

# WATER CANADA

## Think Small, **Think Big**

**Restoring Water  
in Indigenous  
Communities**



**Small System Solutions  
for Wastewater**  
(page 20 and 32)

**Federal First Nations  
Drinking Water Regulations  
at a Crossroads** (page 10)



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# Small-Scale Solutions and the Bigger Picture



BY KATHERINE BALPATAK

**IN THIS ISSUE OF WATER CANADA,** we focus on the challenges and solutions to drinking and wastewater issues in small communities, with an emphasis on indigenous communities. Our cover, "Think Small, Think Big," is a reference to the "small," decentralized technologies and approaches many experts believe to be the most prudent options for small and remote communities; contrasted with the need for a "big," new approach to address the many barriers in (re)establishing clean drinking water in First Nations communities.

In writing this editorial, I am mindful of the fact that most of our readers—whether indigenous or not—share the desire to see improved access to clean water across Canada; and yet, there is a fundamental difference in the way Western and indigenous people view the "management of water resources" to achieve that goal. I hope this edition of Water Canada will highlight some of the best practices and solutions being employed in and by First Nations communities to bridge these disparate perspectives and to interpret aspects of the regulations that have hindered progress.

On page 17, University of Saskatchewan professors Lori Bradford and Lalita Bharadwaj describe an approach they have

developed with First Nations communities in the Northwest Territories to monitor watershed conditions based on parameters that are culturally and scientifically relevant; and on page 8, Carolyn DuBois describes an innovative data platform designed to make this kind of data available to communities. On pages 20 and 32 respectively, we explore a turn-key variety of water treatment that is cost-effective for remote communities and the latest research on tundra ecosystem services proving to be effective for wastewater treatment in the North. On page 28, Jodi Garwood of the BC Water and Wastewater Association provides advice on how small communities can finance water systems in a self-sustaining manner; and on page 14, George Kakepetum of the Northern Chiefs Council describes a water operator training program that has helped restore access to clean water in many Ontario First Nations communities.

Now that the consultations for the 2016 federal budget have wrapped up, the anticipation of this government's investments in infrastructure is palpable. The promises made to indigenous communities, which include housing, water, and broader goal of reconciliation, are immense.

Water access is an important step, and our sector has an important role to play. wc

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**CAROLYN DUBOIS**

Carolyn is the water program manager at the Gordon Foundation.  
**PG 8**

**GEORDI KAKEPETUM**

Geordi is the chief executive director of Keewaytinook Okimakanak, a non-political chiefs council for northern Ontario.  
**PG 14**

**JODI GARWOOD**

Jodi is a technical communications specialist with the BC Water & Waste Association  
**PG 28**

## ABOUT THE COVER



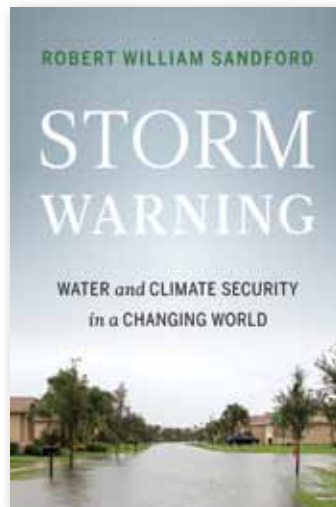
Ahnissabae artist Roy Thomas (1949 – 2004) was one of the leading representatives of what is commonly referred to as the Woodland School of Art. He was born in 1949 in the boreal forest east of Long Lac in Northeastern Ontario. Through this painting, “Experience Knowledge,” Thomas shares a lesson about progress through experience. “The more we travel through life, the more knowledge we gain,” were the artist’s remarks on this painting. “For me it has been important to understand the four directions: where you come from, where you’ve been, where you are, and where you’re going [...] Take only the good in all these directions, and it will be much easier,” he told a community magazine in Thunder Bay.

