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2018 Newmarket Water System Non-Revenue Water Update Information Report to Council

Report Number: 2019-05

Department(s): Public Works Services

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In accordance with the Procedure By-law, any member of Council may make a request to the Town Clerk that this Report be placed on an upcoming Committee of the Whole agenda for discussion.

Executive Summary

Non-revenue water is defined as water that is not billable to the end user, and is comprised of losses (such as customer metering inaccuracies, unauthorized consumption/water theft, data handling errors, and true water system leakage) and unbilled authorized consumption (such as usage of water for infrastructure operation and maintenance, flushing and for emergency services, such as fire flow).

The Town of Newmarket, like all drinking water system owners in North America, experiences non-revenue water as part of its water purchase / water sale process. Newmarket purchases metered treated drinking water from York Region and in turn sells water to the residents and customers of the Town. The Town tracks consumption and billing volumes through residential, industrial, commercial and institution (ICI) water meters. The water volume difference between York Region's billing and Town's sales is known as non-revenue water. Non-revenue water is generally expressed as a percentage and has financial impacts on Town water and wastewater revenue collection.

In 2018, the percentage of non-revenue water experienced by the Town was approximately 21.47%. York Region is compiling 2018 data for York Region's other municipalities and it is not available at this time.

In 2017, the percentage of non-revenue water experienced by the Town was approximately 17.27%. In 2017, the non-revenue water percentages varied from approximately 9% to 30% amongst the nine (9) local municipalities in York Region¹.

American Water Works Association (AWWA) research estimates the average non-revenue water for North America's drinking water systems ranges from 20 to 25 per cent every day with some systems reporting close to 50% losses².

The non-revenue water percentage can vary greatly from system to system. The 2018 value of 21.47% non-revenue water being reported for Newmarket is within the estimated average based on industry research.

In 2018, the financial cost of non-revenue water to the Town was approximately \$5.3 million dollars based on water and wastewater rates being charged by York Region and the recoveries received from Town customers. As all municipalities have some non-revenue water, Newmarket usually budgets approximately 12% - 16% of water purchases for this issue. For 2018 the estimated non-revenue cost was \$3.9 million, leaving approximately \$1.4 million unbudgeted for. Town and Regional staff are currently in discussions with respect to this overage.

Purpose

The purpose of this report is to provide information on what actions the Town of Newmarket is taking to further understand non-revenue water volumes and to implement industry best practices to reduce and manage non-revenue water within the Town's drinking water system.

Background

The Town experiences levels of non-revenue water in its drinking water system due to challenges such as metering and billing data inaccuracies, system operations and maintenance activities such as flushing, system leakage due to aging infrastructure, firefighting, water use during new development, new watermain commissioning and testing and water theft.

¹ 2017 water data is reported by each municipality in the IWA/AWWA water audit spreadsheets provided to York Region. York Region accepts no responsibility for the data or for any errors or inaccuracies in the data.

² Ress, Erin and Roberson, J. Alan. "The Financial and Policy Implications of Water Loss," American Water Works Association 108, no. 2 (2016)

Table 1 shows the non-revenue water percentages since 2009.

Table 1:

Year	Purchased volume from York Region (m3)	Billed volume for Town of Newmarket (m3)	% Difference – Purchase vs. Consumption (non-revenue water)
2009	8,741,611	7,368,900	15.70%
2010	9,129,588	7,539,311	17.42%
2011	8,479,472	7,345,696	13.37%
2012	8,598,676	7,191,412	16.37%
2013	8,613,261	7,080,899	17.79%
2014	8,130,411	7,011,144	13.77%
2015	8,242,358	6,940,811	15.79%
2016	8,175,016	7,045,890	13.81%
2017	8,061,649	6,669,617	17.27%
2018	8,768,108	6,885,791	21.47%

