2021 **YORK REGION**

LONG-TERM WATER CONSERVATION STRATEGY UPDATE

SEPTEMBER 2021

York Region

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1.0 EXECUTIVE SUMMARY

The Regional Municipality of York (the Region) is committed to providing sustainable long-term water servicing to its residents and businesses for current and future generations. Recognizing this, the Region has implemented demand management programming for more than two decades. Since 1998, the Water for Tomorrow and Long-Term Water Conservation Strategy programs have contributed to saving more than 27 megalitres per day (MLD). Understanding the need for smart water management, the Region has integrated its water conservation and infrastructure planning into its sustainable growth plans and policies. The Region is also mandated by the Province of Ontario to develop and implement the water conservation strategy.

This 2021 Long-Term Water Conservation Strategy Update (the 2021 Update) builds on previous 2016 and 2011 strategies. It refines long-term goals and sets out updated programs to achieve them. The 2021 Update was developed based on insight from a review of existing and historical programs, best-in-class research, stakeholder engagement and cost-benefit analysis. Going forward, the Region will maintain its previous aspirational goal of 150 litres per capita per day (LCD) by 2051, while focusing more holistically on reducing bulk water supply volumes (including residential, business and Regional/local municipal demands). This will help to ensure demands align with the Water and Wastewater Master Plan projections and support use of the existing Intra-Basin Transfer volumes beyond 2031.

Long-Term Water Conservation Strategy Objectives

The Region's Long-Term Water Conservation Strategy objectives and targets were revised to align with internal and external drivers. The four overarching objectives for the 2021 Update are:

1. Promote the responsible use of water as a resource
2. Apply a One Water approach to enhance water system sustainability and drive efficiency
3. Reduce water consumption as population increases for sustainable long-term servicing
4. Be a water efficiency and conservation influencer for our residents, the industry and regulatory partners

Long-Term Water Conservation Strategy Programs

The updated Long-Term Water Conservation Strategy programs place emphasis on cost-effective opportunities to realize long-term water savings. The Strategy is organized around five program areas:

1. **York Region and local municipal non-revenue water** – support regional and local municipalities' efforts to manage system losses and other sources of non-revenue water
2. **Residential water use** – continue to raise awareness and engage residents and students on water conservation, reducing outdoor water use and encourage water efficiency in new residential developments
3. **Industrial, Commercial and Institutional (ICI) water use** – support ICI customers to manage their water use through programs and targeted incentives
4. **Water reuse** – continue to advance research into centralized municipal and decentralized water reuse
5. **Corporate Social Responsibility** – demonstrate leadership by improving the efficiency of York Region's own facilities and operations

To successfully deliver the 2021 Update, the Region will require support from its local municipalities and the Province. Collaboration with other jurisdictions and stakeholders will also support the Region in advancing its programs. The Region will evaluate and refine its programs over the next five years and continue to demonstrate leadership in the field of water conservation and efficiency.

2.0 BACKGROUND

The 2021 Long-Term Water Conservation Strategy provides an update to the 2011 and 2016 Long-Term Water Conservation Strategies. These strategies enhance and extend the Region's commitment to leading water conservation programming, protecting water resources and providing sustainable long-term servicing.

2.0 BACKGROUND

2.1 YORK WATER SYSTEM

Centrally located in the Greater Toronto Hamilton Area (GTHA), York Region is one of the fastest growing regions in Canada. The Region is a two-tiered municipality comprised of nine local municipalities. The Region is exclusively responsible for bulk water supply, treatment and storage and acts as a wholesale water supplier to the local municipalities. Regional transmission mains transfer the water to infrastructure owned and operated by the local municipalities. Local municipal systems distribute water directly to end users.

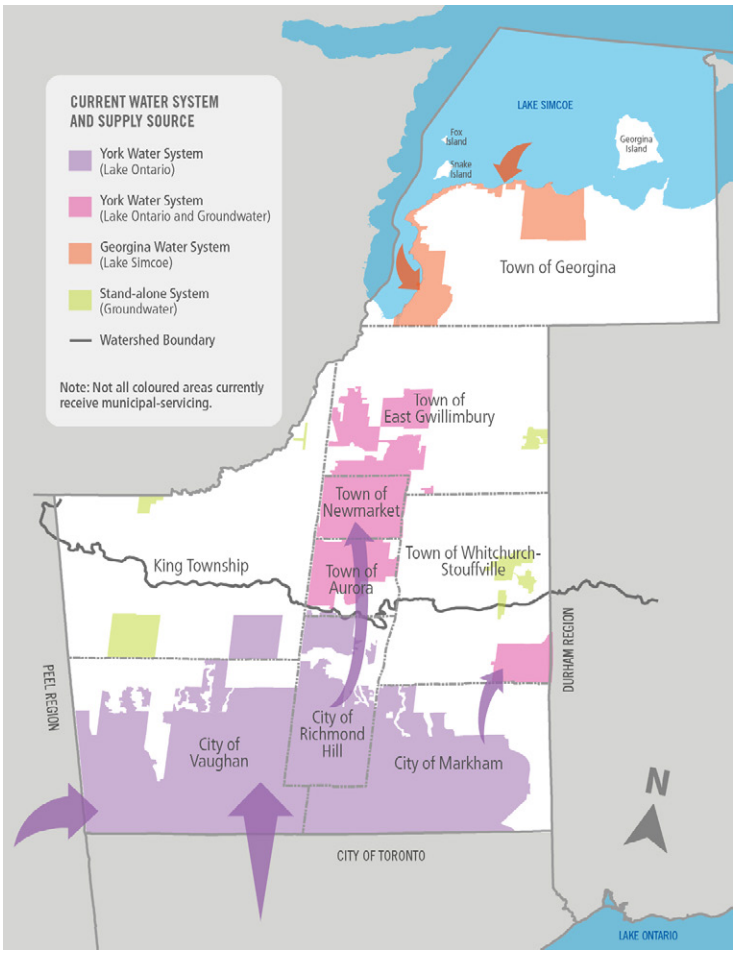
Similarly, the Region acts as a wholesale provider of wastewater services, collecting wastewater from local municipal sewers and conveying it through a network of trunk sewers and pumping stations to treatment plants.

The Region delivers drinking water through:

- Two surface-water treatment plants
- 24 groundwater treatment facilities (including 40 production wells)
- 22 pumping stations
- 44 elevated water tanks and reservoirs
- 360 kilometres of transmission mains

York Region has no direct access to Lake Ontario for its water supply. The Region purchases water from the City of Toronto and the Region of Peel via long-term water supply agreements. The Region also draws water from Lake Simcoe and groundwater sources through a system of production wells (Figure A).

Figure A: 2021 York Water System and supply source



2.0 BACKGROUND

2.2 HISTORY OF WATER CONSERVATION AND SUSTAINABLE GROWTH

Since implementing York Region's 1998 Long-Term Water Supply Master Plan and the Water for Tomorrow program, water conservation planning has been integral to the Region's water demand management. In 2011, the Region developed its first Long-Term Water Conservation Strategy, which was updated in 2016. These strategies expanded on existing Regional plans and set the stage for innovative and jurisdiction-leading water conservation programming.

Over the past 23 years, an estimated 27 megalitres per day (MLD) has been saved because of the Region's Water for Tomorrow and Long-Term Water Conservation Strategy programming; this is enough water to meet the daily needs of approximately 135,000 people. A summary of historical program achievements as of 2020 is presented in Figure B.

Known as *A Place to Grow: Growth Plan for the Greater Golden Horseshoe*, the Provincial Growth Plan sets out population and employment forecasts. In 2020, the Ontario Ministry of Municipal Affairs and Housing updated and extended the Growth Plan's population and employment forecasts to 2051.

By 2051, York Region is expected to grow to approximately 2,020,000 people and 990,000 jobs, resulting in increased demand on the water supply system. Water supply and wastewater servicing capacities significantly impact Regional growth considerations. The Region has integrated water conservation and infrastructure planning into its sustainable growth plans and policies to meet these future water demands.

2.0 BACKGROUND

Figure B: Historical programs and achievements (1998 to 2020)