**NEXT ISSUE: MARCH/APRIL**

- **Public-private partnerships for renewing water infrastructure**
- **Corporate risk and financial performance and water**
- **Government’s changing role in water management**

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## Book Review:

# Storm Warning

BY SHANNON CARTO

**THROUGH ROBERT SANDFORD’S BOOK,** *Storm Warning*, the reader is taken on a journey across Canada to explore the unique and indelible signature that climate change has left on our nation’s water resources—both the seen and unseen.

Sandford provides a comprehensive summary of the research and data being amassed by world-renowned Canadian researchers and leading organizations. The focus on Canadian researchers, which must be acknowledged, does not detract from his ability to provide the reader with a clear and poignant picture of Canada’s hydro-climatic regime, province-specific climate issues, and the implications of past and potentially future policy and regulation. The book is technical, yet readable. It’s suitable for anyone who is interested in better understanding the recent extreme weather events that have been felt across Canada, why these events happened, and what they mean. For seasoned scientists, the book serves as a one-stop shop for understanding the state of the knowledge on this topic in Canada, where gaps exist, and where trends are emerging.

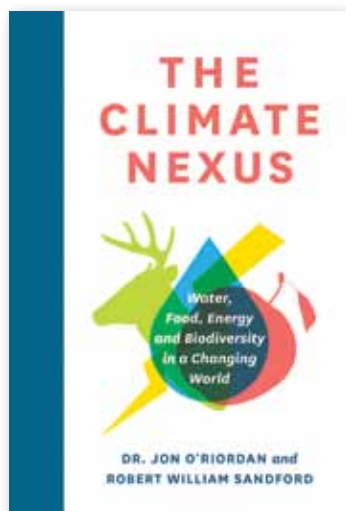
The objective of this book, as perceived by this reviewer, is to explore the relationship between climate change and water governance in Canada. The author achieves this by highlighting how territorial and provincial governments have responded to the impacts

experienced to date. Sandford’s most critical chapters are those he dedicated to exploring the policy and regulatory success stories that have emerged from the territories and Western Canada. The author hammers home the fact humans are responsible for climate change and makes reference several times to the Anthropocene—a concept that has entered the mainstream lexicon in an effort to mark the place in geological history when humans forever changed the Earth. Although this reviewer has accepted the fact we are standing on the cusp of a new era of “Earth system disruption,” I believe the author overlooks the need for pairing this concept with a discussion about the natural forces that are also at play.

In the last chapters, Sanford provides a reasonable and implementable framework for translating and mobilizing research into adaptation plans and policies, which is tactical, broad, and timely. Overall, the book provides a clear picture of where we stand, what we stand to lose, and what we need to stand for in the coming years to ensure our long-term survival. **WC**



Shannon Carto holds a PhD in paleoclimatology from the University of Toronto. She is also the climate change coordinator for the Town of Caledon in Ontario.



## Book Review: The Climate Nexus

BY MIKHAIL SMILOVIC

**DR. JON O'RIORDAN AND ROBERT WILLIAM SANDFORD** guide us through the richly complex and nuanced relationships of the water, food, energy, and climate nexus from both the global and Canadian perspectives. The Climate Nexus is a narrative of the opportunities to be gained through increased awareness, “restorative development,” and collaboration; but also a warning about the potential collapse of our environmental, economic, and political resiliency.

The authors describe the present context as a changing world where our actions (and appropriately, inactions) “rival the larger processes of nature.” They expand on the consequences of individual and international negligence and complacency—that is, the status quo. International frameworks intended to lead the global community toward a sustainable future are surveyed, as well as the necessary actions to avoid irreversible “tipping-points.” Minding the changing and warming climates and oceans, disturbed carbon and

nutrient cycles, compromised and eroding soils, and non-stationary hydrological cycles, the authors defend two movements to reach a desired future: first, development must not only be sustainable but also restorative; and second, we must harness the power of public interest and informed choice.

