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Building a Baseline, Narrowing the Gap

BY KATHERINE BALPATAKY

IN LATE AUGUST, the federal government released its first-ever dataset under Canada's Core Public Infrastructure (CCPI) survey in an effort to build Canada's public infrastructure knowledge base. Although water infrastructure data beyond culverts won't be released until later this fall, these data should support a more evidence-based approach to public infrastructure policies, programs, and investment decisions.

Given the enormous investments that have been made in drinking water and wastewater since the 2016 federal budget, it will be good to assess the progress that has been made, both for improving the assets and establishing asset management plans for the future. Municipalities across Canada are still scrambling to meet the Wastewater Systems Effluent Regulations; and given the many intense storm events we've experienced this year, no doubt, the national tally of Combined Sewer Overflows will demonstrate that current investments have not gone far enough.

This issue of Water Canada focuses on water project finance. In discussing the ideas herein with the authors, it became clear to me that a broader narrative is emerging. Here's my take on it: The majority of municipalities need establish sustainable accounting regimes based on knowledge of their infrastructure assets to better plan for the future and eventually become self-sufficient; the tools and expertise to establish these accounting regimes exist, and we are now entering a new era in our capacity to plan, in that we can now begin to account for both the grey, green, and natural infrastructure, each crucial to become climate resilient; and finally, a whole new world of capital exists outside our borders

that we can tap into, only none of that money will become available unless we can achieve points one and two.

At the root of this challenge is the fact that Canadians need to understand why user-fees exist, why clean potable water costs money, and why swimmable, drinkable, fishable waters also come with a cost. But it's worth it, right? Inherently, we know this. I mean, look at the number of Canadians who turned out for a jump off of the new Gord Downie Pier in Kingston, Ontario, or joined Environment Minister Catherine McKenna for a four-kilometre swim in the Ottawa River (both events hosted by our friends, the Waterkeepers).

I frequently reflect back on the ideas that were shared during the Nation-to-Nation Water Governance session at the 9th annual Canadian Water Summit in June, where one of my water heroes, Merrell-Ann Phare, along with Chief Harvey, described the unifying force of water for getting things done. As Phare put it, "I think it's because, at a very core level, we all know that if we don't have water, that's probably the most serious problem we have."

Canadian municipalities are championing this collaborative spirit. Across all levels of government, perhaps more than ever, new ideas and technologies are being piloted, evaluated, the lessons are shared, and we are slowly advancing the ways in which communities are built and re-built. As Pierre Lavallée, president and CEO of Canada's Infrastructure Bank said to me, "There seems to be broad consensus around the country that we could have better, stronger, more sustainable infrastructure. [But] we aren't going to solve it by ourselves." WC

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All back issues of Water Canada are available for download at watercanada.net/issues



SARA JANE O'NEILL
Sara Jane is a senior research associate for sustainable communities for the Smart Prosperity Institute.
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TODD GARTNER
Todd is director of the Natural Infrastructure Initiative with the World Resources Institute.
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JOHN H. MATTHEWS
John is a coordinator with the Alliance for Global Water Adaptation (AGWA).
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ABOUT THE COVER

Collaboration is the new disruption: When an entrepreneur seeks to launch a new business, they typically require help with technical assessments, piloting and testing, sales and marketing, talent acquisition, skills development, and access to capital. In this issue, we feature six hotbeds of Canadian innovation—open for business, collaboration, and to draw new talent.

CORRECTIONS (JULY/AUG ISSUE)

On page 17, we reported that Trihedral completed 200 installations of VTScada, when it should have read, “1,200 installations.”
On page 24, we printed some outdated figures pertaining to Health Canada’s proposed maximum acceptable concentration (MAC) for lead in drinking water.

Health Canada’s 2017 consultations proposed:
• lowering the MAC from 0.010 mg/L to 0.005 mg/L; and
• applying the proposed MAC to water samples taken at the tap.

We apologize for these errors.

NEXT ISSUE: NOVEMBER/DECEMBER

- **AI for Phosphorus Hotspots**
- **Great Lakes Stormwater Collaborative**
- **Medical Marijuana Wastewater**

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BY TODD WESTCOTT

NORTH AMERICAN FOREST FIRES have achieved unprecedented scale in 2018. New research funding from the Natural Sciences and Engineering Research Council of Canada’s (NSERC) Strategic Partnership Grant for Networks will aim to provide water security solutions amidst catastrophic fires and other climatic disasters.

A research team led by University of Waterloo Engineering professor and Water Institute member Monica Emelko will receive \$5.5 million in funding to provide new knowledge on the impacts of different forest management strategies on drinking water source quality and treatability.

“High-quality water supplies, such as those in many parts of North America, are at greatest risk from the threats of natural disturbances such as wildfires and floods,” said Emelko. “These disturbances, exacerbated by climate change, are increasing in severity and are likely to result in a long-lasting legacy of water quality deterioration in several parts of Canada.”

The network is co-led by professor Uldis Silins, a forest hydrologist from the University of Alberta, with whom Emelko co-leads the Southern Rockies Watershed Project. They were the first

group cited by the Intergovernmental Panel on Climate Change in identifying climate change-associated threats to global drinking water security through water quality.

In Ontario alone, there have been over 120 fires this summer, according to the Ministry of Natural Resources and Forestry. Disturbances like forest fires are having an increasingly negative effect on source water and pose a challenge to the design and operational response capacities of water quality treatment plants.

The 2016 wildfire that devastated the community of Fort McMurray, Alta., is one searing example of a fire that disrupted a community’s access to clean drinking water and robust wastewater infrastructure, making with water quality impacts on humans and the environment a major concern.

Emelko was involved in the study of the Fort McMurray wildfire’s impacts on water quality in the region.

“Canada is neither unique nor exempt from climate change threats. Increasing swings in weather—rainy periods followed by long, dry hot periods—enhance the growth of vegetation that fuels wildfires in many regions,” said Emelko.

Speaking with the Toronto Star, Emelko noted that a long-term effect of forest fires is that they can concentrate nutrients, which are then found downstream of fire locations for years thereafter. "They can sit there in riverbeds and reservoirs and can create a legacy of effects," she said.

"The water used by the majority of Canadians, Americans, and many others globally originates in forests. Traditional

approaches for protecting these critical water supplies cannot protect them from the potentially devastating effects of mother nature," said Emelko. wc



Todd Westcott is Water Canada's content and marketing manager.

Online at WATERCANADA.NET



RESEARCH: New method for long-term groundwater monitoring could reduce costs. bit.ly/LTGWmon



NEWS: Canada releases core public infrastructure data. bit.ly/CdnInfraSurvey



NEWS: Collaboration drives funding application for wastewater recovery system. bit.ly/WWTPrecovery

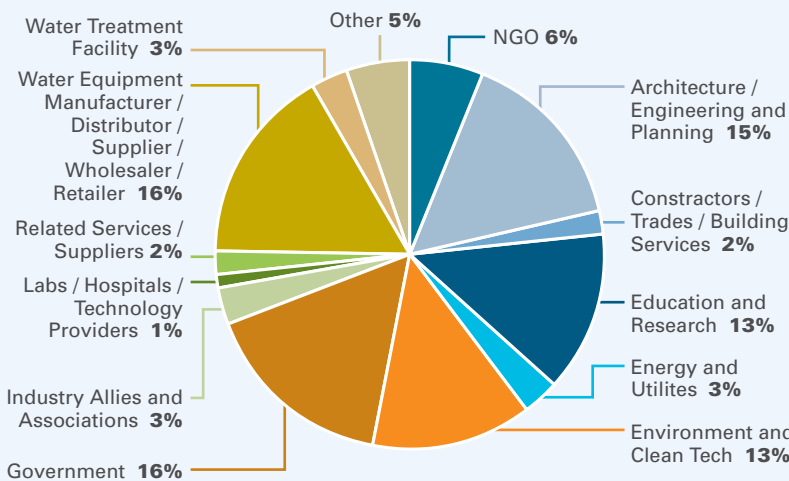


NEWS: Kehewin Cree Nation starts work on new water treatment system. bit.ly/KehewinWater

Readership Study

Back in March, Water Canada launched a readership study to better understand our audience and discover what our readers enjoy. Here's a snapshot of the results.

DATA FROM THE 2018 READERSHIP SURVEY: What area of the water industry do you work in?



HERE'S WHAT YOU TOLD US

The top five topics that interest our readers:
(selected out of a list of 30)

- 1 Green infrastructure
- 2 Technology innovation
- 3 Scientific research
- 4 Drinking water
- 5 Water resources management

Average age of survey respondents: **40**

Respondents who are male: **63%**

Respondents who are female: **34%**

Respondents who ranked their level of seniority as senior: **64%**

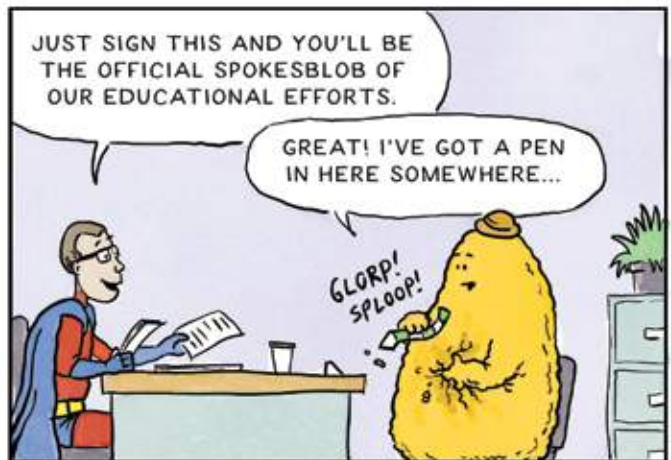
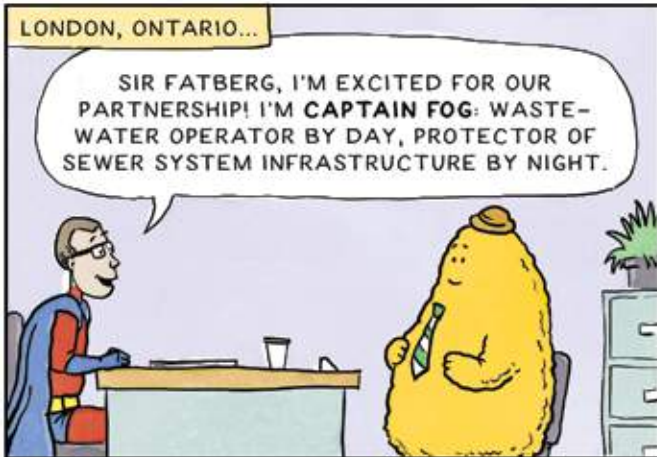
Respondents who said they read the entire magazine: **19%**

As a gesture of thanks to all whom participated, we've made a **\$200 donation to Engineers Without Borders.**
Thank you to all participants.

THE ADVENTURES OF FATBERG



PRESENTED BY KSB CANADA, WATER CANADA & MESUG
STORY & DRAWINGS BY NATHAN T. WRIGHT



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Nathan T. Wright is a freelance illustrator and artist based in Des Moines, Iowa, USA.





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Nature Bank



The benefits of valuing and accounting for natural assets in financial and asset management frameworks. BY SARA JANE O'NEILL

LOCAL GOVERNMENTS across Canada are focusing on sustainable service delivery—delivering core municipal services in a reliable and cost effective manner in the face of increased demand, a changing climate, and constrained budgets.

Unfortunately, many municipalities are missing a key component of that service delivery system: natural assets. This oversight can expose local governments and taxpayers to potentially significant unidentified financial risk. Natural assets, such as wetlands, forests, and creeks, provide many of the same services to communities as engineered assets but are generally not accounted for

and/or undervalued in asset management practices. If natural assets are lost or compromised because they are not managed properly, taxpayers will be on the hook for finding and paying for a replacement.

By contrast, well-managed natural assets can provide core services and a host of other amenities at a lower cost than engineered alternatives alone.

Asset inventory

When the Town of Gibsons, B.C., developed their asset inventory they

identified their natural aquifer as a key municipal asset, providing residents with drinking water today and 50 years into the future. If the aquifer were

The town's aquifer as well as its creeks, forest, wetlands, and natural foreshore are all managed as key infrastructure components.

ever compromised, the Town would be responsible for finding an alternative water source, at significant cost to taxpayers. With this understanding, in 2014 Gibsons became the first North American town to recognize

natural assets as municipal assets, giving them the same operations and maintenance status.

Now, the Town's aquifer as well as its creeks, forest, wetlands, and natural foreshore are all managed as key infrastructure components, helping the municipality reduce costs—savings that are being passed on to local developers and residents.

Building on the Gibsons' experience, the Municipal Natural Assets Initiative (MNAI) has developed a methodology and guidance documents to help other local governments identify, value, and manage natural assets within traditional financial and asset management planning frameworks. The first five pilot communities to apply the methodology assessed the value of stormwater services provided by a local natural asset and how that value changed under various scenarios:

- The **Nanaimo, B.C.** project assessed a reclaimed wetland and floodplain known as the Buttertubs Marsh Conservation Area. The marsh was found to provide stormwater storage and flood-regulation benefits comparable to engineered infrastructure. The marsh's storage benefit, valued at more than \$4.5 million, increased to between \$6.5 and \$8.2 million under climate change scenarios.
- The **City of Grand Forks, B.C.**, which made headlines recently for devastating floods, assessed the flood-mitigation and related benefits provided by the Kettle River floodplain. The floodplain was found to provide between \$500 and \$3,500 per hectare in flood protection to the city's downtown buildings during high-flow events.
- The **District of West Vancouver, B.C.** compared the costs of daylighting (i.e., uncovering) a covered portion of a creek to the costs of replacing it with an upgraded culvert. The district found the capital costs, as well as the operations and maintenance costs, of restoring the creek were similar to the expense of upgrading the

culvert to meet current stormwater management requirements.

