ratios presented to not reflect all of the value delivered by the program or initiative, and this needs to be considered when evaluating or assessing the scenarios.

Table 1 is broadly separated into the 2006-2016 and the 2017-2024 periods, with the former period representing the time up to the 2016 WC&E update, and the latter representing the more recent period and the refreshed program. This table has been summarized based on the City's financial account records as well as records maintained of cubic metres of water saved for each program. Individual small programs are collapsed/grouped into broader portfolios for this table as the City's

financial records do not capture all costs for smaller programs separately. The City's financial records representing salary, expense, rebate and incentives are not consistent across all years but the following table compares the two periods for illustrative purposes.

Table 1 Historical Performance of WC&E Strategy

Program	2006-2016					2017-2024							
	Cubic Metres per Day Saved	Present Value Cost (1,000\$)	Present Value Benefit (1,000\$)	Net Present Value (1,000\$)	Benefit-cost Ratio	Cubic Metres per Day Saved	Present Value Cost (1,000\$)				Present Value Benefit (1,000\$)	Net Present Value (1,000\$)	Benefit-cost Ratio
							Direct Costs	Staffing	Rebates	Total			
Blue Built Homes	5	\$63	\$42	-\$21	0.7	13	\$0	\$222	\$0	\$222	\$103	-\$118	0.5
Direct Residential Programs	2,785	\$3,468	\$22,224	\$18,757	6.4	357	\$353	\$705	\$397	\$1,455	\$2,848	\$1,392	2.0
Municipal Facility Upgrades	63	\$525	\$505	-\$20	1.0	58	\$0	\$222	\$0	\$222	\$459	\$237	2.1
ICI / Business	1,616	\$1,685	\$12,899	\$11,214	7.7	173	\$305	\$787	\$315	\$1,407	\$1,383	-\$24	1.0
Leakage	5,084	\$1,807	\$40,573	\$38,766	22.5	1,874	\$948	\$0	\$0	\$948	\$14,958	\$14,010	15.8
Supporting Expenses													
Staffing		\$4,715		-\$4,715				\$6,261		\$6,261		-\$6,261	
Other Costs		\$11,973		-\$11,973			\$1,510			\$1,510		-\$1,510	
Total	9,553	\$24,235	\$76,244	\$52,009	3.1	2,475	\$3,116	\$8,196	\$712	\$12,025	\$19,751	\$7,726	1.6

From 2006 to 2016, the program achieved total savings of about 9,553 m³ per day with a present value cost of roughly \$24.2 million (\$2.2 million/year) and a present value benefit near \$76.2 million (\$6.9M/year). This produced a net present value of about \$52.0 million and an overall benefit-cost ratio of 3.1, indicating very strong returns on investment in the initial program years.

From 2017 to 2024, the program delivered about 2,475 m³ per day of savings at a present value cost of roughly \$12.0 million (\$1.4M / year), generating about \$19.8 million (\$2.5M/year) in present value benefits. The resulting net present value is about \$7.7 million with an overall benefit-cost ratio of 1.6. While performance remains positive, returns have moderated compared to the first decade, and the cost per m³/day saved increased from roughly \$2,536 in 2006–2016 to about \$4,858 in 2017–2024.

Leak reduction accounted for roughly 53 per cent of daily savings in 2006–2016 (about 5,084 m³/day) and rose to about 76 per cent of the savings composition in 2017–2024 (about 1,874 m³/day). Direct residential programs continue to perform well, posting a benefit-cost ratio of

2.0 in 2017–2024 and contributing about 357 m³/day of savings. The Water Smart Business program provided a smaller but positive contribution at 173 m³/day with a benefit-cost ratio of 1.0. Blue Built Home savings were modest at 13 m³/day and showed a negative net present value in the recent period.

Two context factors help explain the trend. First, benefit-cost ratios typically decline over time as the most cost-effective opportunities are captured early in a program's life. Second, the program revamp in 2017 introduced a new savings-tracking methodology, which may have contributed to lower reported savings in subsequent years. Additionally, leakage repair O&M costs are not captured, which means that the benefit-cost ratio for the leakage reduction program are overstated.

Overall, the WC&E program continues to generate net financial benefits and meaningful demand reduction, with results in recent years increasingly dependent on system leakage control and targeted residential and business measures. The data suggests opportunities to refine program design for lower-performing offerings, sustain and modernize leakage detection and repair, focusing efforts on high-return opportunities, and improve tracking and cost attribution so that future benefit-cost results reflect full program effort.

2.1.3 Historical Water Demand Trends

Understanding historical water use trends is important for the Blueprint's development to help make projections of future water demand. The total volume of water needed by residential, commercial, industrial, and public users patterns, inefficiencies and opportunities for integrated management across drinking water, wastewater and stormwater systems. Figure 2 illustrates historical average day demand (ADD) trends for Guelph between 2006 and 2024, disaggregated by customer sector and compared against corresponding residential and employment population growth over the same period.

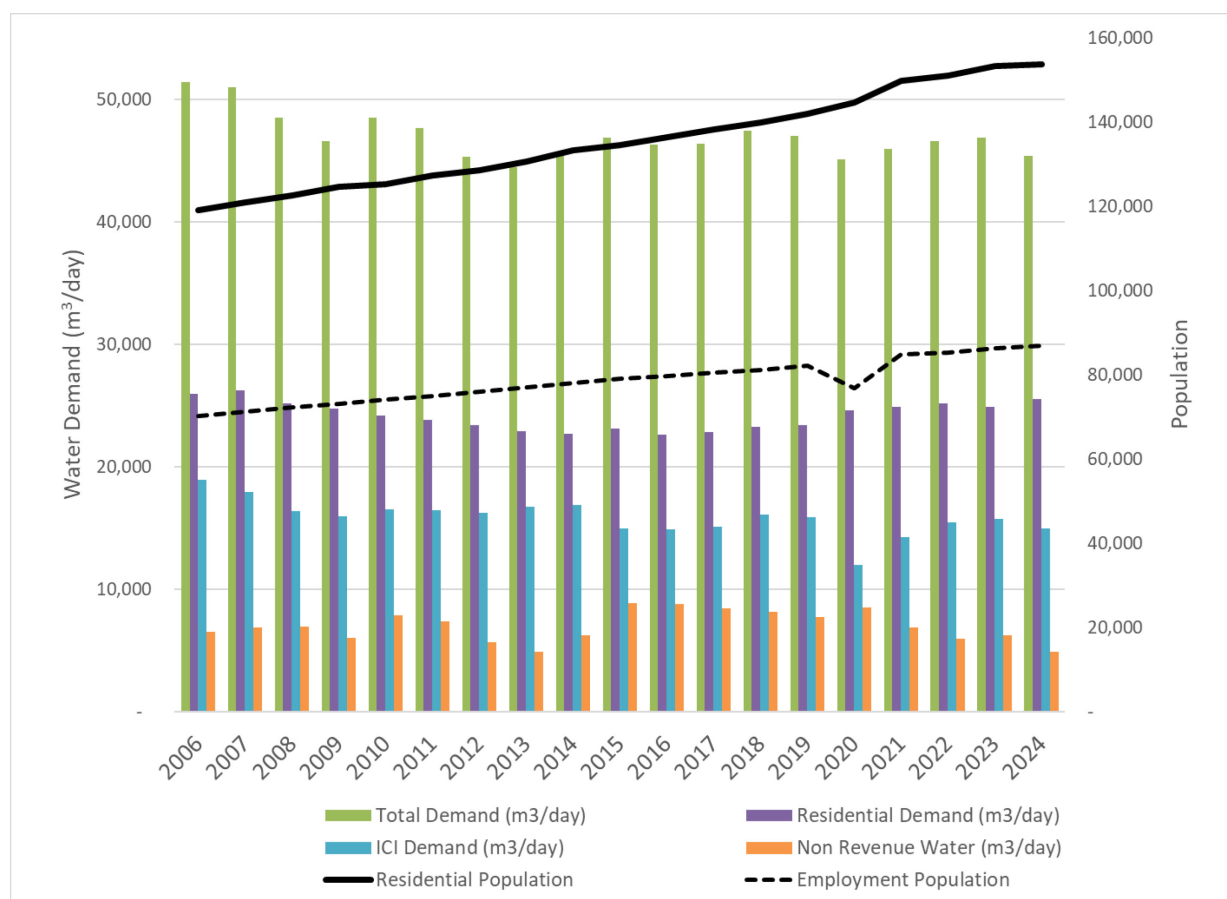


Figure 2 Historical Average Day Demand (ADD), City of Guelph

The stacked bars (green) represent total system water demand in cubic metres per day (m³/day), divided into three components:

- Residential consumption (purple)
- Industrial, Commercial, and Institutional (ICI) consumption (blue)
- Non-revenue water demand (orange)

The solid black line indicates residential population growth, while the dashed black line shows the employment population trend.

Figure 3 illustrates historical per capita trends for Guelph between 2006 and 2024 for the same categories illustrated in Figure 2. The City made per capita water demand calculations as part of the annual water balance and water demand reporting process.

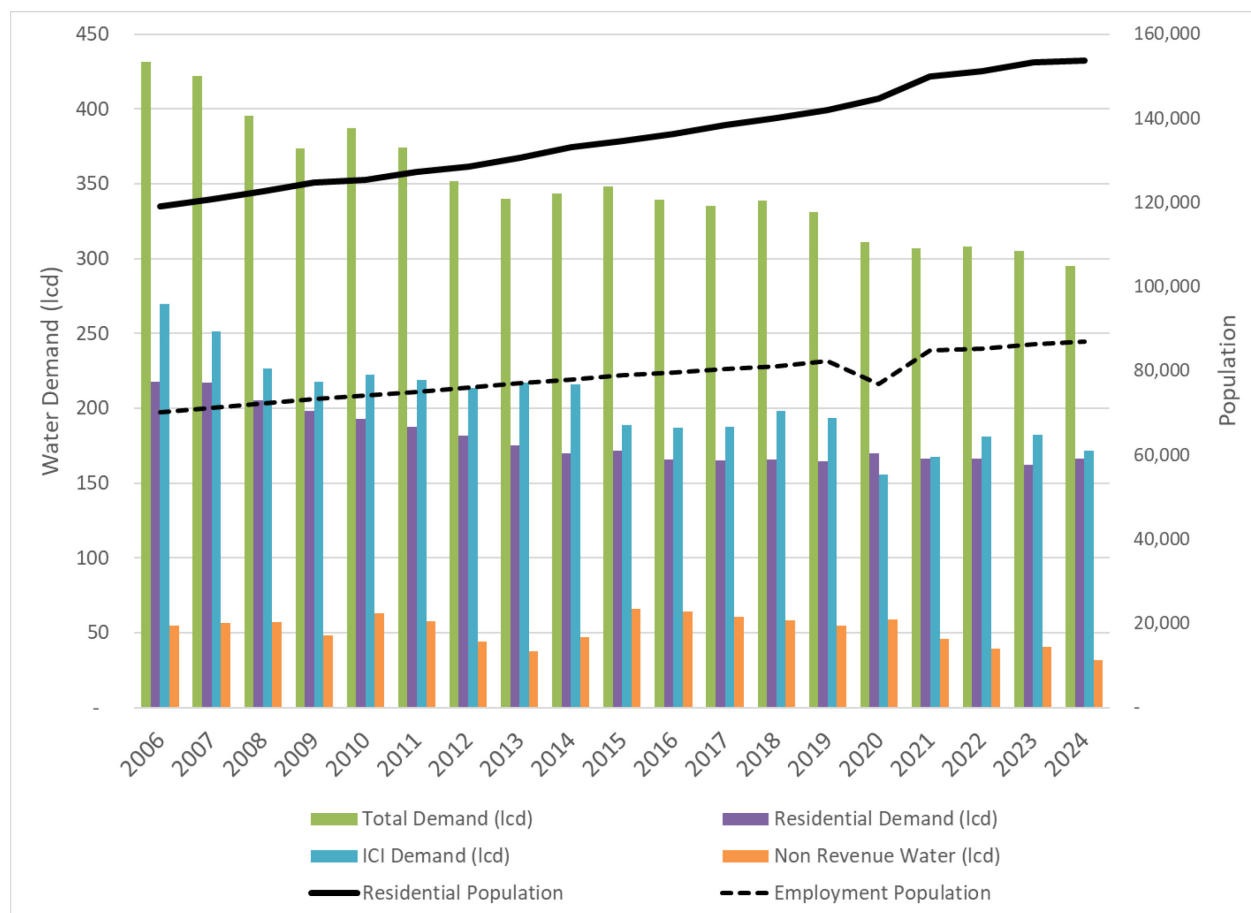


Figure 3 Per Capita Historical Day Demand, City of Guelph

Between 2006 and 2024, Guelph’s residential population increased steadily from approximately 120,000 to nearly 155,000, and employment population rose from roughly 70,000 to 85,000. Despite this combined population growth of more than 25 per cent, total water production declined modestly over the same period, from about 47,000 m³/day in 2006 to approximately 44,000 m³/day in 2024.

The figures demonstrate the following:

- Residential water demand has remained relatively stable, even as population grew, illustrating strong improvements in per capita water use efficiency. During this period, average residential demand has fallen from approximately 218 litres per capita per day (lcd) to the range of 162-166 lcd in recent years. The results illustrate sustained efficiency improvements in residential indoor water use, including adoption of high-efficiency fixtures and appliances. The results also illustrate the feedback from the community on continued implementation of outdoor water use restrictions and seasonal conservation programs.

- ICI demand shows a gradual decline over time, reflecting efficiency gains and shifts in industrial and commercial activity. ICI demand shows the greatest level of disruption with the effects of the COVID-19 pandemic shutdowns and hybrid work transition from 2020-2021. Normalized with employment population, ICI demand has fallen from 260 lcd in 2006 to 170-180 in recent years. The results illustrate the impact of the City's WC&E programs and targeted ICI sector efficiency gains, achieved through audits, retrofits and process optimization.
- Non-revenue water has remained consistently low based on AWWA/IWA annual water balance reporting program, typically between 5,000–6,000 m³/day, illustrating the success of the City's ongoing attention and continued emphasis on leak detection, metering accuracy and system maintenance.
- The flattening of total system demand highlights the effectiveness of Guelph's long-term WC&E strategies to decouple water use increases from population growth.

Overall, Figures 1 and 2 underscore Guelph's success in maintaining stable and/or declining water demand during periods of significant population and employment growth. Despite this growth, per capita demands have remained on a consistent downward trend, indicating that WC&E measures are largely reclaiming capacity to support the City's commitments to housing and growth to meet the Province's Places to Grow projections for Guelph as a growth centre. This is an important foundation for a refreshed WC&E strategy within a One Water planning and development framework.

2.1.4 Existing Water Related Strategies and Plans

As discussed in Technical Memo 1 (Situational Analysis), and Technical Memo 2 (Review of Initiatives), the City is engaged in a recurring cycle for the review and planning of its water-related asset and operational requirements through its master planning process. Water-related master plans include the Stormwater Management Master Plan (2023), Water Supply Master Plan (2023), Water and Wastewater Servicing Master Plan (2023), Wastewater Treatment and Biosolids Management Master Plan (2023), Ground River Source Protection Plan (2025), and the Natural Assets Inventory, Condition, Risk and Service Attribution (2022). Together, these plans establish the City's current and planned initiatives relating to infrastructure, natural assets, drinking water source protection, monitoring programs, policy updates, asset management and growth servicing to 2051. These plans were reviewed in Tech Memo 2 and initiatives that intersect with The Blueprint were identified and reviewed with City staff. These items will be reintroduced in Tech Memo 4 - Implementation Plan, and considered in the initiative development and scheduling.

2.1.5 Water Demand Management Challenges

The City has had success with the reduction of planned water demand through successive WC&E strategies. However, with this success, the City faces a mix of new challenges with its water demand management programs while facing a growing population and economic base, aging infrastructure, and climate risks as detailed below:

- **Water Demand Management Uncertainty.** The City is currently delivering water to residential customers at a consumption rate of approximately 162-166 litres per capita per day, but there are uncertainties in understanding how this demand is distributed across the population (e.g., demographics, density, infrastructure). This raises questions of future demand estimation while facing a growing population.
- **Data and Reporting Limitations.** At present, water-related data management is de-centralized with no common standards, quality assurance or control methods. As an example, existing water consumption, programs and water balance datasets are managed in separate spreadsheets, each of which has been updated by various staff members over time.
- **Performance Monitoring and Management.** There is a lack of consistent Key Performance Indicators (KPIs) and coordinated/integrated reporting, which makes it difficult to evaluate program effectiveness and guide decisions.
- **Customer Engagement Fatigue and Gaps.** While Guelph has a history of successful programs like Water Smart Business, participation has declined in recent years and many of these programs are in of need refreshing should they continue. High-volume water users (ICI and multi-residential) require renewed and targeted engagement. Residential programs need to be redesigned to maintain public interest and effectiveness, and to put focus where future improvements can be found.
- **Program Alignment Across Departments.** Water-related sustainability programs are spread across multiple City service areas (water supply, wastewater, stormwater) and managed quite independently, creating a need for more consolidated, customer-facing coordination to achieve the benefits of a One Water approach.
- **Non-Revenue Water (NRW) and System Optimization.** As reported in the City's annual water conservation and efficiency report, the City has reduced water leakage below the Economic Level of Leakage (ELL) and it is therefore uncertain as to the value of future incremental investments. Challenges remain in addressing unaccounted-for water, reducing losses in system operations (e.g., water main flushing and swabbing, road cleaning), and finding opportunities to substitute potable water with non-potable sources, including sewer flushing.
- **Costs and Benefits of Further Innovation.** The City is aware of, and has experimented with, innovative practices including water recycling programs (reuse of greywater, or rainwater capture). Due to various factors including a relatively low cost of water, existing high-efficiency fixture standards and business needs to demonstrate a relatively short return on investment, it is difficult to establish viable business cases to invest into technologies including greywater reuse and rainwater harvesting.
- **Financial and Resource Constraints.** Expanding water management programs, new technologies (such as advanced metering infrastructure), and more aggressive customer incentives, require funding and staff capacity. Aligning these needs with the City's current capital and operating plans and current revenue pressures is an ongoing challenge.

