



Ryerson Urban Water

2018 Annual Report

Ryerson
University



Ryerson
Urban
Water

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We are proud to have engaged with our campus operations to use the university as a living lab and to “walk the talk” as we move forward with our projects.

Nicholas Reid
Executive Director

Message From Our Executive Director

The pressures and demands on urban water and the environment are relentless and complex. The need for a holistic, collaborative, cross disciplinary approach to achieving a healthy urban water cycle has never been greater.

In April of 2017 we were delighted to host over 100 research colleagues and industry partners to launch Ryerson Urban Water’s strategic plan building upon a legacy of cross disciplinary research and collaboration of our founding members. This report recaps the activities and progress of Ryerson Urban Water towards achieving our goals in research, education, policy, think tanks and incubation for 2017/18.

Throughout the year we have brought together researchers, NGOs, consultants, engineers, architects, utilities, planners, and students, from across disciplines and across professional practices with the intention of creating dialogue and points of intersection. We have fostered a range of collaborative events including: hacking solutions for the mining industry, implementing green infrastructure, and workshopping distributed wastewater treatment technologies. Throughout, our holistic approach has been enthusiastically received. We are proud to have engaged with our campus operations to use the university as a living lab and to “walk the talk” as we move forward with our projects. Read on to see the breadth and depth of activities facilitated by Ryerson Urban Water and don’t hesitate to reach out to collaborate with us.

Applied Research

Partners

City of Toronto

Waterfront Toronto

Ministry of Environment & Climate Change

Toronto & Region Conservation Authority

Prime Strategy & Planning

Green Infrastructure Ontario Coalition

Credit Valley Conservation

City of Mississauga

Region of Peel

Trojan Technologies

EM Fluids

Bishop Water Technologies

Eramosa

Cole Engineering

Aquafor Beech Limited

Next Level Stormwater Management

WSP

KSB Pumps

KGS Group Consulting Engineers

World Wildlife Fund

Water Canada

\$2 million

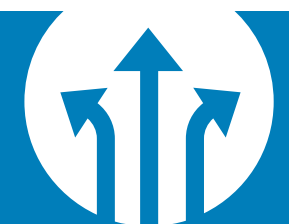
Cash awards of \$1 million & in-kind contributions of \$1 million.

Funding tools

- NSERC
- MITACS
- Federation of Canadian Municipalities Funds
- Environment Canada's Lake Simcoe & Georgian Bay Conservation Clean Up Fund
- SOWC's Advancing Water Technologies Fund
- Direct Contracts



Principal Investigators from the Faculties of Science, Engineering & Architectural Science, & Arts.



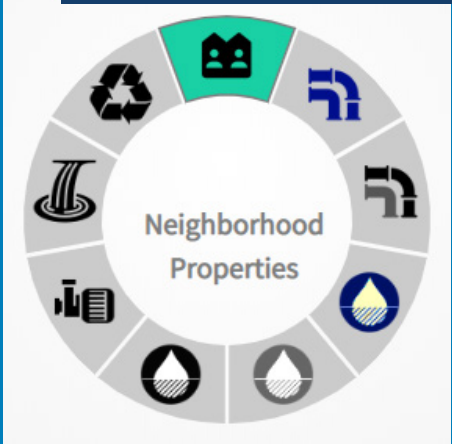
In April 2017 we were delighted to host over 100 research colleagues and industry partners to launch Ryerson Urban Water's strategic plan.

Optimized Water Resources Management Using the IWRET Tool

As cities are experiencing increased intensification, aging infrastructure, and climate change challenges, traditional approaches to water management are no longer sustainable. RUW's Darko Joksimovic and Vladimir Nikolov are developing the Integrated Water Resources Evaluation Tool (IWRET), an urban water management modelling tool that decision makers use to select optimal water management strategies on a precinct by precinct basis. IWRET's development was sponsored by Waterfront Toronto, funded by the Canadian Federation of Municipalities, and supported by the City of Toronto, the Toronto and Region Conservation Authority, and the Ministry of Environment and Climate Change. Waterfront Toronto's Villiers Island precinct was used as the test case for this powerful tool. The tool is receiving strong engagement and interest from developers, engineering firms, municipalities, and conservation authorities.



