



Memorandum

TO: Committee of the Whole
FROM: Erin Mahoney, Commissioner Environmental Services
DATE: February 17, 2017
RE: **Update on Water and Wastewater Research and Innovation**

This memo provides an update to Council on water and wastewater research activities and innovations undertaken over the last year.

Research program brings about innovative solutions and is key to Environmental Services meeting and anticipating emerging challenges

To stay ahead of regulatory changes and in step with advances in treatment technology, the Environmental Services Department has been engaged in a research and innovation program since 2008 spanning both water and wastewater disciplines. The program supports protection of public health and the environment by:

- understanding emerging challenges;
- leveraging and implementing the latest technologies;
- optimizing facility operations to reduce chemical consumption and improve treatment quality; and
- aligning with a complex and changing regulatory framework.

Through strategic partnerships with various universities, agencies, industry experts, and our services providers, York Region has made considerable progress in the implementation of innovation solutions to complex problems and challenges in the water and wastewater industry. These partnerships include University of Toronto's Drinking Water Research Group (DWRG), the Water Research Foundation, University of Waterloo, University of British Columbia, Ministry of the Environment and Climate Change (the Ministry), Peel Region, Durham Region, City of Toronto and many others.

Environmental Services leading the way with adoption of One Water framework

Environmental Services integrated the One Water approach into the 2016 Water and Wastewater Master Plan. The One Water approach strives to view all water as a resource by making the best use of existing infrastructure and finding alternative pathways for water use. By following this approach, the pressure on natural and financial resources is lessened by reducing the need for new infrastructure. The research and innovation program mirrors this framework, incorporating research at all stages of the water cycle including customer engagement. Some highlights from ongoing and future projects include:

Source Water: Early Detection and Removal of Blue-Green Algae Toxins

Keeping in step with emerging issues related to blue-green algae in Lake Erie, the DWRG in partnership with York Region and four other Ontario municipalities, obtained federal funding towards a three-year project for the early detection and treatment of blue-green algae toxins, which may impact human health. Through regular monitoring and substantial watershed planning efforts, the occurrence of dense algae blooms in Lake Simcoe have been avoided. This research will provide utilities with the knowledge and tools to provide early line of sight to deal with impacts to drinking water treatment. Anticipated Completion: 2019.

Source Water and Treatment: Mussel Control at Drinking Water Intakes

Building on previous research done by the DWRG and lake monitoring by Lake Simcoe and Region Conservation Authority, further work will be undertaken to develop new monitoring techniques and the use of alternative physical and chemical control strategies to reduce the colonization of a new species of mussels on drinking water intakes. Renata Claudi, a global leading mussel researcher, is part of the research team. Results will be relevant to all Southern Ontario utilities with surface water plants as this new invasive mussel is prevalent in most freshwater systems. Anticipated Completion: 2019.

Source and Treatment: Investigation of Alternative Sources of Disinfection By-Products

York Region has recently participated with the DWRG on a Water Research Foundation project to explore the issue of emerging disinfection by-products in source water. Typically, these chemicals form in the water during disinfection. Recent research suggests that alternative sources may contribute and thereby increase the presence of these chemicals in drinking water. An example of an emerging disinfection by-product is nitrosodimethylamine (NDMA), regulated in Ontario to 9 parts per billion in drinking water to protect public health. Research will investigate alternative sources of precursors through the water cycle. Anticipated Completion: 2019.

Source, Treatment and Distribution: Investigation of Alternative Groundwater Treatment Strategies

In order to address distribution challenges associated with groundwater, York Region commissioned the Groundwater Treatment Strategy in 2016 with CH2M Consulting Services to evaluate alternative treatment methods at groundwater wells to address iron and manganese water quality issues. The project also pilots the treatment methods to understand impact on the distribution systems. This work further gauges the impact of Health Canada's recently proposed guideline for manganese. Anticipated Completion: 2018.

Treatment and Distribution: Optimization of Biological Filtration

In partnership with the DWRG, a pilot is ongoing at the Georgina Water Treatment Plant to better understand biological filtration in the granular activated carbon filters with the goal of optimizing operations and improving water quality in the distribution system. Anticipated Completion: Work in this area expected to continue into 2018 and 2019.