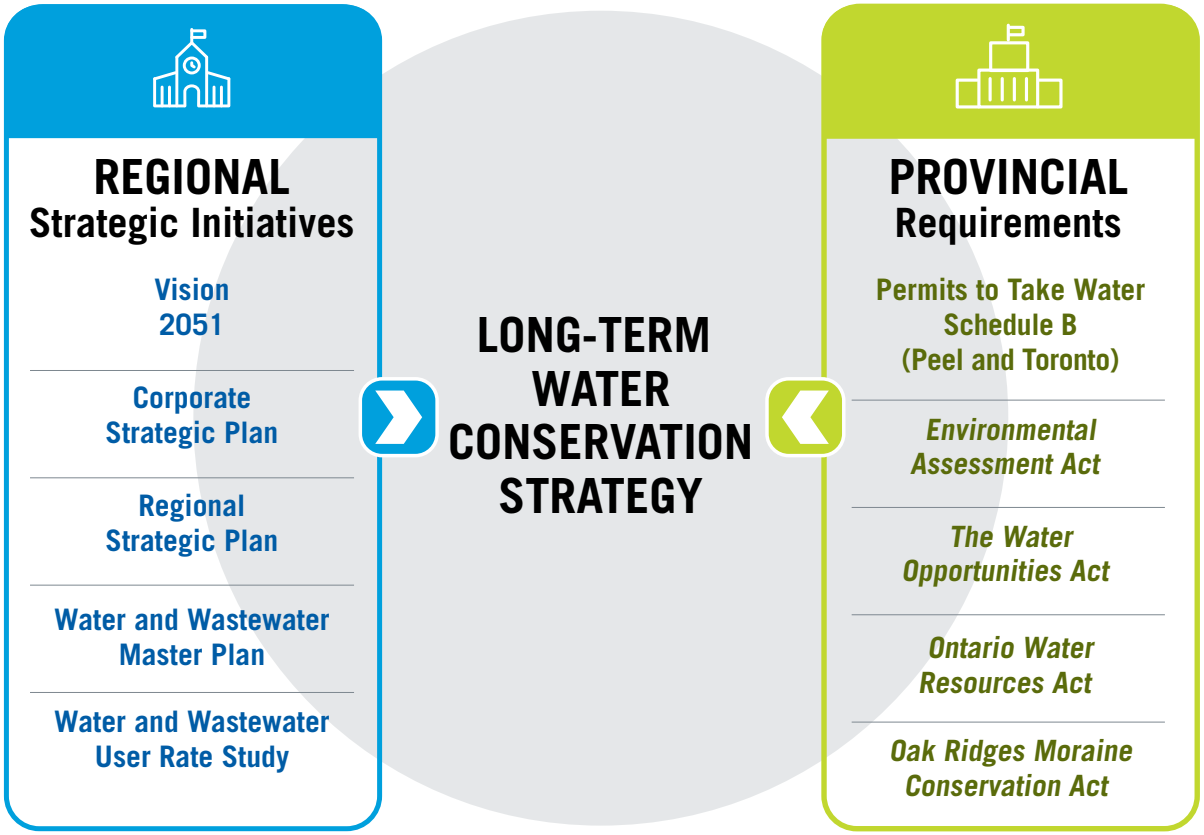
2.0 BACKGROUND

2.3 REGIONAL STRATEGIC INITIATIVES AND PROVINCIAL REQUIREMENTS DRIVING WATER CONSERVATION

The Region's sustainability goals are set out in Regional strategies and plans. The water conservation strategy translates these commitments into actionable and innovative demand management programming. Water conservation planning is also mandated by the Province of Ontario under multiple statutes and regulatory approvals (Figure C). Of notable importance to the Long-Term Water Conservation Strategy are the Region of Peel and City of Toronto's Permits to Take Water, which regulate York Region's intra-basin transfer requirements including the implementation of a water conservation strategy and permitted volumes. Several other provincial, regional and local municipal laws and policies influence water conservation planning and program delivery more indirectly. Additional information on Regional strategic initiatives and regulatory requirements can be found in Appendix A and B, respectively.

While the Region is mandated by the Province to develop and implement the water conservation strategy, the Region is committed to delivering demand management programs as part of its Water and Wastewater Master Plan and recognizes the wide range of benefits from conserving water as further outlined in Section 2.4.

Figure C: Strategic initiatives and Provincial requirements



2.0 BACKGROUND

2.4 WATER CONSERVATION BENEFITS

Water conservation has many benefits beyond simply reducing demand on water supply and on water and wastewater infrastructure. Associated advantages include reduced energy consumption, lower greenhouse gas emissions, deferred infrastructure costs and reduced operational costs, among others. Table A outlines how these benefits apply to the Region.

Table A: Benefits of water conservation

Societal benefits	Environmental benefits
• Ensures clean, safe drinking water is available to all Regional customers in a sustainable manner • Promotes stewardship within the community by offering ways for individuals to reduce or mitigate their own ecological footprint • Provides opportunities for education and awareness about local drinking water • Supports equity and fairness: those who conserve will have lower bills compared to those who waste and put excessive demand on the system	• Allows a greater number of customers to be serviced within the Region's current Permits to Take Water • Reduces or avoids impacts from construction of new infrastructure • Reduces chemical use in water and wastewater treatment • Reduces treated wastewater discharged to the environment • Reduces energy use and greenhouse gas emissions due to reductions in water treatment and pumping • Reduces peak demand on supply sources • Enhances resilience to prolonged drought and a changing climate
Financial benefits	**Legislative and policy linkages**
• Defers capital investment in new bulk water supply and treatment infrastructure (that is, needs are met with conservation rather than new supply) • Reduces operations and maintenance costs • Reduces energy costs for the Region (less pumping and treatments) and for residents (less heating) • Reduces water bills for residents and businesses • Improves chances of Provincial and Federal government infrastructure funding and other grants by adoption of best practices • Reduces or defers investment in wastewater infrastructure	• Supports goals of the Regional Official Plan and Vision 2051 • Meets requirements under Schedule B of York Region's Permits to Take Water regulating the intra-basin transfer under Ontario Regulation 387/04 • Meets requirements under Province's Conditions of Approval for the Southeast Collector Trunk Sewer Individual Environmental Assessment • Ensures compliance with conservation planning requirements in the *Oak Ridges Moraine Conservation Act* • Supports other Regional strategies, policies, and plans (for example, the Water and Wastewater Master Plan and Inflow and Infiltration Reduction Strategy)

3.0 2021 LONG-TERM WATER CONSERVATION STRATEGY UPDATE

3.0 2021 LONG-TERM WATER CONSERVATION STRATEGY UPDATE

In 2020, the Region began assessing the previous water conservation strategy, engaged with stakeholders, completed a best-in-class review and evaluated potential opportunities for water conservation programming. This work culminated in this 2021 Long-Term Water Conservation Strategy Update (the 2021 Update).

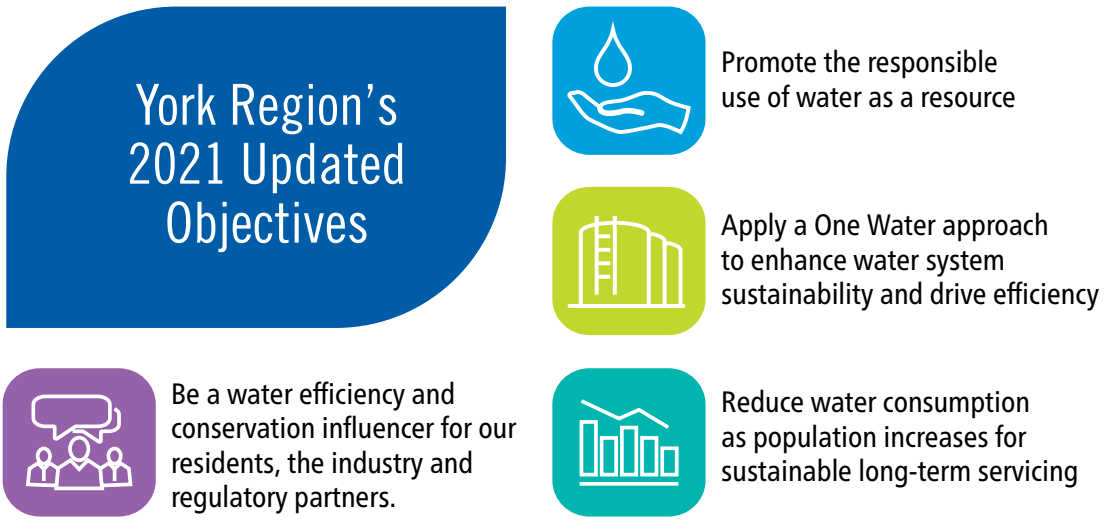
Many factors influence how water is used within the Region, as well as in each local municipality. These factors create both opportunities and challenges for water conservation. A changing marketplace, new technologies and processes, better data analytics, weather variability, climate change, intensification of development in municipal corridors and new growth projections are some of the many factors impacting water use now and in the future.

The 2021 Update builds on the Region's past successes and significant reductions in per capita demand. The 2021-2025 demand management programming targets cost-effective water saving opportunities for residential, industrial, commercial, and institutional (ICI) customers and enables the Region to continue maintaining and realizing additional long-term water savings that support the Water and Wastewater Master Plan growth projections.

3.1 2021 UPDATED OBJECTIVES

The objectives for the 2021 Update were updated and streamlined with input from key stakeholders (Figure D). Water conservation programming will embody a One Water approach in tackling water savings, efficiency and optimization. One Water is an integrated planning and implementation approach that considers our local municipal and regional systems as part of one water system, which services all the Region's residents. Reviewing all options from a One Water approach will promote strategic system-wide benefits. This list provides a concise mandate for conservation work, while encompassing the longer list of objectives found in the 2011 and 2016 strategies (see Appendix C).

Figure D: Water conservation strategy objectives



3.2 DEVELOPMENT OF THE 2021 UPDATE

3.2.1 SCREENING OF POTENTIAL WATER CONSERVATION MEASURES

To inventory current demand management programs, evaluate and inform potential water conservation measures, the Region utilized Econics' proprietary Measures Assessment Tool (MAT). This tool compiles over 160 water conservation measures based on the examination of programs across North America and a review of leading best practices manuals and guidelines. The MAT also includes criteria that enable evaluation of water conservation measures based on their potential contribution to various desired outcomes, such as:

- Financial cost to water savings ratio
- Energy conservation and greenhouse gas reduction
- Peaking factor reduction
- Participation rate
- Implementation control and ease
- Measurability

Application of these screening criteria helped rank potential water conservation measures, which were then investigated further through best-in-class research (Section 3.2.4).

3.2.2 STAKEHOLDER ENGAGEMENT AND CONSULTATION

York Region engaged internal and external stakeholders through consultation and engagement sessions, as well as telephone and online surveys, to help inform programming direction. External stakeholders engaged included the local municipalities and over 600 York Region residents and businesses.

During development of the 2021 Update, meetings with the Water Conservation Advisory Committee (WCAC) members were held to solicit feedback and guidance. Advisory members represent community groups, environmental non-government organizations, the Lake Simcoe Region Conservation Authority (LSRCA), local business representatives, local municipalities, the Ministry of Environment, Conservation and Parks (MECP), the Toronto and Region Conservation Authority (TRCA), York Region Public and Catholic District School Boards and York Region residents.

York Region also engaged its nine local municipalities through a series of workshops. Non-revenue water (NRW) and leak detection activities are top of mind for the local municipalities.

3.2.3 INDIGENOUS COMMUNITY ENGAGEMENT

Engagement with Indigenous communities (The Chippewas of Rama, Curve Lake First Nation, Hiawatha First Nation and Mississaugas of the Credit First Nation) occurred through the Water and Wastewater Master Plan process in coordination with the Municipal Comprehensive Review and update to the Transportation Master Plan. The role of demand management programs and their integration in long-term service delivery planning through the Water and Wastewater Master Plan was shared, including the Long-Term Water Conservation Strategy Update. The communities were appreciative of the Region's focus on water conservation as part of the holistic approach to long-term planning and were invited to provide input to the 2021 Long-Term Water Conservation Strategy Update. Although no community opted to provide specific input to the Strategy, communities provided feedback on the value of water more generally which included that:

- Indigenous people have a unique historic and cultural relationship to water that gives rise to important perspectives on how to manage water resources
- Water is viewed as more than just a valuable resource and is recognized as a sacred gift
- Water must be protected considering anticipated future growth

York Region acknowledges the central importance of water in the culture and lives of Indigenous people and is committed to sustainable management and use of this essential resource not only in the present, but also over the long term for future generations. More information about Indigenous community engagement can be found in the 2021 Water and Wastewater Master Plan (available in early 2022).