The Climate Nexus is a motivating manifesto to address the wicked problems of waste, inequality, and undervalued environmental services. Technological advancements may buffer the realities of our unfortunate destiny, but engineered environmental services can never match the myriad of benefits the natural environment provides. This book is a call to action for individuals, governments, and local and global communities. **WC**



Mikhail Smilovic is a PhD candidate at McGill University focused on the water, food, energy, and climate nexus

### CORRECTION

In the January/February 2016 issue of Water Canada, “Path of Resistance” by Kara Neudorf featured an illustration of a virus, whereas the intent was to illustrate bacteria.



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**BLOG:** Film has an important role to play in our cultural history. Water Canada shares a collection of short films about indigenous traditions for water, water infrastructure, and rights. [bit.ly/IndigenousH20Film](http://bit.ly/IndigenousH20Film)

**BLOG:** If you are looking for deeper reading about Canadian indigenous water governance, rights, and research, researcher Rosie Simms has curated a list of “must reads.” [bit.ly/IndigenousH20Read](http://bit.ly/IndigenousH20Read)



**NEWS:** UBC researchers have developed a tool designed to help small to medium-sized communities address the challenges posed by aging drinking water infrastructure. [bit.ly/TOOLsmallmuni](http://bit.ly/TOOLsmallmuni)

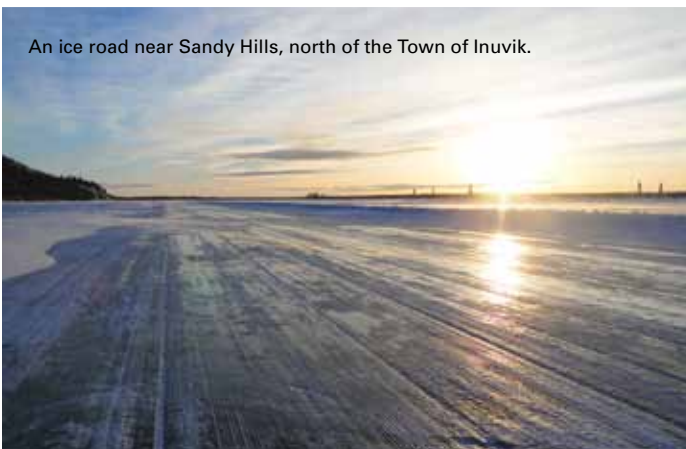
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The Mackenzie River, which originates in Great Slave Lake, flows into the Arctic Ocean.



An ice road near Sandy Hills, north of the Town of Inuvik.



The Mackenzie Basin drains 20 per cent of Canada's landmass and is among the most ecologically significant watersheds in the world.



The Beaufort Delta Region borders the Yukon.



# Big Data, Open Access

A community-based monitoring program gives the public access to water quality information in the Northwest Territories.

BY CAROLYN DUBOIS

**IF YOU TALK TO** anyone who thinks seriously about water, the conversation will at some point turn to the need for evidence-based decision making. If you follow this line of inquiry to the most practical of questions—where is this evidence and how is it being used?—the answers get complicated. From government research to community-based monitoring, data is being collected by the terabyte. So where does it all go?

Mackenzie DataStream is a new tool that makes accessing such evidence as straightforward as possible. This online platform allows the public and decision makers to view and download a growing database of information about water quality in Canada's Mackenzie Basin.

Mackenzie DataStream was born of the vision underpinning the Northwest Territories-wide, community-based monitoring program. Built through a partnership between the Gordon Foundation and the Government of the Northwest Territories, Mackenzie DataStream was developed to share community water data collected in the territory. It is well positioned to accommodate data from other communities, researchers, and agencies throughout the six jurisdictions in the Mackenzie Basin.

"Mackenzie DataStream is a valuable source of information for N.W.T. water management and is included in the 2016-2020 Action Plan for the N.W.T. Water Stewardship Strategy," said Erin Kelly, assistant deputy minister of the Department of Environment and Natural Resources of the Government of the Northwest Territories (GNWT). "We believe that Mackenzie DataStream will grow and inform the co-operative management of the Mackenzie Basin as a whole."