Features of Urban Water System



RYERSON WILL BE **LESS SALTY** THIS WINTER

#LessSalty

Road salt doesn't disappear with snow. It ends up in our water and harms wildlife.

Ryerson University

Ryerson Urban Water

Ryerson Urban Water is partnering with WWF-Canada to help make our campus more sustainable this winter. By cutting excessive road salt application on campus, we're investing in the safety of our students and the health of our ecosystems.

© 1986 Panda symbol WWF-World Wide Fund For Nature (also known as World Wildlife Fund). "WWF" is a WWF Registered Trademark.

Land Use & Watershed Health

RUW's Claire Oswald and Stephanie Melles are working on the impacts of land use and pollutants on watershed quality. Their research includes urban pollutants such as road salt and how salt moves through and impacts a watershed. This work has lead to a partnership with World Wildlife Fund supporting a salt reduction demonstration on Ryerson campus. As well, they are investigating toxins such as mercury associated with industrial pollution and the impacts on water quality and ecosystem health.





Blue Roofs & Sustainable Development

Blue Roofs are a new strategy for attenuating stormwater flow and reducing heat island effect. RUW is collaborating with Credit Valley Conservation Authority to study the feasibility of installing a blue roof on their headquarters. This includes conducting a global environment scan of blue roof demonstrations and policy frameworks and collaborating with 10 other blue roof experts on the study. Graduate students from architecture, public policy, and urban planning lead the Ryerson team.

Transforming Biosolids to Value for Municipalities

Many wastewater treatment utilities around the world manage their biosolid residuals using an incineration process that results in a significant mass of ash. RUW is studying the composition of this ash in the context of resource recovery. With cooperation from three Ontario municipalities, our researchers analyzed composite ash samples from municipal biosolid incinerators and identified a broad suite of elements, including common and precious metals. Using market prices and ash production estimates, the value of each metal per tonne of ash was calculated, revealing a promising opportunity to offset costs. These results were presented at both the Water and Environment Association of Ontario Annual Conference and the Central Canadian Symposium on Water Quality Research. With support from our municipal partners, this work led to an invited proposal to the Environmental Research and Education Foundation.



