Office of the Commissioner
Public Works
Memorandum
FOR INFORMATION

To: Committee of the Whole

Meeting Date: April 10, 2025

From: Laura McDowell
Commissioner of Public Works

Re: **Update on Public Works Research and Innovation Program**

This memo updates Council on research and innovation projects undertaken by Public Works in 2024 and highlights activities related to service delivery for water, wastewater, waste management, forestry, energy conservation, roads, and transit programs.

Public Works supports York Region's Strategic Plan by addressing business needs and operational challenges through research and innovation projects

Since 2008, staff have engaged in research and innovation initiatives that support public health and environmental protection, while addressing operational challenges to improve services. Public Works' research aligns with the Region's innovation mindset and vision to build strong, caring and safe communities.

In 2024, Public Works advanced more than 30 research initiatives, achieving cost-savings, safer public spaces, process improvement efficiencies, and new customer experience approaches that optimize community health and resident wellbeing. All projects span the Council's four Strategic Plan Areas of Focus. Appendix A summarizes how key projects align with each Area of Focus. Appendix B describes completed and ongoing projects.

Research continues to demonstrate positive impacts on Public Works' operations. This is exemplified in the Region's partnership with Markham District Energy (MDE) to reduce reliance on natural gas and recover what was previously considered waste heat in the Region's sewers. The wastewater energy transfer project is currently on track for commissioning in Q2 2026 and is anticipated to be the largest of its kind. Once fully implemented, the project will support York Region's Climate Change Action Plan by reducing community greenhouse gas emissions by up to 30,000 tonnes per year (equivalent to annual emissions from 5,500 cars).

Key collaborations help ensure positive research and innovation outcomes

Public Works accesses expertise and funding through partnerships with research institutions, academia, industry, municipalities and funding organizations. In 2024, Public Works engaged with over 30 organizations, such as Water Research Foundation and the Canadian Urban Transit

Research and Innovation Consortium, to explore new service delivery approaches, understand emerging challenges and improve processes. Creating and maintaining these partnerships create a multitude of operational benefits. Working with multi-disciplinary groups has saved money and time, such as reducing staff time to monitor street trees and enhancing their survival, reducing replacement costs.

York Region recognized and awarded for research and innovation results

In 2024, Public Works received multiple awards for the Automated Facilities Deficiencies Detection System (CityRover) project that uses artificial intelligence to scan bus stops for repairs and maintenance needs, resulting in significant annual savings which will be calculated after full implementation across the transit system. Awards received include: the Innovation Award from Municipal World, an Innovation Award from the Institute of Public Administration of Canada and the Excellence in Municipal Systems Award from the Municipal Information Systems Association. Building on this success, Public Works will continue to responsibly explore other opportunities to use artificial intelligence to advance the delivery of services.

York Region continues to see long-term recognition from its research initiatives. The wastewater surveillance project, launched in 2020 to help track Sars-CoV-2, has now developed into an ongoing program. As one of the first municipalities to explore wastewater surveillance for Sars-CoV-2, York Region's experience will be highlighted in a book about Canadian municipal innovation to be published later in 2025. The research was also published in Scientific Reports, the fifth most cited journal in the world in 2023.

Public Works research and innovation an important element of continual improvement

Through strong partnerships and cutting-edge projects, Public Works' 2024 research and innovation initiatives have achieved cost savings, improved service quality and received national and global recognition. These efforts continue to advance the Region's strategic priorities and support its vision of building strong, caring, and safe communities.

For more information on this memo, please contact David Szeptycki, Director, Sustainability, Communications and Innovation at 1-877-464-9675 ext. 75723. Accessible formats or communication support are available upon request.

Laura McDowell, P.Eng
Commissioner of Public Works

Erin Mahoney
Chief Administrative Officer

March 24, 2025
#16556534

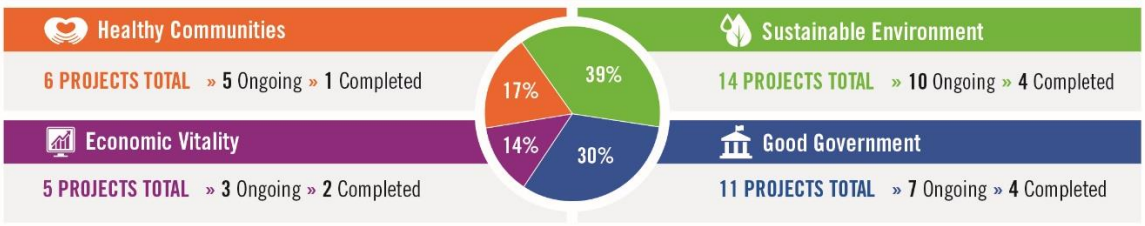
Appendix A – 2024 Research and Innovation Highlights
Appendix B – 2024 Research and Innovation Projects List