When the pilot version launched in November 2015 in Dettah, Northwest Territories, it contained water-quality data collected by 22 communities from across the territory. These communities monitor the full gamut



of water quality parameters, including dissolved metals, turbidity, temperature, chlorophyll-a, and hydrocarbons (oil and gas chemicals).

Fundamental to the Mackenzie DataStream strategy is a focus on datasets that matter to communities. Members of the NWT Water Strategy Aboriginal Steering Committee, for example, are encouraged by its potential and state that “it is our hope that Mackenzie DataStream will provide the information necessary to monitor effective implementation of the objectives of the NWT Water Strategy and track commitments made under the bilateral water management agreements by provinces and territories in the basin.”

### Open access philosophy

In line with movements to “democratize” access to information, a philosophy of openness and accessibility has guided the development every aspect of the project. The interface is simple to navigate and

includes graphing tools that allow users to visualize the information that most interests them. Its datasets are complete and available for download in a format that allows users to perform their own analyses. Finally, even its source code, built by Alberta-based Tesera Systems Inc., is open source and available for re-use and community-driven improvements.

“One of Mackenzie DataStream’s strengths is that the datasets will be curated to ensure it does not become a data ‘dump site’ with an inconsistent structure or lack of documentation on data quality,” said Peter Pulsifer, a research scientist at the U.S. National Snow and Ice Centre and Exchange for Local Observations and Knowledge of the Arctic. “This is achieved through careful partnerships and real, human connections among data contributors.” As more partners come on board with datasets, DataStream will extend its reach across the critically important Mackenzie Basin.

Mackenzie DataStream’s open-access approach is part of a widespread shift, as evidenced by policies adopted by organizations like the Bill and Melinda Gates Foundation, the National Science Foundation, and most recently, Canada’s tri-agency of federal research funders (the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council, and the Social Sciences and Humanities Research Council).

Former GNWT environment minister J. Michael Miltenberger explained that this open-access, community-monitoring-based approach is challenging traditional notions like scientific examination being limited to experts. “The public can and should have a role in stewarding Canada’s watersheds,” he said. “Technologies like Mackenzie DataStream provide fundamental supports for making this shift.” WC

Carolyn DuBois is the water program manager at the Gordon Foundation.

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# Idling No More

Ottawa's progress to implement drinking water regulations for First Nations has stalled. With five years to make good on promises, the Liberals need a new approach.

BY EVE KRAKOW

**IN 2005**, when half the people living on the Kashechewan First Nation reserve in Northern Ontario were evacuated following an *E. coli* outbreak in the drinking water supply, the plight of First Nations communities living under boil-water advisories was made visible. Since then, several high-profile media stories have shone a light on this issue, including former national Chief Shawn Atleo's appeals to Prime Minister Stephen Harper and demands made this past fall by the Neskantaga First Nation after they entered their 20th year of living under a boil-water advisory. These stories have left many Canadians wondering, "Why can't we get clean water to First Nations people?"

In the 10 years since the Kashechewan crisis, the federal government has launched its Plan of Action for Drinking Water in First Nation Communities (2006), followed by the National Assessment of First Nations Water and Wastewater Systems (2009) and bills S-8 and S-11—culminating in the *Safe Drinking Water for First Nations Act*, which came into force in November 2013. Under this legislation, a process was initiated to develop drinking water regulations in each region that would become legally binding. And now, in

2016, Prime Minister Justin Trudeau has pledged to eliminate drinking water advisories in all First Nations communities within five years, with a specific promise to help fund a new

If regulations came into force, chiefs and councils would be immediately liable—without having first been given the capacity to provide safe drinking water.

water treatment plant for the Neskantaga First Nation.