- The **Region of Peel, Ont.** assessed stormwater services provided by different ecosystem types in two subwatersheds under a 100-year storm event and future climate change scenarios. The value of the stormwater services provided by natural assets in the subwatersheds was estimated at \$704 million under current climate conditions and \$764 million under future climate change conditions.
- The **Town of Oakville, Ont.**, which is losing green space to development, assessed the value of stormwater services provided by the Maplehurst remnant channel. The town found it would require between \$1.2 and \$1.4 million to replace a 240-plus-metre remnant channel with engineered infrastructure.

While the work on natural asset management is ongoing, these initial results are promising and demonstrate the significant value of natural assets and the services they provide, as well as the financial risk facing municipalities if those services are lost. They also revealed that in a changing climate and increasing development pressures, the value of natural assets can increase because they are often more resilient to changing conditions. wc

Sara Jane is a senior research associate for sustainable communities for the Smart Prosperity Institute.

The Municipal Natural Assets Initiative (MNAI) is a not-for-profit enterprise guiding municipalities in identifying, valuing, and accounting for natural assets in their financial and asset management frameworks. To learn more about MNAI and the results from the first cohort of pilot communities, visit MNAI.ca.

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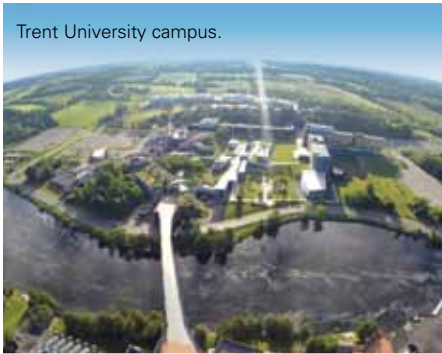
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Water Technology Success Starts Here

Peterborough & the Kawarthas offer world class support for entrepreneurs to launch their business.

“Dynamic and booming” describes Peterborough and the Kawarthas’ reputation as a water technology innovation hub helping entrepreneurs to launch their business in the global marketplace. With less than one million people living in the region and a tight-knit business community, the support and speed of service a new company can expect is extraordinary, and the access to research laboratories, venture capital, and global networks is world class.

Michael Skinner, president and CEO of the Innovation Cluster said, “What makes Peterborough’s innovation ecosystem so unique is twofold. First, you have a business community that has really gotten behind helping entrepreneurs. We also have our business support organizations under one roof in the VentureNorth Building. This reduces the complexity for business owners.”

The Innovation Cluster is an organization that supports entrepreneurs in the formation and growth of their technology-driven companies. It provides clients exclusive access to capital

through the Innovation Cluster’s partnership with the Peterborough Region Angel Network, Innovation Specialists, funding connections, programs, workshops, networking, Experts in Residence, a full-service incubation program, accelerator program, and tech community. The Innovation Cluster recently launched the Trent Makerspace, located in the DNA Building at Trent University, which allows researchers and industries in the region to continue development and testing of innovative and sustainable technologies designed to solve the world’s water problems.

“Whether it is access to funding, finding connections or lab testing, businesses will find this in Peterborough,” said Skinner.

A world-class knowledge hub

Given that some of the most successful water technologies the Innovation Cluster has supported came from Peterborough’s own Trent University, the Cluster operates one of their two full-service business incubators on campus. They work closely with both Fleming College and Trent

University to assist in the commercialization of IP-based products and solutions.

“We have a global strength in this area that is as good or better than anywhere else in Canada,” said John Knight, manager of Corporate Research Partnerships at Trent University. “Because we are small, everybody knows everybody; you can accomplish everything you need to do in a short period of time. You can help a company evaluate a new technology, get it launched and tested, pitch it to the Angel Investors Network—it’s kind of incredible the support that a company can access,” he said. He explained that the region has successfully launched some state-of-the-art water technologies, and those entrepreneurs are there to be mentors and advisors, and potential business partners.

With over 70 faculty members, including some of the top water scientists in the world conducting environmental and sustainability research, Trent University offers water technology entrepreneurs access to highly skilled and trained graduates from





Trent Water Quality Centre.



CAWT water technology verification and validation.



CAWT researchers work with a range of technologies.



The CAWT facility can host small and large projects.



CAWT has an accredited analytical laboratory.

its Water Sciences BSc program and \$65 million in research laboratories including the Trent Water Quality Centre. Trent will also soon be opening its Research and Innovation Park, a 34-hectare, multi-use enterprise centre branded as Cleantech Commons. With origins at Trent University and the Innovation Cluster, the park's first confirmed tenant Noblegen Inc. will break ground in 2019 for the \$40 million gateway facility at Cleantech Commons. Noblegen develops the natural abilities of microorganisms to produce much-needed alternatives to unsustainable ingredient sources including removal of groundwater pollutants by algae. The innovation park will enable small companies to rent or lease demonstration space to pilot operations for their technologies. Trent is also co-founder of the International Institute for Environmental Sciences, based at Nanjing University, which provides linkages to a global network of experts, not to mention, Chinese markets.

"There are doors already open in the China marketplace and the international marketplace through the network," said Knight.

Accelerating to market

Of significant benefit for both early- and

late-stage technologies, Fleming College's Centre for Advancement of Water and Wastewater Technologies (CAWT) provides a full range of services that assist and accelerate the development and commercialization of water and wastewater-related technologies.

Dr. Barbara Siembida-Lösch, manager and senior scientist at the CAWT said, "We have our niche, which is water and wastewater, and we have a full suite of services that we can offer."

The CAWT provides guidance at all stages of the startup process. "Depending on where they are in their R&D process and/or commercialization pathway—from early days, helping them get research and development together, to establishing a pilot or bench-scale system and then helping them run it, optimize it, learn more about it," said Siembida-Lösch.

Over the past several years, the CAWT has increased its performance measurement, testing, verification, and certification services to include several national and international standards, including a partnership with NSF International.

"As water and wastewater regulations across the world become more stringent,

forward-thinking companies are looking to obtain verification of their technologies and products before entering global markets," said Siembida-Lösch. "Already a go-to location for applied research support, the CAWT is now establishing itself as a focal point for water and wastewater technology performance validation and verification."

The CAWT is also building an off-campus expansion facility designed to accommodate the testing of onsite wastewater technologies to national standards that require longer tests and specific climate conditions.

"It's a great collaborative environment," said Siembida-Lösch. "We can pull everything together to ensure that your business is a success."

A perfect place to live

If you are an outdoorsy person and love water, you can do no better than the Kawarthas," said John Gillis, cleantech innovation specialist with the Innovation Cluster. "The Kawarthas' comes from the Anishinaabe word meaning 'the land of shining waters.' We've got the Trent-Severn Waterway here, 151 lakes, and countless rivers, which makes it the perfect place for the cleantech sector to thrive. ■

For more details, visit innovationcluster.ca/pkcleantech

canadian 10th Annual **water** summit

2019

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Blue Mountain Resort
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The Canadian Water Resources Association (CWRA) and Canadian Water Summit are bringing their national events together in 2019 to create a week of exciting water conference sessions, workshops, networking dinners, and industry awards on the shores of Georgian Bay.

The first part of the week will be the CWRA National Conference and their programming around the theme of “Shared Water, Competing Ethics: Collaboration in Water Management” which will transition to the 10th annual Canadian Water Summit which explores

Progress, Prosperity, and Partnerships: Driving Innovation in the Blue Economy



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TOP 6 PLACES TO LAUNCH YOUR WATERTECH STARTUP

**Canadian
innovation
clusters that
will make your
business soar.**

BY KATHERINE BALPATAKY

Canada has ambitions to become a cleantech powerhouse, fuelling new jobs, growing the economy, reducing emissions, and protecting water. In January, the federal government announced that it would invest \$700 million over the next five years through the Business Development Bank of Canada (BDC) to grow Canada's clean technology industry—a major boost. However, the most exciting advancements are occurring at the local level where innovation clusters are industry-driven, university-fuelled, and funded by private venture capitalists with skin in the game.

From east to west, Water Canada has profiled the top six areas in Canada where fostering water technologies has been identified as a key economic priority, there is a budding support network, and the lifestyle perks make for an attractive new home.

LIFESTYLE PERKS

With its lakes and mountains, Sherbrooke provides all the advantages of a dynamic urban metropolis with fast access to nature for open air enthusiasts. Sailing, swimming, kayaking, golf, tennis, soccer, horse-riding, hiking, biking, downhill skiing, snowshoeing, and a diversified cultural and gastronomic scene are all enjoyed in the region.

FINANCIAL INCENTIVES

Cost of living in Sherbrooke is below average prices in most major Canadian cities. Sherbrooke offers a soft-landing program with subsidies for property tax credit, industrial and scientific land from \$1/sq.ft.

MEDIAN COST FOR FOUR-BEDROOM HOUSE

\$205,000

LOCAL WATER BODIES

Sherbrooke has been called the City of Rivers (Cité des rivières), because it was built at the confluence of two main rivers, the Magog and St-François, where an independent hydroelectric power plant was established.

BUSINESS ECOSYSTEM SERVICES

It's an innovation and business hub with a large ecosystem of around 50 organizations that support the businesses and entrepreneurs at different levels, including Sherbrooke Innopole, Progestion Estrie, Accelerator for the creation of technological businesses (ACET/Accélérateur de création d'entreprises technologiques), Espace-inc, Environmental bioindustry créneau accord (CABIE), réseau environnement-Estrie, Chamber of commerce Sherbrooke, Maison régionale de l'industrie, Synergie Estrie (Circular economy initiative for industrial symbiosis in Sherbrooke).

LOCAL INDUSTRIES

Advanced manufacturing, cleantech (117 companies and 3,000 employees), information computational science, life sciences, and nanotechnology.

UNIVERSITIES

Laboratoire de génie de l'environnement, Centre d'études et de valorisation de la diversité microbienne, Équipe de recherche sur le développement de technologies avancées de traitement des eaux usées, Université de Sherbrooke Entrepreneurship Institute.

WATERTech SUCCESS STORIES

DBO Expert, E2 Metrix, Oneka Technology, BXA technology, SPIBio, Avizo Expert-Conseil.



E2Metrix Inc is one of the region's watertech successes, offering tertiary treatment of municipal wastewater using electrocoagulation and electro-oxidation. The City of Sherbrooke has installed the technology within its own utility.

1 Sherbrooke, Quebec

LOCATED IN THE SOUTHEAST PORTION of the Province of Québec, known as the Estrie region, Sherbrooke is a proud supporter and innovator of water technologies.

"Sherbrooke is a hub for water technologies," said Myriam Bélisle, director of business services for cleantech with Sherbrooke Innopole, a local organization focused on supporting the city's five priority sectors. "We have a specialized team and laboratory of experts in water engineering at Sherbrooke University; we have six specialized clean technology companies in that field. We've even won the best drinking water contest for Canada and second place for North America in 2018," she said.

The city is very proud to walk the talk when it comes to green living and green industry, which is also part of the provincial strategy for economic development. As such, Sherbrooke receives provincial funding to support its cleantech cluster of environmental bio-industries—of which water is an explicit focus.

The results are good. Cleantech is the second largest industry in the city with over 117 thriving cleantech businesses and over 50 organizations that support area entrepreneurs.

Even without the incentives, the city is great for startups, because

it's affordable. Several comparative studies have shown the cost of human capital, electricity, transportation, telecommunications, and taxes are globally lower in Sherbrooke than most other cities in developed countries.

"We were considered in 2016 one of the top 10 most business-friendly cities in Canada by Canadian Business," said Bélisle.

She explained that her group offers programs to stimulate cross-pollination of ideas. For the watertech clients, this could include access to other cleantech businesses, the city's wealth of engineering firms, the municipality, the manufacturing sector, or the other business support services.

"Because we are a smaller city, we have a network that happens naturally, and we know our business ecosystem, and with the Maison régionale de l'industrie, Synergie Estrie [Circular economy initiative for industrial symbiosis] initiative, we want to accelerate the synergies between businesses."

While largely French-speaking, the city's bilingualism rate is 40 per cent, one of the highest in Québec. As far as exports are concerned, the city is well connected by rail, highway, a nearby airport, and two deepwater ports. Additionally, the U.S. border is just 30 minutes away.

LIFESTYLE PERKS

One of the province's shortest average commute times, low cost of living, multiple health care facilities, and a focus on nature and local culinary experiences.

FINANCIAL INCENTIVES

The City of Peterborough has developed a suite of financial incentives to stimulate investment in the Central Area including grants for facade improvement, Central Area Revitalization, brownfields redevelopment, residential conversion, and heritage properties.

INDUSTRIAL DEVELOPMENT CHARGES Exempt

MEDIAN COST FOR FOUR-BEDROOM HOUSE

\$329,900

LOCAL WATER BODIES

The Otonabee River, part of the Trent Severn Waterway system, runs through the city; Peterborough & the Kawarthas are surrounded by 151 lakes.

BUSINESS ECOSYSTEM SERVICES

Centre for Advancement of Water and Wastewater Technologies (CAWT), Cleantech Commons, Greater Peterborough Area Innovation Cluster, Peterborough Region Angel Network, Startup Peterborough, and Venture North.