Water Education



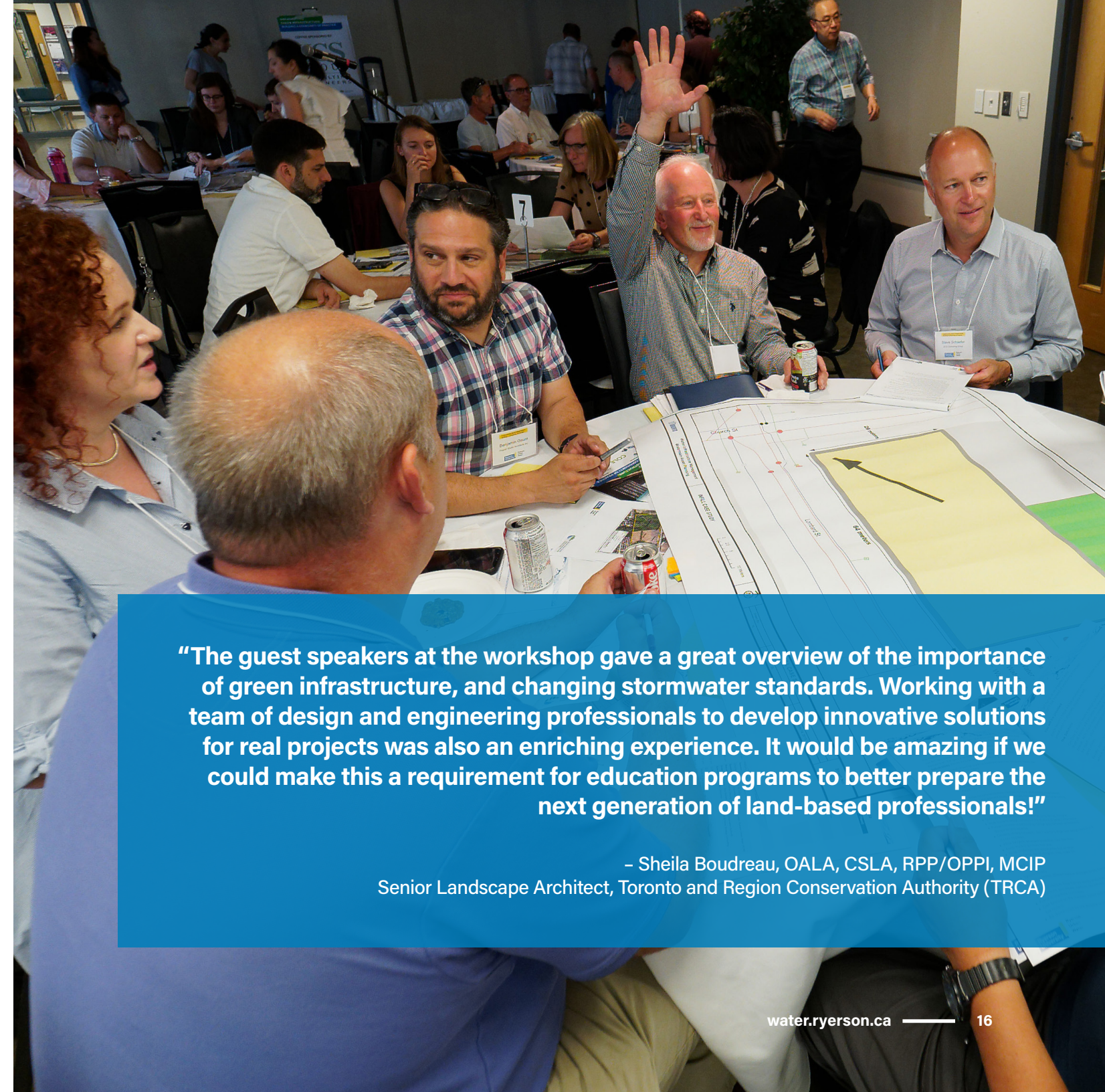
"Group work on real sites clarified issues. I brought an open mind and experienced valuable, enjoyable learning."

Stephen Pollock, OAA, Green Bee Atelier Inc.

Education & Integrated Design toward Successful Green Infrastructure

RUW hosted a two day workshop to educate professionals on the most recent standards and regulations for green infrastructure in Ontario and bring practitioners together to solve challenges standing in the way of green infrastructure implementation.

Speakers from Ontario's Environment Ministry, conservation authorities, and municipalities unveiled new standards and guidelines for managing stormwater. Registrants were placed at tables with a mix of practitioners from other disciplines to create site plans for green infrastructure with consideration of the business model, community engagement, and regulatory frameworks. Registration included 110 engineers, architects, planners, landscape architects, manufacturers and developers.



"The guest speakers at the workshop gave a great overview of the importance of green infrastructure, and changing stormwater standards. Working with a team of design and engineering professionals to develop innovative solutions for real projects was also an enriching experience. It would be amazing if we could make this a requirement for education programs to better prepare the next generation of land-based professionals!"

– Sheila Boudreau, OALA, CSLA, RPP/OPPI, MCIP
Senior Landscape Architect, Toronto and Region Conservation Authority (TRCA)



RUW provides water education to professionals, the public, university and elementary school students.

Outreach to Indigenous High School Students

Initiated and co-led by RUW Advisory Board member Sheila Boudreau, the RUW Office contributed to a successful award from the Canadian Landscape Architecture Foundation for a project called: 'Including the Voice of Indigenous Youth in Green Infrastructure,' now named 'Nikibii Dawadinna Giigwag,' meaning 'Flooded Valley Healing' in Anishinaabemowin (Manitoulin dialect).