2.1.6 Stormwater Management Challenges

The City of Guelph completed its Stormwater Management Master Plan in 2023, approved by Council under the Municipal Class Environmental Assessment process, with an implementation horizon running to 2051. The Master Plan represents the City's most current and comprehensive assessment of its stormwater system and its deficiencies, and it provides an important planning context for The Blueprint.

Guelph covers approximately 88 km² of urban land organized into 23 subwatersheds, with roughly 90 km of watercourses. Existing stormwater management facilities currently provide some form of control to only 46.6 per cent of the City's urban area, meaning approximately 53.4 per cent of the urban area has no water quality or quantity control. Much of this uncontrolled area was built before modern stormwater management requirements were in effect.

The findings of the 2023 Stormwater Management Master Plan identified the current challenges with stormwater management:

- **Legacy Infrastructure Gap.** The legacy infrastructure gap is the central challenge the master plan sets out to address. Older parts of the city were developed under significantly lower stormwater standards, and these areas generally received poor subwatershed health and are therefore the top priority for project implementation.
- **Maintenance and Upgrading.** Beyond coverage gaps, the existing stormwater facility network requires substantial maintenance and upgrading. The master plan identifies a significant number of facilities requiring sediment removal, structural maintenance, and performance retrofits, including conversions from dry to wet ponds to restore water quality treatment capacity. Fifteen new end-of-pipe stormwater management facilities are also recommended, eleven of which are to be integrated with planned park rehabilitations.
- **Urban Flooding.** Urban flooding is a growing concern. Hydrologic and hydraulic modelling confirms that climate change and urban intensification pose a measurable risk to the level of service provided by the City's minor storm sewer system, and that low impact development measures will be required to build climate resilience into the network.
- **Watercourse Health.** Watercourse health is also under pressure. The master plan identifies numerous erosion sites across the city's creek system, ranging from failing outfalls and retaining walls to exposed sanitary infrastructure and scoured banks, requiring a combination of local repair works, reach-based restoration, and in some cases, removal of risk.
- **Budget Pressures.** Finally, budget pressures are already affecting the pace of implementation. Through the 2025 and 2026 budget cycles, 31 stormwater projects have been deferred from the immediate-term horizon into medium and long-term timeframes, with water quality treatment, watercourse remediation and channel naturalization among the programs most affected.

Taken together, these conditions underscore why stormwater management is a key element of The Blueprint. The City is simultaneously managing a large backlog of uncontrolled catchments, aging facility infrastructure, increasing flood risk driven by climate change, and constrained capital capacity. The One Water approach offers a framework for identifying synergies between stormwater, water supply and conservation investments that could improve overall system resilience and reduce long-run costs.

2.1.7 Wastewater Treatment Challenges

The City of Guelph's wastewater treatment system is centred on the Water Resource Recovery Centre (WRRC) at 530 Wellington Street West, which receives all municipal wastewater and discharges treated effluent directly to the Speed River. The Wastewater Treatment and Biosolids Management Master Plan, approved by Council in 2022, provides the framework for managing treatment capacity, effluent quality and biosolids through to 2051.

- **Wastewater Assimilation.** The central challenge is a common conflict between growth and a constrained receiving water body. Future wastewater flow projections developed as part of the Master Plan show average daily flows increasing from approximately 56.6 ML/d in 2019 to 79.2 ML/d by 2051, driven by population growth from roughly 142,000 to 203,000 people over that period. This growth represents a roughly 40 per cent increase in treated effluent volume over the planning horizon. The Speed River, however, has a fixed assimilative capacity, and the Master Plan explicitly addresses the impact of Guelph's growing population on both the wastewater treatment process and the Speed River's capacity to receive additional effluent. As flows rise, tighter effluent quality limits become necessary to hold pollutant loadings within what the river can sustain, requiring progressively more advanced treatment technology over time.
- **Inflow and Infiltration (I&I).** Compounding the growth pressure is the problem of inflow and infiltration. Sanitary flow monitoring conducted between 2016 and 2020 revealed significant rain-derived inflow in older downtown sewers. This extraneous flow consumes treatment capacity that is already under pressure from population growth, and it worsens directly with the same intense storm events that the stormwater system is increasingly struggling to manage. Reducing I&I is therefore both a collection system maintenance priority and a plant capacity issue.
- **Biosolids management.** The volume of residual solids produced at the WRRC will grow in proportion to wastewater flows, requiring expanded handling, processing and disposal capacity over the planning horizon. The Master Plan directs the City to continue and potentially expand on-site energy production to reduce costs and carbon footprint, and to improve filtration to increase capacity in the third stage of the treatment process.
- **Budget Pressures.** Finally, budget pressures are already affecting the pace of capital delivery. Growth-enabling projects from the Master Plan have been captured in the City's 10-year capital budget, and upgrades at the WRRC are identified as supporting growth City-wide, including in the Secondary Plan areas. As with stormwater, the affordability environment means that deferred investment in treatment capacity carries real risk: each year of delay against a rising flow trajectory narrows the window before the plant reaches its permitted limit.

2.2 Future Trends

2.2.1 Water Demand

Forecasting future water demand is a critical component of long-term water supply planning. Reliable demand projections allow the City to evaluate whether existing water supply, treatment, and distribution infrastructure will be sufficient to meet future needs and to identify when additional investments may be required. Water demand forecasts must account for anticipated population and employment growth, changes in land use patterns, and potential shifts in per capita water consumption resulting from public stewardship programs (audits, rebates, incentives), technology improvements and system management practices.

This section presents an updated assessment of future water demand to the planning horizon of 2051. The analysis begins with a breakdown of current water demand (2024), including residential, ICI and non-revenue water components. These values establish the baseline from which future demands are projected.

The section then reviews the 2051 demand projections developed as part of the 2022 Water Supply Master Plan (WSMP). These projections incorporated assumptions regarding population and employment growth as well as anticipated improvements in water use efficiency. The analysis presents Scenario 5 from the 2022 WSMP, which reflects assumptions made at the time of the study and correspondingly lower per capita water use assumptions.

Finally, the section evaluates a projection based on maintaining current per capita water demand levels, providing a comparison to the previously developed planning scenarios. This comparison illustrates the potential influence of current conservation trends on long-term system demand and infrastructure requirements.

Table 2 summarizes future water demand projections described above:

Table 2 2051 Water Demand Projections

	Residential Population	Employment Population	2024 Water Demand		2051 Water Demand Estimates					
					2022 WSMP		2022 WSMP Scenario 5		Current Trend Projection	
			Lcd	m³/day	Lcd	m³/day	Lcd	m³/day	Lcd	m³/day
Existing Demand										
Low / Medium Density Residential	99,308		170	17,457	167	16,584	158	15,689	170	16,882
High Density Residential	54,492		155	8,006	167	9,100	158	8,609	155	8,446
ICI		87,000	172	14,945	191	16,617	181	15,720	181	15,720
Total Customer Demand				40,408		42,302		40,017		41,048
Growth Demand (2025-2051)										
New Low / Medium Density	25,816				167	4,311	158	4,078	162	4,182
New High Density	27,389				167	4,574	158	4,327	147	4,026
New ICI		29,000			191	5,539	181	5,240	181	5,249
Additional Customer Demand						14,424		13,645		13,457
Non Revenue Water Demand										
Existing (2024)	153,800		32	4,915						
Future (2051)	208,000				61	12,688	58	12,064	41	8,528
Average Day Demand (ADD) (m³/day)				45,323		69,414		65,727		63,034
Maximum Day Demand (MDD)(m³/day)				60,733		93,014		88,074		84,465
Cumulative MDD Savings (m³/day)										3,609
Value of Savings over Scenario 5 (\$M)										\$28M

2024 Water Demand

This section describes the breakdown of the City's average 2024 water demand based on water balance calculations, billing and production records.

Low- and medium-density residential customers use 17,457 m³/day, or 170 Lcd (Litres Per Capita Per Day) with a population of 99,308. High-density residential development customers use 8,006 m³/day, or 155 Lcd with a population of 54,492.

The ICI sector accounts for an average water demand of 14,945 m³/day, which translates to 172 lcd based on employment population. The 2022 WSMP describes ICI water demand in terms of employment population which provides the basis for this summary.

In addition to customer consumption, the City experiences non-revenue water demand associated with water losses, leaks and operational uses. Non-revenue demand is approximately 4,915 m³/day, equivalent to about 32 lcd based on the estimated serviced residential population of 153,800.

Together, these components produce the total current average day demand of 45,323 m³/day, with a corresponding maximum day demand (MDD) of 60,733 m³/day using the MDD adjustment factor (MDF) of 1.34 introduced in the 2022 WSMP.

2051 Water Demand Based on the 2022 Water Supply Master Plan

The 2022 Water Supply Master Plan (WSMP) projected future demand based on assumptions that reflected water demand trends at that time. Under the assumptions of this scenario, the current populations would generate 42,302 m³/day of customer demand. This estimate reflects changes in per capita water use assumptions, including:

- 167 lcd for the low-, medium- and high-density residential populations
- 191 lcd for the ICI employment population

From 2025-2051, the Province of Ontario's Places to Grow Act projects a population increase of 25,816 residents in low- and medium-density areas and 27,389 residents in high-density areas, along with an employment population increase of 29,000. This growth will increase ADD by 14,424 m³/day based on the per capita assumptions.

Non-revenue water demand is also projected to increase as the system grows. With a future serviced population of 208,000, non-revenue demand is estimated at 12,688 m³/day, reflecting a planning allowance of 61 lcd.

Combined, these components result in a total projected 2051 ADD of 69,414 m³/day, with a corresponding MDD of 93,014 m³/day.

2051 Water Demand Based on the 2022 WSMP Scenario 5 Conservation Case

The 2022 Scenario 5 represents an aggressive water conservation scenario that assumes further reductions in per capita demand. Under this scenario, ADD associated with the existing population is estimated at 40,017 m³/day, reflecting a 4.6 per cent reduction in per capita water consumption as follows:

- 158 lcd for residential population
- 181 lcd for ICI population

Future growth contributes an additional 13,645 m³/day of customer demand based on the water consumption reduction assumptions.

Non-revenue water demand is also reduced under this scenario, estimated at 12,064 m³/day based on 58 lcd.

Together, these assumptions result in a 2051 average day demand of 65,727 m³/day and a maximum day demand of 88,074 m³/day.

2051 Water Demand with Current Trend

If the City were to maintain current per capita water use levels and experience minor efficiency gains in new construction, water demand in 2051 would be lower than the 2022 WSMP Scenario 5 conservation case. Assumptions built into this project include:

- Existing Residential: 170 lcd for low/medium density and 155 lcd for high density as per the 2024 scenario.
- New Residential: 162 lcd for low/medium density and 147 lcd for high density, which represents a 5 per cent reduction from the 2024 scenario. This reduction is assumed to be conservative given that new homes are constructed with higher efficiency toilets and fixtures compared with many of the existing homes. Furthermore, half of new development will be occurring in high-density residential which is likely to have an even lower per capita rate.
- Existing and New ICI: 181 lcd, which is 9 lcd higher than the current trend and equal to the 2022 WSMP Scenario 5 assumption. Maintaining this assumption equal to Scenario 5 is assumed reasonable given greater variability and uncertainty in future businesses. While this higher assumption has been maintained, it could be very likely that future ICI water consumption will be much lower than current given trends toward low water use commercial activity.
- Non-Revenue Water: 41 lcd, which is 9 lcd greater than the current trend but more consistent with NRW per capita demand several years ago and considers the potential that current NRW may be lower than longer-term trends that may be associated with aging infrastructure.

Under this projection:

- Existing customer demand in 2051 is estimated at 41,048 m³/day.
- Growth between 2025 and 2051 contributes 13,457 m³/day of additional demand.
- Non-revenue water demand is estimated at 8,528 m³/day, reflecting an assumption of 41 L/person/day.

The above assumptions result in a total projected 2051 ADD of 63,034 m³/day, with a MDD of 84,465 m³/day. Relative to the Scenario 5 planning case, maintaining current water use levels results in 3,609 m³/day lower MDD, representing an estimated infrastructure savings of approximately \$28 million. Based on in this projection, the most critical assumptions (and opportunities) for future water demand include the uncertainty built into NRW demand and ICI sector water demand.

2.2.2 Stormwater

The Stormwater Master Plan used a city-wide minor/major system hydraulic model, built on approximately 425 km of modelled storm sewer, to assess how the conveyance system will perform under a range of future scenarios. The modelling tested growth intensification alone, growth combined with climate change, grey infrastructure (pipe upsizing), and three levels of green infrastructure volume control (5 mm, 14 mm and 28 mm retention targets). The results indicate that the combined pressure of urban growth and a changing climate will materially worsen surcharging and flood risk unless substantive source controls are implemented.

- Rainfall intensification.** The analysis found statistically significant increasing trends in short-duration rainfall events, particularly at the 1-hour duration, indicating that this increase is unlikely to be due to chance. Increasing trends were also observed across most other sub-hourly and multi-hour durations. The analysis also projects that climate change will continue to drive upward shifts in rainfall intensity through 2050 and beyond. The Stormwater Management Master Plan incorporated updated climate-adjusted IDF curves into its modelling, meaning the scenario results reflect the expected future precipitation environment rather than historical norms.
- Future growth effects.** Urban intensification under Official Plan Amendment 80 and the Clair-Maltby Secondary Plan will increase directly connected impervious area across many existing catchments. The Stormwater Management Master Plan explicitly modelled future imperviousness associated with infill development and combined it with climate change parameters to ensure planned infrastructure responses are future-ready. Growth alone expands the volume and speed of runoff entering the storm sewer system, compressing times of concentration and increasing the frequency of surcharged conditions in the minor system.
- Combined growth and climate change scenario.** The modelling identified this combined scenario as the design stress case for the system. The hydrologic and hydraulic analysis confirms that climate change and urban intensification together pose a measurable risk to the level of service provided by the City's minor storm sewer system, which is designed to convey runoff generated between the 1-in-2 year and the 1-in-5-year event. The major system (designed for the 1-in-100-year event) also faces increased overland flow volumes and depths at identified flood-prone locations, as demonstrated by 2D modelling of four high-priority sites.
- Water balance implications.** Increased imperviousness suppresses infiltration and evapotranspiration, converting a larger share of precipitation into surface runoff. Climate change is expected to result in increased extreme rain events in southern Ontario, and this trend, combined with denser urban land cover, will place further stress on both the conveyance network and receiving watercourses. The longer-term effect is a shift in the city's water balance away from groundwater recharge and toward higher and faster surface runoff, compounding both flood risk and erosion in downstream watercourses.

- **Green infrastructure as the preferred response.** The model scenarios consistently demonstrated that Low Impact Development (LID) volume control outperforms grey infrastructure (pipe upsizing) in addressing these trends. The Stormwater Management Master Plan's preferred approach is to require 5 mm of on-site volume retention for all new development and redevelopment, with higher targets applied where feasible through LID road retrofits and park-integrated facilities.

2.2.3 Wastewater

The Wastewater Treatment and Biosolids Management Master Plan, approved by Council in 2022, sets out a strategy to manage treatment capacity and environmental compliance from the date of approval through to 2051. It is the primary source of the City's long-term wastewater flow projections and infrastructure priorities.