In December 2015, however, at its



Special Chiefs Assembly, the Assembly of First Nations (AFN) passed a resolution asking for the government to repeal this act. As a primary measure, the AFN is advocating for the necessary funding to eliminate drinking water advisories. However, the AFN resolution also calls on the federal government to revisit the report of the 2006 Expert Panel on Safe Drinking Water for First Nations—a document containing recommendations that were to be the basis of all future planning but were somehow lost.

### One step forward, two steps back

Julie Abouchar, a partner with Willms & Shier Environmental Lawyers LLP,

served as an advisor to the 2006 federal panel. She explained that there are currently no legally binding standards for the provision of drinking water on reserves. After the Walkerton tragedy in May 2000 (when seven people died from a contaminated water supply), all Canadian provinces brought in legally binding standards for drinking water. But reserves are governed by federal laws, not provincial laws. “The federal law has no standard, just objectives—which was the same situation in the provinces before Walkerton,” Abouchar said.

Established by the (then) Department of Indian Affairs and Northern Development (IAND) with the support of the AFN, the expert panel’s mandate

was to consider options for a regulatory framework for First Nations communities located on reserves. (The Conservative government changed IAND to Aboriginal Affairs and Northern Development Canada, AANDC, in 2011. The recent Liberal government has since changed the name to Indigenous and Northern Affairs Canada, or INAC.) While the panel proposed several options, they stressed three conditions necessary for any plan to succeed: close the resource gap, hold discussions with First Nations, and deal with high-risk communities immediately. According to the AFN and Abouchar, it is precisely these conditions that are missing from the current legislation. Moreover, the way the federal legislation





Justin Trudeau addresses the Assembly of First Nations' 36th annual general assembly, noting that the "innocuously named *Safe Drinking Water on First Nations Act*" is an example of the "Ottawa-knows-best approach to governance."

stands, said Abouchar, "If regulations came into force, chiefs and councils would be immediately liable—without having first been given the capacity to provide safe drinking water."

### Getting up to standard

Chief Shining Turtle (Franklin Paibomsai) of the Whitefish River First Nation in Ontario is a civil engineer with the Ontario First Nations Technical Services Corporation. He chairs a task force currently reviewing the technical elements of the existing legislation for the AFN. He said that understanding why the drinking water situation is so dire requires an understanding of the history of infrastructure planning. "In the mid-1980s, the government began

devolving services to First Nations," he said. "They knew about the challenges, and decided to unload them. But they did not accompany this devolution with the resources and training required to build the necessary capacity."

In some cases, this lack of capacity was as literal as the pipes in the ground. The chief explained that while current Ontario regulations state that drinking water systems must have a capacity of 450 litres per person per day, the systems on reserves were built for only 180 litres per day—because of a decision made by the federal government decades ago. Bringing systems up to the current standard would require ripping up all the pipes and starting over. "All these systems have failed because they're undersized

to begin with, because of a deliberate management practice by the Department of Indian Affairs," the chief said. "Where in the nature of humanity does an Indian drink less water than a white man?"

A study published in the *Canadian Water Resources Journal* in September 2015 estimated that between 2001 and 2013 about \$2 billion was invested to improve drinking water on First Nations lands. Chief Shining Turtle said that while to the general public this may sound like a considerable investment, it has hardly been enough to cover the costs of building, operating, and maintaining water infrastructure in the 633 bands across the country—many of which are in remote areas. A 2011 assessment by DINAC (now INAC) determined that \$4.7 billion would be needed over the next 10 years for First Nations water and wastewater systems to meet INAC protocols.

### Act one

Under the 2013 *Safe Drinking Water for First Nations Act*, the federal government was to develop regional regulations. They started with the Yukon and Northwest Territories, where there was essentially only one community under federal jurisdiction. Then they worked with the Atlantic Policy Congress (APC), which supported the process in the Maritimes.

John Paul, executive director of the APC Secretariat, said his team submitted a detailed proposal for regulations to AANDC about two years ago. "The information that we provided basically fell into an abyss. [...] We haven't received any kind of formal response."