3.2.4 WATER CONSUMPTION TRENDS

The 2021 Update evaluated water consumption trends over the last decade to inform targets. With the forecasted population and employment growth, the Region will continue to track bulk water demands over time to ensure alignment with the Water and Wastewater Master Plan projections.

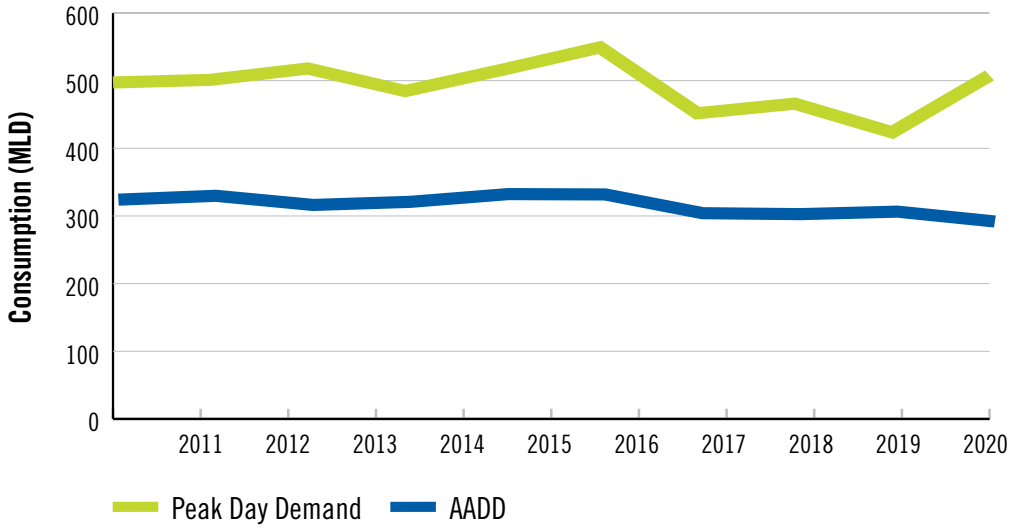
For many years, the Region has focused on achieving full-cost recovery pricing for water and wastewater services with the goal of ensuring long-term financial sustainability. This included a focus on fully funding long-term asset management needs in a manner that is fair to current and future generations. While the intention of reaching full-cost recovery is not to reduce per capita water demand, the effect of pricing on consumption will continue to be considered as part of financial sustainability plans for Regional water and wastewater rates.

3.2.4.1 AVERAGE ANNUAL DAY WATER DEMAND (AADD) AND PEAK DEMANDS

Average annual day demands reflect the total volume of water delivered during the given year. AADD values are impacted by changes in both indoor and outdoor consumption, however reductions in indoor demands (since they occur 365 days per year) are the most impactful. Between 2012 and 2020, peak day demand represented 156% of average annual day demand in the York Water System (Figure E). The York Water System does not include the Georgina Water System or other stand-alone systems and is the Region's largest drinking water treatment and supply system. In 2020, it provided approximately 95% of the total water supplied.

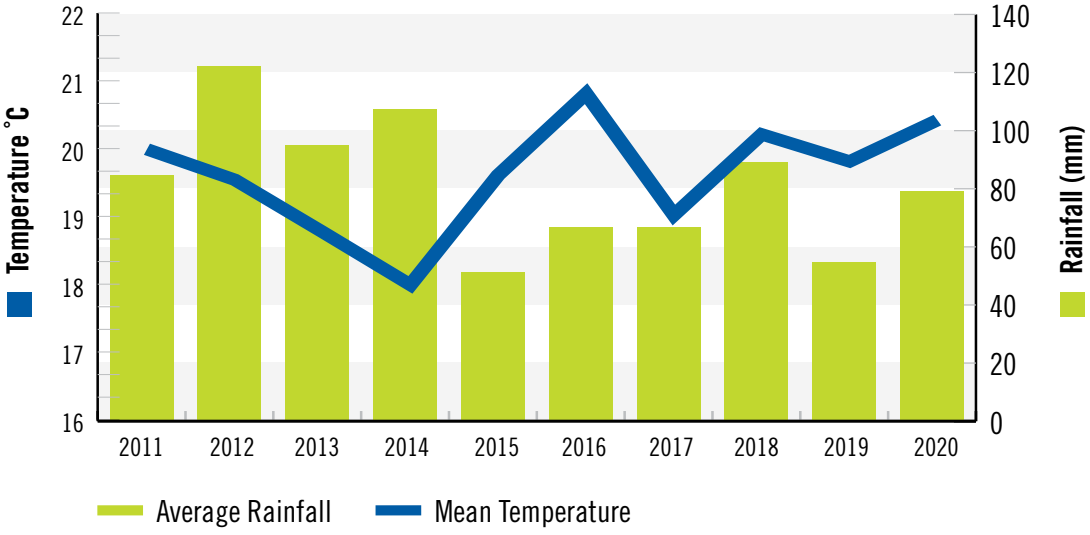
Each year, the single day when water demands are greatest is known as "peak day" demand. The "peak day" generally occurs in summer during an extended period of hot and dry weather when outdoor water use is the greatest. As such, the magnitude of the "peak day" demand is dependent on weather conditions and can vary significantly from year to year.

Figure E: York Water System peak day and average annual day demands



Mean temperature and average rainfall help showcase this correlation, however the periods between rainfall or the duration of consecutive hot/dry days are likely more accurate indicators. Figure F shows the average temperature and rainfall between July to September from both Buttonville Airport and Udora weather station[1]. Both 2016 and 2020 were comparably hotter and drier summers, with "peak day" demand increases in these years.

Figure F: Temperature and rainfall (July to September) 2011 to 2020



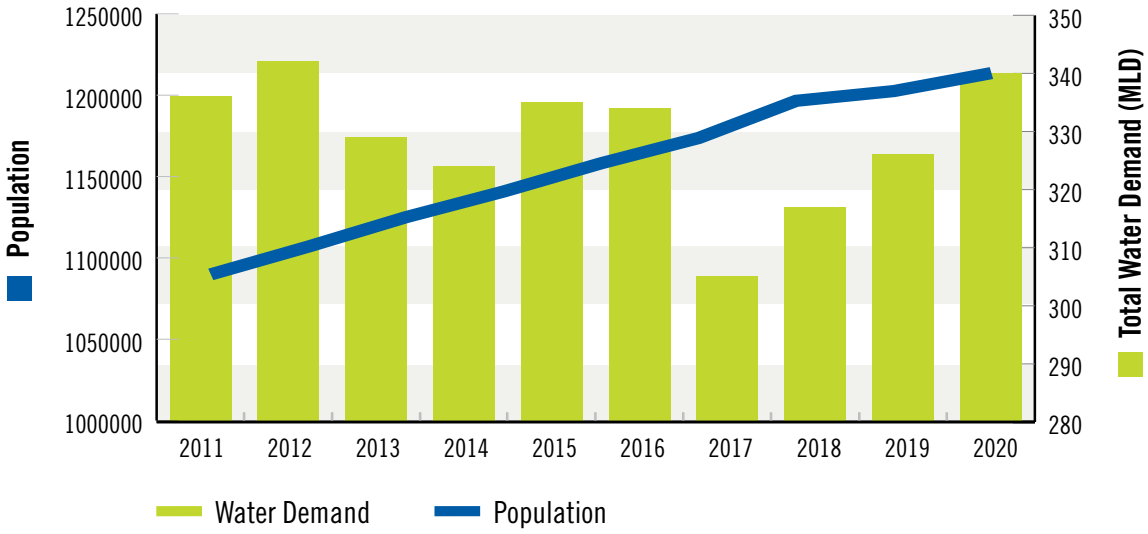
[1] Weather data obtained from https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

3.2.4.2 POPULATION GROWTH VERSUS WATER DEMAND

Total water supply volumes over the last decade fluctuated between 305 MLD to 342 MLD despite continued population growth (Figure G). In December 2018, one of the main bulk water supply meters was replaced with new technology which increased the accuracy and confidence in total water demand volumes (this meter measures approximately 25-30% of the Region's total bulk water supplied). Initial estimates show consumption between 2011 to August 2016 may be lower than total water demand reported, whereas 2017 and 2018 are likely higher than reported demands. Overall, the data over the last decade supports the trend of increasing population while total water demand remains relatively flat.

The significant population increases expected in the Region will result in higher total supply volumes, even if residential demands per person decrease, unless a portion of future water demand can be provided by water reuse.

Figure G: Population versus total water demand



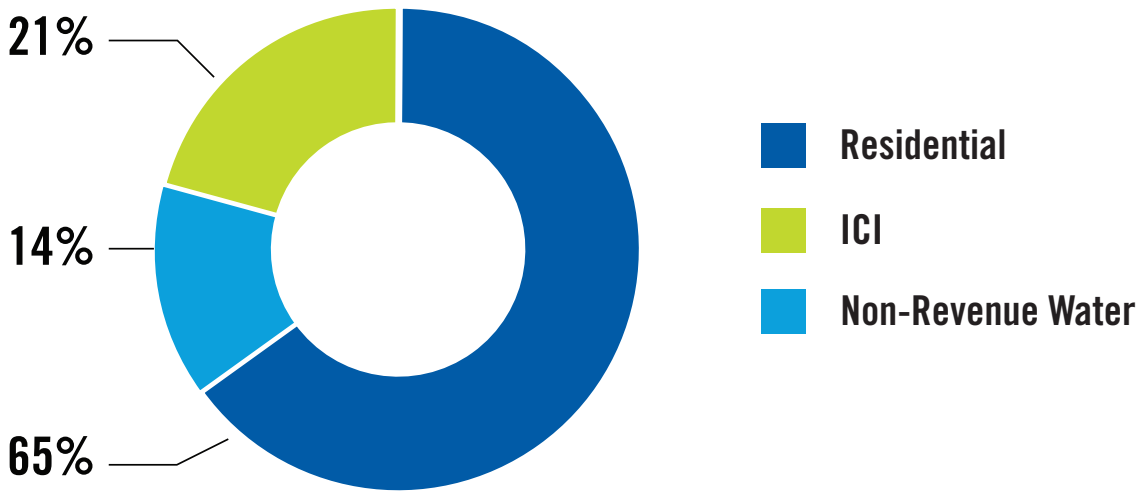
*In December 2018, a water supply meter was replaced with new technology which increased accuracy and confidence in the volumes going forward.