- **Growing flows against a fixed receiving environment.** Wastewater flow projections developed as part of the master plan show average daily flows increasing from approximately 56.6 ML/d in 2019 to 79.2 ML/d by 2051, driven by population growth from roughly 142,000 to 203,000 people over that period. This represents a roughly 40 per cent increase in average treated effluent volume over the planning horizon. The constraint is not only plant capacity, but the Speed River itself: the master plan explicitly addresses the impact of Guelph's growing population on the Speed River's capacity to assimilate additional treated effluent loads. As flows increase, tighter effluent quality limits become necessary to hold pollutant loadings within the river's assimilative capacity, requiring progressively more advanced treatment processes over time.
- **Approaching existing capacity limits.** The plant's approved capacity at the time of the 2009 Master Plan was 73.3 ML/d, and flow projections indicate that this capacity threshold would be reached by approximately 2031. The 2022 Master Plan responds to this pressure by directing the City to maximize use of existing buildings and treatment processes before committing to new infrastructure, and by improving filtration to increase capacity in the third stage of the wastewater treatment process and ensuring regulated discharge limits into the Speed River remain safe and sustainable based on technical data collected upstream and downstream of the treatment facility.
- **Inflow and infiltration as a hidden driver.** A material share of the flow reaching the WRRC is from rain-derived inflow entering the collection system through aging infrastructure. Sanitary flow monitoring conducted between 2016 and 2020 revealed significant rain-derived inflow in older downtown sewers, and recalibration efforts have been underway as a result. The 2019-2020 Inflow and Infiltration (I&I) Study identified defects and mitigation strategies, and reducing extraneous flow remains both an operational and capital priority. Every litre of I&I that reaches the WRRC consumes treatment capacity that population growth has already claimed, making I&I reduction a direct lever on the timing of future plant expansions.

- **Biosolids and energy as linked challenges.** The Master Plan addresses biosolids management alongside treatment capacity, with a focus on resource recovery, greenhouse gas reduction and energy efficiency at the WRRC. The Master Plan takes into account infrastructure lifecycles, river assimilative capacity studies and makes recommendations on equipment replacement timing accordingly.
- **Conservation as a capacity buffer.** The Master Plan is explicitly integrated with the WSMP through shared water demand forecasts. Since most of the water demand ends up as wastewater, the water demand forecast used to project supply requirements serves equally as the primary input to the Master Plan's flow projections, and the Master Plan then identifies alternatives to address future treatment capacity needs. This linkage is directly relevant to The Blueprint, as water demand reduction achieved through conservation programs, AMI-enabled leak detection and per capita consumption improvements all translate directly into lower wastewater flows, deferred capital expenditure at the WRRC, and reduced pollutant loading to the Speed River. Constraints on wastewater assimilative capacity also influence overall water supply planning, and treated effluent reuse represents an identified opportunity that connects the supply and wastewater treatment systems within a One Water framework.

2.3 One Water Vision

While developing The Blueprint, the City established the following visions and principles statement to guide this project:

“The City of Guelph is recognized as a national leader in water conservation and efficiency. Guelph is building a collaborative relationship with its valued residential, industrial, commercial and institutional water users by integrating water supply, wastewater, stormwater and reuse into a One Water framework. The City will safeguard water resources, support community growth, and build climate resilience while maintaining water demand at the lowest achievable and economically sustainable levels.”

The Blueprint: Guelph's One Water Plan follows the One Water approach, which refers to an integrated planning and implementation strategy that considers the urban water cycle as a single, interconnected system. Rather than treating drinking water supply, stormwater and wastewater as separate entities, it aims to balance the needs of humans and the environment by managing water resources in a sustainable, equal and efficient manner.

One Water acknowledges the interactions between:

- the natural water cycle including precipitation, runoff, evapotranspiration, streamflow, and groundwater recharge;
- human impacts to the hydrologic cycle including water takings for water supply, wastewater discharge, and construction of buildings and paved surfaces resulting in increased urban runoff;
- natural features including wetlands and watercourses; and

- water-related infrastructure (sewers, watermains, bridges, stormwater facilities).

The One Water philosophy emphasizes the importance of reducing the need for new infrastructure construction and longevity of current infrastructure by optimizing the use of existing systems. This approach also places an emphasis on water conservation and offsetting drinking water with fit-for-purpose supply, such as stormwater or wastewater. These practices not only identify cost-effective solutions but also reduce the dependence on existing water sources, while minimizing impacts on the natural environment.

2.3.1 One Water Strategic Direction

Through various workshops and planning sessions, the project team arrived at a One Water strategic direction as illustrated on Figure 4. The structure establishes an integrated framework for managing water as a single, interconnected resource. It moves beyond traditional siloed approaches by linking water supply, wastewater and stormwater under common principles, coordinated governance and shared planning. Its outcomes will be guided by reliable data, active customer engagement, municipal system optimization and planning, and strong governance structures that embed One Water thinking into all water-related City plans and activities.

Functional Elements of the One Water Plan

The One Water Functional Structure provides a framework for how the City may coordinate the programs, data and decision processes that support drinking water, wastewater, stormwater and groundwater management. The structure is designed to ensure that all work undertaken through The Blueprint is aligned, transparent and guided by both operational needs and long-term planning objectives.

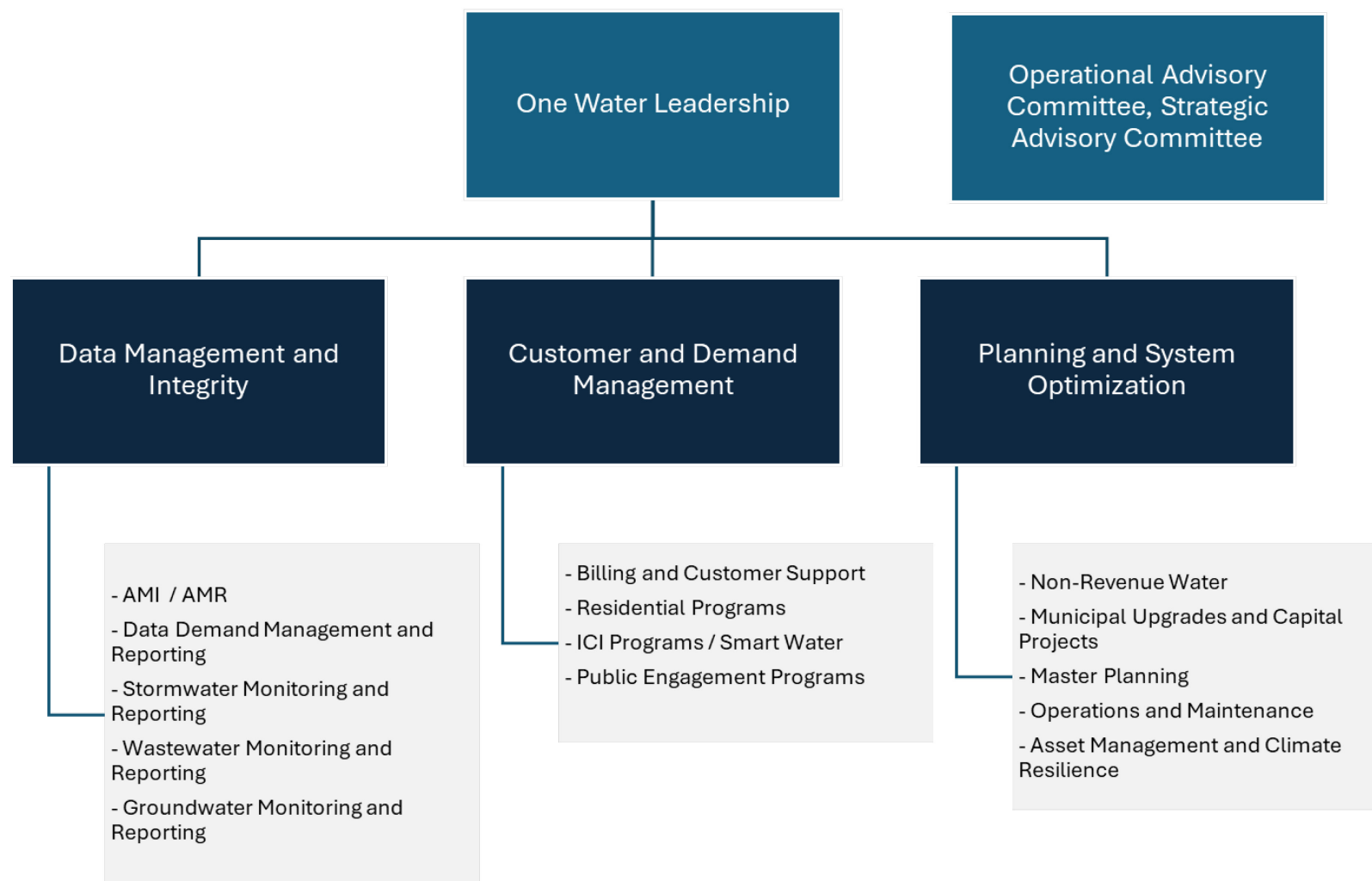


Figure 4 One Water Functional Structure

At the organizational level, One Water Leadership provides strategic direction and oversees implementation. Leadership may be supported by two committees. The Operational Advisory Committee focuses on program delivery, continuous improvement and staff coordination. The Strategic Advisory Committee provides guidance on long-range planning, alignment with corporate priorities and integration across service areas.

Three functional areas organize the programs that support One Water implementation.

- **Data Management and Integrity** includes programs responsible for collecting, managing and interpreting data across all water systems. This includes AMI and AMR, data management and reporting, stormwater monitoring and modelling, wastewater monitoring and modelling, groundwater monitoring and modelling and hydraulic modelling of the water system. Together, these programs provide a consistent and reliable information base that supports system performance assessments, coordinated reporting and evidence-based planning.
- **Customer and Demand Management** brings together programs that interact directly with residential, multi-residential and ICI customers. This includes billing and customer support, residential programs, ICI and Water Smart programs, and public engagement programs. These programs support water conservation, wastewater flow reduction opportunities, stormwater stewardship and the broader customer-facing components of the One Water Plan.
- **Planning and System Optimization** includes programs that guide long-term system performance, infrastructure planning and capital investment. This includes non-revenue water, master planning, municipal upgrades and capital projects, and asset management and climate resilience. These programs ensure that growth planning, operational improvements and capital decisions are aligned with One Water objectives and consider the full water cycle.

Together, these functional areas create a coordinated governance structure that links organizational leadership, operational programs and long-range planning. This structure will guide the transition from strategic direction development in Technical Memo 3 to integrated implementation planning in Technical Memo 4.

3 One Water Scenarios

This section provides an evaluation of the One Water initiatives introduced in Technical Memo 2. While the evaluation includes the project direct benefits associated with water demand reduction, it considers the many indirect benefits associated with building the One Water framework and integrating various related programs. The scope of this study included the evaluation of direct water demand savings initiatives but does not quantify the value of the many indirect benefits that may be realized by the City.

The City’s water management programs evolved over the past decade as a result of successful conservation initiatives, declining non-revenue water and changing patterns of industrial and residential water use. As a result, current per capita water demand is now lower than previously projected in the City’s Water Supply Master Plan. While this trend is positive, it also introduces uncertainty regarding the scale and type of water demand management initiatives required to manage long-term demand. At the same time, the City continues to face important strategic considerations including population growth, climate variability, infrastructure renewal and the need to maintain cost-effective and resilient water services. For these reasons, it is necessary to evaluate alternative approaches for managing water demand, including the assimilative capacity of the receiving bodies, over the long-term.

To support this evaluation, a set of program scenarios (Table 3) was developed to explore how different combinations of programs, policies, investments and organizational approaches could influence future water demand and the delivery of water-related programs. The scenarios range from a reduced program focused on the highest-return initiatives, to approaches that strengthen existing programs, introduce an integrated One Water governance structure, deploy advanced metering infrastructure or pursue district-scale water reuse systems. Each scenario represents a different level of ambition and investment and provides insight into the potential water savings, operational implications and strategic benefits associated with each approach.

Evaluating these scenarios allows the City to compare options in a structured way and to understand the trade-offs between program cost, organizational complexity, infrastructure investment and long-term water demand outcomes. This analysis helps identify a preferred path forward that supports sustainable water use, efficient system operation and alignment with broader One Water objectives.

The scenarios are intended to illustrate how different policy choices and investment strategies could influence future water consumption and the structure of the City’s water management programs and are described below:

Table 3 **Summary of One Water Scenarios**

Scenario	Program Approach	Key Features	Organizational / Technology Changes
Scenario A – Scaled Down	Reduced conservation program focused on maintaining only the highest-return initiatives.	Maintain key direct incentives and leak detection efforts; remove lower-performing residential incentives; continue public education and outreach programs to maintain awareness and water stewardship.	Existing organizational structure maintained with limited program scope.

Scenario	Program Approach	Key Features	Organizational / Technology Changes
Scenario B – Modified Business as Usual	Refined version of the current conservation program with targeted improvements.	Expand the Water Smart Business program maintaining audits, site visits and provide higher-value rebates; maintain non-revenue water reduction efforts; scale back lower-impact residential incentives while retaining education and outreach programs.	Minor adjustments to existing program delivery while maintaining current organizational resources.
Scenario C – One Water Structure	Integrated water management approach that reorganizes water conservation, planning and system optimization activities.	Includes all Scenario B initiatives plus expanded data management, enhanced internal reporting, integration of planning and asset management across water functions, and consolidation of customer programs within a One Water framework.	Establish a One Water governance structure supported by integrated analytics and data management systems; repositioning organizational resources.
Scenario D – AMI / AMR-Enabled System	Technology-enabled demand management built on the One Water organizational model.	Includes Scenario C initiatives plus universal advanced metering infrastructure, improved customer water-use reporting, enhanced leak detection and system optimization through tools such as virtual district metered areas.	Full AMI/AMR deployment with expanded data analytics and monitoring capability.
Scenario E – Residential District Water Reuse	Advanced infrastructure scenario incorporating district-scale non-potable water reuse systems.	Includes Scenario D initiatives plus potential development of district water reuse systems in major growth areas, such as reuse of treated wastewater effluent or groundwater management systems for toilet flushing and irrigation.	Requires development of district-scale reuse infrastructure integrated with new community development.

Together, these five scenarios illustrate a progression from program optimization, to organizational integration, to advanced data and information solutions, allowing decision-makers to evaluate how different levels of action and investment could influence future water demand and system performance.

3.1 Direct Water Demand Reduction Projections

This section provides an overview of the City’s current and proposed direct water savings initiatives, summarizing their projected savings, costs, and relative cost-effectiveness based on the detailed calculations presented in Appendix A. The following sections summarize how each program may contribute to overall water-demand reduction until 2051 as summarized in Table 4 spanning residential, ICI, non-revenue water, and system-wide metering or reuse initiatives.

Table 4 Summary of Direct Water Consumption Initiatives

Initiative	Historical Water Savings (m ³ /day)	Future Demand Reduction Opportunity (m ³ /day)	Value of Future Water Reduction	Future Investment	Future Indirect Benefit	Benefit-cost Ratio
Residential Initiatives						
Multi-Residential Water Audit	192.3	672.9	\$5,248,511	\$432,614	n/a	12.1
Blue Built Home Certification	12.9	41.2	\$321,086	\$705,372	n/a	0.5
Single-Family Home Water Audit	37.8	141.1	\$1,100,471	\$585,000	n/a	1.9
Water Sub-Metering Rebate	9.3	44.5	\$347,389	\$13,000	n/a	26.7
Royal Flush Toilet Rebate	186.6	173.8	\$1,355,718	\$227,500	n/a	6.0
Rain Barrel Discounts	27.0	78.0	\$608,400	\$351,000	n/a	1.7
Rain Garden Rebates	8.5	29.7	\$231,944	\$513,485	n/a	0.5
Rainwater Harvesting Rebates	1.6	11.9	\$93,165	\$128,793	n/a	0.7
Greywater Rebates	N/A	7.8	\$60,840	\$130,000	n/a	0.5
Water Smart Business						
Water Smart Business Program	224.6	2,306.0	\$17,987,167	\$1,153,024	n/a	15.6
Water Smart Business Program (Double Investment)	224.6	3,843.4	\$29,978,612	\$3,843,412	n/a	7.8
Water Loss Strategy						
Water Loss Strategy and Leak Detection Program		2,208.1	\$17,223,343	\$2,600,000	n/a	6.6
New Programs						
AMI/AMR Implementation		1,687.1	\$13,159,159	\$28,000,000	\$23,400,000	1.3
AMI/AMR Implementation + High Volume User focus		3,374.1	\$26,318,317	\$28,000,000	\$23,400,000	1.8
Focus on new builds - Residential Water Reuse		366.8	\$2,860,658	\$12,000,000	n/a	0.2

Note: The direct benefits of several of the customer-focused programs (e.g., ICI stormwater rebate) could not be monetized for this assessment and could not therefore be used for the quantified evaluation.

Table 4 above is derived from the water savings projections in Appendix A. Appendix A was reviewed by the City and discussed in a workshop setting, and reflects the experience developed

by the City over the course of the WC&E program. The columns in Table 4 above are described as follows:

- **Historical Water Savings (m³/day).** Historical water savings are documented by the City as part of its WC&E program.
- **Future Demand Reduction Opportunity (m³/day).** The future water demand opportunity is calculated in Appendix A according to assumptions documented. The calculation is based on the assumptions over a 26-year period (e.g., 2026-2051).
- **Value of Future Water Demand Reduction.** The Value of the future water demand reductions is calculated based on \$7,800 of water savings per cubic meter saved.
- **Future Investment.** Future investment includes rebates, incentives and direct costs not including salaries.
- **Future Indirect Benefit.** The future indirect benefit is only used to account for the calculated benefit of implementing AMI/AMR according to a 2019 AMI/AMR feasibility study.
- **Benefit-cost Ratio.** The benefit-cost ratio is calculated as the ratio of the future investment to the value of water savings.