LOCAL INDUSTRIES

Aerospace, advanced manufacturing, and agriculture.

UNIVERSITIES

Trent University (Trent Water Quality Centre and the future Trent Research and Innovation Park), The Centre for Advancement of Water and Wastewater Technologies (CAWT) at Fleming College, and Seneca College.

WATERTECH SUCCESS STORIES

Aclarus, Noblegen, and Rainmakers Worldwide.

Credit: Greater Peterborough Innovation Cluster



Michael Skinner speaks with a cleantech client.



Michael Skinner, president and CEO of the Greater Peterborough Innovation Cluster, speaking at CleanTech Power Breakfast.



Trent University Chemical Sciences Building.



Aerial view of downtown Peterborough, Ont.

2 Peterborough, Ontario

TOUTING ITS “FRIENDLY PEOPLE, inspiring landscapes, and a well-connected business community,” the City of Peterborough is vying for water technology businesses interested in small-city living, affordability, and an intimate, close-knit business community. In the heart of cottage country, the municipality boasts the highest percentage of immigrant entrepreneurs in Canada.

Even with its small city charm, the Peterborough and Kawarthas region offers globally-recognized perks, such as the most comprehensive mass spectrometry facility in Canada and a fully accredited laboratory offering analysis of a full suite of standard parameters, metals, and microbiology, with the capability to develop customized analytical methods.

Michael Skinner, president and CEO of the Greater Peterborough Innovation Cluster said, “Although Peterborough

is a medium-sized city, the region is in close proximity to Ottawa and Toronto, boasting an abundance of resources available to businesses with an added affordable housing market. The area is in close proximity of educational institutions, First Nations communities, and non-profit organizations dedicated to supporting start-up culture.”

Skinner noted that the intimate environment offers a strong culture of business-to-business mentorship. “Having all of our business support organizations under one roof in the Venture North Building has reduced the complexity in determining which organizations provides what services. The close relationship between both Fleming College (CWAT) and Trent University with the Innovation Cluster has allowed a strong focus on cleantech to be developed, especially with respect to water and wastewater in Peterborough.”

Credit: Greater Peterborough Innovation Cluster

Credit: Trent University

Credit: Economic Development Agency of Peterborough

LIFESTYLE PERKS

Access to the Niagara Escarpment; one of Ontario's most concentrated centres for healthcare research; the only city in southern Ontario that offers rail, road, air, and port transportation and at lower costs than its neighbours in the GTA.

FINANCIAL INCENTIVES

The City of Hamilton offers a number of programs for property owners and developers to help offset costs of improvements and conversions of brownfields, heritage properties, core area properties, and buildings and LEED certified buildings.

MEDIAN COST OF A DETACHED HOUSE

\$525,000

INDUSTRIAL DEVELOPMENT CHARGES

July 6, 2018 to July 5, 2019:
\$12.53 per square foot.

LOCAL WATER BODIES

Nestled on the shores of Hamilton Harbour and Lake Ontario; boasting dozens of waterfalls on the Niagara Escarpment.

BUSINESS ECOSYSTEM SERVICES

Don Pether Incubation Centre and Innovation Factory.

LOCAL INDUSTRIES

One of the three largest food and beverage processing areas in North America.

UNIVERSITY-FUELED

McMaster University ranks as one of Canada's top three most research-intensive universities. Mohawk is the largest trainer of apprentices in the province of Ontario. In 2009, the university opened the McMaster Innovation Park (MIP), offering collaborative space for researchers and entrepreneurs alike to co-locate, connect, and commercialize.

WATERTECH SUCCESS STORIES

ASI Group Ltd., Ecodyne Limited (headquartered in Burlington but with a location in Hamilton), Fibrecast (an Anaergia company), Hydromantis, and SUEZ Water Technologies and Solutions (newly-built ozone production facility).



"There are many opportunities in this field and our companies are succeeding, because they understand clearly what is required with water technologies now and in the future."

Glen Norton, economic development director, City of Hamilton



In March 2018, the City of Hamilton unveiled a much-anticipated plan that paves the way for development and a changing skyline in the downtown through 2031.

3 Hamilton, Ontario

WITHIN THE GLOBALLY RECOGNIZED

Toronto-Waterloo corridor for cleantech, the Hammer, as it is affectionately known, has much to offer watertech startups. Over the last decade, Hamilton has been reinventing itself from a steel and textile production belt into a vibrant centre of arts, nature, and innovation. Reader's Digest ranked Hamilton the ninth best city to raise a family out of forty-two major Canadian urban centres. And while the legacy of industrial pollution is real, the city has long been at the forefront of new environmental and water technologies as its works to clean up Hamilton Harbour.

Glen Norton, City of Hamilton's economic development director said, "What is happening in Hamilton is a collection of businesses who have approached this industry with great care, great thought, and a strategic focus."

At the intersection of the Greater Golden Horseshoe, close to Toronto,

the Niagara Peninsula, and the U.S. border, the city offers multiple modes of transportation to serve global markets. Given its foothold in the centre of the corridor, it is also in close proximity to numerous water research institutes.

"Hamilton is home to UNU-INWEH [United Nations University Institute for Water Environment and Health], which acts as the UN Think Tank on Water and contributes to the resolution of the global water challenge through a unique programme of applied research and education, located at the McMaster Innovation Park," said Norton.

When asked about the broader economic goals the cluster serves, Norton added, "It services our advanced manufacturing sector greatly [...] as we work to build a well-trained workforce—particularly those skilled engineers and engineering technologists coming out of McMaster University and Mohawk College."

Photo: Shutterstock.com/BBC

LIFESTYLE PERKS

Large metropolitan population, proximity to wilderness and mountains, rich arts and entertainment sector, the most extensive urban pathway and bikeway system in North America.

FINANCIAL INCENTIVES

The Opportunity Calgary Investment Fund offers a total of \$100 million for private sector companies, non-profits, and public institutions making transformative investments in Calgary that will be catalysts for economic growth, diversification, increased employment, and expansion of the property tax assessment base.

MEDIAN COST OF A DETACHED HOUSE

\$500,000

LOCAL WATER BODIES

Bow River, Chestermere Lake, Sikome Lake.

BUSINESS ECOSYSTEM SERVICES

Alberta Innovates, Alberta WaterSmart, Calgary Technologies Inc., Canadian Oil Sands Innovation Alliance (COSIA), Creative Destruction Labs, Clean Resource Innovation Network (CRIN), District Ventures and IBM Innovation Space, Tundra ACE, WaterNEXT, Zone Startups.

LOCAL INDUSTRIES

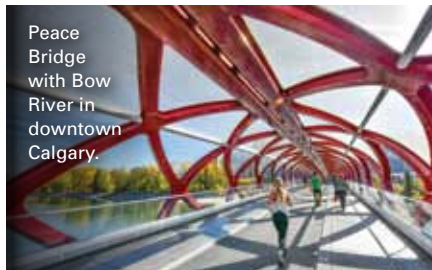
Oil and gas, agriculture, and food processing.

UNIVERSITIES

University of Calgary (Advancing Canadian Wastewater Assets, a partnership between the university and City of Calgary, and Haskayne School of Business), Southern Alberta Institute of Technology will soon offer a water sustainability program.

WATERTECH SUCCESS STORIES

FREDSense Technologies, Livestock Water Recycling, Roshan Water Solutions.



Peace Bridge with Bow River in downtown Calgary.



A busy shopping and pedestrian plaza on Stephen Avenue in the heart of downtown Calgary.



Calgary's skyline.



Beautiful turquoise waters of the Moraine Lake in Banff National Park and the snow-covered peaks of the Rocky Mountains.



“The people that work here are very focused on the applied side of things, working with industry who are interested to find solutions to [environmental] problems.”

Rick Tofani, director of applied research and innovation services, Southern Alberta Institute of Technology

4 Calgary, Alberta

FOR ENTREPRENEURS who appreciate western hospitality, Calgary just might be the place to set up shop. In 2018, the CD Howe Institute named Calgary the “most innovative city in Canada,” and in the Economist Intelligence Unit ranked Calgary fourth in its list of the world’s most liveable cities.

Supporting a small but growing cluster of water cleantech operators—most of which support the oil and gas sector—the city is diversifying to support watertech for value-added food processing companies and agriculture.

As chief technology officer of WaterNEXT (Western Canada’s Water technology accelerator), lab scientist for Creative Destruction Labs, and director of engineering and projects with WaterSMART, Mike Dixon is at the centre of all the action.

“I think it’s fair to say that Calgary as a space is in development rather than an established place to base yourself in order to get loads of support for your

water technology startup, as compared to a place like Waterloo. But, the downfall of establishing your startup in Ontario, if you are going to be working with industrial waters or oil and gas, is that it places you a long way from where the action is happening,” said Dixon.

He explained that being established in Calgary goes a long way for establishing trust, growing a network, and gaining customer feedback for watertech companies with a focus on oil and gas companies. “The biggest perk is that you are immediately plugged in with the right people in the space,” Dixon said.

To put it in perspective, Dixon’s accelerator group WaterNEXT reviewed applications from over fifty water startups in the last twelve months, and of that fifty, about forty of those were focused on oil and gas. He explained that the advantage of the relatively small cluster for cleantech is that many of the accelerators and support services around town work together to help their clients.

LIFESTYLE PERKS

Average commute within Saskatoon is 20 minutes.

FINANCIAL INCENTIVES

A tax abatement incentive is available to companies focused on energy, oil and gas, mining, manufacturing, processing, technology, transportation and logistics, telecommunications, or data processing. Incentives include: exemptions or reductions of any city tax or fee; waiving of utility deposits and down payments on land; and exemptions of reductions of prepaid servicing levies. SREDA also provides financial support to international companies with technologies that are complementary to the Saskatchewan agriculture industry.

MEDIAN COST FOR DETACHED HOUSE

\$296,500

LOCAL WATER BODIES

Saskatoon is situated along the banks of the scenic South Saskatchewan River.

BUSINESS ECOSYSTEM SERVICES

Global Institute for Food Security, Innovation Place, Saskatchewan Food Industry Development Centre, SREDA, Livestock and Forage Centre of Excellence (LFCE).

LOCAL INDUSTRIES

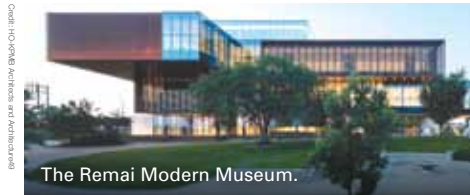
Food, crop, and beverage processing; electronics and instrumentation; oil and gas; mining; forestry.

UNIVERSITIES

University of Saskatchewan – Global Institute for Water Security & Centre for Hydrology.

WATERTECH SUCCESS STORIES

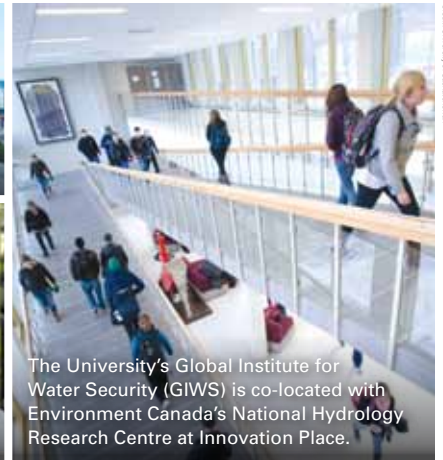
Innocorps Research Corporation, Soil Vision, Contango Strategies.



The Remai Modern Museum.



In 2018, the City of Saskatoon and the University of Saskatchewan signed a memorandum of understanding to explore collaborations.



The University's Global Institute for Water Security (GIWS) is co-located with Environment Canada's National Hydrology Research Centre at Innovation Place.

5 Saskatoon, Saskatchewan

AMID ROLLING GRASSLANDS and the Saskatchewan River sits the city of Saskatoon—the largest city in the Province of Saskatchewan—also a growing innovation hub. Although water is not defined as an innovation priority here, there is a noteworthy ecosystem of business services and R&D for companies involved in agriculture, life sciences (including biotech), mining, and other engineering technologies.

The Saskatoon Region has always been a leader in the agriculture and bioscience industries, and Saskatoon is home to one of five federal government Innovation Superclusters Initiatives. This one focused on agricultural crop production and the processing of food and food ingredients.

There is, though, a water profile. Two innovative research centres at the University of Saskatchewan aim are growing expertise in water security and agricultural technologies: The Global Institute for Water Security (containing the Smart Water Systems Laboratory) and The Global Institute for Food Security (containing the Omics and Precision Agriculture Laboratory, or OPAL, as it's called). The newly created OPAL lab supports clean technologies designed to improve crop yields and quality, while mitigating negative environmental impacts and over-use of valuable resources, like soil nutrients and water.

For companies that are engaged with the university labs, there is also a technology park on campus where companies can lease space and access business services.

Given that mining is also a major industry in the area, the Saskatoon Regional Economic Development Authority (SREDA) has been involved in a number of activities to draw new mining-related technologies to the region. For example, in 2016, SREDA launched a business program called the Mining Technology Explore Program (EXPLORE). Through this program, SREDA selected four international companies with technologies applicable to the local mining industry to showcase their goods with industry. The winners included one watertech company from Calgary, Alta. SREDA plans to launch more of these programs in the future.

Alex Fallon, the president and CEO of SREDA, told a Global News reporter that, “within each of our key economic sectors—whether it's mining or agriculture or manufacturing—there are challenges and opportunities. [...] It's good to see the growth in the technology sector.”