Treatment and Distribution: Monitoring Toronto's Corrosion Control Plan in the York Water System

As part of City of Toronto's Corrosion Control Plan, York Region actively monitors phosphorus throughout the York Water System as the City uses a phosphorus product to line old piping within City limits. This is to prevent lead from entering into drinking water. Data will also be used to inform Health Canada's proposed lower lead limit. Results are regularly reported to local municipalities and Public Health. Anticipated Completion: Work in this area expected to continue into 2018 and 2019.

Distribution: Innovative Upgrades to Improved Water Quality in Local Municipal Distribution Systems

Last year, York Region successfully commissioned two facility upgrades at Aurora South Reservoir and Glenway Reservoir to improve water quality in the local distribution systems; with two more upgrades projects underway at Holland Landing West and East Vaughan Booster. These facilities are some of the first of their kind in North America and are proving very effective in maintaining secondary residuals for the local systems. Building on that achievement, further investigation using a second application by an in-tank system is underway. If successful, it will be the first installation in Ontario. Anticipated Completion: Late 2017.

Collection and Conveyance: Data Analytics to Drive Energy Optimization

In 2014, Environmental Services partnered with York University's Schulich School of Business to complete three data analytics projects at Vaughan Pressure District 7 Water System, Newmarket and Aurora Sewage Pumping Stations. Through these projects, data analytics techniques have identified efficiencies in pumping patterns to inform new operational approaches resulting in energy and cost savings. Based on early findings, estimated annual energy savings at one facility are approximately 78,000 kilowatt hours, or \$13,000. Environmental Services continues to seek opportunities to leverage existing data and data analytics techniques. Anticipated Completion: Late 2017.

Collection and Conveyance: Investigating Emerging Contaminants at the Source

In Spring 2016, the Environmental Monitoring and Enforcement team, under the Sewer Use Bylaw, initiated a field research program with the Ministry to assess wastewater discharges from pharmaceutical manufacturers and funeral homes as potential sources for emerging contaminants. Working with business owners as part of a collaborative research undertaking, results will inform and provide greater insight into loading of contaminants from point sources and methods to control emerging contaminants. Anticipated Completion: Late 2017.

Wastewater Treatment: Effluent Heat Recovery and Reuse Pilot Study

York Region undertook a feasibility study to assess energy consumption at the Keswick Water Resource Recovery Facility. The existing electric heating system for the membrane cleaning process was identified as the single most energy consuming process at the facility. The energy audit recommended heat recovery and reuse as a viable alternative for the membrane cleaning process. Anticipated Completion: Late 2017.

Wastewater Treatment: Water Reuse Demonstration Project

Environmental Services kicked off a three-year Water Reuse Research Demonstration Project in January 2017. The Project will include partnering with an academic institution to use reclaimed water from an existing Water Resource Recovery Facility to irrigate a non-food crop for two growing seasons. The Ministry has provided feedback on the terms of reference and will continue to be engaged as the project proceeds. The team will evaluate the effects of reclaimed water on plant health, soil properties along with water quality and quantity. The results will help York Region better understand the technical, regulatory and environmental implications of water reuse. York Region has received \$50,000 from the RBC Blue Water Project Funding to support this project. Anticipated Completion: 2020.

Wastewater Treatment: Investigation of Membrane Performance During Cold Weather Conditions

York Region facilitated a federally funded research partnership with General Electric and the universities of British Columbia and Waterloo to optimize the biological processes and membrane treatment at the Keswick Water Resource Recovery Facility. This partnership with internationally recognized experts in wastewater treatment will provide a strategy to address cold water challenges. It has the potential to increase membrane life expectancy, improve operations and assist the Region in attaining and improving the high quality water returned to Lake Simcoe. As well, this inaugural project sets out the framework for industry leading wastewater research and paves the way for more wastewater research in anticipation of the Upper York Sewage Solution and Water Reclamation Centre. Anticipated completion: 2020.

York Region continues to promote shared knowledge with the industry

Research and innovation initiatives have and will continue to improve plant operations, asset management programs and inform capital projects. Staff engagement with industry experts has created opportunities to modify practices to meet regulatory

requirements as well as develop new programs and tools to anticipate the needs and challenges the industry faces.

Our improved knowledge better positions York Region staff to advocate and respond to proposed advancements in regulatory governance. These ongoing efforts demonstrate York Region's commitment to continuous improvement, leadership, and operational excellence in water and wastewater service delivery.

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