The results of the calculations should be viewed as being relative, in terms of which initiatives should be prioritized over others. Actual demand savings will be based on various unknown factors including economic and residential trends, social factors and the impacts of aging infrastructure and the effectiveness of the City's future asset management programs. The direct benefits of several of the customer-focused programs (e.g., ICI stormwater rebate) could not be monetized for this assessment and could not therefore be used for the quantified evaluation. These programs, however, were still considered as part of the evaluation with the understanding that indirect benefits could be further monetized in the future.

The following sections describe the assumptions used to in developing the water demand reduction projections for the One Water scenario assessment. Many of the programs considered have multiple indirect or co-benefits that are not monetized within the scope of this project. There, the benefits and benefit-cost ratios are underestimated. Many of the indirect benefits of these programs are discussed in Technical Memo 2 and summarized later in Section 3.5 of this document.

3.1.1 Residential Programs

Single-Family Home Water Audit

The Single-Family Home Water Audit program provides in-home assessments of water use, identifying leaks and inefficient fixtures. The program has projected future savings over the 2026-2051 period of about 141.1 m³/day and a benefit-cost ratio of 1.9. This program offers uncalculated opportunity to educate on residential stormwater management, including rebate programs and best management practices, and things to be cautious when using their wastewater service (i.e., fats, oils, greases).

Multi-Residential Water Audit

Multi-residential audits are highly effective due to the scale of buildings assessed. Past performance shows strong savings, and forward projections estimate 672.9 m³/day of additional savings over the 2026-2051 period with a very high benefit-cost ratio of 12.1. This program offers uncalculated opportunity to educate on residential stormwater management and things to be cautious when using their wastewater service (i.e., fats, oils, greases). The City's past experience with this program and leveraging it to maintain relationships with building owners and managers makes it an impactful and economically efficient initiative.

Residential Sub-Water Metering Rebate

The sub-metering rebate encourages installation of unit-level consumption meters in buildings. Though participation numbers are lower than other programs, the savings per rebate are high, yielding a projected 44.5 m³/day of reductions at minimal cost and a strong benefit-cost ratio of 26.7. The City may be able to continue promoting the use of sub-meters without having to offer the rebate.

Royal Flush Toilet Rebate

This long-running rebate supports replacement of older toilets with WaterSense models. Historical uptake has been strong, and future participation is expected to remain steady but decrease over time. The program may deliver roughly 173.8 m³/day of projected savings at a benefit-cost ratio of about 6.0.

Rain Barrel Discounts

Rain barrel sales help reduce summer outdoor demand by diverting rainfall for irrigation and reducing direct runoff. Savings are modest but quantifiable, with projected reductions of 78 m³/day and a benefit-cost ratio of 1.7. This program is currently paid for by Stormwater as an outdoor-water initiative supporting community culture and education around conservation and cultivating an understanding on stormwater management and impact on infrastructure.

Rain Garden Rebates

Rain gardens contribute to stormwater retention, water quality polishing and irrigation offset. However, water-use savings alone remain relatively low; projected reductions are about 30 m³/day against a benefit-cost ratio of 0.5. However, this program has an uncalculated indirect benefit and may fit well within an educational program like the City's Healthy Landscapes program. This program is run by Stormwater, and from a One Water perspective is rationalized based on environmental and stormwater management co-benefits rather than potable demand savings.

Rainwater Harvesting Rebates

Rebates for storage tanks and all-season systems generate small but measurable reductions in potable use, totaling roughly 12 m³/day in projected savings. With a benefit-cost ratio of 0.7, the

program provides some value but is not cost-competitive based solely on water savings. This program is run by Stormwater, and from a One Water perspective is rationalized based on environmental and stormwater management co-benefits rather than potable demand savings.

Greywater Reuse Rebates

Greywater reuse systems for toilet flushing offer limited demand reduction due to low uptake and small per-unit savings. Forecast savings of 7.8 m³/day yield a benefit-cost ratio of 0.5, placing this initiative in the lower tier of cost-effectiveness.

Blue Built Home Certification

This certification aggregates multiple efficiency measures but historically has low participation and high cost per unit of savings. Forecast reductions of 41 m³/day result in a benefit-cost ratio of 0.5, indicating that while it has educational and market-signal value, it is not cost-effective as a pure water-savings program.

3.1.2 ICI Water Programs

Water Smart Business Program

The Water Smart Business Program provides audits and retrofit incentives for ICI customers and remains one of the strongest performers in the entire initiative suite. With projected savings and water leak identification and reduction exceeding 2,300 m³/day and a benefit-cost ratio of 15.6, it offers impactful future returns with proven historical results.

Water Smart Business – Double Investment Scenario

The City recognizes an opportunity to increase business participation in the Water Smart Business Program, particularly if it can stack ICI programs together and focus on high use customers. Doubling incentives may increase both participation and total water savings, pushing projected reductions to roughly 3,843 m³/day. The resulting benefit-cost ratio of 7.8 remains strong, though lower than the current program due to rising marginal costs. It represents an effective expansion option for larger-scale ICI engagement.

3.1.3 Non-Revenue Water

Water Loss Strategy and Leak Detection Program

Leak detection and repair is one of the most impactful investments for reducing system losses. The program targets a reduction of 2,208 m³/day with a benefit-cost ratio of 6.6 (not including cost of leak repair) providing the City can maintain its current rate of leakage on a per capita basis. This program consistently delivers high system value, especially given the compounding long-term impact of reduced real losses.

3.1.4 AMI / AMR

AMI / AMR – Standard Implementation

Advanced Metering Infrastructure and Advanced Meter Reading (AMI/AMR) enables precise customer-level monitoring and water demand reporting improved monitoring of distribution losses. Standard AMI implementation is projected to reduce demand by 1,687 m³/day and delivers a moderate benefit-cost ratio of 1.3 when meter-reading savings are included. It provides long-term structural benefits beyond the quantified water savings.

AMI / AMR – Active Management Scenario

When combined with high-use customer targeting, data analyses and virtual district metered areas, AMI is likely to strengthen operational performance and reduce water consumption. Savings may double to 3,374 m³/day, and the benefit-cost ratio increasing to 1.8. This scenario represents a more transformative, data-driven approach to system optimization.

3.1.5 Residential District Reuse / Purple Pipe

This scenario represents implementation of district-scale reuse for toilets and irrigation, offsetting demand in new development areas, but infrastructure costs are high. Projected savings of 367 m³/day for a large sized residential yield a benefit-cost ratio of 0.24, indicating that while technologically feasible, reuse requires specific development conditions to be cost-effective. The main barriers to making a residential district reuse program cost beneficial is the high cost of twinning water distribution infrastructure, and the limited use of water not treated to a potable drinking water standard.

3.2 One Water Scenario Descriptions

The five scenarios described in this section represent distinct combinations of programs, organizational changes and infrastructure investments, assembled to allow a structured comparison of how different levels of ambition and investment could influence future water demand and system performance. Each scenario is cumulative: Scenario B includes all Scenario A initiatives, Scenario C includes all Scenario B initiatives, and so on through Scenario E. This additive structure ensures that the scenarios represent coherent program packages rather than isolated alternatives, and that the relative contribution of each incremental investment layer can be assessed against the layers beneath it.

The initiative assignments within each scenario were developed in collaboration with the Core Project Team and confirmed at a working session held on February 20, 2026. That session, together with the scenario ranking exercises documented in Technical Memo 2, informed both the composition of each scenario and the phasing assumptions carried into the evaluation. The full list of initiatives assigned to each scenario is provided in Appendix B.

The quantitative evaluation framework described in Section 3.3 is focused on direct water demand savings and program costs. The scope does not fully monetize the many indirect benefits that the One Water framework generates across wastewater, stormwater, asset management, customer service and regulatory performance. The exception is AMI/AMR, for which a calculated indirect benefit is carried forward from the 2019 AMR/AMI feasibility study. All other indirect benefits are described in Section 3.5. The benefit-cost ratios used in the comparative evaluation should therefore be read as conservative lower bounds rather than complete assessments of program value.

The five scenarios are described in Sections 3.2.1 through 3.2.5, followed by the evaluation framework and results in Section 3.3.

3.2.1 Scenario A – Scaled Down Program

This scenario represents a streamlined version of the existing WC&E program (see Table 5). It focuses on maintaining only the highest-return initiatives, such as key direct incentives and continued attention to non-revenue water reduction, while removing lower-performing programs such as certain residential rebates. Education and outreach activities are retained to maintain public awareness and support for water stewardship. This scenario represents a minimal program focused primarily on cost efficiency.

Table 5 Scenario A - Scaled Down Program Initiatives

Category	Initiative
Organizational Structure	Existing Oversight
Organizational Structure	Indirect and Public Programs
Organizational Structure	Stormwater Program
Organizational Structure	Smart Business Program
Organizational Structure	Residential Programs
Direct Residential Programs	Single Family Home Water Audit
Direct Residential Programs	Multi Residential Water Audit
Direct Residential Programs	Rain Barrel Discounts
Direct ICI Programs	Stormwater Credit for Business
Direct ICI Programs	Water Smart Business Program
Indirect Programs	Public Outreach Events
Non-Revenue Water	Water Loss Strategy and Leak Detection Program
Data Management and Integrity	Urban Stormwater Management and Modelling

Note: Refer to Technical Memo 2 for comprehensive initiative descriptions.

3.2.2 Scenario B – Modified Business as Usual

Scenario B builds on the current program but introduces targeted improvements. Some lower-return incentives are scaled back while investment is increased in higher-impact initiatives such as the Water Smart Business program, audits and site visits. This approach maintains the existing

program structure but seeks to improve overall effectiveness through strategic adjustments and a greater focus on high-volume users. Scenario B includes both the initiatives in Table 6 and the initiatives in Scenario A.

Table 6 Scenario B – Modified Business as Usual Initiatives

Category	Initiative
Organizational Structure	Expanded Smart Business Program
Organizational Structure	Healthy Landscapes Program
Indirect Programs	Healthy Landscapes Visits
Indirect Programs	Subsidized Tree Planting Program
Indirect Programs	Curriculum Linked Education Program
Non-Revenue Water	Municipal Facility Water Efficiency Upgrades
Residential Programs	Lower Income Retrofit Subsidy Program
Residential Programs	High Volume Water User and Geography Program
Direct ICI Programs	Water Smart Business Program (Double Incentive)
Data Management	Water Consumption Data Management and Reporting
Data Management	Water Balance and Reporting
Data Management	AMI Pilot Project

3.2.3 Scenario C – One Water Structure

Scenario C shifts the focus from individual programs toward developing a more integrated organizational model for water management at the City. In addition to the initiatives in Scenario B, this scenario introduces a One Water governance structure that integrates planning, asset management, customer programs and system optimization. Expanded data management, reporting and cross-department coordination create the foundation for a more data-driven and integrated water management approach. While immediate demand reductions may be modest, this scenario is intended to establish the organizational capacity needed for long-term system optimization. Scenario C includes the initiatives in Table 7 below and the initiatives in Scenarios A and B.

Table 7 Scenario C – One Water Structure Initiatives

Category	Initiative
Organizational Structure	AMI and AMR Leadership
Organizational Structure	One Water Oversight Structure
Residential Programs	Rain Garden Rebates
New Residential Programs	Community-Led Initiatives
Data Management	Expanded Stormwater Monitoring
Data Management	Enhanced Monitoring and Flow Measurement
Data Management	Integrated Data and Analytics Platform
One Water Planning	Asset Management Alignment
One Water Planning	Consolidate Management of Customer-Facing Interactions
One Water Planning	Integrate Master Planning

Category	Initiative
One Water Planning	Integrated Water Demand and Conservation Management and Reporting
One Water Planning	Implement Consistent KPI Framework
One Water Planning	Climate Risk and Asset Management Program
One Water Planning	Stormwater Management and Low Impact Development Strategy
One Water Planning	Updated Policies, Standards and Maintenance
One Water Planning	Water Related Energy Monitoring and GHG Mitigation
One Water Planning	Energy Optimization and Efficiency Reporting
New ICI Programs	High Volume Water User and Sector Program
New ICI Programs	ICI Recognition Programs

3.2.4 Scenario D – AMI / AMR Enabled System

Scenario D builds on the One Water framework by introducing universal AMI/AMR implementation and enhanced data analytics. These technologies enable more transparent customer water-use reporting, improved leak detection and system optimization through tools such as virtual district metered areas. The scenario therefore combines organizational integration with advanced monitoring technology to drive further reductions in water demand and non-revenue water. Scenario D includes the initiatives in Table 8 and the initiatives in Scenarios A, B and C.

Table 8 Scenario D – AMI/AMR Enabled System Initiatives

Category	Initiative
Organizational Structure	Project Management Capacity
Residential Programs	Study Tiered Water or Conservation Pricing (Residential)
ICI Programs	Study Tiered Water or Conservation Pricing (ICI)
ICI Programs	Non-Potable Water Reuse and Alternative Supply
Data Management	AMI Implementation Passive Management
Data Management	AMI Data Management and Reporting
Systems Optimization	Systems Optimization Specialist
Systems Optimization	Virtual District Metered Areas

3.2.5 Scenario E – Residential District Water Reuse

Scenario E represents the most advanced scenario and incorporates district-scale water reuse systems in key development areas. Potential applications include reuse of treated wastewater effluent or groundwater management systems for non-potable uses such as toilet flushing and irrigation. While this scenario offers the potential for additional reductions in per capita water demand in specific districts, the infrastructure costs associated with these systems would be significant relative to the overall water savings achieved. Scenario E includes the initiatives in Table 9 and the initiatives in Scenarios A, B, C and D.

Table 9 Scenario E - Residential District Water Reuse Initiatives

Category	Initiative
Residential Programs	Water Sub Metering Rebate
Residential Programs	Rainwater Harvesting Rebates
Residential Programs	Greywater Rebates
Residential Programs	District Water Reuse / Purple Pipe
Non-Revenue Water	Purple Pipe Water Reuse and Recycling

3.3 One Water Scenario Evaluation

The evaluation of the One Water scenarios is intended to create a strategic path for the City's future One Water initiatives. In addition to comparing the magnitude and cost of potential water savings, the preferred approach should also be assessed against a broader set of criteria that reflect the City's long-term objectives for integrated water management. These criteria include the ability of each scenario to reduce potable water demand, improve operational efficiency, restore the natural water cycle, and strengthen the integration of planning and decision making across drinking water, wastewater and stormwater systems. Consideration will also be given to how each scenario supports improved data management and monitoring, enhances coordination between customer programs and infrastructure planning, and builds the organizational capacity needed to optimize the entire urban water system over time. Taken together, these factors help identify a strategic direction that not only manages future water demand, but also advances a more integrated, efficient and resilient approach to water-related planning and operations.

The scope of this current study does not include identification of the City's staff or operational costs outside of the current WC&E strategy. The scope does not therefore include an estimation of direct benefits or co-benefits that may be experienced when the City migrates into a One Water framework. The following analysis in this section evaluates the Scenarios in terms of potential savings of water, balanced by the increase in staff and expenditures that would be required to build a One Water Plan but only those incremental investments needed to meet the water savings objectives.

Table 10 below provides a comparative evaluation of the One Water scenarios based on two primary metrics: incremental water demand reduction savings and incremental program cost. The purpose of this comparison is to illustrate how progressively more comprehensive program approaches influence long-term water savings and the cost required to achieve those savings.