3.2.4.3 WATER DEMAND BY SECTOR

York Region breaks down water consumption into three categories – residential, ICI and non-revenue water[2]. Non-revenue water occurs in both Regional and local municipal water systems. This usage reflects the aggregate of all non-revenue water losses in both supply and distribution systems. Tracking water consumption by sector enables the Region to understand how usage is distributed among sectors and how it changes over time. Distribution among the three categories has remained relatively consistent since 2010. On average residential use represents 65% of total consumption followed by ICI at 21% and Regional/local municipal non-revenue water at 14%[3] (Figure H). Sectoral consumption fluctuations have been minimal (+/-3% change) over the last decade.

Due to COVID-19 pandemic restrictions starting in 2020, residents worked and studied more from home and some businesses operated remotely or at reduced capacities, while others were closed. In 2020, there was an increase in residential consumption and a decrease in commercial consumption when compared to the average water usage by sector. This shift in consumption may impact sectoral demands during the ongoing pandemic and potentially in future years if changes in business practices persist post-pandemic.

Figure H: 2010* to 2020 average water usage per sector



* 2010 data was used in lieu as 2011 data was not available

[2] Non-revenue water consists of the volumes of water that are not billed to residents and/or businesses and produce no revenue; this is equal to watermain flushing, firefighting and street cleaning (referred to as unbilled authorized consumption) plus theft and metering inaccuracies (apparent or paper losses) and leaks (real losses). Refer to page 16 or section 3.2.4.5 for additional information.

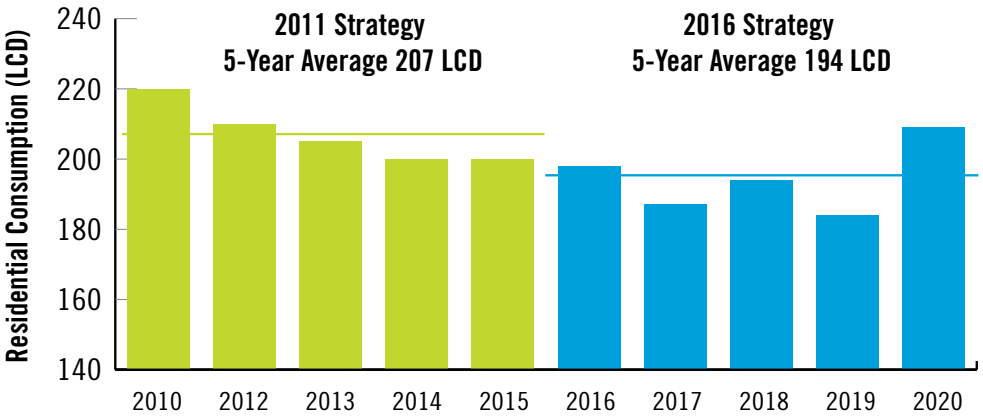
[3] The 14% represents a combination of both Regional and local municipal non-revenue water.

3.2.4.4 SINGLE-FAMILY RESIDENTIAL CONSUMPTION

Single-family residential per capita water demands have declined over the last decade due to Regional water conservation measures, the growing presence of efficient plumbing fixtures and appliances in the marketplace and updated Provincial Building Code requirements.

The Region is trending towards continued residential water savings and decreasing per capita demand, with 2011 to 2015 averaging 207 litres per capita per day (LCD), and 2016 to 2020 averaging 194 LCD for single-family households (Figure I). In 2020, single-family residential consumption increased to 209 LCD which is likely due to the pandemic restrictions, which saw an increase in residents working and studying from home, as well as the hot and dry weather. It is uncertain at this time how the pandemic and subsequent restrictions will impact residential water consumption in 2021 or in future years.

Figure I: Single-family residential consumption per capita



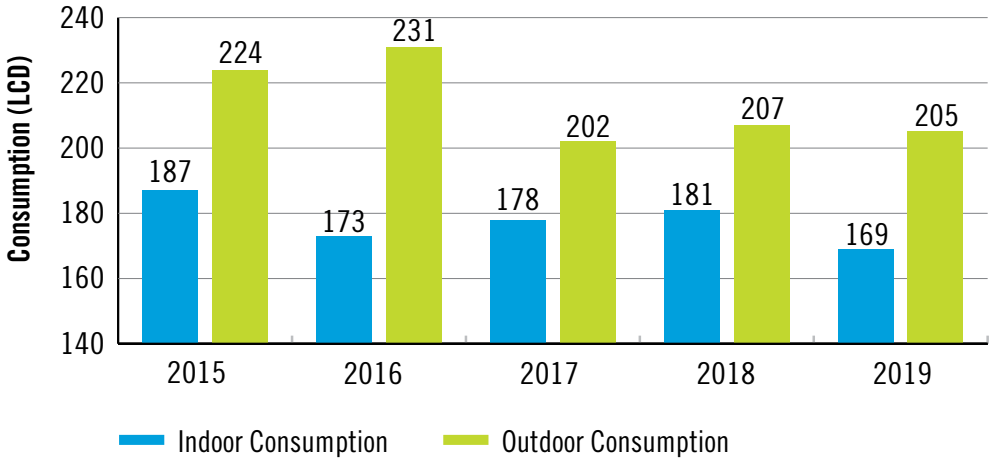
*2010 data was used in lieu as 2011 data was not available

Weather plays a significant factor in seasonal water use, particularly in the summer months. Seasonal residential demand increases are primarily related to lawn and garden watering and other outdoor uses. Typically, the hotter and drier the weather and the longer the duration of hot and/or dry events there is a greater amount of water consumed. Therefore, increases in residential consumption could also be attributed to a hot and dry summer season in 2020.

A review of 2015-2019 indoor/outdoor residential water consumption data shows that residents use an average of 36 LCD more in the summer than in the winter (Figure J). This analysis assumed consumption between January and March represents indoor water use only and July to September represents both indoor and outdoor consumption. Data is not available for historical outdoor consumption prior to 2015.

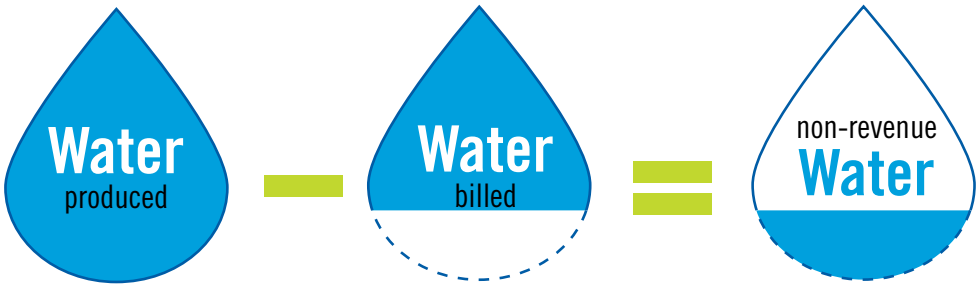
Residential outdoor demand is relatively low compared to many other Canadian regions, primarily due to Southern Ontario's relatively wet summers. Further reducing outdoor demands will be challenging, but opportunities do exist and may be warranted due to anticipated impacts of climate change.

Figure J: Indoor versus outdoor residential consumption



3.2.4.5 NON-REVENUE WATER

Non-revenue water consists of the volumes of water that are produced but not billed to residents and/or businesses and produce no revenue. Non-revenue water can occur in both the Regional and local municipal distribution systems.



York Region and its local municipalities have worked in partnership over the last decade to understand and reduce non-revenue water. Based on the kilometres of watermains, the local municipalities are an important partner in reducing non-revenue water as they own approximately 83% of the system.

The need to manage non-revenue water better has become increasingly important. In addition to reducing water consumption, non-revenue water management allows the Region and its municipalities to drive efficiencies in operations, enhance financial performance and increase climate resilience.