A little sunshine never hurt when it comes to innovation, so it's worth noting that Saskatoon is one of the sunniest places in Canada with an average of 2,328 hours of sunshine per year. In 2018, Saskatoon was ranked 4th by USA TODAY on the top 10 list of best cities to visit in Canada.

LIFESTYLE PERKS

Mountains and oceans; metropolitan community; the city's compact size, defined by a 20-minute radius, makes getting around easy; arts festivals and museums; mild winters.

MEDIAN COST FOR DETACHED HOUSE

\$2,988,000

LOCAL WATER BODIES

Pacific Ocean, with third largest port in North America, and the Fraser River.

BUSINESS ECOSYSTEM SERVICES

CanadaCleantech CONNECT, BC Cleantech CEO Alliance, Chrysalix, Evok Innovations, Foresight Cleantech Acceleration Centre, Vancouver Startup Society.

LOCAL INDUSTRIES

Trade, film, technology, tourism, natural resources, and construction.

UNIVERSITIES

Simon Fraser University (Pacific Water Research Centre); University of British Columbia (Master of Engineering Leadership (MEL) in Integrated Water Management, Program on Water Governance).

WATERTECH SUCCESS STORIES

Aquatic Informatics Inc, Axine Water Technologies, Ostara Nutrient Recovery Technologies Inc., Saltworks, Semios, WaterTrax.



Being able to partner with universities, such as the University of British Columbia, make Vancouver an attractive city to establish a startup.

PHOTO: UNIVERSITY OF BRITISH COLUMBIA

6 Vancouver, British Columbia

KNOWN FOR ITS stunning vistas of sea and mountains, as well as its environmentally conscious population, it's no surprise that Vancouver, B.C. frequently tops various lists as one of the world's top ten cleantech clusters.

"We are unique, because of successful startups that have already flourished here. We have the talent pool and expertise to continue to launch successful watertech companies," said Jeannette Jackson, managing director, Foresight Cleantech Accelerator Centre, an organization that has supported over 10 water companies through the last two years.

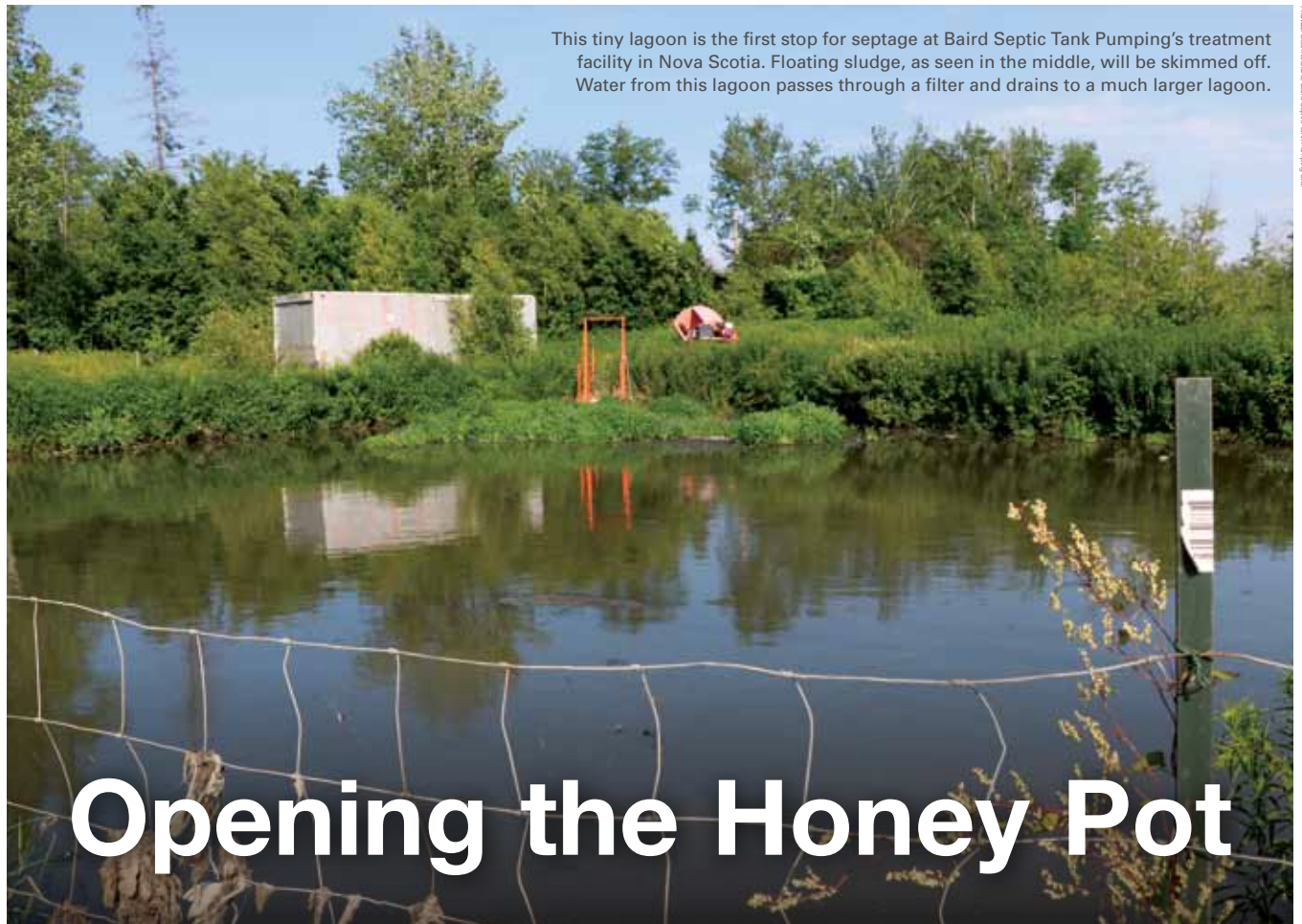
"Vancouver, more importantly B.C., is the perfect platform for watertech companies, because we have a diverse water landscape and industry mix, creating a market of clear opportunities for companies to tackle. From desalination to wastewater treatment to water power generation, our watertech industry is addressing water issues relevant to B.C., Canada, and across the globe," she said.

The City of Vancouver boasts that it has

eight innovation clusters within its borders, with the neighbourhood of False Creek Flats being the central home to "green emerging and innovation businesses." And this year, the federal government committed to invest \$1.4 billion over 10 years into Vancouver's Digital Technology Supercluster to fund 100 collaborative projects, create 50,000 jobs, and inspire a projected \$15 billion in GDP growth.

Supportive government policies and programs promote innovation within the city, making clean technology a major pillar under Vancouver's Green Economy umbrella. The proof: Vancouver is consistently ranked among the top cities in the world for its forward-minded thinking around sustainability, including innovations in green building design and construction, as well as urban development.

The westerly location also offers an edge for businesses, with the shortest distances to Asia from any major North American city and ready access to U.S. markets, including Washington State and California.



This tiny lagoon is the first stop for septage at Baird Septic Tank Pumping's treatment facility in Nova Scotia. Floating sludge, as seen in the middle, will be skimmed off. Water from this lagoon passes through a filter and drains to a much larger lagoon.

PHOTO: JIMMY WILSON/STOCK PHOTO

Opening the Honey Pot

Septage review sparks interest in best practices. BY SAUL CHERNOS

ALL EYES ARE ON BETTER PRACTICES as Ontario's environment ministry reviews rules that allow untreated septic and holding tank sewage to be spread on farmland and emptied into municipal wastewater systems. Current standards have long been a concern.

Back in 2000, *The Globe and Mail* pointed to a 1998 ministry reference document that said up to 1.75 million cubic metres of sewage is pumped from more than a million septic tanks in Ontario every year. Much of this septage can be dumped directly onto rural land, regardless of heavy metal and pathogen levels. For private sewage haulers, all that's required is a ministry certificate of approval spelling out the setbacks from roads and neighbours and how long sewage-soaked soil must sit before it can be used for crops and livestock.

Ontario is in good company. Two years ago, 30 people protested in Clinton,

British Columbia after a truck hauling raw sewage, destined for use as fertilizer, overturned on an icy road near Big Bar Lake. "A lot of people weren't aware that biosolids were being dumped in the Big Bar region for years," the Vancouver Sun quoted protest spokesperson Amanda Bourgeois. The regional district responded with a statement noting that the biosolids were non-toxic and not considered to be a hazardous material, maintaining they were "a treated, nutrient rich by-product of the wastewater treatment process used to enrich soils and stimulate plant growth." However, the incident sparked concerns that were not easily quelled.

Even with relatively lax rules regarding treatment, illegal activity occurs. Earlier this year, a Prince Edward Island septage hauler was sentenced to four months in jail and ordered to pay more than \$10,000 in restitution after dumping untreated

sewage onto farmland without a permit.

Ontario review

When Ontario launched a review of the province's hauled sewage policy two years ago, the ministry said it was considering a range of approaches, from geographically-based rules to something more province-wide. After the provincial election in June saw the Conservatives replace the incumbent Liberal government, the ministry has been waiting for direction said spokesperson Gary Wheeler: "At this stage, providing comment about the policy and the review would be premature," he said.

Rick Esselment, government relations chair with the Ontario Onsite Wastewater Association, said he hopes Ontario's review will determine how much raw sewage ends up on farmland and in local treatment systems, define acceptable levels of treatment, and



Allan Baird looks down from a wharf overlooking his largest lagoon. The green pipe leads towards a filter that traps solids and drains to a third, smaller lagoon, which, in turn, drains into a wetland.



As the treated septage flows into the wetland, cattails seen in this narrow, shallow trench feed off the nutrients.



Allan Baird points towards the lower part of the wetland where the treated water ends up. "There's no cattails, because there's no nutrients left in the water," Baird said.



Rene Goulet's reed beds were built first by installing cement sand over the two types of gravel, with a felt liner at the bottom to ensure the bed would not contaminate the water table.

ensure municipalities are adequately funded to build out receiving capacities.

"A lot of Ontario has no wastewater treatment plant within a reasonable distance that would have the receiving capacity," said Esselment. "We really need a blended approach."

Esselment noted that personal hygiene products, pill bottles, and other inorganics people flush down the toilet should be

A lot of Ontario has no wastewater treatment plant within a reasonable distance that would have the receiving capacity.

filtered out prior to land application. "Maybe not a full wastewater treatment process, such as a municipal treatment plant, but something at the very least to screen out non-biodegradable materials and then stabilize the waste so there's

less pathogenic risk being dispersed onto the environment."

Esselment pointed to Goulet Septic Pumping and Design in Green Valley, near Cornwall, Ontario, which operates a lagoon and reed bed filtration system, as an example of an innovator in processing septage.

Owner René Goulet said his 18-hectare site, built in 2006 on former agricultural land, has shallow soil atop limestone and is zoned for waste disposal. The system was launched as part of a province-wide pilot and, while the research has concluded, Goulet continues to abide by his certificate of approval.

"We have to stay 100 feet away from the road and from neighbours as a buffer zone," Goulet said.

Goulet's system operates much like a giant septic system. When his truck brings in a load, a homemade bar screen

weeds out plastics and other debris before dumping the organic matter into reed beds, where it percolates before the liquid is pumped into an adjacent 56-by-100-metre lagoon. The solids settle and, when the lagoon fills, the water on top is pumped through a 2,000-metre-long pipe and water cannons spray it onto poplar trees, which absorb the nutrients, ultimately delivering clean water to the aquifer.

"The poplar trees grow very fast and suck up a lot of juice," Goulet said.

Holding tank waste goes directly into the lagoon, as it is mostly effluent with some sludge. So does septage that exceeds what the reed beds can handle. Key to the system's overall functionality is the clay base covered by a double liner—one felt, the other rubber—which prevents rocks from intruding. Ten-centimetre perforated PVC pipes, placed on top of the liner and covered with layers of differently-sized gravel and sand provide air flow to assist the reed beds.

The dewatered sludge from the reed beds is removed every seven-to-ten years

and spread on nearby farmland, while sludge from the lagoon decomposes onsite. Goulet hauls inorganic waste—everything from beer caps and sanitary napkins to golf balls and underwear—to the local landfill.

Goulet sends samples from his monitoring wells to Ontario's environment ministry for analysis and reports the number of septic and holding tanks his company pumps and the total volume deposited at his site.

Having seen his system go from trial to fully operational, Goulet is keen to see the results of Ontario's review. "It's 2018," he said. "Spreading sludge directly on land without being treated is not the way to go anymore."

Atlantic approach

Ontario could look to Nova Scotia, which has made considerable strides since banning land application of untreated septage in the 1990s and auditing all lagoons in 2000. "None of us was in

total compliance," Baird's Septic Tank Pumping owner Allan Baird recalled. "They gave us until 2010 to be in total compliance."

Realizing his lagoons are his biggest asset, Baird participated in a government program to offset the \$400,000 price tag of an upgrade and by the end of the fourth year was fully compliant. "I was probably one of the first ones to put in a wetland," he said. "The effluent that leaves my lagoons and wetland goes into a brook that's cleaner than what comes out of any municipal sewage treatment plant."

Baird's three lagoons are separated by filters to screen out solids and other undesirables. Gravity serves as the main actor, with the lagoons flowing into a maze-shaped wetland where cattails absorb the waste. "The last two or three rows before the water is discharged, there's no cattails because there's no nutrients left in the water," Baird said. "I wouldn't drink it, but it's visibly clear."