Table 10 Evaluation of Water Savings Benefits and Costs

Scenario Component	Scenario A Budget Reduction	Scenario B Business As Usual	Scenario C One Water	Scenario D AMI/AMR	Scenario E Residential District Water Reuse
Scenario 5 Demand Projections					
2051 S5 Demand Projection (ADD)	65,727	65,727	65,727	65,727	65,727
2051 S5 Demand Projection (MDD)	88,074	88,074	88,074	88,074	88,074
Current Trend Demand Projections					
2051 Current Trend Demand Projection (ADD)	63,034	63,034	63,034	63,034	63,034
2051 Current Trend Demand Projection (MDD)	84,465	84,465	84,465	84,465	84,465
Demand Reduction Initiatives					
2051 Demand Reduction Target	3,198	4,785	4,785	6,046	6,477
2051 NRW Reduction Target	2,208	2,208	2,208	2,635	2,635
Total Reduction Target	5,406	6,994	6,994	8,681	9,112
One Water Scenario Demand Projection					
2051 Demand Target (ADD)	57,627	56,040	56,040	54,353	53,922
2051 Demand Target (MDD)	77,221	75,094	75,094	72,833	72,255
One Water Demand Reduction (versus Scenario 5)					
2051 Demand Reduction (ADD)	8,099	9,686	9,686	11,374	11,805
2051 Demand Reduction (MDD)	10,853	12,980	12,980	15,241	15,818
Cost					
Staff Costs	\$581,100	\$971,100	\$1,845,000	\$2,145,000	\$2,145,000
Annual Disbursements	\$223,500	\$373,500	\$553,500	\$643,500	\$643,500
Annual Investment	\$96,986	\$200,463	\$200,463	\$200,463	\$210,916
Total Annual Costs	\$901,586	\$1,545,063	\$2,598,963	\$2,988,963	\$2,999,416
Total Annual Costs (2026-2051)	\$23,441,238	\$40,171,626	\$67,573,026	\$77,713,026	\$77,984,819
Implementation / One Time Costs	\$0	\$0	\$0	\$28,000,000	\$40,000,000
Total Costs (2026-2051)	\$23,441,238	\$40,171,626	\$67,573,026	\$105,713,026	\$117,984,819
Benefit¹					
Value of Water Demand Reduction (\$7,800 / m ³ /day)	\$84,651,773	\$101,242,909	\$101,242,909	\$118,876,181	\$123,381,330
Indirect Benefits	\$0	\$0	\$0	\$23,400,000	\$23,400,000
Total Benefit	\$84,651,773	\$101,242,909	\$101,242,909	\$142,276,181	\$146,781,330
Incremental Benefit¹ Cost Ratio (BCR)	3.61	0.99	0.00	1.08	0.37
Cumulative Benefit¹ Cost Ratio	3.61	2.52	1.50	1.35	1.24

Note:

¹ – Benefits only include the tangible value of savings in water demand (\$7,800 m³/day) and cost savings benefits with AMI/AMR.

Each scenario builds on the previous scenario by introducing additional initiatives, organizational changes or technology investments. Table 10 therefore shows the benefits and costs associated with moving from one scenario to the next, allowing the relative efficiency of different approaches to water demand management to be compared. In general, the earlier scenarios focus primarily on optimizing existing conservation programs, while the later scenarios introduce broader organizational integration, AMI/AMR infrastructure, and potential district-scale water reuse systems.

It is important to recognize that this evaluation is intentionally limited in scope. The comparison focuses only on direct potable water demand reductions and the incremental costs of implementing the associated programs or infrastructure. A number of important benefits associated with a One Water approach are not captured in this analysis.

First, the evaluation only monetizes the indirect benefit of AMI/AMR and does not include indirect benefits to other municipal service areas, such as reduced wastewater treatment loads, stormwater management benefits, improved asset management decision making, energy savings or greenhouse gas reductions. Many One Water initiatives are designed to create value across multiple parts of the urban water system, and these broader benefits are not reflected in the cost comparison.

Second, the analysis does not include the costs associated with many supporting activities that would form part of a broader One Water transition. These may include feasibility studies, pilot projects, policy development, planning studies, detailed engineering investigations or other implementation planning efforts that would occur over time as part of program development. Many of these costs are already accounted for by the City where these projects are included as outcomes of the master planning cycle.

Finally, the scenario analysis approach represents a simplified implementation schedule, where all scenarios are implemented and executed at the same time, with water savings and costs accounted for evenly throughout the time period. Additional details on these cost estimates and also refinement of staffing costs will be considered as part of Technical Memo 4 – Implementation Plan.

For the above reasons, the table should be interpreted as a high-level comparative tool that illustrates the relative magnitude of water savings and program costs associated with different strategic approaches. It is not intended to represent a complete benefit-cost analysis of the broader One Water initiative, which would involve a wider range of benefits, costs and service area impacts.

Table 10 above includes the following information for the evaluation of each of the Scenarios.

Scenario 5 Demand Projections

The Scenario 5 Demand Projections for ADD and MDD are based on the assumptions set forth in the 2022 WSMP and described in Section 2.2.

Current Trend Demand Projections

The current trend demand projections for ADD and MDD are based on 2024 water demand data and described in Section 2.2.

Demand Reduction Initiatives

The demand reduction describes the total of the average day water consumption and NRW water demand reduction targets associated with the initiatives described in Section 3.1 and assigned to each Scenario. These reductions are denoted as targets as they may be achieved based on the assumptions made in Section 3.1.

One Water Scenario Demand Projection

The One Water Scenario Demand ADD Projection is calculated as the ADD Current Trend Demand Projection subtracted by the Total ADD Reduction Target (ADD). The One Water Scenario Demand MDD Projection is calculated by multiplying the ADD value by the 1.34 MDD adjustment factor described in the 2022 WSMP.

Total Water Demand Reduction (versus Scenario 5)

The Total Water Demand Reduction is calculated by subtracting the One Water Scenario Demand Projection from the Scenario 5 Demand Projections for ADD and MDD.

Value of Demand Reduction (versus Scenario 5)

The Value of the Demand Reduction is calculated by multiplying the 2051 Demand Reduction (MDD) by \$7,800, which is an estimate of the total cost for the City of incremental water supply and treatment for each additional cubic metre of water per day.

Annual Cost

This section provides an estimate of the annual cost (Present Value) supporting the One Water structure and initiatives relating to water demand reduction. The costs do not include staffing or resources currently relating to other service areas that may be rolled into the One Water structure in the future.

- **Staff Costs:** Staff costs are calculated as the FTE equivalent of estimated total direct staff multiplied by \$78,000, which is roughly calculated from 2024 financial records.
- **Annual Disbursements:** Annual disbursements include all expenses and costs not included in salary, rebates or implementation costs and are calculated based on \$30,000 multiplied by the number of full-time staff, which is roughly calculated from 2024 financial records. Examples of disbursements can range from marketing, food, travel, conferences, contractors etc.
- **Annual Investment:** Total investment calculated as annual rebates and program costs calculated based on the initiative calculations described in Section 3.1.

- **Total Annual Costs:** Total annual costs are calculated based on the sum of staff costs, disbursements and investment.
- **Cumulative Annual Costs (2026-2051):** This total is calculated by multiplying the total annual cost by 26 years.
- **Implementation/One Time Costs:** Implementation costs are included to account for a) AMI/AMR implementation and b) infrastructure construction for Scenario E.
- **Indirect Benefits:** Indirect Benefits are only included to recognize the reduced cost of meter reading when implementing AMI/AMR.

Benefit-Cost Ratio

The benefit-cost ratio represents the ratio of water demand reduction (over Scenario 5) plus indirect benefits divided by the cumulative annual cost.

3.3.1 Scenario A – Scaled Down Program

Scenario A represents a reduced water conservation and efficiency program focused on maintaining only the highest-performing initiatives. The scenario prioritizes direct incentives and operational activities that have historically produced the greatest reductions in water demand, while removing or scaling back lower-performing programs. The strategic premise with the initiatives selected is that current water demand trends are lower than those considered in the 2022 WSMP, and that the City is likely to experience a continued reduction in water demand with a small reduction in investment. Key elements include maintaining targeted residential and multi-residential water audits, continuing the leak detection and water loss management program, and retaining education and outreach initiatives that help sustain a culture of water stewardship within the community.

From an evaluation perspective, Scenario A represents the lowest program cost among the scenarios but also delivers the lowest incremental water savings. The scenario largely preserves the current trend of declining non-revenue water and maintains core conservation activities but does not introduce significant new tools or program structures to drive additional demand reductions. As a result, the scenario provides a baseline level of conservation performance while minimizing program expenditures.

3.3.2 Scenario B – Modified Business as Usual

Scenario B builds on the current program structure but introduces targeted modifications to improve overall program effectiveness. The primary focus of this scenario is strengthening initiatives that have demonstrated strong performance, particularly those targeting high-volume water users in the ICI sector. Expanded investment in the Smart Water Business program, including site visits, audits and higher-value incentives, is intended to drive additional efficiency improvements among large water users.

Compared with Scenario A, Scenario B achieves greater water demand reduction while maintaining a moderate program cost. The scenario improves the effectiveness of the conservation program by concentrating resources on high-impact initiatives while reducing emphasis on lower-return residential incentives. As a result, the scenario represents a refinement of the existing program that increases water savings without fundamentally changing the organizational structure or introducing major new infrastructure investments.

3.3.3 Scenario C – One Water Organizational Structure

Scenario C represents a strategic shift from program optimization toward organizational integration through a One Water framework. In addition to the conservation initiatives included in Scenario B, this scenario introduces changes to the way water management activities are coordinated within the organization. Key elements include expanded data management and reporting capabilities, integration of planning and asset management across water-related functions, and consolidation of customer-facing programs under a unified One Water approach.

The evaluation indicates that the direct water savings associated with Scenario C are similar to those achieved in Scenario B. However, the primary objective of this scenario is not immediate demand reduction, but rather the establishment of a more integrated and data-driven organizational structure capable of supporting future system optimization. By aligning planning, asset management and customer programs, the scenario creates the institutional foundation required to deliver conservation initiatives more effectively over the long-term.

Because many of the benefits of organizational integration occur indirectly, they are not fully captured in the benefits used in this evaluation. As a result, the scenario's strategic value extends beyond the direct savings reflected in Table 10.

3.3.4 Scenario D – AMI / AMR Enabled System

Scenario D builds on the One Water organizational structure by introducing advanced metering infrastructure (AMI/AMR) across the water system. Universal smart metering provides near real-time consumption data for both the utility and customers, enabling more proactive demand management, improved leak detection and greater transparency in water use.

The introduction of AMI/AMR enables several operational improvements, including enhanced identification of system leaks, improved customer feedback on water consumption patterns, and the potential implementation of virtual district metered areas to support system optimization. These capabilities support both reductions in non-revenue water and modest reductions in customer water use resulting from improved consumption awareness.

The evaluation indicates that Scenario D produces additional water savings relative to Scenario C, particularly through improved leak detection and system monitoring. However, these benefits come with a significant increase in program and technology costs associated with system-wide meter replacement, data management systems and ongoing operational support.

3.3.5 Scenario E – Residential District Water Reuse

Scenario E represents the most advanced scenario and introduces district-scale non-potable water reuse systems in selected growth areas. These systems could include reuse of treated wastewater effluent or groundwater management systems to supply non-potable water for uses such as toilet flushing and irrigation within new residential districts.

The evaluation indicates that this scenario provides additional reductions in potable water demand in areas where district reuse systems are implemented. However, the infrastructure costs associated with constructing and maintaining separate distribution systems for non-potable water are substantial relative to the magnitude of water savings achieved.

As a result, while the scenario demonstrates the technical potential for reducing potable water demand within new developments, the incremental cost per unit of water saved is significantly higher than other scenarios. The evaluation therefore highlights that district-scale reuse systems may be more appropriately considered in the context of broader sustainability objectives rather than as a primary strategy for cost-effective water demand reduction.

3.3.6 Implications to Guelph's One Water Plan

Historically, the City's WC&E strategies have included programs and initiatives designed to reduce per capita water use. These initiatives have included fixture and appliance rebate programs, outdoor watering restrictions, industrial water audits and ongoing leak detection and repair efforts. The conservation and efficiency approach is primarily program-based and technology-driven. Initiatives from the Stormwater and Wastewater programs have had success, but have not been integrated with each other and to WC&E efforts.

This approach has been highly successful. Guelph's per capita water demand has declined by roughly 20-25 per cent since the mid-2000s, even as the city's population and employment base have grown steadily. However, as many easy and cost-effective efficiency measures have already been implemented, the marginal savings from additional conservation efforts are diminishing. The City is now approaching a point of "efficiency saturation," where achieving further reductions requires new thinking beyond traditional conservation tools.

Moving toward a strategy of water demand management would represent a broader, more integrated approach to managing how, when and where water is used across the community. While conservation and efficiency aim to reduce water use per capita, water demand management focuses on optimizing total system demand in relation to supply capacity, economic activity, land use and environmental objectives.

Practically, the One Water Plan would involve:

- Using demand forecasts as an active planning tool for growth management and servicing strategies. A management approach that relies on demand forecasts and adaptive management planning could include setting a strategic priority to ensure that the City always

has permitted water capacity in place to meet the projected water demand for a set period into the future, as an example. This approach could be reinforced with regular updates to water demand and capacity projections and incorporation of an adaptive management planning approach for new water supply.

- Prioritizing high-volume water users (high-density residential and ICI) for reductions based on customer-specific business needs and efficiency, given their influence on annual demand requirements.
- Expanding real-time monitoring and data analytics (e.g., through AMI/Smart Metering) to identify, predict and manage demand patterns dynamically. Without real-time monitoring it would be very difficult for Guelph to measure the success of its demand forecasting program, and to identify temporal or spatial trends in water use and efficiency.
- Embedding water use efficiency criteria into new development consultation, approvals and zoning bylaws.
- Aligning water pricing and conservation incentives to balance revenue stability with long-term demand objectives.
- Integrating water demand, supply and treatment objectives with all planning activities.
- Setting measurable, system-wide performance targets for both total and sectoral water demand and water supply capacity.

This strategic evolution would enhance the City's ability to defer or avoid costly new water supply projects, maintain system reliability under climate stress, and support Guelph's One Water objectives through greater integration of water supply, stormwater management and wastewater. See Table 11 below for a high level comparison of the Scenarios outlined above.

Table 11 Scenario Comparison Table

Scenario	Key Focus	Water Demand Reduction	Incremental Program Cost	Additional Benefits
Scenario A: Scaled Down Program	Maintain highest-performing initiatives	Lowest incremental savings	Lowest program cost	Preserves core conservation activities, sustaining a culture of water stewardship; minimal new tools introduced.
Scenario B: Modified Business as Usual	Strengthen existing programs, targeting high-volume users	Moderate water savings	Moderate program cost	Improved conservation effectiveness without major infrastructure changes; focus on high-impact initiatives.

Scenario	Key Focus	Water Demand Reduction	Incremental Program Cost	Additional Benefits
Scenario C: One Water Organizational Structure	Integrate water management activities	Similar to Scenario B	Higher costs due to organizational changes	Established data management and asset management integration; supports future system optimization through improved planning.
Scenario D: AMI/AMR Enabled System	Introduce advanced metering infrastructure	Additional savings due to system monitoring	Significant increase in program and technology costs	Enhanced leak detection, improves customer feedback; supports reductions in non-revenue water and proactive demand management.
Scenario E: Residential District Water Reuse	Implement district-scale non-potable water reuse systems	Significant reduction in potable demand in certain areas	Highest infrastructure costs relative to savings	Demonstrates potential for reuse in new developments but is costly; best viewed in context of broader sustainability goals.

3.4 Scenario Evaluation and Rationale

The One Water scenarios created to implement the various scenarios were evaluated through a structured process that combined interest-holder input, quantitative technical analysis and a multi-criteria evaluation of the five strategic scenarios. This section documents that process and the comparative evaluation that supports the recommendation to proceed with Scenario D, the AMI/AMR-Enabled System.

3.4.1 Interest-holder Engagement

A ranking workshop facilitated by Montrose was completed with key City of Guelph interest-holders. Participants applied an agreed evaluation framework to review and discuss the initiatives carried forward from the Review of Initiatives (Task Memo 2) and assemble them into logical scenarios described in the previous section. The rankings indicated how individual initiatives performed relative to one another and identified practical considerations, such as operational fit, customer acceptance and sequencing, that a desktop analysis would not capture.

The final set of initiatives, and the scenario into which they were grouped, was informed by the workshop results, consultant expertise, the baselines and findings established in Technical Memos 1 and 2, a review of comparable One Water programs in other jurisdictions, and interviews with external experts including staff from other municipalities as well as builders, plumbers and contractors. Additional considerations such as implementation timing, dependencies between initiatives, affordability, regulatory requirements and the need for a balanced and achievable

program were also taken into account. This approach ensured that the recommended scenario reflects both City priorities and practical implementation realities.

3.4.2 Scenario Evaluation Framework

To compare the five scenarios on a consistent basis, the scenarios were evaluated against the six criteria introduced in Technical Memo 2, using the same 1 to 5 rating scale applied to the individual initiatives during the ranking workshop. Applying a single scale at both the initiative level and the scenario level keeps the evaluation consistent and traceable from the underlying initiatives through to the final recommendation. The six criteria are:

- **Water Demand Reduction.** The incremental, measurable potable water demand reduction the scenario delivers above the scenario beneath it.
- **Environment and Climate.** The ability of the scenario to address wider environmental and climate risk factors, including restoration of the natural water cycle, reduced energy and greenhouse gas intensity, and resilience to climate stress.
- **Financial and Economic.** Whether the scenario delivers a positive benefit-cost ratio on its directly monetized benefits and costs, with indirect co-benefits accounted for on a conservative, qualitative basis.
- **Strategic Alignment.** How well the scenario advances the City's One Water ambition, in particular the integration of drinking water, wastewater and stormwater under coordinated governance, planning and data.
- **Societal and Cultural.** How well the scenario fits Guelph's social context and the City's established culture of water stewardship and customer engagement.
- **Political and Regulatory.** Whether the scenario can be implemented within the current political and regulatory environment without approvals or conditions that introduce material delivery risk.