Non-revenue water is broken down into three main categories:

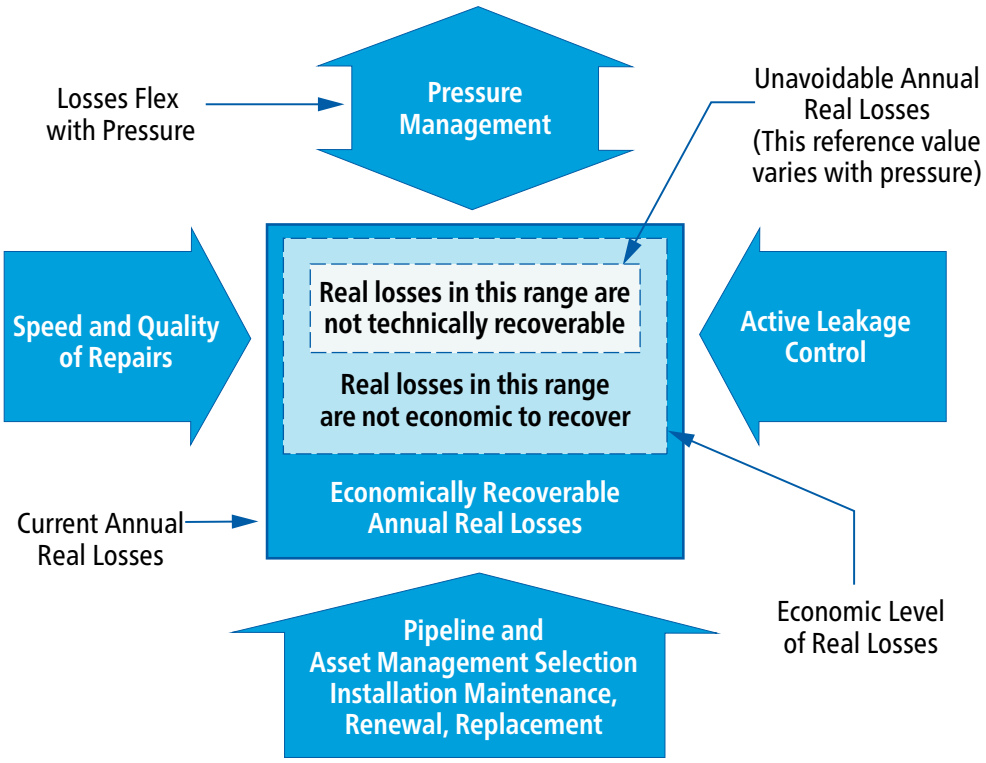
- **Unbilled authorized consumption** such as water for operation and maintenance activities (for example, watermain flushing for water quality purposes) and for emergency services
- **Apparent or "paper" losses** such as theft and metering inaccuracies
- **Real losses**, which are leaks in the water distribution system

Strategies to help minimize non-revenue water include:

- Understanding non-revenue water through the compilation of the International Water Association (IWA)/American Water Works Association (AWWA) Water Audit at the local municipal level
- Reducing real loss or leakage through:
  - Conducting leak detection inspections on water infrastructure
  - Implementing permanent or temporary District Metered Areas (DMAs), which involves comparing the theoretical demand of an isolated area of the distribution system to the measured actual demand. A high actual demand compared to the theoretical demand can indicate leakage and warrant further investigation
  - Pressure reduction/management to reduce leakage in the distribution system, as leakage can vary in relation to pressure, meaning higher pressures result in increased leakage rates, and even higher watermain burst rates

A multi-prong approach is required for reductions in non-revenue water (Figure K).

Figure K: Control of real losses (AWWA, 2016)



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HISTORICAL NON-REVENUE WATER ACHIEVEMENTS INCLUDE:

LOCAL MUNICIPALITIES

Some or all municipalities have:

- Adopted IWA/AWWA Water Audit methodology
- Implemented meter verification and change out programs
- Improved data collection and tracking for water balance
- Completed leak detection activities
- Developed and implemented asset management strategies including replacement of watermains

YORK REGION

- Partnership with local municipalities for leak detection
- Partnership with local municipalities on pilot mobile, temporary, and permanent district metered areas
- Replacement of City of Toronto and the Region of Peel's wholesale billing meters for increased accuracy of bulk water supplied
- Inspection, leak detection and repairs of Regional pipes and valve chambers
- Developed and implemented asset management strategy including replacement of high-risk watermains
- Support for local municipal IWA/AWWA Water Audit

For the last decade, each of the Region's local municipalities have completed an annual review of its water balance (Figure L) and related non-revenue water using the IWA/AWWA Water Audit software tool. This tool assesses the volume of non-revenue water by category as well as establishes an infrastructure leakage index (ILI), a performance indicator quantifying how well a distribution system is managed for the control of real losses (leakage) at the current operating pressure. The IWA/AWWA Water Audit is an internationally-accepted best practice methodology that enables tracking and improving losses over time.

In addition, the Region and its local municipalities have developed and implemented strategies to help minimize non-revenue water such as conducting leak detection investigations.

Historically, the Region tracked the local municipalities percentage of non-revenue water and ILI. In 2019, AWWA discontinued non-revenue water as a percentage indicator; AWWA will be using new key performance indicators to quantify real and apparent losses. ILI will continue to be calculated as a key performance indicator. ILI is the ratio of Current Annual Real Losses (CARL) to Unavoidable Annual Real Losses (UARL) (ILI = CARL/UARL). Therefore, an ILI of 1.0 signifies that the current level of leakage equals the technical minimum level of leakage. Although possible, achieving an ILI of 1.0 or lower requires a high level of diligence towards active leakage management practices and is considered a "best managed" system. A target ILI value between 1.0 and 3.0 was established for the nine municipalities in the 2016 Long-Term Water Conservation Strategy and aligned with best practices. The Region will be re-evaluating ILI as a performance target as part of an ongoing consulting assignment in 2021.

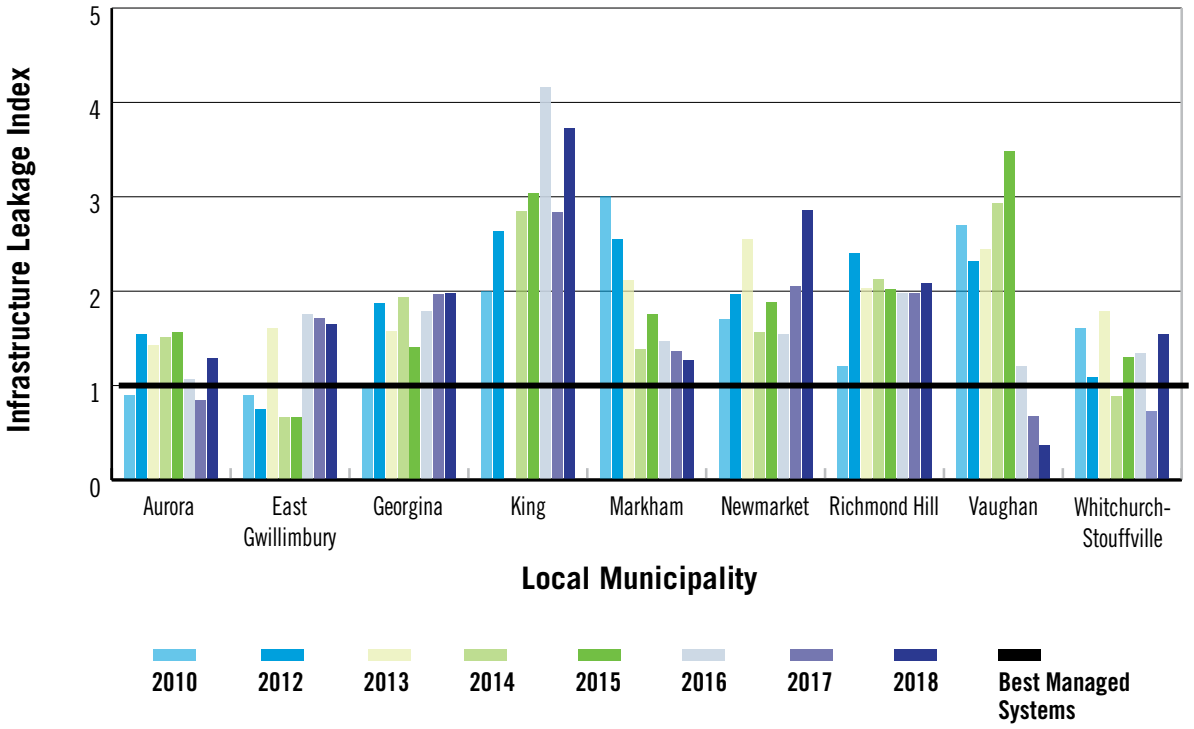
Figure L: IWA/AWWA Water Balance

<table>
<tr><th colspan="7">IWA/AWWA Water Balance</th></tr>
<tr><td rowspan="10">Volume From Own Sources (corrected for known errors)

Water Imported (corrected for known errors)</td><td rowspan="10">System Input Volume</td><td>Water Exported (corrected for known errors)</td><td></td><td colspan="2">Billed Water Exported</td><td>Revenue Water</td></tr>
<tr><td rowspan="9">Water Supplied</td><td rowspan="3">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="8">Non-revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="6">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Unauthorized Consumption</td></tr>
<tr><td>Systematic Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and Distribution Mains</td></tr>
<tr><td>Leakage on Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections up to the Point of Customer Metering</td></tr>
<tr><td colspan="7">NOTE: all data in volume for the period of reference typically one year.</td></tr>
</table>

By improving data management and quantification of non-revenue water, water loss volumes and ILI values may increase or fluctuate. For this reason, US EPA Best Practices suggests that trends should be measured over a five-year period.

Figure M: Local municipal infrastructure leakage index (ILI) [4]



*2010 data was used in lieu as 2011 data was not available
2013 data for King was not available

The infrastructure leakage index (ILI) shows variations year-to-year which are expected (Figure M). Many of the municipalities have remained in the target range of 1.0-3.0 with some larger variations occurring in King and Vaughan. The variations and spikes in King can likely be attributed to the increased flushing in Schomberg which is necessary to maintain water quality and flow within the system. In Vaughan it was determined that a main water billing meter needed replacement to increase accuracy in the volumes; this meter was replaced in 2018. Improving data quality will continue to be a priority to ensure results can be tracked with confidence over time.

With the updated AWWA Water Audit software's key performance metrics and data grading tools, it will be important to evaluate and update the non-revenue water metrics as well as industry benchmarks. These metrics will support the identification and prioritization of reductions in non-revenue water, along with areas of data improvement. Proactive programming will be important to ensure systems are well-managed and maintain and/or improve current ILI trends.

[4] 2019 water balances not completed by some local municipalities due to pandemic in 2020.

3.2.5 BEST-IN-CLASS RESEARCH

To assist in the development and improvement of the Region's programs, a detailed review of case studies from North American and international communities leading in water conservation programming was conducted. This review included current trends and best practices in water demand management. Specific attention was given to jurisdictions with targeted residential and ICI sector programming, as well as regional or municipal programming targeting non-revenue water management. Key program highlights are provided in Table B.