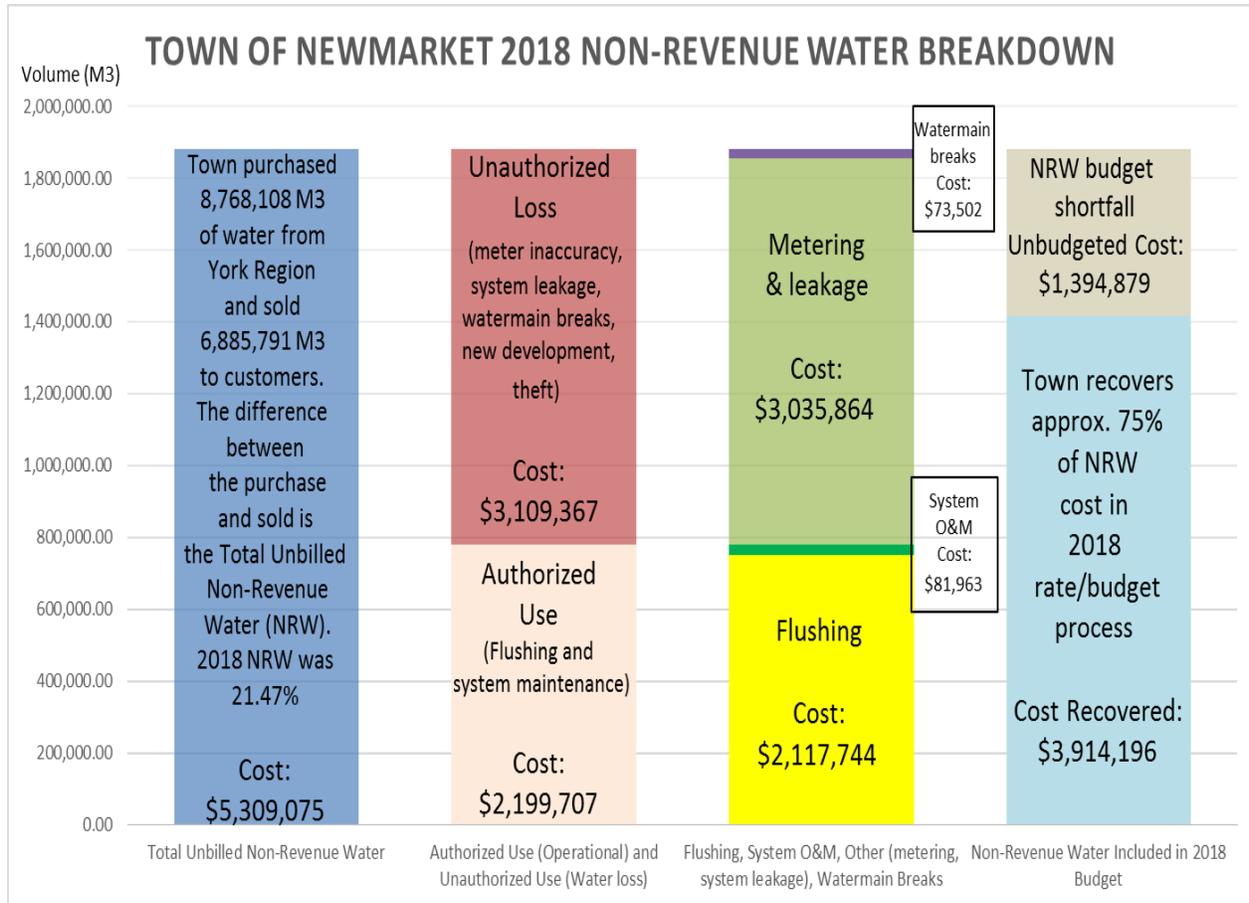
In 2018, the difference between the water volume billed by the Region and sold by the Town was approximately 21.47%. This includes the following:

- Water used for flushing to maintain water quality (approximately 750,840 m³, 8.56%)
- Routine maintenance activities (approximately 29,060 m³, 0.33%)
- Watermain breaks (approximately 26,060 m³, 0.30%)
- Other Water Loss including water meter inaccuracies, system leakage, firefighting, theft, new watermain commissioning / testing (1,076,357 m³, 12.28%)

Based on the water and wastewater rate charged by York Region and the recoveries the Town received from its customers, the Town experienced approximately \$5.3 million dollars of non-revenue water in 2018.