On the 1 to 5 scale, 1 indicates the scenario does not advance the criterion, 3 indicates a neutral or adequate result, and 5 indicates the scenario advances the criterion strongly. The scenarios are cumulative, each building on the one before it, so for five of the six criteria the scores reflect the full content of each scenario. Water Demand Reduction is the exception. It is scored on the incremental water saved that each scenario adds beyond the scenario beneath it, because that increment is what the additional investment at each step is intended to offset. A scenario that adds organizational capacity without materially increasing direct savings, or that adds a small, localized volume at high cost, therefore receives a lower score on this criterion regardless of its cumulative total.

The results are summarized in the decision matrix below.

Table 12 One Water Scenario Decision Matrix (1 = does not advance criterion, 5 = advances criterion strongly)

Evaluation Criterion	A: Scaled Down	B: Modified BAU	C: One Water Structure	D: AMI/AMR Enabled	E: District Reuse
Water Demand Reduction (incremental)	3	4	4	5	5
Environment and Climate	2	3	4	5	5
Financial and Economic	5	3	2	4	1
Strategic Alignment	1	3	5	5	3
Societal and Cultural	2	4	5	4	2
Political and Regulatory	3	3	5	4	2
Total Score (out of 30)	16	20	25	27	18

3.4.3 Interpretation of Results

Scenario D receives the highest total at 27 of 30, followed by Scenario C at 25, Scenario B at 20, Scenario E at 18 and Scenario A at 16. The basis for each scenario's scores is set out below.

Scenario A (Scaled Down Program) receives the lowest total. By retaining only the highest-performing existing initiatives, it preserves the current declining trend in residential, ICI and non-revenue water but introduces no new tools or structures to drive additional reductions. Its low cost supports a high financial score as the City has the opportunity to achieve its stated water demand goals while minimizing costs. The scenario receives a moderate low scores (3) on water demand reduction as there are opportunities to achieve further savings. The scenario receives lower scores on strategic alignment, because scaling the program back moves the City away from the One Water ambition that the City is pursuing.

Scenario B (Modified Business as Usual) has a lower financial score than Scenario A because it requires a higher amount of spending on more complex programs, particularly the high-volume ICI initiatives such as the Water Smart Business Program, which provided opportunities to increase water demand savings. Scores on strategic alignment, societal and cultural, and political and regulatory are higher as the Scenario maintains the ability to deliver broader environmental and water programs with indirect benefits that are not reflected in the financial score. It remains a refinement of the existing siloed program and does not establish the organizational integration, data capability or system-side optimization that define the One Water approach, so it receives a moderate score on strategic alignment.

Scenario C (One Water Organizational Structure) is the point at which the program shifts toward integration. It establishes the governance, planning and data-management foundations the One Water vision requires, and it consolidates customer-facing programs under a single coordinated approach. It therefore receives the top score on strategic alignment and on societal and cultural fit, as it is the clearest organizational expression of the City's One Water ambition and builds on Guelph's existing stewardship culture. Its direct demand reduction is similar to Scenario B, so the incremental water saved is small, and much of its value is indirect and not captured in the financial case.

Scenario D (AMI/AMR-Enabled System) receives the highest total because it converts the organizational foundation of Scenario C into measurable, financially justified savings. Universal advanced metering, enhanced data analytics, improved leak detection and system optimization through tools such as virtual district metered areas deliver the largest increment of water demand reduction of any step in the sequence, roughly doubling the savings achieved by the conservation programs alone. Scenario D receives a top score on water demand reduction, environment and climate and strategic alignment. The metering and data layer is what operationalizes the One Water vision, providing the near real-time information the City needs to forecast demand, target high-volume users, validate savings, and manage the water supply and distribution system as a single integrated resource, and giving customers direct visibility into their own water use.

Scenario E (Residential District Water Reuse) is the most advanced scenario but adds little on an incremental basis. Beyond the savings already delivered under Scenario D, district-scale residential reuse contributes approximately 400 m³/day, and only in select new development areas. Its financial score is the lowest of the five scenarios: the cost of constructing and operating separate non-potable distribution infrastructure is high relative to the water saved, with the residential reuse initiative returning a benefit-cost ratio of approximately 0.3, below 1.0 and therefore indicating that costs exceed the monetized benefits. It also receives low scores on societal and cultural fit (uncertain desire in using non-potable water) and on the political and regulatory criterion (uncertain regulatory pathway), because district-scale dual-pipe systems require new regulatory approvals, depend on coordinated action with the development sector, and face public acceptance considerations that are not yet resolved in the Guelph context.

3.4.4 The Financial Case

Guelph's current per capita consumption already trends below the Scenario 5 case, which was the baseline objective set at the outset of this study. Achieving Scenario 5 is not the most achievable target available to the City; it will likely be achieved regardless of the One Water strategy. The Blueprint is designed to go further, and the financial case rests on the savings achieved above the Scenario 5 target, which is the value the City would not otherwise capture.

The savings associated with reduced water demand will likely exceed the cost of the program. Valuing the demand reductions above the Scenario 5 baseline against the long-run avoided cost of incremental water supply and treatment capacity, estimated at \$7,800 per cubic metre per day of maximum day demand avoided, Scenario D is projected to generate more than \$140 million in

cumulative benefits against approximately \$105 million in cumulative net cost over the planning horizon to 2051, expressed in 2026 dollars.

The Benefit to Cost Ratio for Scenario D is a conservative lower bound. With the exception of the metering efficiency benefit carried forward from the 2019 AMR/AMI feasibility study, the evaluation does not monetize the indirect co-benefits that a One Water approach generates across wastewater treatment loads, stormwater management, asset management, energy use and greenhouse gas reduction. As the City's data capability matures under Scenario D and these co-benefits become measurable, the realized return is expected to exceed the figure presented here.

3.4.5 Conclusion

Scenario D, the AMI/AMR-Enabled System, is the recommended strategic path forward for The Blueprint: Guelph's One Water Plan. It is the balanced position among the five scenarios: it delivers the largest increment of measurable water demand reduction, it is aligned with the City's One Water ambition, it fits the City's stewardship culture, it is financially justified on conservative assumptions, and it can be implemented within the current political and regulatory environment. It is not outscored on any individual criterion by any alternative, which makes the recommendation robust to differences of opinion about the relative importance of those criteria.

The more advanced measures contemplated under Scenario E, including district water reuse and purple-pipe systems, are not rejected but are deferred. They remain potential future opportunities to be considered on a case-by-case basis where conditions are favourable, such as in new development areas or where supporting infrastructure can be implemented cost-effectively. The Blueprint preserves this option through the targeted feasibility studies in Action J, allowing the City to revisit these measures as costs, regulations and public acceptance evolve, without committing resources to them before they are viable. Scenario D establishes the integrated, data-driven foundation on which those future measures would depend.

3.5 Recommended One Water Actions and Tasks

Scenario D, the AMI/AMR-Enabled System, is the recommended strategic path forward for The Blueprint: Guelph's One Water Plan. As established in Section 3.4, this selection reflects both the financial case for water demand reduction and the broader strategic value of the organizational, data and infrastructure investments that underpin the plan. Section 3.5 describes how Scenario D is structured as an implementation program, organized into ten strategic actions that translate the One Water vision into concrete, sequenced commitments.

The ten actions, labelled Actions A through J, are organized across four strategic themes introduced in Section 2.3: One Water Governance and Planning, Customer Engagement, System Optimization and Data Management and Integrity. Action A establishes the governance foundation on which all other actions depend. Actions B through E deliver direct and indirect conservation programs across residential and ICI customer segments. Actions F and G address metering infrastructure and water loss management. Action H builds the systems planning and optimization function that integrates capital investment decisions across the water cycle. Action I develops the

common data platform that underpins evidence-based management across all other actions. Action J funds a set of targeted feasibility studies that evaluate policy instruments and infrastructure opportunities not yet ready for implementation commitment.

The actions are cumulative in the sense that they are designed to reinforce one another over time, rather than operate as independent workstreams. Governance reform under Action A creates the coordination structures needed for Actions B through J to function coherently. The data platform built under Action I amplifies the effectiveness of AMI under Action F, the leak detection program under Action G, and the demand forecasting function under Action H. This interdependence is a deliberate design feature of the One Water approach: the combined value of the program exceeds what any individual action could deliver in isolation.

Table 13 below summarizes all ten actions and their associated tasks. Each action is described in greater detail in the corresponding subsection of Section 3.5, including its direct water savings contribution, implementation tasks, phasing and resource requirements. The indirect benefits generated by each action, many of which extend across wastewater, stormwater, asset management, and customer service, are summarized at the close of this section.

Table 13 Summary of Implementation Actions and Tasks

Action	Task	Description
A. Implement One Water Framework	Establishes the organizational structure, leadership and governance processes needed to transition the City toward a unified One Water management model. This action also creates the institutional foundation for coordinated delivery of water, wastewater, stormwater and conservation programs under shared objectives.	
	Maintain Current Oversight	Preserves existing reporting lines and operational responsibilities during the early transition to ensure continuity of all water-related services while new integrated structures are gradually introduced.
	Prepare Change Management Plan	Develops a structured plan to guide staff through the cultural and operational changes required by One Water integration, including communications, training and phased role transitions.
	Build One Water Oversight Structure	Creates a dedicated governance body and Operational and Strategic Advisory Committees, to coordinate programs, align cross-departmental priorities and guide strategy implementation across all water services.
	Implement Consistent KPI Framework	Introduces a shared set of performance indicators across drinking water, wastewater, stormwater and customer programs to enable transparent monitoring and evidence-based adaptive management.
B. Refresh Direct Residential	Updates and strengthens programs that work directly with single family households to reduce indoor water use through audits and targeted incentives. These programs maintain proven conservation tools while expanding access to underserved populations.	

Action	Task	Description
Water Management Programs	Maintain and boost Single-Family Home Water Audit	Continues offering in-home water efficiency assessments that help residents identify leaks, inefficient fixtures and irrigation practices and how to manage rainwater, connecting them with available rebate and incentive programs. AMI/AMR data, once implemented and available, can be used to prioritize candidates for audits (e.g., potential leaks, high-volume users, irregular trends).
	Introduce Low Income Single-Family Home Subsidy	Establishes a new subsidized program to ensure water efficiency and stormwater management upgrades - including fixture replacements and leak repairs - are accessible and financially feasible for lower-income households.
C. Refresh Healthy Landscapes Program	Promotes outdoor water efficiency and improved stormwater management at the property level through education, subsidies and green infrastructure incentives. Programs focus on reducing irrigation demand, improving infiltration and enhancing ecological health across the community.	
	Maintain and boost Current Program	Continues existing outreach and guidance programs that support sustainable landscaping practices, including drought-resistant planting and efficient irrigation techniques.
	Reimagine delivery of Residential Water Education Program	Delivers targeted education on rain barrels, rain gardens, and water-efficient vegetation choices to help residents understand and reduce their outdoor water use and stormwater footprint and to reintroduce water into the environment. Tie-in to Residential Water Use program.
	Maintain Rain Barrel Subsidies	Reinstates the discounted rain barrel program to encourage residents to capture rooftop runoff for irrigation use, reducing potable water demand during the summer outdoor watering season, and leverage as education tool for understanding stormwater impacts.
	Maintain Subsidized Tree Planting Program	Continues providing residents with access to discounted native trees to improve stormwater infiltration, reduce urban heat, enhance biodiversity and support long-term climate adaptation.
D. Refresh Water Smart Business Program	Strengthens and expands water conservation and stormwater management programs for the ICI sector, with a focus on high-volume users and building a culture of recognition and continuous improvement.	
	Maintain Stormwater Credit for Business	Continues offering stormwater fee credits to ICI customers that install best management practices such as green roofs, permeable pavement or infiltration systems to reduce runoff volumes and improve water quality.
	Maintain Current ICI Incentives	Preserves audit and retrofit incentive programs that support ICI customers in identifying and implementing water efficiency improvements.
	Expand ICI Incentives (Double Incentive)	Increases audit funding and rebate values, develop sector-based programming to drive greater participation, particularly among high-volume users, targeting a near-doubling of program water savings over the planning horizon.

Action	Task	Description
	Maintain Multi-Residential Water Audit	Continues providing building-level water efficiency assessments for large multi-residential properties to identify leaks, fixture upgrade opportunities and sub-metering.
	Develop and Introduce Recognition Program	Launches an awards and recognition program to publicly celebrate businesses and institutions demonstrating leadership in water conservation or stormwater management, encouraging peer learning and program visibility.
E. Refresh Indirect Water Management Residential Programs	Maintains and modernizes education, outreach, and community-led engagement programs that foster water conservation behaviours and stewardship without requiring direct audits or financial incentives.	
	Maintain Curriculum-Linked Education Program	Continues delivering water education materials, classroom visits and facility tours to schools, helping students build awareness of the water cycle, infrastructure and the importance of conservation. Right size number of tours, presentations per year.
	Maintain Public Outreach Events	Preserves seasonal campaigns, workshops, and open houses that help residents learn about One Water principles and practical ways to conserve water and manage stormwater on their properties. Right size number of events per year.
	Introduce Community-Led Initiatives (SNAP-like)	Launches a new neighbourhood-scale stewardship program modelled on the TRCA's Sustainable Neighbourhood Action Program, empowering community groups to plan and implement local water, green infrastructure and resilience projects.
F. Implement AMI/AMR City-Wide	Deploys advanced metering infrastructure and automated meter reading technology across the city in a phased approach, enabling real-time consumption monitoring, proactive leak detection, customer engagement and data-driven demand management.	
	Introduce AMI/AMR Leader	Establishes dedicated program leadership and governance to oversee AMI/AMR planning, procurement, phased deployment, data standards and ongoing program management.
	Revisit AMI/AMR Business Case / Implementation Plan	The 2019 AMI/AMR feasibility study can be revisited either as an update to that study or potentially by the City issuing request for bids for implementation.
	Implement AMI/AMR (Install, Configure, Billing)	Executes phased deployment of smart meters beginning with high-volume and new customers, integrating with billing systems, leveraging City collection systems (i.e., waste trucks for data collection) and providing customers with access to their own consumption data.

Action	Task	Description
	Operate AMI/AMR (with Annual Software Costs)	Manages ongoing system operations including software licensing, data transmission infrastructure, system maintenance and quality assurance of meter data.
	Develop AMI/AMR Internal Data Management and Reporting	Builds internal capacity to receive, store and analyze AMI data, linking consumption records with geospatial datasets and historical billing information to support advanced analytics and Virtual DMA operations.
G. Maintain and Expand Water Loss Strategy and Leak Detection Program	Sustains and strengthens the City's system-level non-revenue water program through continued active leak detection and introduces virtual district metering tools to enhance loss identification and support proactive NRW management.	
	Maintain Water Loss Strategy and Leak Detection Program	Continues active leak detection surveys, pressure monitoring, and targeted pipe repair programs to keep real water losses at or below current per capita levels as the system grows.
	Complete Virtual DMA Pilot Project	Pilots a virtual district metered area approach using AMI consumption data and hydraulic modelling to identify system anomalies, localize leaks and validate model performance in a defined study area.
	Implement Virtual DMA and Water Balance Tools	Scales the virtual DMA approach city-wide and integrates outputs with the AWWA water balance reporting program to enable proactive, spatially targeted NRW management across the distribution system.
H. Build Systems Optimization and Planning Function	Establishes an integrated planning and operational function that aligns asset management, capital planning, master planning and system optimization under the One Water framework to ensure long-term reliability, efficiency and resilience.	
	Continue Municipal Facility Water Efficiency Upgrades	Maintains a program of audits and retrofit upgrades at City-owned facilities to improve fixture efficiency, reduce operational water consumption and lower operating costs.
	Routine Water Demand and Capacity Projections	Produces regular updates to water demand forecasts and supply capacity assessments to support proactive growth management, permit planning and infrastructure investment decisions.
	Routine AWWA-Style Water Balance Reporting	Maintains consistent annual water balance reporting using AWWA methodology to track system losses, benchmark NRW performance and meet regulatory reporting requirements.
	Create Project Management Capability	Establishes dedicated project management capacity to plan, coordinate and deliver large cross-departmental One Water initiatives such as AMI deployment, data platform development and master plan integration.