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Paul agreed that any regulations will need to be backed by financial resources. His engineers have estimated that their region alone (First Nations communities in Atlantic Canada) would require an

customary law be set out in the federal statute preamble.

“Going across the country, we heard a lot of individuals say they have indigenous law that they want to apply to water,” Abouchar said, recalling the panel’s process. “Our recommendation was that the federal government take into account, however it can, those indigenous water laws, and the cultural perspective on

water.” Although it’s unclear exactly how this would work in practice, she believes proper consultation on any federal statute would be a good starting point.

### Nation to nation

In a water regulation development status update issued at the end of January 2016, INAC wrote that Minister Carolyn Bennett of Indigenous Affairs and Northern Development has been directed “to undertake a review of laws, policies and operational practices in partnership with First Nations,” and that work on developing water regulations is “on hold while it is determined what the review will cover and how it will be carried out. This provides an opportunity for First Nation stakeholders to share views, concerns, and priorities before any further work is done.” The document puts forth several issues to consider, including whether legal, enforceable standards for water and wastewater are needed to help safeguard communities in the future; and if so, what should be considered in developing them and who

should be involved, and the possibility of alternative mechanisms to protect the health and safety of First Nation residents when it comes to water and wastewater.

Earlier, in response to Water Canada’s request about the regulation development process, INAC reiterated the government’s commitment to “a renewed, respectful, and inclusive nation-to-nation process.” The email further stated, “The Government of Canada has committed to address and resolve Drinking Water Advisories on First Nations lands in five years and is now examining how it will move forward on eliminating long-term drinking water advisories.”

Leblanc, who will work with the various parties involved to further the resolutions passed at the AFN Special Chiefs Assembly, said it’s too early to say if all this goodwill will translate into concrete action on the ground. “Everyone is waiting to get direction, waiting for the budget.”

Chief Shining Turtle takes hope from the new prime minister’s attitude—Justin Trudeau spoke in person at the AFN Special Chiefs Assembly in December 2015—but said the task before him is huge. “They have to go back and engage with people. Visit communities, see what’s working, what’s needed, the real costs. Then come up with a plan.” WC



Eve Krakow is a freelance writer based in Montreal.

The federal law has no standard, just objectives—which was the same situation in the provinces before Walkerton.

immediate investment of roughly \$225 million just to bring the drinking water systems up to standard. It appears, however, that federal work to develop regulations stopped because of the opposition faced in other regions.

“I was involved in those engagement sessions, and it was not consultation,” said Irving Leblanc, special advisor to the AFN on housing, water, infrastructure, and emergency issues management. “There was no respect for water or for First Nations processes and beliefs.” He described how chiefs in the various regions cut short or monopolized meetings with traditional ceremonies to voice their discontent. In Alberta, he said, while the chiefs initially supported the process based on their discussions with government officials, they later rescinded their support because those talks were not honoured. The AFN Resolution on Safe Drinking Water also states that the current legislation does not reflect First Nations’ customary laws regarding water. In fact, the 2006 expert panel had recommended that the importance of

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# Recipe for Hope

The Safe Water Project delivers training, support, and clean water to First Nation communities.

BY GEORDI KAKEPETUM

**CHIEF JOE CROW** of Fort Severn First Nation proudly speaks of the milestone his community will realize this year. “For the first time in more than two years, our people will be able to turn on the tap and just drink the water without first having to boil it. People are trusting the water system again, and we are very excited about what this means for the future of our community.”

As of March 2015, 20 per cent of First Nations were on a drinking water advisory, a situation some have experienced for years—even decades. Our communities were part of this statistic. Although we have modern water-treatment infrastructure and facilities (they were built starting in 1999), we have faced both short and long-term boil water advisories since 2001. This includes two advisories that have been in place for more than 1,000 days, as well as one that has been in place

for more than 15 years.

Part of the problem was that we lacked the capacity to operate the facilities that had been built. Of the 14 water operators we employed, only one had the required certification to manage their community’s water supply. The result was that we had to rely on an outside third party to oversee and assist with the management of our drinking water. Given that our communities are remote and can only be accessed by plane or winter road, it often took time for this third-party support to arrive.