The project engaged Toronto Indigenous youth from different high schools to participate in green infrastructure activities, primarily at Bolton Camp (Toronto and Region Conservation Authority), and the Daniels Faculty of Architecture, Landscape and Design (University of Toronto). This work involved re-imagining Bolton Camp to include a conceptual design for an Elder/ Indigenous teachings cabin and landscape, which the 2019 program will progress to detailed design.



Outreach to School-Aged Children through Great Waters Challenge

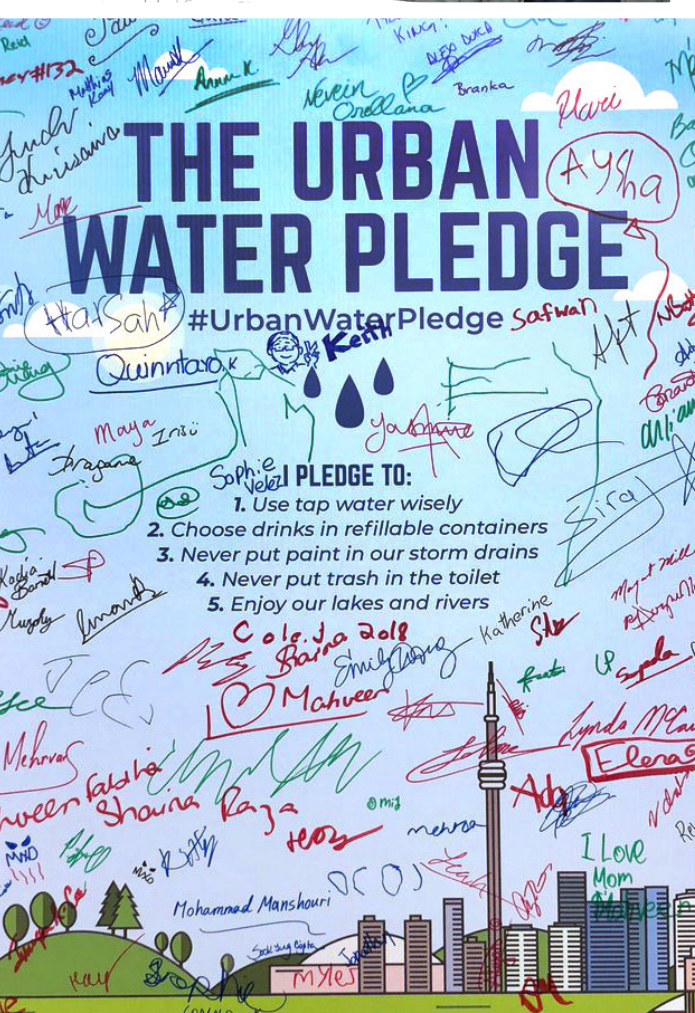
Ryerson supported the Great Waters Challenge by hosting the winning class on campus for the day. The grade 6 class from John English Middle School, Etobicoke, spent the school year learning about and integrating water knowledge into their community. Among their accomplishments, they hosted a World Water Day Fair at their school, created film essays, and raised funds for World Wildlife's Freshwater Fund.

As a reward, the students won a field trip to Ryerson. RUW provided an urban water clinic and an outdoor field exercise. Student teams went on a hunt to locate storm sewer drains on campus and identify garbage that would be carried to Lake Ontario by stormwater. It was an interactive and fun day!

Outreach to High School Students through SHAD

SHAD is a registered Canadian charity that empowers exceptional youth to make the world a better place. Its award-winning enrichment and entrepreneurship program brings high school students together to envision their potential. In July 2018, Ryerson hosted 72 of these exceptional students selected from more than 4000 across

Canada. RUW's Lynda McCarthy held an interactive clinic on key urban water issues including: rainwater harvesting, engineered wetlands, urban forests, rain gardens, bioretention cells, green roofs, urban farming, permeable sidewalks, pollinator gardens, and citizen science.