Action	Task	Description
	Align Asset Management with One Water (incl. Climate Risk)	Integrates One Water objectives and climate resilience considerations into the City's asset management planning, renewal prioritization and capital budget processes.
	Integrated Master Planning (incl. Water Supply, Stormwater, Wastewater, Linear)	Coordinates the next cycle of master plans across water supply, stormwater, wastewater and linear infrastructure to capture co-benefits, eliminate duplication and align investment priorities with One Water goals.
	Monitor and Update Policies, Standards and Processes	Reviews and updates municipal policies, technical standards and operational procedures on a regular basis to reflect One Water principles, emerging best practices and lessons learned from program delivery.
	Integrate Energy and GHG Optimization and Efficiency Reporting	Tracks energy consumption and greenhouse gas emissions across water-related facilities and incorporates efficiency objectives into operational plans, capital project design and corporate sustainability reporting.
I. Design and Build Common Data Platform	Develops a centralized, integrated data and analytics platform connecting water supply, wastewater, stormwater and groundwater datasets to support evidence-based planning, operational decision making and future evolution toward a cohesive hydrology model of the urban water system.	
	One Water Data Management Review and Strategy	Conducts a comprehensive review of existing data systems, standards and gaps across all water-related programs and develops a strategy for integration, quality assurance and platform architecture.
	Build a Common/Integrated Data and Analytics Platform	Constructs a scalable enterprise platform to ingest, link and analyze datasets from internal and external sources including AMI, SCADA, GIS and cloud-based systems to produce actionable operational and planning intelligence.
	Expanded Stormwater Monitoring Network and Data Management	Adds monitoring locations and data management infrastructure to improve spatial understanding of stormwater runoff volumes, water quality and the performance of stormwater management facilities.
	Enhanced Wastewater Monitoring and Data Management	Strengthens monitoring of wastewater flows, inflow and infiltration and treatment plant performance and integrates this data into the shared platform to support system-wide reporting.
	Integrate Groundwater Monitoring and Pumping (SCADA)	Links the City's groundwater monitoring program and SCADA-based pumping records into the shared platform to support water supply sustainability analysis and reporting.

Action	Task	Description
	Manage Water Balance Calculations and Reporting	Automates and standardizes the annual water balance process using integrated data sources, reducing manual effort, improving accuracy and enabling more frequent reporting.
	Water Consumption and Reporting	Builds customer-level and system-level consumption reporting tools using AMI data to support program targeting, billing accuracy, customer engagement and demand management analytics.
J. Complete One Water Studies	Conducts targeted analytical and feasibility studies to evaluate emerging policy tools and infrastructure opportunities that could strengthen long-term water demand management, system resilience and equitable access to conservation programs.	
	Study: Lower-Income Retrofit Subsidy	Evaluates the feasibility, design, and cost effectiveness of a subsidy program to support low-income households in upgrading to efficient water fixtures and appliances, ensuring conservation benefits are accessible across all income levels.
	Study: Tiered Water / Conservation Pricing	Analyzes whether tiered or conservation-based water pricing structures could encourage reduced consumption among high-volume users while maintaining equitable access, revenue stability and alignment with municipal financial objectives.
	Study: Non-Potable ICI Water Reuse and Alternative Supply	Explores opportunities for ICI customers to substitute treated stormwater, greywater, or reclaimed wastewater for non-potable uses such as cooling, irrigation or process water, reducing demand on the potable supply.
	Study: District and Municipal Water Reuse Opportunities	Investigates the technical and economic feasibility of district-scale non-potable water reuse systems (including purple pipe infrastructure) for new development areas such as Clair-Maltby and the Guelph Innovation District, and for municipal operational uses.

3.5.1 Indirect Benefits of the One Water Strategy

Each of the ten Implementation Actions produces indirect benefits that extend beyond direct water savings. These benefits are described in greater detail in the Direct Benefits and Indirect Benefits subsections of Sections 2 through 11; the following provides a cross-action summary organized by action.

Action A: Implement One Water Framework

The governance and oversight structures created by Action A are the organizational foundation upon which all other indirect benefits depend. The primary indirect benefits are improved organizational efficiency through reduced duplication and streamlined cross-departmental coordination, enhanced staff engagement and retention through a well-managed change process, and political and reputational benefit from establishing Guelph as a leader in integrated water management. The KPI framework produces an adaptive management capability that allows early

course correction, an indirect financial benefit that is difficult to quantify but significant over a 25-year horizon.

Action B: Refresh Direct Residential Water Use Programs

Action B produces equity and social benefits by extending water efficiency program access to lower-income households. It also produces public co-benefits and builds community trust through direct resident engagement, and catalyzes participation in related rebate programs through the multiplier effect of home audit interactions.

Action C: Refresh Healthy Landscapes Program

Action C delivers some of the most diverse indirect benefits in the plan. Rain gardens, rain barrels and tree planting collectively reduce stormwater runoff volumes and peak flow rates, contribute to groundwater recharge, reduce urban heat island effects, enhance biodiversity and ecological connectivity, and build climate resilience against more intense precipitation events. Community participation in outdoor landscape programs also builds public awareness of and affinity for the One Water concept.

Action D: Refresh Water Smart Business Program

Action D produces competitive advantages for participating ICI customers and stimulates peer learning through the recognition program. Stormwater credits directly reduce runoff volumes entering the municipal drainage system, lowering treatment costs at the Water Resource Recovery Centre. ICI water reductions translate directly into reduced wastewater volumes. The program also contributes to economic development signalling by demonstrating Guelph's commitment to business sustainability.

Action E: Refresh Indirect Residential Programs

Action E creates long-term cultural change by building water conservation values through the education system, which reaches all socioeconomic groups. Outreach events catalyze direct program participation, functioning as a low-cost conversion channel for audits and rebates. The SNAP-like community program builds local adaptive capacity and creates a network of stewardship advocates distributed across Guelph neighbourhoods.

Action F: Implement AMI/AMR City-Wide

AMI produces substantial indirect benefits beyond the direct demand reductions counted previously. AMI improves billing accuracy, protects utility revenue from apparent losses, supports emergency response during water main events, and substantially improves the accuracy and timeliness of regulatory reporting and long-range demand forecasting.

Action G: Maintain and Expand Water Loss Strategy and Leak Detection Program

Active leak detection extends the service life of water main assets, reduces public health risk from leaking pipe contamination pathways, improves customer service by reducing main breaks, and

generates system knowledge that supports better capital investment decisions. The Virtual DMA program adds a continuously improving understanding of hydraulic system behaviour that benefits multiple downstream planning and operational functions. Energy savings from reduced pumping volumes are a further co-benefit.

Action H: Build Systems Optimization and Planning Function

Action H produces benefits in terms of O&M planning and efficiency, capital deferral benefits, and integrated planning can demonstrate to Council and regulators a high level of confidence in planned expansion of municipal infrastructure. Integrated master planning ensures policy coherence across the City's regulated infrastructure obligations. Climate resilience integration protects long-term capital investment decisions from being overtaken by adaptation requirements. Energy and GHG reporting contributes to corporate carbon reduction commitments.

Action I: Design and Build Common Data Platform

The data platform creates the technological pathway toward a knowledge-based approach to managing water-related infrastructure. It reduces staff time in data reconciliation and reporting, improves the quality and speed of both operational and strategic decision making, supports transparent external reporting and breaks down data silos that currently impede cross-departmental collaboration. The stormwater, wastewater and groundwater monitoring expansions specifically support better management decisions, earlier anomaly detection and reduced regulatory compliance risk.

Action J: Complete One Water Studies

The One Water Studies produce policy optionality, allowing the City to evaluate and develop the most effective, equitable and financially sound policy instruments before committing to implementation. Rigorous feasibility studies build stakeholder credibility and demonstrate evidence-based governance. The regulatory pathway work for tiered pricing and water reuse may open opportunities for Guelph to influence provincial policy and position itself as a pilot municipality for innovative water management approaches. The non-potable ICI reuse study may identify public-private partnership opportunities with large industrial water users.

4 Key Performance Indicators and Monitoring Framework

The successful implementation of The Blueprint relies on the City's ability to measure performance consistently, evaluate progress transparently and adaptively manage programs based on measurable evidence. A formal Key Performance Indicator (KPI) framework that is consistent across water-related business functions will provide this foundation. The proposed KPIs outlined in this section are intended to support operational decision making, strategic planning and ongoing evaluation of water demand management, system optimization, customer engagement and financial performance. These proposed KPIs are not intended to be final; rather the City should consider and modify this list to arrive at the final number of KPIs which reflect measurement of leading indicators (e.g., touchpoints with customers) and performance measurement (e.g., actual water demand).

The KPIs are grouped into thematic areas that reflect the major components of the One Water approach. These themes align directly with the structure of The Blueprint including Water Demand, Non Revenue Water, Data Management, Customer and ICI Engagement, Financial and Revenue Stability and Adaptive Review. Taken together, these indicators support the City in tracking progress toward long-term targets while ensuring that water supply, wastewater and stormwater systems are managed cohesively.

Table 14 provides a condensed summary of the recommended KPIs with the purposes intended for each theme. The following subsections describe each KPI area in narrative form, including its purpose, relevance and practical application. The proposed KPIs are skewed toward water conservation and efficiency programs and should be expanded further to meet the needs of other water-related functions as these functions are integrated into the One Water framework.

Table 14 KPI Themes

KPI Theme	Representative KPIs	Purpose
Water Demand KPIs	Total ADD and MDD; Per capita residential and ICI water use; Production Rates; Achievement of demand reduction targets	Tracks progress toward managing water demand below projected levels and ensuring the City maintains capacity to meet long-term needs
Non Revenue Water KPIs	Total NRW volume; Real and apparent losses; Leak detection rates and repair timelines; physical DMA infrastructure data, as available	Supports system optimization, water loss control and maximized use of existing water supply
Stormwater KPIs	Runoff volume, peak flow volume, infiltration capacity added, program cost per unit of runoff	Tracks progress in implementing programs to reduce stormwater discharge and enhance environmental benefits.
Wastewater KPIs	Wastewater volume reduced, non-potable reuse volume, program cost per unit of wastewater reduced, avoided treatment cost and payback	Tracks progress in implementing wastewater KPIs to reduce load on the City's wastewater treatment plant.
Data Management KPIs	Data completeness; Data accuracy; Integration across systems; Reporting timeliness; Digital platform usage	Ensures data quality, transparency and ability to integrate water, wastewater and stormwater data
Customer and ICI Engagement KPIs	Participation rates; High-volume user engagement; Customer leak resolution; Surveyed awareness levels; Digital engagement	Measures customer impact, supports behavioural change and ensures visible community participation
Financial and Revenue Stability Metrics	Revenue stability index; Cost per unit of water supplied; Deferred or avoided capital costs; Program cost effectiveness	Ensures long-term affordability, financial resilience and alignment between demand trends and investment needs

4.1 Water Demand KPIs

Water Demand KPIs evaluate the City's progress in managing total water use and in meeting long-term targets. These indicators provide insight into how effectively programs influence behaviour,

how residential and ICI sectors respond to conservation efforts, and whether population growth remains aligned with available water supply capacity.

Total Average Day Demand and Maximum Day Demand are the most critical long-range indicators because they influence supply capacity planning, permit requirements, infrastructure needs and long-term financial obligations. Tracking these values against forecasted demand helps determine the City's ability to maintain security of supply over the next several decades.

Per capita (or per unit) water use indicators provide a finer level of detail that can be used to guide specific initiatives. Tracking per capita consumption separately for low- and medium-density homes, high-density housing and ICI sectors allows the City to understand where reductions are occurring, where plateaus are emerging and where intensification or new development patterns create opportunities for targeted programs. The ability to measure these KPIs may require collection or estimation of new data (e.g., population of high-density residential units). Normalized water demand consumption may also track customers based on building or business age to better understand trends and demand based on age of construction or other factors.

The KPIs also include tracking progress toward explicit reduction targets derived from the water demand scenarios discussed earlier. Measuring annual progress toward these targets will help refine the Implementation Plan, allocate resources to high value opportunities, and identify where additional measures or new strategies are required to stay within long-term supply capacity limits.

Table 15 Water Demand KPIs

KPI	Description
Total Average Day Demand (ADD) Performance	Measured as actual ADD relative to annual forecasted ADD. Tracked separately for residential and ICI customers and stratified by sector where possible. It indicates the effectiveness of conservation, efficiency and reuse programs.
Maximum Day Demand (MDD) Performance	Measured as actual MDD relative to forecasted MDD. Tracked separately for residential and ICI customers and stratified by sector where possible. This KPI indicates the performance of peak water demand reduction initiatives and ensures peak demand remains within available supply and system capacity.
Per Capita Total Demand	Calculated and tracked as an indicator that is common to many different municipalities.
Per Capita (or per unit) Residential Demand	Tracked separately for low- and medium-density and for high-density housing categories and potentially the age of residential building. Supports targeted program design and demand forecasting.
Per Capita (or per business) ICI Demand	Measured relative to employment population and stratified by sector when possible. Helps identify large users and assess the impact of ICI programs.
Achievement of Demand Reduction Targets	Measured as annual change in total and per capita demand compared to One Water scenario targets which would be revised according to frequency desired by the City.

4.2 Non-Revenue Water KPIs

Non-Revenue Water KPIs assess the volume of water that is produced but not billed to customers. Although the City has achieved strong performance in recent years, ongoing measurement of NRW remains essential. This ensures that water losses do not increase as infrastructure ages and that investments in monitoring technologies produce measurable benefits. The KPIs may also reinforce that future losses from new infrastructure may be lower than older infrastructure in response to newer materials or constructions techniques.

Tracking total NRW volume and the percentage of total system input provides a system level view of losses. Complementary indicators such as real losses per service connection, apparent losses from metering or data errors, and the timeliness of leak detection and repair allow for more detailed analysis.

As the City introduces Virtual DMAs through AMI, KPIs that measure water demand variance within districts will become increasingly valuable. These indicators help identify leaks earlier, validate model predictions, evaluate system pressure behaviour and optimize maintenance activities. Together, these KPIs contribute to enhanced system performance and reduced reliance on new supply sources.

Table 16 Non-Revenue Demand KPIs

KPI	Description
Total Non-Revenue Water Volume	Measured in cubic metres per day and as a percentage of system input volume. Compared to annual reduction targets.
Real Losses per Service Connection	Measured in total cubic metres per day or litres per connection per day, using AWWA Water Balance methodology.
Apparent Losses	Measured or estimated through meter accuracy audits, billing adjustments and identification of unauthorized consumption.
Leak Detection Rate and Repair Timeliness	Measured as the number of leaks detected and repaired per year and the average response time to repair.
District Metered Area (DMA) and Virtual DMA Performance	To be determined as appropriate and as implemented; potentially measured as variance between expected and observed flows within DMA or virtual DMA zones, indicating potential losses or anomalies.

4.3 Stormwater KPIs

This section defines Stormwater KPIs so performance can be tracked consistently, results can be communicated transparently, and program design can be adjusted based on evidence during the Implementation Plan cycle.

Table 17 Stormwater KPIs

KPI	Description
Estimated Runoff Volume Reduced per Installation (m ³ /year)	Calculated using standardized rainfall, impervious area and device performance assumptions for rain gardens, cisterns, permeable pavement, downspout disconnections, rain barrels, and other low impact development (LID) installations. Roll up to a Total Program Runoff Volume Reduced metric each year to demonstrate cumulative benefit. This reinforces One Water's intent to manage discharge at the source.
Peak Flow Reduction at Site Scale (per cent)	For ICI credit projects and larger residential projects, estimate design-storm peak attenuation compared to pre-project conditions. Aggregate as Average Peak Flow Reduction for Credited Sites to support credit validation and master planning inputs.
Infiltration Capacity Added (m ³ or equivalent area)	Track estimated storage and infiltration capacity to support watershed-level reporting and to connect to groundwater recharge objectives.
Program Cost per m ³ of Runoff Managed (\$/m ³)	Total program cost divided by estimated runoff volume reduced, allowing comparison across device types and with other municipalities' practices.

4.4 Wastewater KPIs

This section defines Wastewater KPIs so performance can be tracked consistently, results can be communicated transparently, and program design can be adjusted based on evidence during the Implementation Plan cycle.

Table 18 Wastewater KPIs

KPI	Description
Wastewater Volume Reduced per Project and Total Program Reduction (m ³ /year)	Derived from audits, sub-metering, or AMI-based analytics for process changes, fixture upgrades, and on-site reuse.
Non-Potable Reuse Volume (m ³ /year)	Where rebates support greywater, stormwater or process water reuse, quantify potable offset and corresponding reduction in wastewater generation. This supports the reuse emphasis noted for ICI.
Program Cost per m ³ of Wastewater Reduced (\$/m ³)	Total incentive and delivery costs divided by verified annual volume reduction, enabling side-by-side comparison with potable demand savings.
Avoided Treatment Cost and Payback	Estimate avoided variable costs at the WRRC (energy, chemicals, residuals handling) and report City payback period by rebate category. Where reuse displaces potable supply, include avoided supply and distribution costs where appropriate.

4.5 Data Management KPIs

Data Management KPIs measure the City’s capability to collect, manage, integrate and utilize water related data across all One Water systems. The performance of this theme is critical because high quality data is the foundation for system optimization, demand management, customer engagement and forecasting.

Data completeness indicators track the availability of essential datasets such as AMI consumption data, SCADA operational data (e.g., groundwater pumping), stormwater monitoring results, wastewater flow measurements and groundwater observation wells. KPIs measure the degree to which these data meet defined quality standards.

Integration indicators evaluate progress toward linking previously siloed datasets into a shared analytics platform that supports water balance reporting, real-time monitoring and cross-departmental planning. Reporting timeliness indicators measure how quickly critical information can be produced, such as monthly water balances or seasonal demand summaries.

Digital platform usage KPIs track whether staff and customers are effectively using the data systems and whether the tools support meaningful operational improvements.