Table 2 shows the total non-revenue water and a breakdown of activities contributing to the total.

Table 2:



Discussion

Since 2016, the Town has actively participated in a York Region led peer review initiative with a third-party consultant to help local municipalities understand their water losses after its point of supply from the Region. The peer review involved an evaluation of each municipality’s non-revenue water and a summary of recommendations to help address non-revenue water. Recommendations included the tracking and annual completion of water balances with American Water Works Association/International Water Association (IWA) tracking software as well as water loss tracking of Regional and local municipal monthly water loss volumes related to operation and maintenance, watermain or other water infrastructure failures, and capital projects. The Town participates in this initiative and regularly provides data to York Region.

The key drivers of the Town’s non-revenue water totals include;

- Aging water meters and/or inaccuracies of outside remote reading devices that require replacement

- Aging infrastructure that requires rehabilitation and replacement
- Higher than normal operational requirements to flush water out of the system to reduce water age and maintain chlorine residual

The Town is addressing the key drivers through important initiatives such as;

- Water Meter Replacement Program
- 5 Year Infrastructure Capital Plan
- Optimizing system operations to manage flushing volumes required to reduce water age and maintain chlorine residuals

Table 3 (attached as Appendix A) provides a breakdown of known industry contributors to non-revenue water and the Town's opportunities to address them.

In order to continue to understand non-revenue water challenges, implement controls, track progress and determine benefit, the Town will continue to participate with York Region and the nine (9) local municipalities in the water audit program. To determine overall benefit, the Town will develop and use performance indicators to determine the effectiveness of the chosen actions to reduce non-revenue water.

Conclusion

The Town of Newmarket, like all drinking water system owners in North America, experiences non-revenue water as part of its water purchase / water sale process. Between 2009 and 2017, non-revenue water as a percentage of purchased water from the Region ranged between 13.37% and 17.42%. In 2018, the percentage of non-revenue water experienced by the Town was approximately 21.47%, which resulted in a financial cost of unanticipated non-revenue water of approximately \$1.4 million dollars. The Town is addressing the key drivers to manage non-revenue water by completing important initiatives such as the Water Meter Replacement Program, five Year Infrastructure Capital Plan and optimizing system operations to manage flushing volumes required to reduce water age and maintain chlorine residuals. As more data is collected and analyzed by staff, the Town will be in a better position to prioritize and implement additional operational changes and capital projects to evaluate the effectiveness of key initiatives and continuously improve non-revenue water controls.

Business Plan and Strategic Plan Linkages

The Community Strategic Plan for the Town of Newmarket articulates the goals of:

- Living well...focusing on health, safety, and the environment to promote activity and enrich lives

- Well-equipped and managed...implement policy and processes that reflect sound and accountable governance for fiscal responsibility, service excellence, and management of assets and services to meet operational demands

Consultation

Key stakeholders that reviewed and contributed to the content of this report include:

- Engineering
- Finance

Human Resource Considerations

None required for the purpose of this report.

Budget Impact

As some non-revenue water is expected in all water systems, the Town currently budgets a certain percentage of unbilled water in the water/wastewater rates. To maintain acceptable chlorine residual, Town staff have flushed, swabbed and implemented other best practices, some of which increase the unbilled water percentage. As the configuration of the Regional and Town water systems are integrated, Town staff are in discussions with Regional staff regarding potential compensation for higher maintenance expenditures. The results of these discussions and the impact of other noted best management practices will be reported back to Council when results are available.

Attachments

Appendix A – Table 3: Initiatives to Address Non-Revenue Water Challenges

Contact

For more information, contact Luigi Colangelo, Manager of Water/Wastewater, at 905-953-5300, ext. 2553, or by email at lcolangelo@newmarket.ca.