Table B: Best-in-class key program highlights

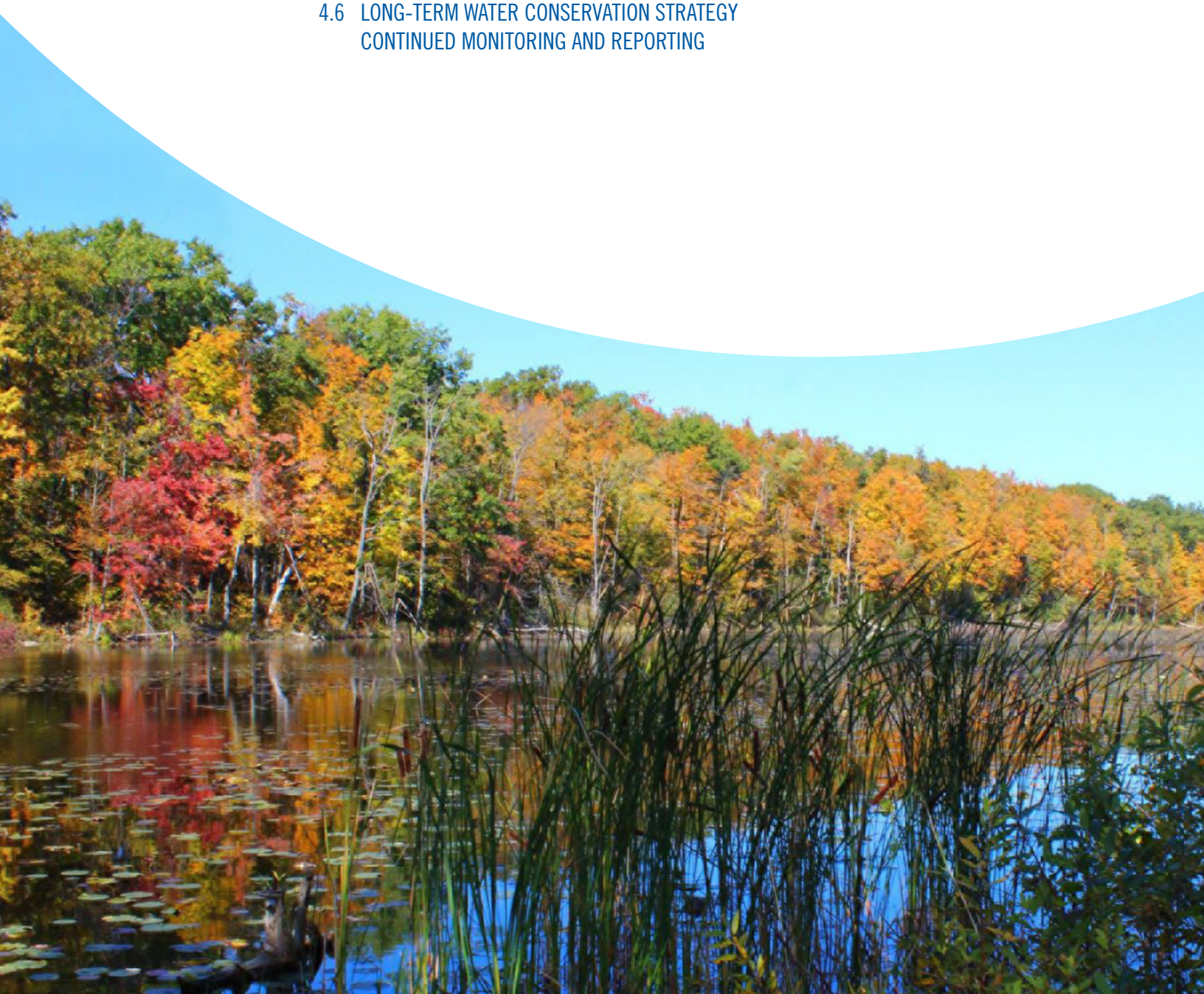
Program	Key Highlights
Targeted residential programming	• Leading jurisdictions often use specific branding to establish an identity • Typically offer third-party software platforms for residents to use independently • Typically offer in-home water audits • Marketing is done primarily through online, billing inserts, letters and customer service desks • Easily scalable simply by modifying the level of promotion and the value of incentives • Requires significant staff resources to deliver
ICI programming	• Leading jurisdictions often use specific branding to establish an identity • York Region's current model remains a best-in-class example ◆ Other best-in-class models include a more targeted approach, for example, offering resources on specific end uses and for precise market segments • Leading jurisdictions provide support tools such as benchmarking data and water efficiency calculators to help businesses determine potential water savings independently • Building relationships with businesses and ICI sectors to foster word-of-mouth promotion of programs and ongoing water savings at facilities is important
Regional or Municipal non-revenue water management	• Requires a holistic system-wide approach to be effective • The IWA/AWWA Water Audit software tool is used for understanding of data and non-revenue water reduction opportunities • Local municipal partnership is required for implementation • Best-in-class programs include the use of complimentary technology such as district metered areas, advanced metering infrastructure, hydrant loggers and pressure management

These best-in-class examples provide short-and long-term strategies and implementation plans that were taken into consideration as part of the 2021 Update. Some of the key highlights were included as part of the 2021 updated programming such as strengthening local municipal partnerships and providing support for the use of complementary technology for non-revenue water management. However, the Region will not be moving forward with all components, including offering in-home water audits for residents. As the Region continues to refine and update its programs, these examples will be further evaluated to determine feasibility of implementation.

3.2.6 EVALUATION OF 2016-2020 WATER CONSERVATION PROGRAMS

In developing the 2021 Update, the Region evaluated the progress between 2016 to 2020 on the water conservation program areas and measures. The review showcased that the Region has investigated and/or executed a wide range of program areas and measures from the 2016 Strategy and will continue many of these in some capacity as part of this Update, including engagement and outreach to residents, non-revenue water management and exploring water reuse opportunities. Section 4 details the 2021 program updates.

4.0 2021 UPDATE MEASURES AND PROGRAMS



4.0 2021 UPDATE MEASURES AND PROGRAMS

4.1 LONG-TERM WATER CONSERVATION STRATEGY PROGRAMS

This 2021 Update will continue to emphasize supporting businesses and institutions to reduce water use, helping residents continue to be efficient and further reduce outdoor demands. There will also be a renewed focus on updating non-revenue water key performance metrics, improving water audit data quality, and reducing non-revenue water and system losses in both the Regional and local municipal distribution systems.

While many of the programs will continue from the 2016 Strategy, the Region will execute in a more targeted approach, such as focusing on areas with potential or current infrastructure constraints, independent systems and/or areas with high outdoor water use.

The 2021 Update measures and programs identified herein include both existing and new initiatives. For ease of reference the measures and programs have been categorized into five areas as follows:

York Region and local municipal non-revenue water – support Regional and local municipalities efforts to manage system losses and other sources of non-revenue water through targeted local municipal programming support, funding opportunities and through building a community of practice

Residential water use – continue to raise awareness and engage residents and students on water conservation, support residential customers manage their water use through programs and targeting incentives, including developer incentives to encourage water efficiency in new residential developments[5]

ICI water use – continue to support ICI customers to manage their water use through programs and targeted incentives

Water reuse – continue to advance the viability of both centralized municipal and decentralized water reuse through targeted research, advocacy and incentives

Corporate Social Responsibility – demonstrate leadership to the broader community by improving the efficiency of York Region's own facilities and operations

[5] Servicing Incentive Program (SIP), Sustainable Development Through LEED® (Leadership in Energy and Environmental Design), and Sustainable Development Incentive Program (SDIP) offer servicing capacity assignment credits to the local municipalities, who may assign these credits as an incentive to promote sustainable residential development. York Region is undertaking a comprehensive review of these programs. The updated program will implement all goals and objectives established in plans and strategies related to: Water Conservation, Climate Change, Community Energy Management, Healthy Built Environment, Inflow and Infiltration Reduction, Integrated Waste Management and Urban Forest Management.

4.0 2021 UPDATE MEASURES AND PROGRAMS

4.2 PROGRAM MEASURES AND IMPLEMENTATION PLAN

Many of the program measures proposed in the 2021 Update are a continuation, extension or refinement of the programs outlined in the 2016 water conservation strategy. Non-revenue water programming will continue from previous strategies and increase in priority over the next five years, including staffing and resource allocation towards its delivery.

Table C highlights the program areas and measures to be undertaken between 2021 and 2025 and the forecasted timelines for research, refinement or implementation of each.

Implementation of the 2021 Update and its program areas will follow an adaptive management framework. This means that the Region will continue to learn from experience and respond as needed to finetune delivery. The objectives, targets, and key performance indicators will guide the delivery. The Region may also periodically engage with residents and other stakeholders as appropriate to continue to seek feedback and enhance programming.

4.0 2021 UPDATE MEASURES AND PROGRAMS

Table C: Long-Term Water Conservation Strategy 2021 updated program and measures

Research Refinement Implementation

PROGRAM AREA			2021	2022	2023	2024	2025
1 Region and Local Municipal Non-Revenue Water	Local Municipal Non-Revenue Water	• Region to continue support for the IWA/AWWA water audits					
		• Region to continue to support local municipal non-revenue water projects, pilots or initiatives, including leak detection or distribution system optimization					
		• Region to establish a community of practice with local municipalities					
	Regional Non-Revenue Water	• Continue asset management plan implementation to minimize losses					
		• Monitor industry for advanced condition assessment technologies					
		• Conduct a study on relevant key performance indicators (KPIs) for Regional non-revenue water and Regional non-revenue water opportunities					
2 Residential Water Use	Outdoor Water Conservation	• Target areas of water supply or wastewater capacity constraints					
		• Continue to promote the Fusion Landscape Professional (FLP) and Water Smart Irrigation Professional (WSIP) certification programs and support program expansion to other jurisdictions in collaboration with the Region of Peel and Landscape Ontario					
		• Offer smart or central irrigation controller incentives to WSIP certified contractors					
		• Continue to support the local municipal outdoor water conservation bylaws through education and promotion					
	Sustainable New Development	• Continue to implement the Region's Servicing Incentive Program and Sustainable Development Through LEED® programs, which offer servicing capacity as an incentive to promote sustainable grade-related and high-rise residential developments					
		• Complete a comprehensive review of these programs					
		• Work with local municipalities and builder/developer industry to identify opportunities for development-scale water reuse or rainwater harvesting projects for non-potable purposes					
	Community Engagement	• Continue to promote and educate residents on water conservation at community events					
		• Continue to educate new Canadians and students on water conservation					
		• Continue to implement the York Children's Water Festival in partnership with the Conservation Authorities and other partners					
		• Develop alternative (online or hybrid) models for engagement and the York Children's Water Festival delivery					
	Community Research	• Continue to conduct public surveys to gain insight into knowledge, understanding and impressions of York Region's water system; as well as track trends over time					
3 ICI Water Use	ICI Water Audits and Incentive Programs	• Conduct a comprehensive review of existing ICI programs including uptake and delivery model for improvements					
		• Continue to offer water audits, including wastewater audits, where applicable, for industrial facilities and modified support to institutional/commercial facilities in York Region					
		• Continue to offer equipment replacement incentives to businesses					
4 Water Reuse	Centralized Reuse	• Undertake an economic study to understand cost implications of a centralized water reuse and evaluate reuse options in York Region for a variety of sectors					
		• Continue to conduct research into the viability of large- and small-scale reuse projects					
	Decentralized Reuse	• Continue to research, support and promote decentralized reuse projects where feasible in the residential and non-residential sectors and in new and existing development					
		• Offer incentives and/or tailored advice for reuse projects through ICI programming					
5 Corporate Social Responsibility	Region-owned Facilities	• Identify and implement opportunities to increase water efficiency at Region-owned facilities, such as York Housing buildings					
		• Continue to build and renovate Region owned facilities following internal technical standards and guidelines and third-party rating systems including LEED® to create sustainable buildings					