Baird uses an excavator to dredge solids from his middle lagoon, places the sludge on a drying pad that drains all liquid back into the lagoon, and hauls the dried waste to a nearby composting site, after which it can be land applied.

Others in Nova Scotia have followed Baird's lead. "Mine was the first my engineer ever designed, but since then he's done several other ones," Baird said.

Lamenting the illegal dumping he hears about all too often, Baird said the jail sentence awarded in P.E.I. "surprised a lot of people." Still, after spending a small fortune to do the right thing, he expressed little sympathy. "When there's other people who aren't in compliance, it irks you." **wc**



Saul Chernos is a Toronto-based freelance journalist and frequent contributor to Water Canada.



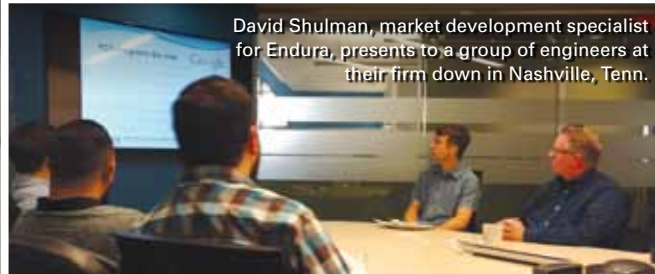
Putting the XL100 to the test, Faith Winter pours lard into the Endura XL grease interceptor for testing purposes.



On site of an XL100 installation in King City, Faith Winter holding up sections of risers that were cut to grade on site.



Faith Winter presents at the NSF FOG Conference in Ann Arbor, Mich. in Feb. 2018.



David Shulman, market development specialist for Endura, presents to a group of engineers at their firm down in Nashville, Tenn.

Fight the FOG

The challenge of fats, oils, and grease entering municipal systems requires a multi-barrier approach. BY FAITH WINTER

THE SOLUTION to combatting the issue of fats, oils, and grease (FOG) in our wastewater stream is not as simple as complying with any given plumbing code. In fact, there is no one-size-fits-all, magic bullet solution. Effectively intercepting and managing FOG is a multi-faceted, collaborative effort amalgamating the right people, equipment, proper maintenance, and appropriate education.

The problem of FOG accumulating in municipal sewer systems has been a victim of “out of sight, out of mind.” That is, until those fat globules build and build until they eventually choke off a significant amount of the sewer line causing a sewer overflow. These spills are slowly increasing in occurrence as this problem has persisted for decades: it is only now catching up with us.

If model plumbing codes have rules and regulations for grease interceptors and requirements for effluent limits of FOG, then why are we still faced with this issue? Without understating the purpose of the model codes, they are simply not enough—and they are not supposed to be. Model plumbing codes are in place to establish a minimum set of standards and practices pertaining

to plumbing installations. While this minimum set of requirements ensures the health and safety of those installing, maintaining, and interacting with the products, we need to go beyond the code if we truly want to reduce the amount of FOG entering the municipal system.

Beyond minimum standards

Going beyond the minimum requirements as established in the model plumbing codes is easier said than done. Unfortunately, the same solution does not work for every case and there is constant need for adjustments and tweaks as we learn more along the way. One thing remains certain: that going beyond the code begins with education. How can we expect anyone to put in the extra effort if we don’t explain why it’s important if we don’t teach them and give them the tools they need to succeed?

In recent years, there has been a push to create more educational opportunities for the grease interceptor market. However, this market is more complex than it appears. From conceptualizing a restaurant, to the realization that a grease interceptor is required, to installing, maintaining, and cleaning that interceptor, a lot of hands can

touch a project. This will require us to aim our educational efforts just about everywhere—from the engineer specifying the products, to the architect designing the building, to the plumber installing the grease interceptor, to the restaurant owner running the business, to the wastewater hauler cleaning out the unit, and even the inspector who ensures the unit is in compliance. All stakeholders require some level of education.

As manufacturers, we know the importance of every one of these stakeholders and the roles they play. But even the highest performing, most well-designed and constructed grease interceptor will fail without proper, thorough, and frequent maintenance. It is our duty as manufacturers to not simply produce products that we can stand behind, but to ensure that those who interact with our products understand how to do so. *wc*



Faith Winter is a market development specialist for Endura grease interceptors out of Barrie, Ont.



Financing Protection

Increasing water's share of the green bonds market.

BY TODD GARTNER AND JOHN H. MATTHEWS

EAST AFRICA'S KARIBA DAM is almost empty due to diminishing rains. In Brazil, Sao Paulo's reservoirs were reduced to dried mud three years ago, and experts say the city is heading toward another dry spell. These are not simply one-off events; they represent systemic failures in water infrastructure development—failures that are increasing in frequency and severity as Earth's climate shifts.

Canada, and its water resources, are especially exposed to climate risks from the countries' rivers and lakes to the ports and arctic systems. Catastrophic floods recently wreaked havoc in New Brunswick, Quebec, Ontario, Manitoba, and British Columbia. At the same time, Canadian and U.S. cities along the Great Lakes are concerned about both extremely high and low water levels as well as poor water quality caused by unprecedented algal blooms. Related concerns have driven Canadian ports along the Saint Lawrence, Pacific, and Atlantic shores to invest heavily to enhance resiliency from coastal climate impacts. Further north, Canada faces a distinct set of challenges as permafrost

becomes impermanent. Groups such as the intergovernmental Arctic Council are increasingly concerned about how capital-intensive investments for remote towns and villages, such as water supply and treatment systems, can continue to function under the “new normal”.

Green bonds for natural infrastructure

A new financial mechanism—“green bonds”—that pay for using ecosystems as “natural infrastructure” for clean, ample water can help. Most people think of water infrastructure as dams, pipes, and water treatment plants. Natural infrastructure like healthy forests, farms, rivers, and wetlands can also address supply and quality challenges by filtering water, buffering against floods, and regulating flow. Combining built and natural forms of infrastructure, for example, by restoring a forest that surrounds a water treatment plant, combines the benefits of both systems. These hybrid approaches often save money, increase the lifespan of built infrastructure, improve resiliency to climate change, and produce co-benefits

like reduced carbon emissions, recreation, rural jobs, and habitat protection.

Water infrastructure projects are often funded by bonds, which allow cities or utilities to pay back investors over time. Bonds have historically ignored natural infrastructure in favour of traditional built infrastructure. Even “green bonds,” which specifically direct financing to environmental projects, have largely overlooked the potential of natural infrastructure. Only a tiny percentage of what the world spends on water investments overall goes to certified green projects. We are investing in concrete, stone, and steel when ecosystems could be providing more resilience and flexibility for the future.

The Climate Bonds Initiative's (CBI) new Water Infrastructure Standard enables water projects—including projects that utilize natural infrastructure—to be certified as green bonds. This provides an avenue for hybrid and natural infrastructure projects to attract the financing they need to address growing water challenges. The standard also allows cities to communicate with corporations

and investors interested in green growth.

The standard for natural infrastructure builds on phase one of CBI's Water Infrastructure Standard, launched in 2016 and focused on climate-friendly built, or "grey infrastructure," for water. Phase one has already directed more than \$1.8 billion to climate-smart water infrastructure. For example, San Francisco Public Utilities Commission issued four green bonds in 2016-17 to finance sustainable storm water and wastewater projects. Cape Town, South Africa issued a green bond in 2017 to upgrade reservoirs, treat dirty water to drinking level quality, and replace and upgrade sewers and pumps. While focusing on traditional grey systems, these projects also take emissions and climate resilience into consideration.

Phase two seeks to issue bonds for nature-based and hybrid water infrastructure projects, such as wetlands and watersheds, forests, ranches, and

agricultural systems that support water collection, storage, and treatment; protect against floods; and boost drought resilience. These bonds will allow a project that uses a forest as a key water filtration tool—rather than, or in combination with a new treatment plant—to attract investors.

Importantly, CBI's green bonds are certified, meaning they meet specific criteria on reducing the rate of climate change and the severity of its impacts, and pass a third party's evaluation. This gives investors assurance that they're funding truly green projects—not projects masquerading as green—and rewarding groups developing resilient, pro-ecosystem water projects. Investors want to know their funds are credible investments in sustainability.

A combination of interest and opportunity make Canada poised to expand its role in the global green bonds market. Issuances of green bonds in 2017 reached over

CAD\$3.8 billion, placing them as the 10th highest national source of labeled green bonds globally according to CBI. As recently as June 2018 the Canada Pension Plan Investment Board issued a CAD\$1.5 billion (USD\$1.1 billion) certified green bond, with portions of proceeds going towards sustainable water and wastewater management among other projects.

The world's mounting water crises make the need for infrastructure investment clear. Investments should go towards the water infrastructure of the future, rather than repeating yesterday's mistakes. Projects involving natural infrastructure last longer, adapt to an ever-changing climate, and help reduce greenhouse gas emissions. **wc**

Todd Gartner is director of the Natural Infrastructure Initiative with the World Resources Institute. John H. Matthews is coordinator with the Alliance for Global Water Adaptation (AGWA).



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The Colour of Money

Green bonds: Canada's path to cleaner debt financing.

BY DAVID STEVENS AND GAURAV GOPINATH

FOR THE ETHICALLY-MINDED INVESTOR, green bonds offer a way to put private capital to work on climate projects. Green bonds also represent a strong potential source of alternative financing for environmentally friendly projects, including green infrastructure.

A 2015 report from the World Water Council noted that green bonds are “starting to become a serious asset class” for financing water infrastructure. According to a report from the Climate Bonds Initiative (CBI), just two years later global issuances of green bonds totalled about US \$156.9 billion, representing an 80 per cent increase over the previous year—a record year. More than half the issuances occurred in the U.S., China, and France and more than half of the issuers in 2017 were first-time issuers. Currently, most green bonds are “use of proceeds” bonds, meaning that proceeds raised from the debentures are restricted to clean infrastructure projects, such as wastewater management, carbon reduction, and renewable energy.

The Canadian green bond market

Canada's green bond market continues to develop and attract both domestic and international interest. However, the Canadian green bond ecosystem remains

quite different from the U.S. market. Most issuances in Canada are placed by government entities rather than corporate issuers. Furthermore, green bonds in Canada tend to have shorter terms to maturity than those issued elsewhere.

The largest issuers on green bonds in Canada in 2017 were:

- TD Bank (\$1.25 billion)
- Export Development Canada (\$1.1 billion)
- Government of Ontario (\$800 million)
- Government of Quebec (\$500 million)
- City of Ottawa (\$102 million)
- CoPower (\$20 million)

The Government of Ontario started 2018 with a bang when it issued a \$1 billion global green bond in late January. In May 2018, Manulife Financial Corporation announced that it intends to issue \$600 million in green bonds with a ten-year term. In June, Canada Pension Plan Investment Board (CPPIB) announced a \$1.5-billion, 10-year green offering, which would be the largest Canadian offering to date.

Proceeds raised from the issuances will be flowing downstream. Manulife's Green Bond Framework, for example, lists the

“development, construction, acquisition, installation, operation, and upgrades of projects that reduce water consumption or improve the efficiency of resources” as an eligible use. CPPIB's bonds will allow for investments in sustainable water, wastewater management, green buildings, and renewable energy. Proceeds from a \$450 million issuance by Ontario Power Generation in June 2018 have been ring-fenced for development of hydroelectric power projects in Ontario.

Investor appetite for green bonds

The steady growth in Canadian green bond issuance reflects significant investor. Past offerings from the provinces of Ontario and Quebec have been oversubscribed by a factor of two to five, which is generally indicative of greater demand than supply.

Interest in green bonds is driven by the fact that investors—particularly institutional investors with green mandates—are increasingly seeking exposure to climate-friendly sectors. Indeed, many investors bemoan the fact that Canadian issuances seem to be lagging behind other jurisdictions, despite the record-breaking issuances in 2017 and 2018.

A recent report from the Investment Industry Association of Canada (IIAC)

called for greater development in Canada's green bond market in order to enable alternative sources of financing for green infrastructure projects. The report noted that use of proceeds are in heavy demand, and interest is high, given mounting pressures on institutional investors to support environmental goals, such as combating climate change through carbon reduction.

The economics of green bonds

To be sure, the cost of issuing green bonds is higher than comparable non-green bonds. In order to obtain CBI's certification that a bond is of the green variety, the issuer must pay CBI a nominal fee consisting of a tenth of a basis point (or \$10 for a \$1,000,000 issuance). Additionally, the issuer must pay a CBI-approved third party to audit whether the issuer's reporting, filing, assets, and financial management structure meet CBI's requirements. The issuer may also incur internal staffing costs to implement any additional systems and protocols required to achieve certification. These are not significant costs for repeat issuers, but they may disincentivize smaller issuers.

Prospects for the future

Despite hurdles, the future of green bonds looks strong. Oversubscribed issuances are a testament to investor interest, and we can expect Canada's green bond ecosystem to grow as more private and government issuers enter the market. Institutional investors seeking to deploy capital toward green uses should look to green bonds as an asset class that offers not just guaranteed financial returns, but a positive environmental impact, as well. wc



David Stevens is a partner and a member of Aird & Berlis LLP's Energy Group. Gaurav Gopinath is a JD/MBA student at the University of Toronto and a summer student with Aird & Berlis LLP.

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A wastewater treatment plant in Iqaluit discharges effluent into Frobisher Bay.