Approval



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Appendix A - Table 3: Initiatives to Address Non-Revenue Water Challenges

Town Initiative to Reduce Non-Revenue Water	Current Challenge	Opportunity for Improvement	Impact To Non-revenue Water H – High M – Medium L – Low
Implementation of the Town's water meter replacement program of aging water meters	<ul style="list-style-type: none"> As previously reported in Joint Report 2015-17, February 10, 2015, the Town of Newmarket owns and maintains over 26,000 residential and commercial water meters within the distribution system. Based on audits, it is estimated that over half of these meters are believed to be under registering usage by about 10% due to age and/or inaccuracies of outside remote reading devices Some meters in the Town's system are as old as 50 years and have limited accuracy 	<ul style="list-style-type: none"> A contract has been awarded for implementation of the Advanced Metering Infrastructure (AMI) Meter Replacement Program. AMI meter replacement will remove older, under registering meters from the system, improving overall meter accuracy for billing purposes. The enhanced metering, data collection, billing process and meter testing and replacement program will improve data accuracy to reduce non-revenue water 	<p>H</p> <p>Meter replacement program to commence in Q3, 2019</p> <p>New meters will improve billing accuracy, reduce non-revenue water and increase Town revenue by approximately \$500,000 per year (Joint Report 2015-17)</p>
Replacement of aging infrastructure through 5 year capital program	<p>The Town has watermains within its drinking water system that are over 70 years old and require replacement. Aging infrastructure contributes to leakage, watermain breaks and impacts chlorine residual decay. It is important that the 5 year capital plan addresses aging watermains within the Town's system.</p>	<ul style="list-style-type: none"> The Town received Clean Water and Wastewater Fund (CWWF) grants to develop watermain condition assessment tools utilizing pipe age, pipe material, history of watermain breaks and impact to water quality. CWWF also contributed to watermain replacement on Gorham Street and Patterson Street. The Town's 5 year capital program includes the replacement of aging watermains that will improve condition and, in turn, reduce leakage and water quality flushing requirements 	<p>H</p> <p>In 2019, projects include Park Avenue, Patterson Street, Charles Street</p> <p>In 2020, proposed projects include Longford Drive, Lorne Avenue, Simcoe Street, Niagara Street</p> <p>Difficult to determine exact loss reduction benefit until work completed and system monitoring established</p>
Participate in water system leakage data exchange and analysis by using the Infrastructure Leakage Index (ILI)	<ul style="list-style-type: none"> Infrastructure Leakage Index (ILI) is a performance indicator quantifying how well a distribution system is managed for the control of real losses (leakage) at the current operating pressure. An ILI value of 1.0 is considered a "best managed" system. In 2017, Newmarket had an ILI value of 2.05. This value is considered fair and presents opportunities for improvement by continuing to invest in replacing aging infrastructure In 2017, York Region's nine (9) local municipalities had an average ILI value of 1.57 	<ul style="list-style-type: none"> Continue to participate with York Region and the local municipalities with system performance data Capital Watermain Replacement Program should support improved ILI values Continue to identify and replace aging infrastructure Quickly address and repair any known leaks in the system 	<p>H</p> <p>Capital Watermain Replacement Program and addressing system leakage will continue throughout 2019</p>
Uni-directional flushing and auto-flushers to reduce water age and maintain quality	<ul style="list-style-type: none"> The Town experiences higher than normal operational requirements to flush water out of the system to reduce water age and maintain chlorine residual Population has increased, but consumption has significantly decreased as a result of Water Conservation efforts (low flow toilets, shower heads, etc.) and higher rates. Coupled with Master Planning's focus on future growth, MECP fire flow design requirements, and Newmarket's location at the dead-end of a very large York Water System, water within the distribution system is retained for longer periods of time which increases water age. 	<ul style="list-style-type: none"> The Town continues to work closely with York Region, consultants and academia to develop operating strategies to reduce water age, chloramine residual decay and to reduce the volume of water flushed In Q1, 2019, the Town's Central Pressure Zone was re-configured to reduce water age and promote improved water movement within the system. Data is being collected and analyzed to determine the effectiveness of this change In 2019, the Town is procuring and installing auto-flushers controlled by chlorine residual analyzers at strategic locations to optimize flushing and 	<p>H</p> <p>The Town will continue to work with industry experts, monitor effects of operational changes in the Central Pressure Zone and implement enhanced flushing strategies</p> <p>Staff to determine and implement actions to reduce unbilled authorized consumption used to reduce water age in the drinking water system</p>