The process by which we tested our water was also an issue. Because of the remoteness of our communities, water samples had to be taken, preserved, and flown to a laboratory to be tested. This process could take up to two weeks, and if there was a problem, it could only be addressed once the laboratory results were known. In the meantime,

our communities remain vulnerable to contaminated water.

Unfortunately, federal government programs, though well intentioned, did little to improve this situation. Rather than funding individual community efforts that addressed and were tailored to the unique circumstances, challenges, and needs of each First Nation, programs like those under the First Nations Water and Wastewater Action Plan (FNWWAP) were developed. These used a top-down and one-size-fits all approach, which tended not to address the root causes of the problem.

However, all this changed in 2015 with the end of specific programs under the FNWWAP. The federal government provided an opportunity for communities to develop alternative ways to resolve drinking water issues.

Building on their earlier success in the creation of the Keewaytinook Centre of



Excellence, a world-class water operator training facility in Dryden, Ontario, the chiefs of our communities envisioned the Safe Water Project. Funded by the federal government as a one-year pilot project, the project was implemented in our communities in May 2015.

These used a top-down and one-size-fits-all approach, which tended not to address the root causes of the problem.

The Safe Water Project has three integrated components: training, operational support, and water monitoring—each designed and tailored to meet the specific needs of each community. Under the first component, community members complete mandatory training to become certified water operators. This training meets provincial certification requirements,

and graduates of the core program are ready to manage water treatment facilities without operational support or oversight.

Given that strengthening capacity takes time, the second component of the project involves providing support to local operators as they pursue certification. Fully certified and licensed water operators are available 24/7 to provide assistance to local operators when and where they need it. Employed by our tribal council, these operators bring a unique perspective to their work. Not only are they members of our communities, but they have also worked with many First Nations and understand the challenges and issues that arise in trying to deliver safe drinking water to communities.

Under the third component, local operators and operational support

personnel utilize industry-leading water monitoring technology to test the water on a continuous basis. Samples are taken every 10 seconds and reports are issued every two minutes, providing operators and personnel with real-time data on what is happening with a community's drinking water so adverse issues can be addressed immediately.

So far, the Safe Water Project has achieved significant results. It has helped prevent numerous boil water advisories. It has lifted the persistent boil water advisories in two of our communities, and we are working to lift a 15-year boil water advisory. It has resulted in the certification of an additional six local water operators, and most importantly, it is delivering safe, clean drinking water—and hope—to our communities. WC

Geordi Kakepetum is the chief executive director of Keewaytinook Okimakanak





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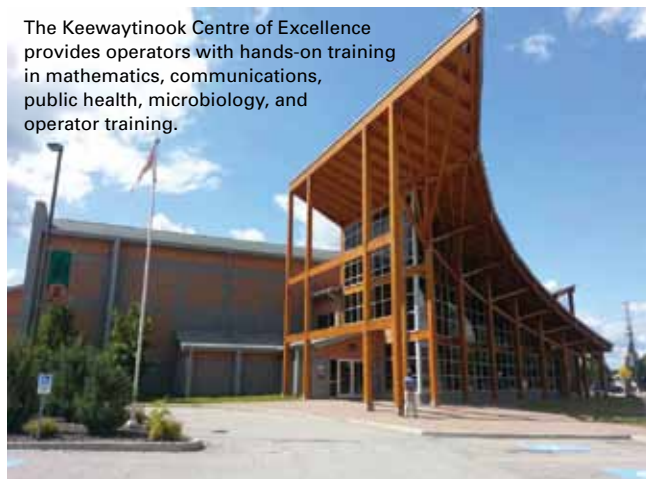


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SSHRC CRSH

## FEATURE

The Keewatinook Centre of Excellence provides operators with hands-on training in mathematics, communications, public health, microbiology, and operator training.