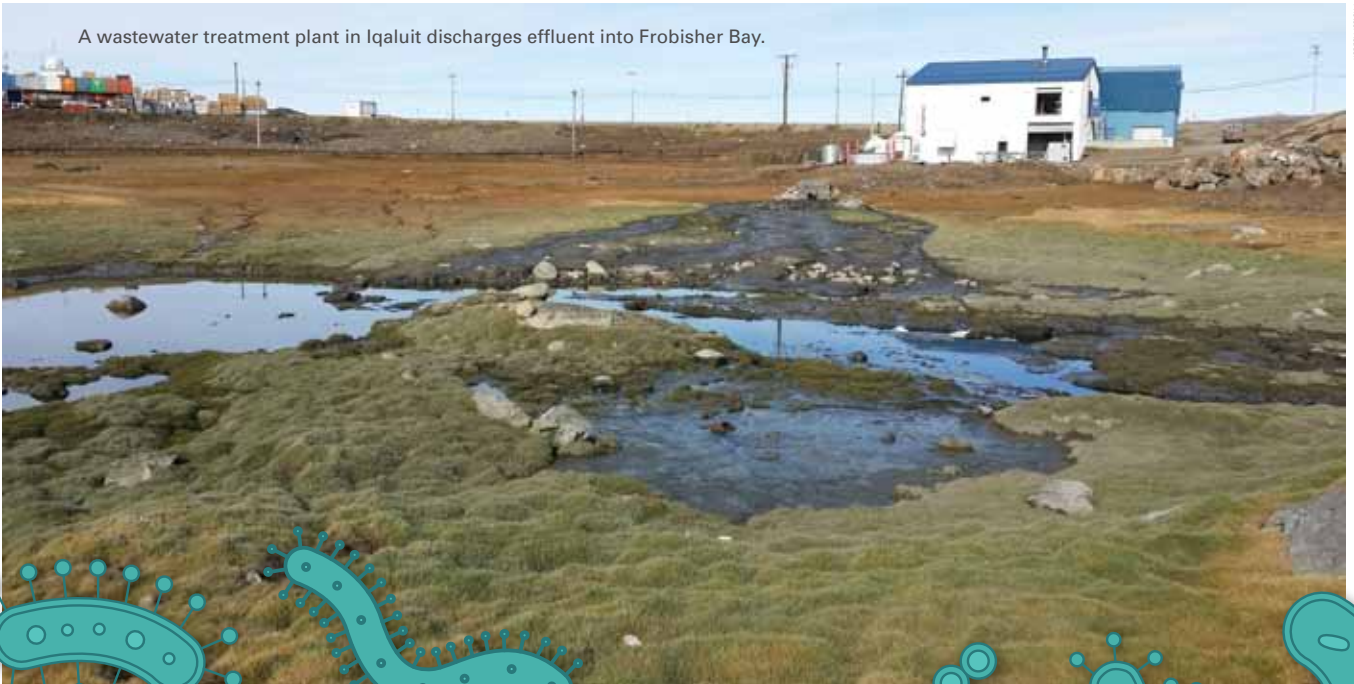


PHOTO: NUNAVUT

ANTIBIOTIC RESISTANT

Canadian wastewater treatment plants are contributing to the persistence of antibiotic resistant bacteria. The cost to Canadians is significant. **BY KARA NEUDORF**

THE GOLDEN AGE of antibiotics from the 1940s to the 1990s has ended, with antibiotic resistance quickly becoming a risk to public health and wastewater treatment processes are playing a role.

The misuse and overuse of antibiotics in healthcare and agriculture has increased the prevalence of antibiotic resistant bacteria. Studies have estimated that, in the United States alone, antibiotic resistance adds \$20 billion in excess direct health care costs, with additional costs to society for lost productivity as high as \$35 billion a year, and globally a 2014 Review on Antimicrobial Resistance estimated that 10 million deaths per year globally in 2050 will be attributable to antibiotic resistance, with a cumulative cost of US\$100 trillion.

Efforts have been implemented to mitigate antibiotic misuse, such as

the European Union's policy on the regulation of clinical prescriptions and their use in animal husbandry and the 2017 Pan-Canadian Framework for Action (Tackling Antimicrobial Resistance and Antimicrobial Use). However, antibiotic resistant outbreaks remain prevalent. Some of this is driven by conventional wastewater treatment systems, which can act as reservoirs for antibiotic resistant elements. Worse, this factor is not often considered in planning for the mitigation the spread and growth of the problem.

A multidisciplinary team of academic researchers from the University of Regina (Dr. Chris Yost), Acadia University (Dr. Anthony Tong), and the University of Dalhousie (Dr. Lisbeth Truelstrup Hansen and Dr. Rob Jamieson) have been researching wastewater treatment

plants as potential antibiotic resistant reservoirs. Their research has examined treatment processes in Saskatchewan, Nova Scotia, Prince Edward Island, and Nunavut.

The project began in the summer of 2015 by investigating the abundance and diversity of antibiotic resistant genes (or ARGs) and comparing their values in influent and effluent samples between the different wastewater treatment plants. These comparisons are being used to help identify mechanisms that control or contribute to the presence of antibiotic resistant bacteria in wastewater treatment plants, with a particular focus on clinically relevant ARGs.

As the move towards a climate-friendly circular economy grows, the reuse of wastewater increases, with biosolids being particularly beneficial



Researcher Robert Johnson sampling a receiver river in Greenwood, Nova Scotia.



This wastewater treatment plant in Greenwood, Nova Scotia, was one the researchers examined.



(L-R) Dr. Kara Neudorf and Joanna Poltarowitz sampling in Iqaluit.

to agricultural practices. Despite this, removal of antibiotic residues and antibiotic resistant bacteria is not a topline objective. Recent wastewater treatment plant upgrades have primarily focused on the removal of nitrogen and phosphorus from influent. Therefore, it presents the question of how is this type of circular economy contributing to the enrichment of antibiotic resistant reservoirs and their spread throughout the environment?

Overall, the type of wastewater treatment plant and source of wastewater (e.g. agriculture or healthcare) did affect the prevalence of ARGs observed in effluent receiving waters. Select ARG enrichment was observed throughout the treatment process in some facilities, but not all wastewater treatment plants observed this trend. One study site in Nova Scotia expanded the examined area to include the watershed upstream of the plant. The researchers found that upstream ARG concentrations were

greatly impacted by human activity, meaning as human impacted areas decreased, overall ARG levels also decreased. One surprising result was the presence of these ARGs in headwater river samples, suggesting their ubiquitous presence in the watershed despite the absence of obvious pollution sources.

This is clear evidence that even though the current wastewater treatment systems are meeting strict effluent quality guidelines, they are not removing ARGs, and in some cases, they are contributing to ARG enrichment. The incubation and spread of ARG into the environment by our current water treatment regime is a risk to public health; many of these genes are associated with mobile genetic elements that can promote the spread of ARGs between both environmental and pathogenic bacteria.

Although more research is still needed to fully understand all contributors to the presence and enrichment of antibiotic resistant elements, it's clear that

wastewater treatment plants play a large role. Since wastewater reuse and waste mining are becoming more prevalent in the approach to optimize resource management, the spread of these ARGs should be of concern and solutions considered. Increased monitoring of their presence and spread throughout the treatment and reuse process will help our understanding the problem and provide insights on how to prevent future enrichment of antibiotic resistance. Additionally, improvements to current treatment facilities present a perfect opportunity to improve upon the removal of both antibiotic residues and ARGs throughout the treatment process. WC



Dr. Kara Neudorf is a postdoc at Dalhousie University.



A simpler path to determining a sustainable capital reinvestment rate.

BY J.P. JOLY, KYLE HUNKER, AND KIRK STINCHCOMBE

ESTABLISHING A SUSTAINABLE capital reinvestment rate for water systems is a huge challenge for small municipalities. It requires an estimation of the annual cost of wear and tear on your infrastructure, a budget for future system improvements, and a vision for when to start building capital. One cannot entertain these kinds of decisions without considering how future generations will be impacted by the decisions you make today. It is one of the thorniest tasks water managers face.

The Town of Gibsons on B.C.'s west coast knows all about this challenge. As Lorraine Coughlin, manager of financial services, explained, "we needed a way to provide council with a more complete picture of the long-term costs of providing a sustainable water system. Then we had to raise understanding and support among residents that our rates needed to change and the reasons why."

With a change in approach, we've found that long-term funding of asset renewal doesn't have to be that complicated, and much of it has to do with communications. We've worked with Gibsons and numerous other communities across North America

to implement a simple, top-down method. It quickly and easily gets you in the ballpark of understanding what your capital reinvestment rate should be. And, because of its simplicity, it's very easy to explain. This leads to more meaningful conversations with elected officials and ratepayers.

We start with a simple concept that we call the "Annual Cost of Sustainable Ownership" (ACSO). This is the rate, in today's dollars, required to cover the average annual rehabilitation and replacement cost of your system assets when looking over a long time horizon, say 50 or 100 years. We use asset information that is typically easy to find to determine how much you would need to spend over the next 100 years to replace it, then, we divide by 100. For Gibsons' water utility that amount was roughly \$600,000 per year in today's dollars (we account for inflation later).

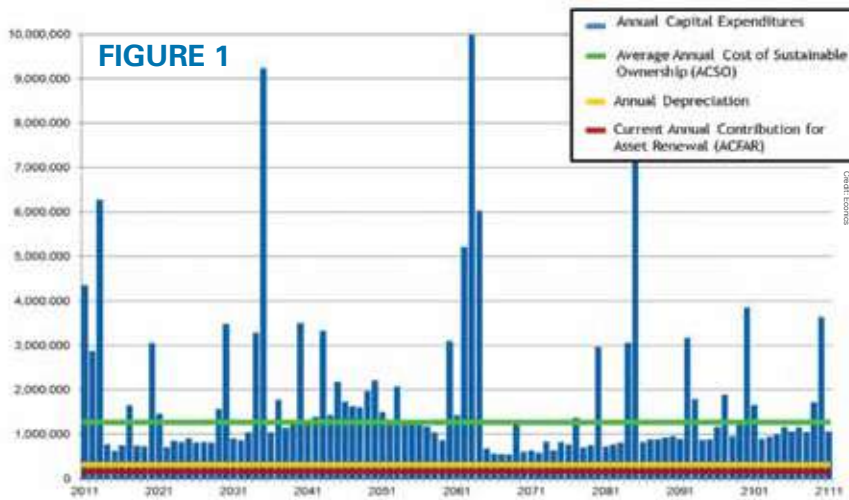
Annual costs and contributions

The next equally simple concept to determine is how much money a utility is investing in asset renewal or putting aside into reserve funds—the "Annual

Contribution for Asset Renewal" (ACFAR). If Gibsons consistently contributes an ACFAR amount that is equal to its ACSO, then—all else being equal—the town will be on track to fund its water services sustainably over the long term. Any unspent amounts of that annual contribution are placed into a reserve fund for future use. These reserve funds and borrowing are tools used to buffer ratepayers from large water rate fluctuations when the need to replace expensive pieces of infrastructure arises.

Because Gibsons' annual contribution for asset renewal stays relatively steady at \$600,000 (plus inflation), ratepayers enjoy the benefits of rate stability, and the reassurance that their essential water services are in good hands.

This simple approach can be supplemented with more sophisticated (and expensive) asset management techniques, such as risk-based analyses that use probability and consequence of asset failure to give you a more refined approach to prioritizing timing of infrastructure projects.



Most North American municipalities are unable to meet their water system funding obligations with existing revenue streams. Figure 1 demonstrates a 100-year asset replacement schedule showing the Annual Cost of Sustainable Ownership and the Annual Contribution for Asset Renewal.

Charting sustainable service delivery

A 2016 Black and Veatch study found that only 28 per cent of communities in North America can meet their water system funding obligations with existing revenue streams. Figure 1 supports this finding, and gives an example of what we typically

find in places that have not yet embraced long-term financial sustainability. In our experience, in most cases, a municipality's ACFAR does not match the ACSO when we get started. As the graph shows, sometimes the annual asset depreciation figure, easily found in the community's annual financial

report, is used as a guide for ACFAR. However, we find that depreciation usually underestimates the need, typically by a wide margin. Calculating your ACSO is a more sustainable methodology.

ACFAR/ACSO is now part of Gibsons' regular planning process, and they stay on top of it. As Lorraine said, "we review our long term financial plan annually, update our asset inventory and our financial numbers, and make sure we look at whether our rates are keeping up. This gives a comfort level that we are on the right track and we are including everything we need."

So figure out your ACSO and start getting your ACFAR up. When ACFAR is equal to the ASCO, everyone wins. WC



J.P. Joly is COO of Economics.
 Kyle Hunker is CFO of Economics.
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A jackhammer crushing asphalt for stormwater drain repair.



Model Decisions

A new tool to imbed cost-based and value-based considerations into to stormwater infrastructure to combat climate change and reduce flood risk.

BY YEKENALEM ABEBE AND SOLOMON TESFAMARIAM

STORM WATER DRAINAGE SYSTEMS are our first line of defence against pluvial flooding. In recent year, many Canadian studies have pointed to the abysmal state of our current stormwater assets and the fact that those drainage networks that are designed based on historical climate regimes may be defunct in the future due to climate change.

Solutions to determine the most cost-effective way to adapt Canada's stormwater drainage systems now and into the future are needed.

In response, a research team out of the University of British Columbia is developing a System Dynamics model coupled GIS capacity to capture the

management process to evaluate the current and future condition of asset components and plan appropriate interventions to improve the overall performance of the system.