Appendix A - Table 3: Initiatives to Address Non-Revenue Water Challenges

	<ul style="list-style-type: none"> Water age contributes to increased chloramine residual decay and a higher rate of biofilm formation, further enhancing chloramine decay York Region groundwater wells are kept online for security of supply, which leads to iron loading within system To manage water age and to prevent chloramine residual decay, flushing is required to maintain stringent regulatory compliance audited by the Province auto-flushers are operated in areas identified with high water age through comprehensive hydraulic modelling 	<p>system maintenance. The auto-flushers will only operate as required based on chlorine residual data, not on a timer as currently practiced</p>	
Execute proactive system maintenance programs	<ul style="list-style-type: none"> Newmarket is located at the dead-end of the very large York Water System Water within the distribution system is retained for longer periods of time, increasing water age The Town is required to implement industry best practice system maintenance programs such as watermain swabbing (cleaning) and dead end flushing 	<ul style="list-style-type: none"> Town has developed and implemented the 2019 uni-directional flushing and swabbing program to clean watermains to reduce water age and increase chlorine residual stability. 2019 dead-end flushing program to clean dead-end watermains implemented to direct fresh water to all of the dead-end water mains within the system to reduce water age and improve chlorine residual 	<p>M</p> <p>Staff to determine and implement actions to reduce unbilled authorized consumption for system maintenance activities</p>
New Development water use for commissioning, testing and construction Water	<ul style="list-style-type: none"> Developers and contractors require water for building, testing and commissioning new development The water used for these activities is generally not metered, however funds are collected from the developers for general construction water use. 	<ul style="list-style-type: none"> Determine and establish internal procedures and processes for improved tracking and accounting for this type of water use Determine a more appropriate process for charging back cost of water used for new development to the developer and contractors 	<p>M</p> <p>Staff will better understand volume of unbilled authorized water used for these activities and bill developers and contractors accordingly</p>
Improved process for watermain break repairs and data tracking	<ul style="list-style-type: none"> Aging infrastructure and pipe material contribute to watermain breaks and failures. In 2018, the Town experienced 34 watermain breaks and repairs 	<ul style="list-style-type: none"> The Town's 5 year capital program includes the replacement of aging watermains that will improve condition and reduce the number of watermain breaks The Town reviewed and updated its "Watermain Break Repair Report Form" using industry best practices and now includes all information as outlined in the MECP Watermain Disinfection Procedure. This will allow for improved data collection and analysis 	<p>L</p>
Improve Internal processes for tracking internal Town operations and maintenance activities	<ul style="list-style-type: none"> Other internal operations use water for operational and maintenance activities that is generally not metered Includes Town activities such as road maintenance, some park irrigation, pressure and flow testing, sewer flushing 	<ul style="list-style-type: none"> Determine and establish internal processes for improved tracking and accounting for this type of water use 	<p>L</p> <p>Staff will review and optimize existing practices</p>
Improve internal processes for tracking water used for firefighting and other related activities	<ul style="list-style-type: none"> Firefighting activities including actual fires, training and truck maintenance are not metered or accounted for 	<ul style="list-style-type: none"> Determine and establish internal processes for improved tracking and accounting for this type of water use 	<p>L</p> <p>Staff will review and optimize existing practices</p>
Theft	<ul style="list-style-type: none"> Theft occurs in drinking water systems and is difficult to manage, enforce and impose violations and track volumes 	<ul style="list-style-type: none"> Determine and establish internal processes for improved tracking and accounting for this type of water use 	<p>L</p>