4.0 2021 UPDATE MEASURES AND PROGRAMS

4.3 LONG-TERM WATER CONSERVATION STRATEGY TARGETS

The 2021 Update will focus on targeting further reductions in total bulk water demand, which includes residential, business and Regional and/or local municipal water consumption. Targeting all sectors contributing to the Region's total water demand will ensure demands continue to align with the Water and Wastewater Master Plan projections, as well as support the use of the existing Intra-Basin Transfer volumes beyond 2031.

The Region will continue to target and track single-family residential reductions, with a long-term aspirational target of 150 LCD by 2051.

4.3.1 SINGLE-FAMILY RESIDENTIAL TARGET

The 2011 and 2016 Strategies included single-family residential demand targets according to three scenarios. These scenarios have been simplified into Expected Scenario A and Aspirational Scenario B (Table D). The Region will continue to support efforts in alignment with Scenario A through continued implementation of Regional programming and existing Provincial regulations.

However, achieving Aspirational Scenario B requires advancements outside of the Region's influence such as new technologies, Provincial or Federal regulatory updates, increase in water reuse or very aggressive fixture replacement. York Region will continue to advocate for relevant water reuse and regulatory changes to support this scenario.

Table D: Single-family residential targets for expected and aspirational scenarios

Scenarios	Conditions	2021	2031	2041	2051
		Consumption Rate (LCD)			
Expected Scenario A	• Regional programming • Existing Provincial legislation and policy • Existing and future development intensification	190	183	176	170
Aspirational Scenario B	• Regional incentive programs • Changes to Provincial legislation and policy • Existing and future development intensification • Increase residential reuse • Market behaviour / technology advances	190	180	165	150

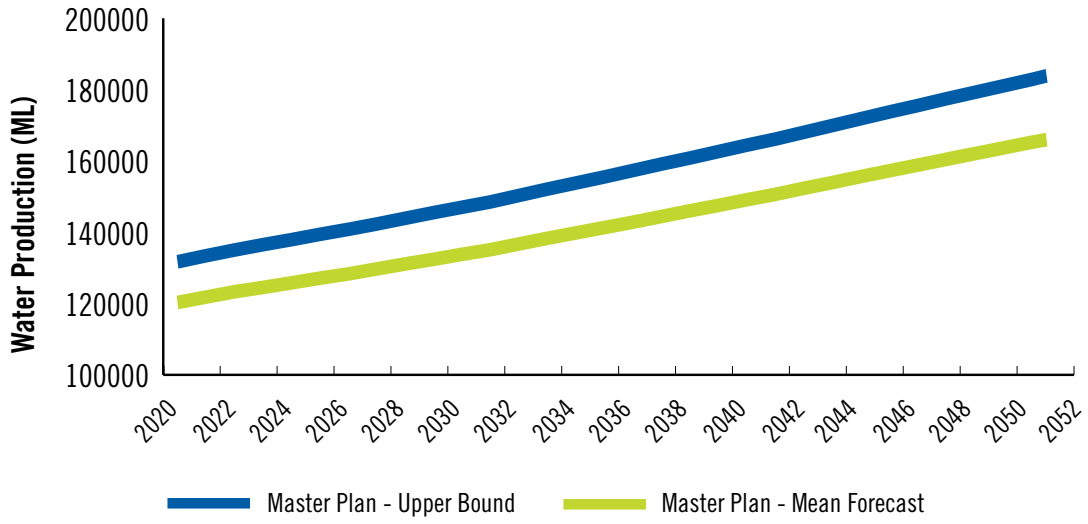
As fluctuations in water consumption are expected due to weather, the Region will update its residential consumption per capita tracking methodology to include a rolling three-year average, for comparison to the targets listed in these scenarios. In addition, it is uncertain at this time how the trajectory on residential water consumption will be impacted by the pandemic or future changes related to the pandemic (for example, an increase in working and/or studying from home). The Region will track these trends an re-calibrate targets and programming accordingly.

4.3.2 WATER AND WASTEWATER MASTER PLAN PROJECTIONS

Non-infrastructure solutions including water conservation are integral parts of the Region's Water and Wastewater Master Plan servicing strategy and play an important role in demand management. The Master Plan leverages a water flows forecast model based on a regression analysis considering historical demand data and the elasticity of water demand to various demand factors such as population growth, climate, water prices, etc. The model produces a range of forecasted outcomes (predicted future flows). To conservatively plan for future servicing, the Master Plan Update uses the upper bound of the 95 per cent confidence interval of forecasted water flows – that is, the highest predicted flow that is statistically expected 95 per cent of the time. This upper bound of forecasted water flow, together with expected population, is used to estimate per capita design rates for drinking water.

The Region will track bulk water production to ensure it is within the Water and Wastewater Master Plan forecasted bounds as shown in Figure N below. This target supports performance measurement across all sectors (residential, ICI and Regional/municipal non-revenue water).

Figure N: Water and Wastewater Master Plan bulk water production projections



4.3.3 WATER CONSUMPTION TRENDING

The Region will continue to analyze water consumption trends to further support and understand consumption behaviours and target water conservation programming accordingly. This will include:

- Bulk water supply (ML) per 100,000 serviced population, a key performance metric in the Region's Corporate Strategic Plan
- Annual bulk water supply compared to York Region's population over time
- Sectoral analysis of residential, ICI, and non-revenue water based on annual bulk water supply
- Average annual day demand and "peak day" demand analysis
- Residential billing consumption analysis to determine average litres per capita consumption and estimated outdoor demands

4.4 WATER SAVINGS

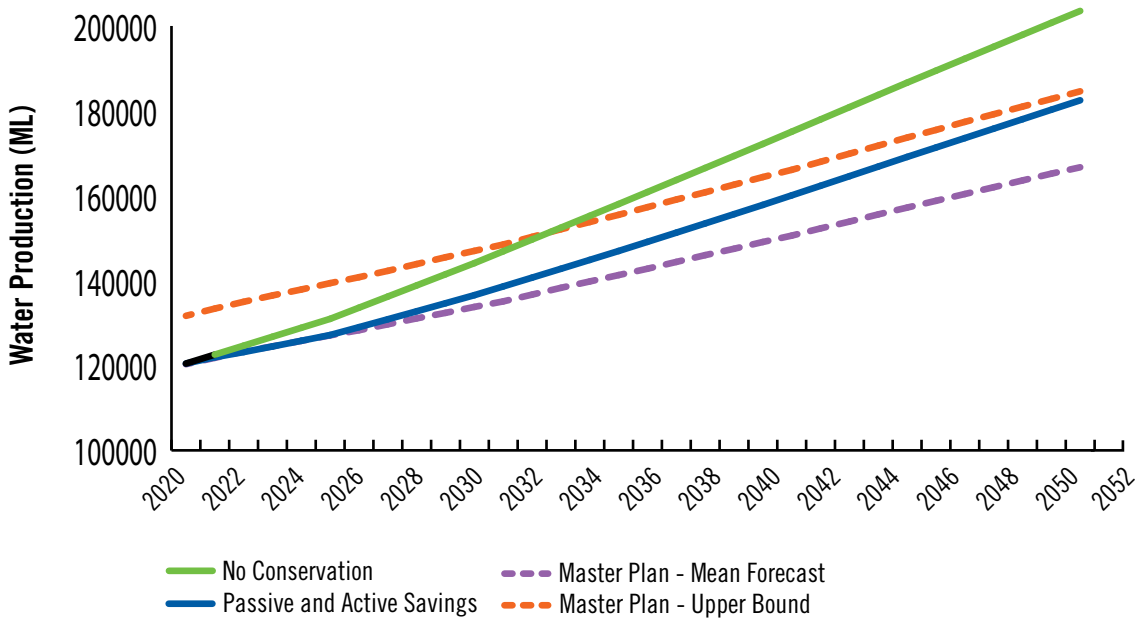
Water conservation delivers a range of environmental, social and economic benefits. The primary goal of the water conservation strategy is to realize water savings over time resulting in sustainable long-term servicing.

Over the last two decades, many utilities saw a decline in per capita demand due to changes in building codes and standards, new technology, increasing public awareness and conservation programs. It is important to differentiate between 'passive' and 'active' savings. Passive savings occur as fixtures and appliances are replaced by more efficient models based on advanced standards, codes and market transformation. Since there is a lower limit of fixture efficiency, market saturation will be reached over time and these savings are expected to plateau. The goal of the water conservation strategy is to develop programs that contribute to reductions beyond this, referred to as active savings.

The Water and Wastewater Master Plan Update assumes that per capita demand will continue to decline as a result of water conservation, through both passive and active savings. The mean and upper projections to 2051 are shown below in Figure O. In addition, the Alliance for Water Efficiency's Conservation (AWE) tracking tool was used to quantitatively evaluate proposed programs and estimate long-term demand impacts. Figure O also showcases two water conservation projections: no conservation, and passive and active savings through the water conservation strategy in contrast to the Master Plan projections.