Public Outreach Through Science Rendezvous

In May 2018, RUW was delighted to participate in Science Rendezvous, Canada's largest outdoor science fair engaging directly with the public. New this year, Ryerson held the fair along the pedestrian portion of Gould Street. Students and members of the public, young and old, strolled along the street and learned about a wide range of topics including electricity, brain function, cell imaging, robotics, and much more!

RUW hosted a Water Tent and asked visitors to sign the "Urban Water Pledge." In explaining the pledge, RUW's Nick Reid and Angela Murphy educated the public about household water usage, stormwater and sanitary sewer flow, and the water cycle in cities. The City of London's Barry Orr was a special guest and explained to visitors that wipes and other disposable products are not flushable despite their labels. These products do not break down in the sanitary sewer and cause \$250M in repairs every year. Moreover, during heavy storm events this garbage is carried out to Lake Ontario.



The RUW Office hosts 10 water education events each year!

Public Education – World Water Week

To bring public attention to World Water Week, the RUW Office hosted a series of activities. Events included a public screening of the *Accidental Parklands* documentary with special guest Dan Berman (Director), the launch of Aquahacking's competition to solve Lake Ontario challenges at

the Digital Media Zone, as well as, a Sustainability and Urban Water Panel featuring topics ranging from the History of the Don River to the fate of chlorides in the environment.

Water Policy



Water Leaders Survey

RUW's Carolyn Johns led a survey of Water Leaders across 334 municipalities and 36 conservation authorities in Ontario. RUW believes that public opinion, behavioural research, and sharing knowledge is a critical step to advancing urban water governance and management. The first survey has been completed and Ontario water leaders were identified, a respondent list was curated, and baseline results were obtained about water values, priorities, and challenges in Ontario.

The key findings included that municipal water leaders ranked drinking water as their top priority and aging infrastructure as the greatest challenge, while funding remains their greatest constraint.

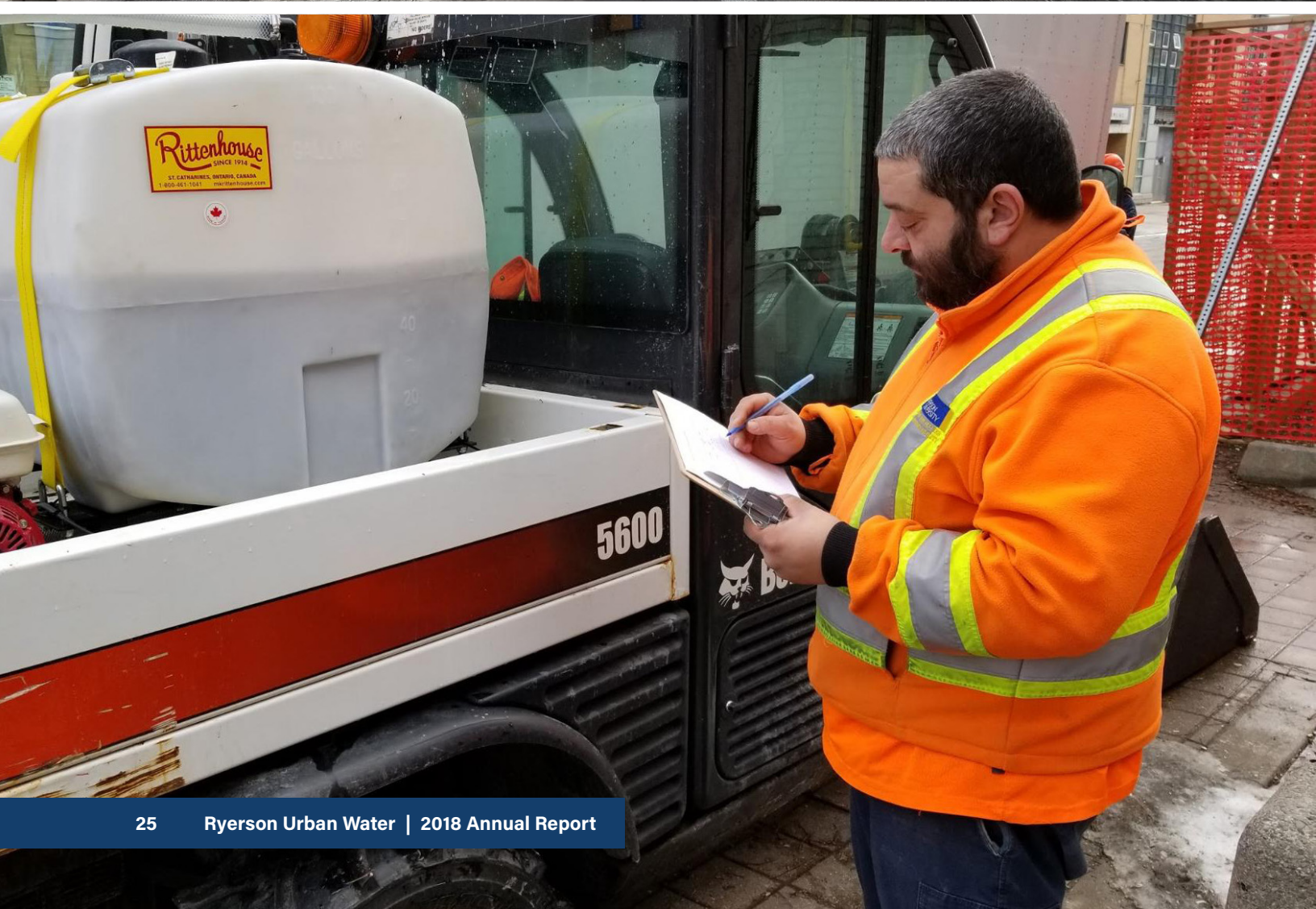
Results will be disseminated and potential partners engaged to plan the themes for subsequent surveys. Themes may include the price of water, planning for climate change, wet weather flows, the interjurisdictional nature of water, rural versus urban challenges, and best practices across municipalities.