Deconstructing a stormwater system

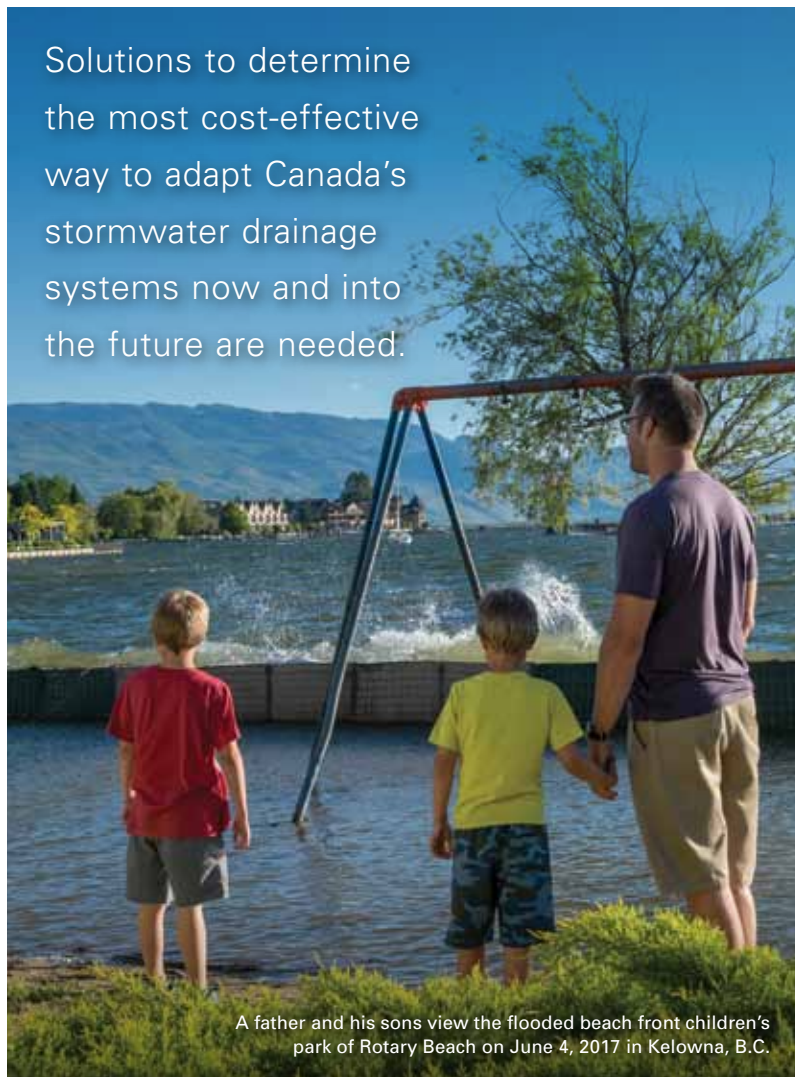
Stormwater drainage systems are composed of multiple components, such as sewer networks, retention ponds, wetlands, and swales, that are geographically distributed and interdependent. Different municipal departments are usually responsible for managing these assets. All these components are expected to function

based on their intended design capacity over the planning horizon, however may not the case due to environmental, physical, and operational factors affecting their performance. For example, metallic pipe corrosion could lead to pipe breaks or silt can accumulate in infiltration trenches reducing the hydraulic capacity of the system. Therefore, to maintain the required level of service and meet the overall stormwater management objective, an effective asset management system is crucial.

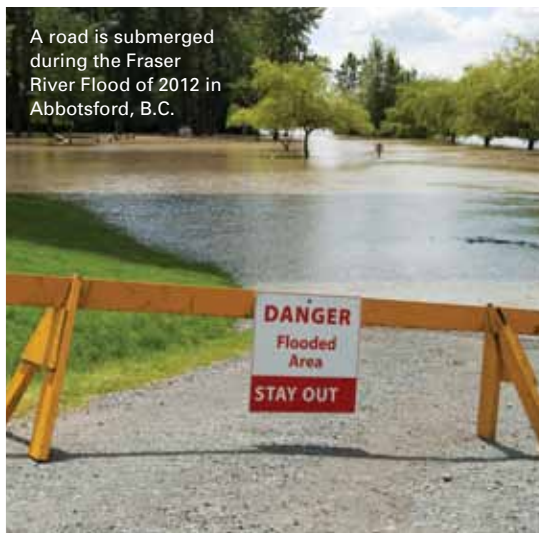
Planning for future costs

In asset management planning, the owner's ultimate goal is to generate a set

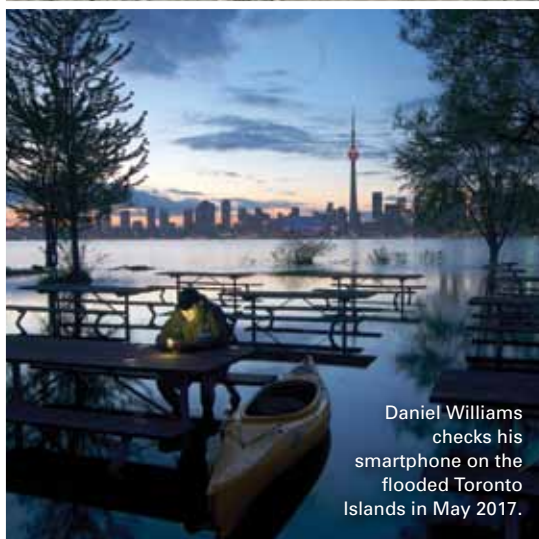
Solutions to determine the most cost-effective way to adapt Canada's stormwater drainage systems now and into the future are needed.



A father and his sons view the flooded beach front children's park of Rotary Beach on June 4, 2017 in Kelowna, B.C.



A road is submerged during the Fraser River Flood of 2012 in Abbotsford, B.C.



Daniel Williams checks his smartphone on the flooded Toronto Islands in May 2017.

Credit: Davey Williams | Flow-Reduction.org

of maintenance and investment actions to optimize its objective function over a planning horizon. To establish a set of optimized actions the owner has the option of using a cost-based or value-based approach. In our research, we have proposed a holistic asset management framework that combines both cost-based and value-based objective functions in the decision-making process. The approach brings a single, unifying framework to investigate all asset components and their interaction in the management process.

The model is divided into three modules:

- ❶ The sewer network (pipes, manholes, and inlets/outfalls)
- ❷ LID technologies (storage, infiltration, and filtration)

❸ Open channel flow routes (gutters, culverts, and ditches)

The modules are being developed in collaboration with multiple municipalities from the Okanagan Region and it is expected to be completed next year. The model validation is scheduled to take place in the coming fall using data collected from our partners. Respecting the many differences between one municipality to the next, the model can be adapted considering the local context and implemented anywhere. When completed, the tool will help municipalities to make network level decisions, specifically, it can assist in:

- Assessing maintenance needs to keep the required level of service;
- Investigating alternative maintenance strategies;

- Estimating operation and life cycle cost; and
- Assess cost covering tariffs.

Asset management is a systematic and cost-effective process of maintaining, upgrading, and operating physical assets. Further research in the area is crucial to improving current practices in stormwater assets management. **wc**



Yekenaem Abebe is a PhD student at the University of British Columbia and NSERC CGD-D award holder. Dr. Solomon Tesfamariam is a professor at UBC Okanagan Campus



Interview with Pierre Lavallée

Banking on better, stronger, more sustainable infrastructure.

BY KATHERINE BALPATAKY

WITH THE ARRIVAL of the Canada Infrastructure Bank’s new president and CEO, Pierre Lavallée, the CIB will soon have its operations team in place. For municipalities, there is much anticipation and many questions about how the CIB, will allocate funds for new infrastructure projects.

Lavallée, who brings experience from various forms of private equity investments and who spent the last six years at Canadian Pension Plan Investment Board (CPPIB), was hired because he understands the global capital deal flow. Given his involvement in several of the CPPIB senior infrastructure investment committees and his work as the interim head of private investment, which included the infrastructure portfolio, he’s got the knowledge and experience to make practical and positive impacts on Canadian infrastructure. But, as he explained, he’s only interested in specific types of infrastructure assets.

“I have had pretty good visibility on the global infrastructure investment scene for the last half dozen years, and I have had longer experience in various forms of private equity investments, either as a personal investor in some of the funds, but more relevant, as providing consulting services,” said Lavallée. “I think there’s a really good opportunity for us to build more infrastructure for Canada and [...] to make a material impact in helping to close the infrastructure gap.”

For municipalities and water utilities that are scrambling to address ailing infrastructure, achieve the Wastewater Systems Effluent Regulations (WSER), and meet the demands of climate change, the opportunity for another finance option, beyond traditional banks, provincial low-interest loans, and P3s should generate interest.

“We are not trying to displace the traditional government approach, and we’re also not trying to replace the privately-funded infrastructure projects. We are trying to invest in that space in between the two, where our participation will cause the construction of new infrastructure that would otherwise not see the light of day,” he said.

The CIB’s mandate, as Lavallée explained, will be to look for projects that can generate revenue based on user fees, such as water charges, that are of interest to global investors, but also carry risks or whose revenues are insufficient to make the outside investment viable, without the help of the bank.

“We are looking for situations where the additions of a public sponsor [...] can play a role to make these things happen.”

Reality bites

In reality, not every water utility is set up in such a way that the CIB will be interested in their projects. In May 2017, an internal federal report commissioned by Infrastructure Canada, and developed

by KPMG, noted that historically international private investors have only invested in municipal water assets after the community adopted full-cost accounting and metering of water use. As it was noted in the 2018 assessment of Canadian municipal accounting regimes by the Canadian Water Network, most municipalities do not presently have sustainable financing schemes in place for their water-related assets.

In the CWN report, *Balancing the Books: Financial Sustainability for Canadian Water Systems*, the analysis showed that Canadian municipal accounting schemes frequently fail to account for inflation, system growth, service enhancements, interest expenses, customer care, and source water protection. These are significant, crucial, and somewhat rudimentary factors for running a utility without deficits. And this is without addressing important external factors, such as rising energy costs and the likely impacts of climate change-related events. Investors will be wise to these inadequacies.

As the KPMG report pointed out, most Canadians are not used to paying the full cost for water services and there is a reluctance to hike rates.

“Catalyzing private capital to invest in Canada’s water utility industry is challenging and would require a transformation of the industry as a whole,” the KPMG report stated.

Lavallée is agnostic about the specific accounting practices used by utilities. However, the fact remains that a sustainable accounting scheme is a requirement of the CIB for any project seeking investment.

“Full-cost accounting has a whole dynamic around it, but the notion of connecting usage to revenues I think is one that private investors would see as a useful connection,” said Lavallée, “because it provides visibility of the factors that they can manage to ensure that the projects are sustainable and that services provided on a sustainable basis. If you separate the drivers of revenue from the drivers of cost, that can make for a very difficult equation for a private investor.”

Responding to the KPMG report, Robert Haller, executive director of CWWA said, “Here is one more reason—not that we need another reason—to move to full-cost accounting and proper asset management. Perhaps this will help in our efforts to transform our utilities to long term, sustainable enterprises.”

Opening the tap

Once the appropriate financials are in place, the idea is that CIB facilitates the flow of private funds to public projects. But is there a risk that these new, ambitious public works projects are privatized?

“If you think about water, there are private companies that invest in water treatment and wastewater treatment around the world. It’s usually the first step when privatization takes place, and we are not here to privatize assets,” said Lavallée.

Lavallée said he understands that Canada lacks an appetite for privatization of water assets in Canada, and that’s not the bank’s goal.

“There is a lot that will continue to happen with the traditional forms of government procurement, with what’s now called traditional P3s—we are not looking to displace any of those. We are looking to play a complementary role in situations where user-generated revenues will provide a stream of income that private investors would find attractive; yet not so attractive that they could be financed entirely privately.” For the CIB, this is the sweet spot.

“The underlying model is the fact that

you can charge the users of water for their consumption and use to finance the maintenance and operations of the facilities for the service and reinvest in expanded capacity. That whole dynamic is one that I think could take place in Canada,” he said.

Meeting the objectives of Canadians

Although the specific details for how each project will be evaluated have not been created yet (the CIB are still hiring the team who will develop the criteria), Lavallée said the bank will ensure that the awarded projects support government priorities, in addition to turning profits for investors.

“We will be looking to ensure that what investments are aligned with governments’—and I emphasize governments’—different levels of governments’ priorities,” said Lavallée. “Within that, there are the priorities on sectors, which have been published, but also taking into consideration the Framework on Climate Change for example, sustainability factors, greenhouse gas reduction benefits. Those things would all be included in our analysis.”

Given that major infrastructure projects often delve into conflicting or competing public interests, priorities, and regulatory environments, it will be interesting to see which projects rise to the top of the CIB analysis. When asked if he could point to a classic example of a CIB-friendly infrastructure project, Lavallée said, “There aren’t classic examples, because nobody has done this before.” But Lavallée remains focused on shared interests in his aspirations to deliver positive outcomes for Canadians.

“There seems to be broad consensus around the country that we could have better, stronger, more sustainable infrastructure. We aren’t going to solve it by ourselves,” said Lavallée.

Does he believe that the bank will achieve what the country wants? “Obviously, I took the job, so I think there’s great potential,” he said. *wc*

Katherine Balpataky is Water Canada’s editor.

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APPOINTED



JEANETTE JACKSON

Foresight Cleantech Accelerator Centre announced that **Jeanette Jackson** has been appointed as its new managing director. Jackson will be responsible for strategic and operational oversight of Foresight's staff and programs, including Foresight Launch and Growth, as well as the ARCTIC Innovation Challenge program. The ARCTIC program has identified mining hot water production as one of its challenges.