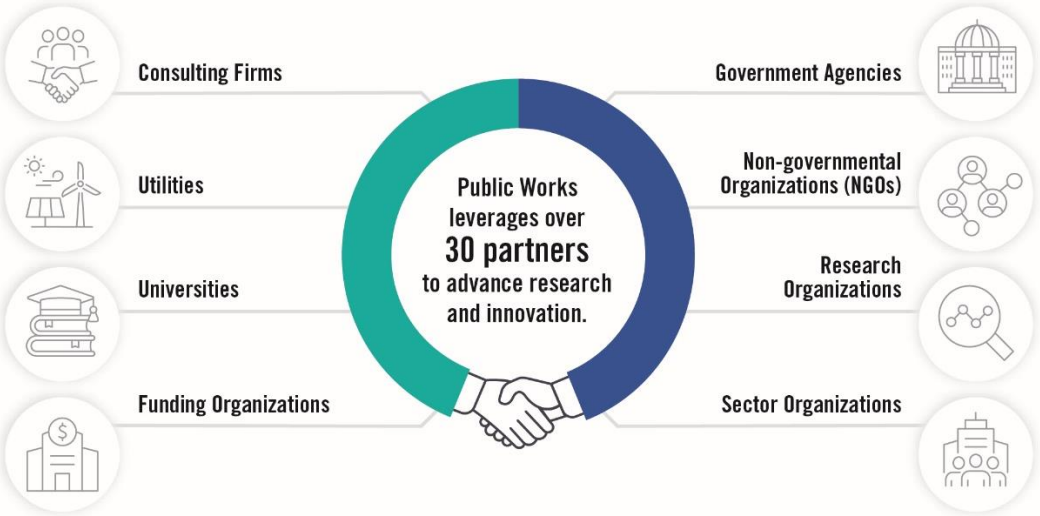
2024 Research and Innovation Highlights

RESEARCH "The creation of new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies and understanding"

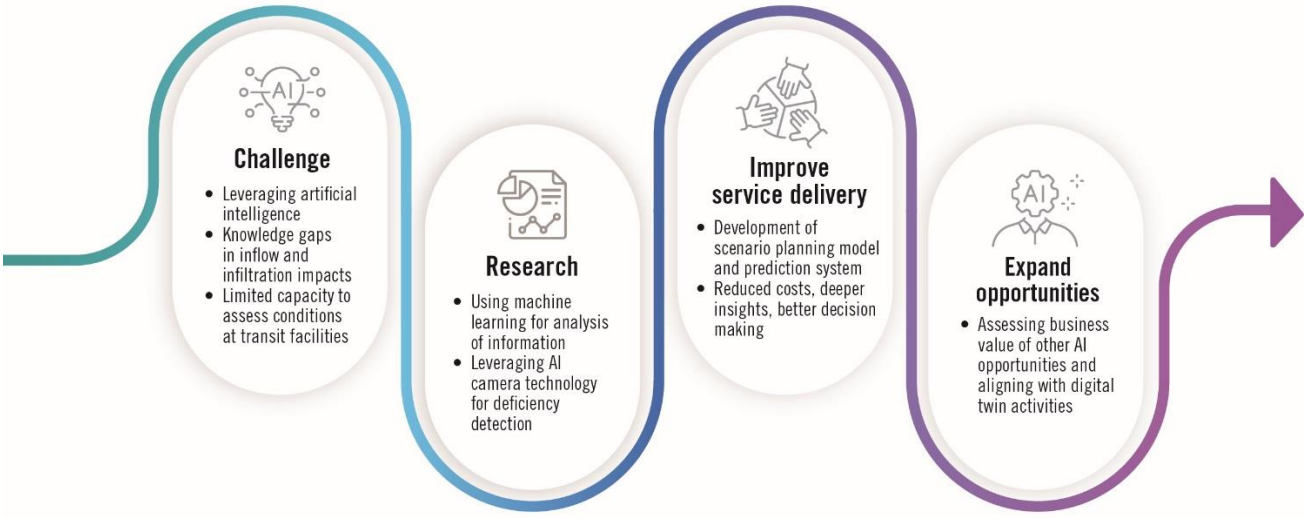
INNOVATION "The application of new ideas resulting in increased value to customers and/or increased productivity or reduced costs."