National Water Vision for Canada

Ryerson Urban Water partnered with Simon Fraser University's Pacific Water Research Centre to host a water symposium at the 2018 Canadian Science Policy Conference in Ottawa. Ten speakers were gathered from politics, environmental law, academia, non-profits, and First Nations communities and organized into two panels. The panels described the current landscape of water governance in Canada and sought to untangle the steps toward developing a framework for a true National Vision for Water in Canada. The Vision includes collaborating with First Nations communities on the next steps, enabling and updating existing legislation such as the 1970 Canada Water Act, engaging Canadians about our fresh water resources, and positioning our water supply on a global level.





Ryerson as a Living Lab – Smart about Salt

Road salt is a major urban pollutant impacting freshwater and causing millions of dollars in damages to public infrastructure. Yet industry norm is to apply excessive quantities of salt in the winter, much more than needed to eliminate ice and associated liability. Ryerson believes in leading social change, so our campus will become a Living Laboratory this winter, piloting a salt reduction study to test the application of brine in various locations on campus while maintaining campus safety. Ryerson Facilities personnel have been working with World Wildlife Fund Canada to learn best practices in the application of brine. Brine uses substantially less salt than rock salt applied directly. Ryerson Facilities procured brine mixing and dispersion equipment and our staff are perfecting application procedures. RUW researcher Claire Oswald is working with Facilities personnel to measure the success of the pilot study and predict outcomes for scaling up the pilot and the impact of broader adoption of this approach across the city. This project is a great example of using the campus as a living lab and moving the needle forward to achieve societal change.

RYERSON WILL BE **LESS SALTY** THIS WINTER

Using the right amount of road salt saves your shoes, our campus, and Ontario's wildlife

#LessSalty

Ryerson University

Ryerson Urban Water

Ryerson Urban Water is partnering with WWF-Canada to help make our campus more sustainable this winter. By cutting excessive road salt application on campus, we're investing in the safety of our students and the health of our ecosystems.

WWF

Think Tanks

RUW is the hub where partners gather, seek input, and hold unbiased non partisan dialogue. We hold workshops and roundtables to bring members of the sector together on issues of concern. This year RUW held workshops in areas of urban metabolism and the holistic “one water” approach to water management.