Passive and active savings through the implementation of the water conservation strategy ensures that total demand projections stay within the upper bound of the Master Plan projections in the long-term. Therefore, water conservation programs are key to achieving savings beyond natural replacement and align with the Master Plan demand projections.

Figure 0: Water savings versus 2021 Water and Wastewater Master Plan projections



4.0 2021 UPDATE MEASURES AND PROGRAMS

4.5 PARTNERS AND GOVERNANCE

The 2021 Update implementation will be led by the Region but will require support from other governing bodies including local municipalities and the Provincial government.

The Region will require support from the nine local municipalities in:

- Ensuring the financial sustainability of water and wastewater servicing
- Customer metering and sharing accurate records with the Region
- Collaborating on targeted outdoor water-use programs
- Developing and enforcing local building codes
- Partnering to implement developer incentive programs
- Managing local non-revenue water

The Region will require support from the Province with:

- Continuing to implement policies, programs, and regulations that encourage water conservation
- Pursuing opportunities to enhance the Ontario Building Code as they arise
- Providing regulatory guidance on water reuse applications

Working in partnership with a variety of stakeholders expands the scope and reach of Regional programs. The Region will continue to work collaboratively with its servicing partners – the City of Toronto, the Region of Peel and the Region of Durham – and will continue to build on partnerships with other stakeholders, including:

- Other regions or municipalities
- Conservation Authorities
- Service providers
- Industry associations, such as the Ontario Water Works Association and Canadian Water Network

4.6 LONG-TERM WATER CONSERVATION STRATEGY CONTINUED MONITORING AND REPORTING

Moving forward, the Region will continue to integrate the Long-Term Water Conservation Strategy and Inflow and Infiltration Reduction Strategy into comprehensive demand management programs under the Water and Wastewater Master Plan, which is generally updated on a five-year cycle to reflect changing conditions and new information. An annual report related to intra-basin transfer amounts will continue to be publicly reported and shared with the MECP and the Ministry of Natural Resources and Forestry by March 31, in fulfillment of the Region's permit to take water Intra-Basin Transfer reporting obligations.

5.0 CONCLUSION

CONCLUSION

The 2021 Update expands on existing Regional plans, strategies and policies and sets the stage for innovative and best-in-class water conservation programming. It was developed based on a review of existing and historical programs, market and best-in-class research, stakeholder engagement and cost-benefit analysis.

Implementation of the 2016 Strategy has resulted in enough water savings to supply approximately 5,000 people per day, resulting in a total water savings since 1998 of enough to supply 135,000 people per day, equivalent to 27 MLD. Despite increases in the Region's population, water demand has been relatively consistent since 2011. The Region will continue to partner and advocate for relevant water reuse and regulatory changes to support long-term water savings and reductions.

The 2021 Update builds upon the extensive water conservation programming York Region has implemented, with this Update further refining programs to achieve remaining cost-effective opportunities for reductions in total bulk water supplied. This strategy includes an emphasis on non-revenue water reduction in partnership with our local municipalities by focusing on initiatives such as completing the IWA/AWWA audits and managing real losses within the systems.

The Region will continue to engage and educate residents through various approaches such as community events and online surveys and provide support through audits and incentives to the ICI sector to realize long-term savings. While many programs, such as the ICI Water Audits and Incentives program and the Outdoor Water Use program, will continue from the previous water conservation strategies, they will be refined and updated based on comprehensive reviews, research, and a targeted approach for their delivery and implementation, for example by targeting areas where there are water supply or wastewater constraints.

Conservation has many benefits beyond simply reducing demand on potable supplies and wastewater infrastructure, including reduced energy consumption, lower greenhouse gas emissions, deferred infrastructure costs, and reduced operational costs for drinking water treatment and wastewater management. By continuing to promote the responsible use of water resources, the water conservation strategy plays an integral role in achieving the Region's aspirational long-term target of 150 LCD by 2051 and demonstrates its leadership in water conservation and efficiency.

6.0 REFERENCES AND APPENDICES

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REFERENCES

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6.0 REFERENCES AND APPENDICES

APPENDIX A: REGIONAL STRATEGIC INITIATIVES

York Region Vision 2051 (released in 2011)

Vision 2051 is the blueprint for York Region's future and helps guide Regional Council and staff decisions. It sets out goals and actions to the year 2051 to achieve the vision of creating strong, caring, and safe communities. Efficiency is a guiding principle, including the goal that "in 2051, sustainability can be practiced in everyday life through climate resiliency, innovative water conservation and reuse, water resource protection, waste reduction, energy conservation and greenhouse gas reduction".

Corporate Strategic Plan (2019-2023)

The 2019 to 2023 Strategic Plan: From Vision to Results is the roadmap emphasizing the Region's priorities over the next four years. This plan aligns with the Regional Council term and contains specific, measurable, achievable, and time-based objectives and action plans.

This Strategic Plan reports annually on the megalitres of treated water consumed per 100,000 serviced population, as a key performance metric of delivering and promoting environmentally sustainable services.

Regional Official Plan (2021)

The Regional Official Plan describes how York Region plans to accommodate future growth and development while meeting the needs of existing residents and businesses in the Region. It sets out policies that guide economic, environmental, and community planning decisions.

York Region Water and Wastewater Master Plan (2021)

The York Region Water and Wastewater Master Plan sets out an integrated long-term approach detailing how York Region will provide water and wastewater services to meet the needs of the Region's growth as identified in the Regional Official Plan. The Master Plan integrates One Water thinking in providing a long-term integrated water and wastewater servicing plan to support growth to 2051 and beyond in a way that is safe, reliable, cost efficient, and sustainable.

The Master Plan has historically incorporated the water conservation strategy and water conservation programming as an integral part of the preferred servicing alternative to support the Region's growth. In 2021, the Region integrated its Master Plan, Long-Term Water Conservation Strategy and I&I Strategy into one comprehensive document. Moving forward, the Region will continue to review and update the Long-Term Water Conservation Strategy as part of the Master Plan.

York Region Water and Wastewater User Rate Study (2021)

In 2021, the Region will undertake a user rate study to assess operational business needs, refine forecasts and align the rate structure with corporate priorities. This work will inform recommendations to Council for a multi-year rate approval for achieving full cost recovery pricing, which includes building sufficient reserves for future rehabilitation and replacement projects. The Region has approved between three to six years of rate increases as part of recent rate studies.

6.0 REFERENCES AND APPENDICES

APPENDIX B: PROVINCIAL REQUIREMENTS

Ontario Regulation 387/04 - Water Taking and Transfer

Ontario Regulation 387/04 under the Ontario Water Resources Act outlines the factors the MECP takes into account when considering an application for a Permit to Take Water, or cancelling, amending, or imposing conditions on a permit. Among its requirements, it provides direction on conservation in permitting decisions.

Schedule B of the Region of Peel's and City of Toronto's Permits to Take Water (PTTW) regulating York Region's intra-basin transfer requires implementation of a water conservation strategy and annual reporting on the monthly volumes of its intra-basin transfer in the preceding calendar year. The Region continues to operate within permitted volumes based on its current population. Ongoing implementation and annual reporting of this strategy is required to comply with permit requirements.

Conditions of Approval for the Southeast Collector Trunk Sewer Individual Environmental Assessment

The *Environmental Assessment Act* sets out a planning and decision-making process so that the potential environmental effects of a project are evaluated before an infrastructure project begins. Condition 8 of the Minister's Conditions of Approval for the Southeast Collector Trunk Sewer Individual Environmental Assessment requires the Region to prepare a water conservation and efficiency strategy.

Oak Ridges Moraine Conservation Act (2001)

The *Oak Ridges Moraine Conservation Act* also include general requirements for municipalities within their boundaries to develop water conservation plans as a component of watershed plans.

Water Opportunities Act (2010)

The *Water Opportunities Act*, identifies three primary purposes:

- To foster innovative water, wastewater and stormwater technologies, services, and practices in the private and public sectors
- To create opportunities for economic development and clean-technology jobs in Ontario
- To conserve and sustain water resources for present and future generations

The Act also permits the province to pass regulations that require municipalities and municipal service providers to prepare municipal water sustainability plans. The Region's Long-Term Water Conservation Strategy is consistent with the purposes of this Act.

6.0 REFERENCES AND APPENDICES

APPENDIX C: LONG-TERM WATER CONSERVATION STRATEGY 2011 AND 2016 OBJECTIVES

The objectives of the 2011 Strategy are summarized as follows:

1. Be a municipal leader in water conservation
2. Maximize sustainability of the water supply through applying best-in-class technology and practices
3. Minimize energy consumption and reduce the Region's carbon footprint
4. Maximize the use of energy efficient technologies, processes, and practices
5. Minimize the financial costs to York Region water customers
6. Maximize partnerships with local municipalities and utilities for cost-effective delivery of Region's water conservation programs
7. Maximize reliability of the water supply system
8. Minimize risk of water service disruptions
9. Maximize system flexibility to respond to change
10. Ensure the Region's drinking water supply meets all existing and future Regional, Provincial and Federal public health and drinking water quality standards
11. Ensure the Region meets future Provincial standards for water reuse for non-potable or potable purposes
12. Align with York Region strategic goals as set out in the Regional Official Plan, Water and Wastewater Master Plan
13. Deliver effective water conservation and protection outreach and education programs to York Region residents, students, and the business community
14. Develop and deliver multicultural water conservation and protection programming and resources to effectively engage the Region's diverse demographics

The 2016 Strategy included these additional objectives to the 2011 list:

1. Enhance integrated water management planning under the Region's "One Water" approach
2. Integrate water and energy conservation to mitigate climate change impacts
3. Enhance and expand data analytics and improve Data Quality Assurance and Quality Control (QA/QC) process
4. Enhance water conservation tracking and reporting framework
5. Strengthen and establish strategic partnerships, committees, and working groups to foster innovative ideas in water conservation
6. Increase water efficiency in new developments/buildings
7. Increase focus on water reuse