Research & Innovation Supporting Strategic Plan Areas of Focus





The Journey from Research to Better Service Delivery: Artificial Intelligence Project Spotlight



2024 Research and Innovation Projects List

COMPLETED RESEARCH IN 2024

Economic Vitality | Healthy Communities | Sustainable Environment | Good Government

AREA OF FOCUS	RESEARCH PROJECT	PROJECT PARTNER(S)	RESEARCH BENEFIT
	Emerging Substances of Concern Prioritization Pilot Project	McGill University	Develop and execute a pilot sampling prioritization study to enhance York Region's knowledge of the presence of key emerging substances of concern.
	Flood Risk Assessment Model Development for Infrastructure in York Region	LEA Consulting	Maps flood impacts on Regional infrastructure to prioritize climate change adaptation planning.
	Resource Recovery Baseline Study for select service areas	Cambium, Inc.	Baseline study will apply a 'circular economy' lens to determine how to reduce, reuse and recover resources generated by selected Regional lines of business.
	Pipe Reactor and Pipe Loop Study	Drinking Water Research Group, Town of Newmarket	Developing a bench scale pipe loop equivalent that can accurately emulate distribution system conditions including flows, sheer force, etc.
	Quantifying gas phase chlorine compounds in sewer system headspaces	University of Waterloo	Provides necessary information for the Region to evaluate the possibility of including Chlorine as a regulatory parameter within the Sewer Use Bylaw.
	Precursor to Digital Twin	CIMA+	Study to create a Digital Twin program of water system and gap analysis of data required.
	Predicting water demand based on historical data	Triple Point Solutions Inc.	This pilot project will explore using Supervisory Control and Data Acquisition (SCADA) data and historical water demands to predict future water demands.

AREA OF FOCUS	RESEARCH PROJECT	PROJECT PARTNER(S)	RESEARCH BENEFIT
	Biological controls for dog-strangling vine	Silv-Econ Ltd., Agriculture and Agri-Food Canada	Tests biological control informing management of the invasive species dog-strangling vine and protects York Region forests and biodiversity.
	Trees and their socio-ecological effects	University of Toronto	Improves understanding of the social and ecological benefits of urban trees by quantifying how much social and ecological benefit is lost when trees are removed.
	Kleinburg WRRF Advanced Biological Nutrient Removal/Recovery Demonstration Pilot	Ministry of the Environment, Conservation and Parks Gross-Wen Technologies	This demonstration pilot will evaluate the effectiveness of algae-based wastewater treatment technologies for nutrient removal.
	Requirements for Quantification of Greenhouse Gas Emissions and Evaluation of Reduction Opportunities in Water and Wastewater Infrastructure Capital Delivery	GHD	This project will contribute to the Region's larger body of climate change work to help reduce GHG emissions. Furthermore, including the quantification of emissions in the evaluation of alternatives during upfront planning and design will help integrate climate change mitigation into investment decision-making for York Region water and wastewater infrastructure assets.

ONGOING RESEARCH IN 2025

Economic Vitality | Healthy Communities | Sustainable Environment | Good Government

AREA OF FOCUS	RESEARCH PROJECT	PROJECT PARTNER(S)	RESEARCH BENEFIT
	Measuring Park Traffic	SmartCone	Assessing York Region Forest visitor traffic to understand volume and type of users.
	Functional Metagenomics Exploration and Discovery of Novel Antimicrobial Resistance	University of Waterloo	To explore how wastewater surveillance can be utilized to better understand antimicrobial resistance circulating in human populations.
	Granular activated Carbon Core Sample Challenge Testing	Drinking Water Research Group, WSP	Testing of granular activated carbon adsorptive capacity to remove by-products from drinking water.
	Microplastics in sewage sludge exploration and detection	York University (Lassonde School of Engineering)	Measuring new approaches to address microplastics and their impact on wastewater treatment systems and advance understanding of their prevalence and fate.
	Cyanotoxin control strategies in drinking water	Drinking Water Research Group, Hamilton, Union Water, Durham, and Niagara	Evaluating effectiveness of granular activated carbon and other treatment processes to remove cyanotoxins, as well as developing monitoring tools for improved response to harmful algal blooms growing in proximity to water intakes.
	Pavement Deficiency System – Pilot for signs	CityRover Inc.	Uses image capture and analytics with artificial intelligence to properly identify and report issues regarding street signs. This system integrates with asset management systems to automatically create service requests to be actioned, removing a manual process.