Distributed Wastewater Technologies – Sustainable Onewater Solutions

In view of climate change, aging urban infrastructure, and recognition of the changing needs of our communities, RUW and Ryerson's Office of the Vice President of Research and Innovation hosted more than 70 industry, academic, and municipal partners from across Canada to discuss innovative, distributed alternatives to conventional water management. Discussions included numerous advancements in decentralized technologies, coupled with hybrid approaches. Participants discussed solutions to challenges moving forward including technical performance limitations, integration with traditional strategies, and community acceptance.



The Integrated Water Resources Evaluation Tool

To assist decision makers in selecting optimal water management strategies, RUW researchers proposed and developed a modelling tool. The tool supports evaluation of numerous scenarios to predict the best strategy for managing water for a given precinct depending on its individual characteristics and needs. In 2017, RUW kicked off the project by hosting approximately 50 leaders from the sector including water managers, planners, municipalities, developers, and conservation authorities, consulting them on the proposed model and its functionality. The sector strongly supported the need for the tool and prioritized the parameters that should be included. Criteria included housing, commercial demands, water demand, water use, water efficiency, and energy efficiency, to name a few. In 2018, RUW hosted 50 potential end users to test the beta model and interface of the tool. The beta version is publicly available and the sector has free access at: iwret.ryerson.ca.

Incubation

RUW brings the challenges of the sector to the brilliant young minds of our Ryerson students.





Hack Mining

Recognizing environmental challenges (such as tailings ponds) associated with Canada's extractive sector, RUW is working with industry to find solutions. In 2017, RUW and Ryerson's Faculty of Science organized Canada's first mining hackathon to address their environmental challenges. Ryerson brought extensive experience in hosting hackathons and passionate students from numerous universities to solve specific problems identified by mining experts. The event was hosted by the Canada Mining Innovation Council and sponsored by Hatch, McEwen Mining, and Agnico Eagle. Michael Wekerle from Dragon's Den gave the participants an inspiring keynote on the elements of a great pitch.

Team MicroBright from the University of Ottawa won the grand prize of \$2,500 cash, 50 silver maple leaf coins, and a consultation with Rob McEwen (Chairman and CEO of McEwen Mining) for their solution to the tailings pond challenge.



AquaHacking

Ryerson Urban Water was a partner and facilitated student recruitment in AquaHacking 2018. Eighteen Ryerson students participated in this year's competition, which kicked off on March 21st at Ryerson's Digital Media Zone. Every year, over several months, AquaHacking brings together multi-disciplinary teams of hackers, engineers, programmers, developers, designers, and other creative minds to collaborate on developing environmentally sustainable solutions to identified water challenges. During the competition, teams are provided with environmental, business, and

innovation training to help them curate and realize their vision. This year the competition focused on four issues affecting Lake Ontario: Water Crisis Prediction and Adaptation, Real Time Reporting of Sewage Overflow and Untreated Sewage Spills, Tackling Endocrine Disrupting Chemicals, and Phosphorus Capture and Recycling in Farming.



Transforming Waste & Reducing Carbon Footprint

In support of reducing our carbon footprint on campus, RUW and Ryerson's Science Discovery Zone partnered with CCI BioEnergy to study anaerobic digestion to manage campus food waste, generate renewable energy, and evaluate the use of liquid digestate as fertilizer – initially on broad-leaf herb (basil) and tomatoes. To date this work has been funded by NSERC Engage and Mitacs Elevate. Looking forward we will seek opportunities to continue this work through funding available in the Clean Tech Sector.



Looking Forward

As 2018 winds down, RUW is proud of our accomplishments to date and we eagerly anticipate a number of initiatives in 2019 and beyond. We are transitioning our activities to the Centre for Urban Innovation where we will be part of a fantastic group advancing research and contributing to the understanding of the Water, Energy, Food Nexus.

Healthy water. Healthy cities.



water.ryerson.ca



@RyUrbanWater

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