"I am delighted to be taking the reins at such an incredibly exciting time for Foresight and Canadian cleantech," said Jackson. "Transformative technologies in industries, such as energy, transportation, robotics, forestry, mining, and oil and gas are the way of the future. I look forward to building on our relationships with government, industry partners, and innovators to bring more game-changing solutions to market."

Jackson is an entrepreneur and business strategist who has served as an executive-in-residence at Foresight for four years. Previously she was the founding CEO of cleantech company, Light-Based Technologies, and was also president of The Brag Company, a combination of online and retail product distribution for smart and luxurious travel products. She has also supported several organizations, including Futurpreneur, as a business coach and mentor, and New Ventures BC, as a mentor and judge.

"We are thrilled to have someone of Jeanette's calibre leading Foresight as we expand and build on our mandate," said **Keith Gillard**, Foresight board member.



ROBERT ANDREWS

EXP has announced the appointment of **Robert Andrews**, former CEO of the Ontario Clean Water Agency (OCWA), as sector leader for Ontario infrastructure. Throughout his career, Andrews has

assembled and led multi-disciplinary teams carrying out large, complex, and innovative water and transportation capital programs. He has played key roles in engineering, technology, and alternative project delivery approaches. Andrews' project experience includes program management and engineering of many of the largest infrastructure systems in the world, including in Toronto, Chicago, New York, San Francisco, Hong Kong, Singapore, Sydney, and London.

"Robert is a recognized expert in water, infrastructure, and transportation, known for his passion and engineering precision," said EXP's president and COO, **Mark Dvorak**. "We're thrilled to have him join our senior management team, representing us in a key market sector."

Past president and CEO of OCWA, Andrews was responsible for the provincial agency that operates and maintains approximately 500 water and wastewater treatment systems that serve more than five million people. Before that, Andrews was chief executive of global water at AECOM, a water engineering and design-build business with 6,000 employees and annual revenues exceeding \$1 billion. Andrews also brings a wealth of alternative project delivery experience, including serving as executive vice president of Earth Tech's global water projects and products.



DAVID NEWSON

Ware Malcomb, an international design firm, has announced that **David Newson** has joined the firm as engineering manager for the Toronto office. In this position, Newson is responsible for the overall growth and management of Ware Malcomb's civil engineering services throughout the Canadian market.

"We are excited to have someone with David's extensive experience in both engineering design and business development join the Ware Malcomb team," said **Tom Jansen**, principal of civil engineering.

"David will be instrumental in leading our civil engineering services in the

Toronto office, and in expanding those services across the Canadian market in the years to come," said **Frank Di Roma**, principal of Ware Malcomb's Toronto office.

Newson brings over 20 years of engineering experience to Ware Malcomb. His previous work experience includes managing commercial and residential civil land development projects, large-scale site redevelopment facilities, and medical facility building sites for Canada's Department of Defense.

Newson holds a Bachelor of Engineering Science degree from the University of Western Ontario and a Master of Business Administration degree from the Richard Ivey School of Business in London, Ontario. He is also a member of the Professional Engineers of Ontario.

EVENTS



Performers at Harbourfront Centre on Canada Day.

World Premiere of Great Lakes Toronto, Ont.

On June 30 and July 1, 2018, Red Sky Performances presented the world premiere of Great Lakes, a dance and live music production performed knee-deep in the Natrel Pond on the shore of Lake Ontario. The show brought together contemporary Indigenous dance, original music, and the connection to five freshwater lakes.

Red Sky Performance is a leading company of contemporary Indigenous performance in Canada and worldwide. Led by Artistic Director **Sandra Laronde** of the Teme-Augama-Anishinaabe (People of the Deep Water), the company is currently in its 18th year of dance, theatre, music, and media.

Co-produced and presented by the Harbourfront Centre on Canada Day, this new work explored interconnectedness between humans and the Great Lakes, water as life-sustaining, and as a creative force.

The Great Lakes and St. Lawrence Cities Initiative Annual Meeting and Conference, Ajax, Ont.

The 15th Annual Meeting and Conference of the Great Lakes and St. Lawrence Cities Initiative was held in beautiful Ajax, Ontario on June 13–15, 2018. Mayor **Steve Parish** and the Ajax planning committee, along with Cities Initiative staff, put together an amazing event that explored issues and solutions around resiliency for municipalities, while also giving delegates a taste of the local character and culture of Ajax.

Day one started with the board of directors meeting, where the directors and staff discussed staffing and business needs for the organization, the Great Lakes- St. Lawrence Collaborative Strategy, Asian carp, and the organization's work on the Compact Council diversion application review process. The board also heard presentations from **Mark Reusser**, vice president of the Ontario

Federation of Agriculture and co-chair of the Thames River Phosphorus Reduction Collaborative (PRC) on the status of the PRC, as well **Peigi Ross**, attorney at Dunsmore Law, who provided the board with preliminary Healthy Workplace training.

After the board meeting and lunch, the directors and membership broke into regional meetings of the organization to discuss issues of regional significance to the membership. Of note, in the Ontario regional meeting, the first gathering of the mayor's Council on Nature and Communities convened.

For the conference portion of the event, welcoming remarks were given from a number of dignitaries, including Aboriginal Elder **Cat Criger**, Lieutenant Governor of Ontario **Elizabeth Dowdeswell**, Member of Parliament **Mark Holland**, Member of

Provincial Parliament **Rod Phillip**, and regional chair **Gerry O'Connell**. The membership and delegates then engaged in a conversation with **Dan Egan**, senior policy fellow with the Milwaukee School of the Freshwater Sciences, journalist, and author of *The Death and Life of the Great Lakes*. The session was moderated by **Dave Ullrich**.

Day three included a keynote address by Ontario Environmental Commissioner Dr. **Dianne Saxe** and was followed by the Tech Solutions for Water Management panel.



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can be found at
[watercanada.net/
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WATER QUALITY
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The banner features a stylized water drop graphic containing a city skyline with the CN Tower, and several smaller water drops with icons representing water quality and technology.



The Honourable Minister Catherine McKenna.



Bryan Gilvesy, CEO of ALUS Canada.



Vance Badawey, MP from the riding of Niagara Centre.



Stacey LaForme, Chief of the Mississaugas of the New Credit First Nation.

Photo: Dan Johnson

Great Lakes Funding Announcement Port Colborne, Ont.

Environment Minister **Catherine McKenna** visited Port Colborne, Ontario, on the shores of Lake Erie, July 19 to announce an \$8.95 million investment over four years for 36 projects aimed at improving the health of the Great Lakes.

Minister McKenna joined a group of Great Lakes mayors, students, First Nations, local media, and conservation groups at the Sugarloaf Marina to make the announcement.

MP **Vance Badawey**, from the riding of Niagara Centre who hosted the event, said, "I am honoured that Canada's Minister

of the Environment and Climate Change has travelled to Port Colborne to make this announcement. Those of us in the City of Port Colborne know that the Great Lakes are an environmental and economic powerhouse with tremendous potential."

As part of the announcement, Swim Drink Fish Canada will receive \$1.8 million over four years to help a citizen-led water quality monitoring program and \$600,000 will go to ALUS Canada to help reduce phosphorus inputs by restoring natural features on agricultural lands. Both groups were

present for the announcement.

"I have a lifelong relationship with the Lake; I have farmed in its watershed for 40 years," said **Bryan Gilvesy**, CEO of ALUS Canada. "Water quality in the Great Lakes is an example of problems that we can tackle together with our community," he said.

Minister McKenna said, "I am really thrilled to be here to tell you about what we are going to do. [...] These are local, on-the-ground projects that will protect and restore the Great Lakes, the water quality, and ecosystem health."



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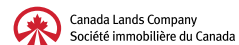
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The Gord Downie Pier Opens in Kingston, Ont.

On July 26th, several hundred people gathered at the waterfront in Kingston, Ont. to celebrate the opening of the Gord Downie Pier—and to swim! The grand reopening festivities included formal remarks by Mayor **Bryan Paterson**, MP **Mark Gerretsen**, and Swim Drink Fish president **Mark Mattson**.

Park renovations included a new promenade, pedestrian bridge, and shade structure, pier upgrades, steps,

and seating. Shoreline works included an upland beach, landscaping and tree planting, and accessibility improvements.

Up to \$1 million in support was provided through the Canada 150 Community Infrastructure Program (CIP 150) and \$500,000 in funding by Swim Drink Fish Canada/ W. Garfield Weston Foundation, as part of the Great Lakes Challenge, a challenge to communities and other funders to do more to restore

the lakes. Further support was provided by the provincial government and the City of Kingston.

Two days after the unveiling ceremony, hundreds of area residents participated in a mass swim at the pier. The Park stretches for several blocks along Kingston's urban waterfront. The pier was named after Canadian icon and Kingston native **Gord Downie**.



The swimmers in action.



Minister Catherine McKenna.



Ottawa Riverkeeper Meredith Brown, left.

The Riverkeeper 4K Ottawa, Ont.

On August 11th, over 275 swimmers and paddlers flocked to the Ottawa River for a most unconventional provincial border crossing, swimming across the mighty Ottawa River to raise awareness for swimmable, drinkable, fishable waters. The Riverkeeper 4K, presented by Alterna Savings, was one of 138 open water races in the internationally recognized Global Swim Series. It was also a chance to encourage people to swim, play, and paddle in the river.

"It was about getting people into the

water and having them realize firsthand why we need to protect it," said **Patrick Nadeau**, executive director for Ottawa Riverkeeper. "You can't love something you never use, and you need to love something to really want to advocate for it."

The Riverkeeper 4K is also one of Ottawa Riverkeeper's largest annual fundraisers. All of the swimmers and paddlers were encouraged to raise money in support of the river. This year, participants raised a record-breaking \$22,500, with a total of \$42,500 raised from the event.

This year the swim took place in memory of **Tom Anzai**. Tom was the race director of the annual Riverkeeper 4K swim. The Tom Anzai Memorial Trophy was presented to the Top Fundraiser and Tom's son, **Kenton Anzai**, took up his cause as race director for the 4K Swim this year.

A couple of local celebrities also took the plunge. Minister **Catherine McKenna** and MP **Will Amos** rose to the challenge, along with **Heidi Levasseur**, who plans to swim across the Atlantic Ocean.

Taking it Global

It's time for Canada to develop an approach to supporting the next generation of global water technology leaders.

BY DR. PETER GALLANT AND JEFF GUILD

IN 2013, the Blue Economy Initiative published *Canada as the Water Solutions Country: Defining the Opportunities*. The paper was designed to help frame and advance a national conversation around Canada's opportunities to become a global leader in water sustainability and innovation. It also focused on improving support for companies to grow beyond the start-up stage, developing the next generation of global leaders.

This past June in Vancouver, BlueTech Research, WaterTAP, and NRC-IRAP revived this discussion, exploring the global potential for Canada's water tech sector with technology companies, utilities, investors, academics, government representatives, and industry support organizations. The consensus was clear: Canada is not taking advantage of its opportunity.

Why is this the case? We've got innovative entrepreneurs, an active investment community, a supportive cleantech-focused federal government, plenty of local talent, utilities with test-bedding capabilities, established academic institutions doing advanced research with commercial potential, several industry organizations, active incubators and accelerators, and access to leading market intelligence. In short, Canada's water technology sector has many of the ingredients it needs to make an impressive impact in the multi-trillion-dollar global market. Indeed, it is estimated that more

than 80 per cent of Canadian water tech companies are exporters. But, Canada's share of the global market remains disproportionately low.

What's missing? Focus—at the national level.

When we look at the success of other thriving water hubs in countries like Singapore, the Netherlands, and Israel, we find they have something in common. In one way or another, each has managed to coordinate their sector's efforts across jurisdictions at a national level and scale. To make use of Canada's opportunity, we need to coordinate at a similar, galvanized level. We need to forge deep partnerships that transcend provinces and territories to leverage our expansive and diverse knowledge, combine solutions and resources when it makes sense, and approach the global market with truly competitive and novel offerings that solve real challenges.

And we need to start by getting to know each other better. The Blue Economy report, referencing a Conference Board of Canada report from 2008, warns that if the water sector remains a fragmented industry, "Canada will miss out on the full range of commercial opportunities for the technological advances Canadians have developed."

Both the 2013 paper and the participants at the June meeting suggest that our micro, small and medium-sized enterprises

(SMEs) need a business boost—and potentially a national convening network with focus and expertise in Canada's water sector—in order to scale our companies, attract capital, build strong partnerships, and open doors to new projects.


We agree, and the good news is that we don't need to start from scratch. There are organizations that currently serve the water tech sector that could convene a network of companies and stakeholders, as well as work with partners to funnel global opportunities and provide scaling services to help Canadian businesses connect and grow together.

The opportunity for Canada is at hand, but time is of the essence. From the Blue Economy paper: "The world faces no greater challenge than that of meeting its future water needs. Canada can be part of the solution, a water solutions country—that's our decision to make, but we need to make it now." **wc**



Dr. Peter Gallant is president and CEO of the Water Technology Acceleration Project (WaterTAP). Jeff Guild is VP, Business Development & Professional Services, BlueTech Research. WaterTAP, BlueTech Research, and NRC-IRAP will host a follow-up discussion on Friday, October 26 in Toronto as part of Ontario Water Innovation Week.

Question today *Imagine tomorrow* Create for the future



We must all hold ourselves accountable for tomorrow. For us, that means engineering innovative solutions to the challenges the future will bring. Can we design a place where our communities can thrive?

We think we can.



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