AREA OF FOCUS	RESEARCH PROJECT	PROJECT PARTNER(S)	RESEARCH BENEFIT
	Pavement Deficiency System – Pilot for pavement marking	CityRover Inc.	Uses image capture and analytics with artificial intelligence to properly identify and report issues regarding pavement markings. This system integrates with asset management systems to automatically create service requests to be actioned, removing a manual process.
	YRT Stop Inspection System	CityRover Inc.	Uses image capture and analytics with artificial intelligence to properly identify and report issues with infrastructure at bus stops. This system integrates with asset management systems to automatically create service requests to be actioned, removing a manual process.
	Driver Monitoring System	Intelligent transportation system companies	York Region Transit is piloting facial scanning technology for bus operators that can monitor and provide alerts to help drivers maintain focus.
	Electric bus management (electromobility)	INIT	MOBILEcharge optimizes fleet charging based on operational requirements and has several benefits: avoids expensive peak loads, delivers predictive analytics to optimize tariffs and prolongs the battery life.
	Electric Fleet Planning, Management and Health Monitoring Systems (ElectroMobility)	INIT, BetterFleet	Will help ensure vehicles are ready to serve YR residents as scheduled, regardless of scenarios which may otherwise delay service.
	Validation of an Integrated Framework of Wastewater and Stormwater Treatment Options of constituents of emerging concern (WRF 5244)	Water Research Foundation	Project will address current research gaps in the One Water framework such as analytical techniques and screening tools, characterization and predictive modeling, and potential health impacts.

AREA OF FOCUS	RESEARCH PROJECT	PROJECT PARTNER(S)	RESEARCH BENEFIT
	Approaches to Build Strong Partnerships and Solidify Successful Interagency Reuse Projects (WRF 5052)	Water Research Foundation	This research will identify characteristics of successful inter-agency water reuse projects that identify the characteristics of partnerships that strengthen reuse project planning and the characteristics of those projects that lent themselves to successful collaboration.
	Artificial Intelligence	CIMA+	Will summarize how Artificial Intelligence (AI) is used today, how other similar organizations use AI and the business opportunities for Public Works for implementing Artificial Intelligence is support of business needs.
	Accelerating Research and Innovation through Collaboration and Emerging Catalysts	The Water Tower, Arcadis	Will provide insight on how Public Works can effectively partner with other organizations to conduct research that will address service delivery needs.
	Greening the Landscape Research Consortium	Vineland Research and Innovation Centre	Supports urban greening research by setting priorities reflecting industry needs and supporting economic success.
	Microplastics sampling from plastics manufacturers	Ministry of the Environment, Conservation and Parks	Sampling program to understand loading to sanitary sewer from different plastic manufacturers.
	Navigating One Water Planning through Municipal Water Programs: Meeting Multiple Objectives and Regulatory Challenges (Project 5175)	Water Research Foundation (WRF); HDR Engineering, Inc.	This project will provide the water sector with a utility-facing One Water Planning guidance document to identify, prioritize and implement interconnected strategies across all phases of the urban hydrologic cycle, while meeting regulatory requirements, environmental objectives, and community priorities.

AREA OF FOCUS	RESEARCH PROJECT	PROJECT PARTNER(S)	RESEARCH BENEFIT
	Maximizing and Accounting for the Value of Natural Assets and Green Infrastructure at Watershed Scale (WRF 5253)	Water Research Foundation	This project will outline benefits of a natural asset management system and solution for utilities and water resource managers and incorporate assessment metrics into natural assets, which will provide a more complete accounting framework that can be scaled up to watershed and community levels, including initial capital investment and long-term impacts.
	Responsible Use of Salt	CityRover Inc.	Leveraging AI to monitor salt application practices at two pilot study sites.
	Mitigation of Fouling of Tertiary Ultrafiltration Membranes at Low Temperatures	University of Waterloo	This study will examine alternative operating strategies that will reduce clogging and thereby reduce the need for extra energy and chemical consumption under these operating conditions.
	Monitoring and mitigation of mussel impact to treatment facilities	Drinking Water Research Group	Research on protecting water treatment infrastructure.
	Net Zero GHG Emissions Design for York Region's Wastewater Projects	GHD	Results will be used by Public Works to assess feasibility of net zero designs or/and retrofits of existing and new Water Resource Recovery Facilities.
	Carbon sequestration study adjacent to Holland Landing Lagoons	Lake Simcoe Region Conservation Authority (LSRCA)	The study will assess the viability of lagoons as a carbon sink for the Region.

AREA OF FOCUS	RESEARCH PROJECT	PROJECT PARTNER(S)	RESEARCH BENEFIT
	Recycled Asphalt Pavement in Asphalt Mixtures	Transportation Association of Canada	The project would develop a practice-ready guideline on the use of Recycled Asphalt Pavement (RAP) in asphalt mixtures that can be applied immediately by Canadian transportation agencies. The guideline would be based on effective agency practices and input from industry leaders, and would address material management, mixture design, plant production, and laydown of asphalt mixes produced with RAP to ensure proper performance.