Table 19 Data Management KPIs

KPI	Description
Data Integration and Completeness	Percentage of required datasets captured, including AMI data availability, SCADA connectivity, stormwater monitoring, wastewater flow meters and groundwater monitoring programs.
Data Accuracy and Validation	Number of validated datasets meeting defined QA and QC requirements. Tracked monthly or quarterly.
Reporting Timeliness	Measured as the time required to produce key reports such as monthly water balance, monthly ADD and MDD, wastewater flow, stormwater performance updates.
Digital Platform Usage and Performance	Measured as user logins, successful data queries, automated alerts and system uptime.

4.6 Customer Engagement KPIs

Customer Engagement KPIs evaluate the reach, effectiveness and influence of residential and business focused programs under the One Water Plan. These KPIs allow the City to measure customer participation in audits, rebates, workshops and other engagement activities, and help determine how effectively the programs motivate behaviour changes that reduce water demand.

Participation rate KPIs provide a clear view of customer reach across the residential, multi-residential and ICI sectors. Engagement KPIs for high-volume users ensure that outreach efforts focus on the customers with the greatest potential impact. Customer leak resolution KPIs track how quickly identified leaks are corrected, reinforcing the value of real-time data and the financial benefit of timely repair.

Awareness KPIs help measure how well residents and businesses understand the One Water concept, stormwater responsibilities, wastewater behaviours and the connection between individual actions and community outcomes. Digital engagement KPIs track use of online tools and self-service platforms, which will become increasingly important as AMI expands.

Table 20 Customer Engagement KPIs

KPI	Description
Program Participation Rates	Measured for each One Water program including residential audits, ICI water audits (water, stormwater, wastewater), Healthy Landscapes, rain gardens and stormwater and wastewater rebate programs.
High-Volume Customer Engagement Coverage	Percentage of high-use ICI and high-density customers that receive audits, AMI installations or engagement sessions each year.
Customer Leak Resolution Rate	Measured as the number of household or ICI leaks identified through AMI that are resolved within defined timeframes.
Customer Satisfaction and Awareness Metrics	Measured through surveys that evaluate a customer's satisfaction after interacting with the City and/or their understanding of One Water, outdoor water use rules, stormwater practices and wastewater system behaviours.
Digital Engagement Metrics	Measured as customer adoption of AMI customer portals or apps, frequency of logins and use of self-service tools.

4.7 Financial and Revenue Metrics

Financial and Revenue Stability KPIs ensure that The Blueprint is implemented in a financially sustainable manner. As per capita water use declines, the City must maintain stable revenue to fund water, wastewater and stormwater operations and capital planning. At the same time, the City must manage the financial implications of growth pressures, system optimization requirements and climate resilience investments.

The Revenue Stability Index measures how actual revenue aligns with projections and helps identify whether additional financial tools or pricing strategies should be considered. The cost per unit of water supplied helps quantify operational efficiency and resource requirements. The City can also track deferred or avoided capital expenditures resulting from demand reductions or reuse strategies to demonstrate long-term value.

Program cost effectiveness KPIs allow the City to evaluate which initiatives deliver the greatest volume of water savings or wastewater and stormwater benefits relative to their cost. Lifecycle cost and asset condition indicators ensure that decisions remain aligned with asset management principles and capital planning requirements.

Table 21 Financial and Revenue KPIs

KPI	Description
Revenue Stability	Tracks alignment between projected and actual billed water, stormwater and wastewater revenues, accounting for changes in consumption.
Cost per Unit of Water Supplied	Measured as operating and capital cost per cubic metre of water supplied or consumed.
Deferred or Avoided Capital Costs	Measured as the cumulative value of supply, wastewater or stormwater infrastructure expenditures deferred through demand reduction and reuse.
Program Cost Effectiveness	Measured annually as dollars spent per cubic metre of water saved or per cubic metre of wastewater or stormwater reduced.
Lifecycle Cost and Asset Condition Indicators	Measured through integration with the Asset Management Plan, including maintenance backlog and risk-based prioritization.

5 Strategic Risks and Implementation Considerations

This section summarizes some of the strategic risks that the City may face when implementing The Blueprint. These risks will be reviewed and addressed with recommended mitigations within Task Memo 4 – Implementation Plan or subsequent change management planning and implementation activities. The City should revisit the risk identification and mitigation process at various times throughout the implementation process to identify new risks as they become better understood.

5.1 Organizational and Structural Considerations

Organizational and structural risks cover governance changes, role clarity, cross-department coordination, and the shift toward a One Water oversight structure. Some of the most significant risks are summarized in the following table:

Table 22 Organizational and Structural Risks

Risk	Description
Fragmented Governance and Siloed Departmental Structures	The existing separation between water, wastewater, stormwater, planning, asset management, and customer-facing teams may pose a barrier to implementing a unified One Water model. Variances in management structure may increase the risk of inconsistent program delivery and incomplete system-wide planning.
Insufficient Cross-Functional Coordination and Change Management Capacity	Implementing One Water will require cross-departmental coordination. Existing processes may not be structured for shared accountability. Without strong change management, integration efforts may be inconsistently executed.
Unclear or Evolving Roles, Responsibilities and Accountability Structures	The shift to an integrated One Water oversight model requires restructuring roles (e.g., One Water leadership), redefining reporting lines and aligning teams. Ambiguity in role definitions or leadership authority could hinder implementation and slow decision-making.

5.2 Data Integration and Technology Considerations

These risks address challenges in consolidating water, wastewater, stormwater, AMI/AMR, SCADA, groundwater, and flow-monitoring datasets; risks of data quality, completeness, system reliability and analytics capacity.

Table 23 Data Integration and Technology Risks

Risk	Description
Fragmented and Siloed Data Systems Across Service Areas	The City's current and future water-related datasets (AMI/AMR, SCADA, groundwater, stormwater monitoring, wastewater flows, billing, and program spreadsheets) currently exist in separate systems, maintained by different staff and departments. This fragmentation creates inconsistencies, complicates reporting and will undermine One Water analytics unless they can be combined into a single platform.
Insufficient Data Quality, Completeness and Validation Protocols	There is lack of consistent QA/QC across datasets with challenges such as incomplete monitoring data, inconsistent spreadsheet-based records and historical updates from multiple staff. Without standardized quality controls, cross system reporting and planning may be difficult.
Deploying AMI/AMR at Scale	Implementing AMI/AMR at scale will be a major infrastructure undertaking with risks related to meter deployment, system configuration, customer onboarding and data integration. The size of this rollout may risk delays and complications in linking new meters to billing and analytics systems.
Limited Internal Capability to Integrate and Manage AMI/AMR Data at Scale	The City currently lacks the internal data management and reporting infrastructure required to bring AMI/AMR datasets in house, link them with historical billing records, and integrate them with geospatial or operational data. This gap creates risk for misinterpretation, underutilization and delays in realizing AMI's benefits should the data management gap not be addressed.
Challenges Implementing a Digital Platform for Enterprise-Wide Analytics	Moving to an integrated digital platform (supporting Virtual DMAs, hydraulic modelling evolution, cross-department analytics, and real-time reporting) is identified as a major infrastructure undertaking. Risks include technology selection, cost, interoperability, data migration and the need for new workflows and skillsets.
Organizational Readiness and Capacity Limitations for Digital Transformation	City staff may lack experience operating large-scale analytics systems, managing new data streams (e.g., stormwater sensors, I&I monitoring, wastewater flows), and supporting evolving digital infrastructure. This creates risk around adoption, long-term operation and the ability to maintain integrated reporting.
Risk of Underutilizing AMI/AMR and Data Platforms Due to Lack of Analytical Preparedness	Even if AMI/AMR is successfully deployed, the City may not achieve its intended benefits (leak detection, demand forecasting, customer insights) unless it has the tools and skills to analyze and act on the data. There is a risk of slow uptake, and unrealized value if analytics infrastructure is not brought online in parallel.
Potential Misalignment Between Technology	The One Water governance model is still evolving, and AMI/AMR deployment requires clear ownership, leadership, data access protocols and cross-functional coordination. If governance does not evolve in parallel

Risk	Description
Deployment (AMI/AMR) and Governance Structure	with the implementation of technology, technology deployments may create unexpected inefficiencies or bottlenecks.

5.3 Resource, Capacity and Funding Constraints

These risks stem from staffing limitations, cross-functional workload, capital and operating budget pressures, and risk of under-resourcing major system transformations.

Table 24 Resource, Capacity and Funding Constraints

Risk	Description
Limited Staffing Capacity to Deliver New Programs and Technologies	Limited staff capacity poses a significant risk to timely adoption, ongoing operations, and long-term delivery of new One Water programs, particularly as organizational demands expand across drinking water, wastewater, stormwater and data systems.
Financial Pressures and Budget Limitations	Capital and operating budget pressures are always a constraint within a municipality. Coupled with the uncertainty of future financial pressures (e.g., climate resilience, aging infrastructure, provincial funding changes) there may be a constant threatening of the rollout of new initiatives.
Increased Workload from Cross-Department Integration Requirements	The One Water framework will demand new levels of coordination across water supply, wastewater, stormwater, planning and asset management. Existing processes and workload levels may not be well-structured for shared accountability, increasing the risk that teams will be overstretched during implementation.

5.4 Policy, Regulatory and Compliance Considerations

These risks relate to Municipal Class EA processes, bylaws (e.g., outside water use), stormwater credits, wastewater regulatory requirements and alignment with updated master plans.

Table 25 Policy, Regulatory and Compliance Risks

Risk	Description
Conflicts or Misalignment with Municipal Class EA Requirements	Water supply, wastewater, and stormwater master plans must follow Municipal Class Environmental Assessment (EA) processes. If One Water initiatives require changes to sequencing, scope or assumptions, they may conflict with existing EA commitments or regulatory pathways. This may create risks around delays, re-approvals, or redesign, especially where integrated planning crosses regulated boundaries.
Regulatory Constraints on Reuse, Recycling and Alternative Water Supply Projects	Emerging reuse strategies (e.g., district-level purple pipe systems, wastewater reuse, stormwater reuse) face uncertainties due to provincial guidelines, health protection requirements and approval pathways. These regulatory uncertainties may limit project viability or extend timelines for pilot approvals and long-term adoption.
Compliance Challenges from Integrating Multiple	Regulatory reporting processes (e.g., water balance, NRW audits, wastewater flow compliance, stormwater monitoring) may rely on existing siloed datasets.

Risk	Description
Water System Data Streams	Integrating these without robust QA/QC introduces risks such as failing to meet regulatory reporting requirements.
Risk of Misalignment Between Updated Master Plans and One Water Direction	The City's master plans (Water Supply, Wastewater, Stormwater, Linear Infrastructure) follow established regulatory cycles. If One Water implementation advances at a different speed or is misaligned with master plans updates, the City may face policy inconsistencies, approval misalignment and duplicated or conflicting requirements.

5.5 Customer Engagement and Public Adoption Considerations

Potential risks of participation fatigue, low uptake of refreshed programs, equity considerations and communication challenges across residential, multi-residential, and ICI customers should be considered as follows:

Table 26 Customer Engagement and Public Adoption Risks

Risk	Description
Participation Fatigue and Declining Engagement in Existing Programs	Several long-standing programs (e.g., Water Smart Business, residential rebates) have seen declines in participation and are "in need of refreshing" to maintain effectiveness. This creates the risk that customers may not respond to new or revamped initiatives.
Difficulty Engaging High-Volume Users and Priority Sectors	High-volume ICI and high-density residential users require renewed, targeted engagement and that without tailored approaches, the City may fail to influence the sectors with the greatest potential for water reduction.
Equity and Accessibility Challenges for Lower-Income and Vulnerable Populations	Without careful design, new programs may be perceived as financially inaccessible or unevenly beneficial, limiting uptake and risking inequitable impacts.
Risk That New Digital Tools (e.g., AMI Customer Portal) Are Under-Adopted	Planned AMI-enabled customer portals, apps, and self-service tools depend on residents adopting new technologies. Without sufficient education and support, customers may not meaningfully use these tools, diminishing benefits such as leak reduction or demand awareness.

5.6 Financial and Revenue Stability Considerations

These risks relate to declining per-capita use, cost recovery, revenue stability, deferred capital projects, and long-term affordability.

Table 27 Financial and Revenue Stability Risks

Risk	Description
Declining Per-Capita Water Use Reducing Utility Revenue Stability	Should conservation improve and per-capita water demand continue to fall, the City risks reduced water-billing revenue, even while system costs remain fixed. This creates financial pressure and threatens long-term cost recovery across water, wastewater and stormwater services.
Increasing Capital and Operating Budget Pressures	Ongoing capital and operating budget constraints are a major risk. The City already faces competing financial pressures (aging infrastructure, climate resilience, regulatory requirements) which may jeopardize the ability to fund One Water initiatives such as AMI/AMR, monitoring upgrades, digital platforms, and cross-department integration.
Under-resourcing Major System Transformations	Many recommended initiatives (AMI/AMR data management, integrated analytics) require significant sustained investment. Inadequate funding for staff, technology and system modernization increases the risk of incomplete or stalled implementation.
Potential for Deferred or Unfunded Infrastructure Renewal	As the plan seeks to defer major supply expansions through conservation and efficiency, insufficient revenue or unstable funding streams could hinder the City's ability to renew existing assets or keep pace with long-term rehabilitation needs. This creates risks for service reliability, regulatory compliance and asset deterioration.
Uncertainty Around Provincial Funding, Grants and Policy Changes	Future provincial policies or funding shifts could limit the City's ability to deliver high-cost programs or pilot projects. Without stable external funding, program rollout and timelines could be constrained.

5.7 Implementation Complexity and Phasing Considerations

This section identifies risks related to phasing AMI/AMR, aligning implementation with future master planning cycles (e.g., 2029), coordinating pilots and sequencing initiatives across departments.

Table 28 Financial and Revenue Stability Risks

Risk	Description
Misalignment Between Technology Deployment and Governance Evolution	There is a risk that the rollout of AMI/AMR and digital platforms could outpace the development of the City's One Water governance model. If governance, leadership roles and accountability structures do not mature at the same time as technology deployment, the City may encounter bottlenecks, unclear ownership or operational inefficiencies.
Phasing Misalignment With AMI/AMR Relative to Other Programs	AMI/AMR installation and initiation should be phased to consider adoption with other programs (e.g., water balance, customer engagement, Virtual DMAs) that will be refreshed and rely on the new technology. This creates pressure to synchronize deployment schedules, while managing technical, financial and organizational constraints.
Complexity Coordinating Multi-Service Area Implementation Activities	The Blueprint requires parallel changes across water supply, wastewater, stormwater, planning, asset management, compliance and customer service teams. There is a risk that existing structures and workflow silos are not

Risk	Description
	designed for simultaneous, interdependent implementation, increasing the chance of sequencing conflicts, duplicated effort and inconsistent execution.
Risk of Over-Stretching Capacity During Overlapping Initiatives	Because many initiatives must run concurrently (AMI deployment, data-platform development, enhanced monitoring, KPI frameworks, customer engagement redesign) limited staffing and technical capacity may lead to project bottlenecks, slowdowns, or trade-offs that compromise program outcomes.
Master Planning Cycles	Should the City plan to initiate the next Master Planning Cycle (2028-2030) with a One Water approach, there may be phasing risks should the One Water implementation not have appropriate governance structures in place at that time.

6 Summary and Next Steps

Technical Memo 3 has selected the preferred One Water direction by using a high level comparison of scenarios to focus on a coordinated set of practical initiatives that the City can implement over time. The memo outlines a One Water approach that would be established through a formal governance framework, supported by a structured change management process and a consistent set of performance indicators. It also highlights the importance of strengthening and expanding some existing programs, including direct residential water use programs, healthy landscapes initiatives and business focused conservation efforts. These programs are enhanced to improve access, increase participation and deliver greater water savings while also supporting stormwater management and broader environmental outcomes. In parallel, The Blueprint emphasizes the role of enabling technology and infrastructure such as advanced metering, continued water loss management and the creation of an integrated planning and systems optimization function to ensure that water, wastewater and stormwater services are managed in a coordinated and efficient way.

A key theme of the selected initiatives is the development of stronger data, monitoring and analytical capabilities. This includes implementing City wide advanced metering, expanding leak detection through virtual district metering approaches, and building a common data platform that connects information across all parts of the water system. Together, these actions support better decision making, improved customer engagement and more proactive system management. The memo also identifies the need for targeted studies to explore future opportunities such as conservation based pricing, non-potable water reuse, and expanded support for lower income households, ensuring that the strategy remains adaptable and forward looking.

Technical Memo 4 will build on this foundation by translating these initiatives into a clear and actionable implementation plan. This will involve confirming priorities and sequencing across the full set of initiatives, identifying what can be delivered in the near term while laying the groundwork for more complex actions. The next phase will define roles and responsibilities across departments, establish governance processes in more detail, and outline the resources required to deliver each component. It will also consider funding strategies, partnership opportunities and how progress will

be tracked through the proposed performance framework. The outcome of Technical Memo 4 will be a practical roadmap that guides the City in advancing the One Water approach in a coordinated, measurable, and achievable way over time.

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