At Credit: Keewatinook Centre of Excellence



**Left:** Nico Suggashie is a graduate of the Safe Water Project training program. He is proud to have been able to prevent a boil water advisory in his community. **Right:** First Nation operators train at the Keewatinook Centre of Excellence.

## The Safe Water Project

Nico Suggashie prevented a boil water advisory.

**NICO SUGGASHIE** has seen first hand what the Safe Water Project has been able to accomplish. A resident of Poplar Hill First Nation, Suggashie graduated high school and spent four years looking for work. Feeling little hope for the future, he enrolled in the Safe Water Project and is currently pursuing his certification as a local water operator. Working closely with the operational support personnel and water monitoring technology installed in the community, he was able to watch for upward and downward trends in the quality of the water (such as the level of chlorine) and intervene and take immediate action at the water plant.

Through his efforts, Suggashie was able to prevent a boil water advisory in his community, something of which he is extremely proud. "I'm making a difference in my community," he said. **wc** —Geordi Kakepetum



Read more about the Safe Water Project at **[bit.ly/SafeWaterProject](http://bit.ly/SafeWaterProject)**

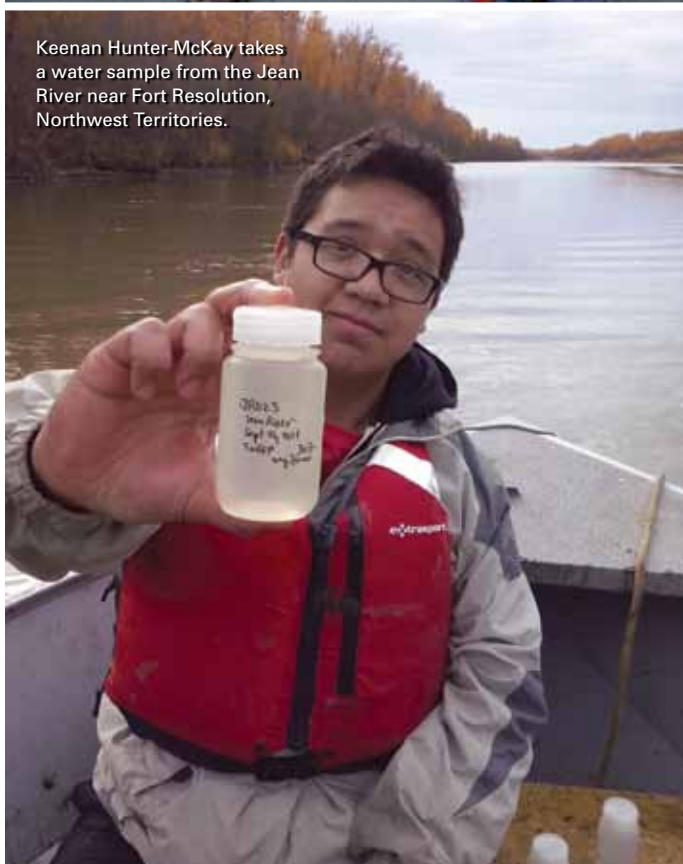


All credits: Lorne Day

Harvey Mandeville of Fort Resolution, Northwest Territories, talks with SWEEP researcher Lalita Bharadwaj.



Keenan Hunter-McKay takes a water sample from the Jean River near Fort Resolution, Northwest Territories.



# TWO-EYED SEEING

Combining Western and traditional knowledge in the Northwest Territories.

BY LORI BRADFORD AND  
LALITA BHARADWAJ

**PEOPLE LIVING IN** the North are observing changes in the environment. They have questions about the health of northern ecosystems due to the effects of upstream development and climate pressures and a desire for increased environmental monitoring. Since 2010, indigenous groups in the Northwest Territories' Slave River Basin have been involved in a partnership called the Slave River and Delta Partnership (SRDP)—a collaboration among government, local people, and educational and academic partners to monitor the northern ecosystem and support water stewardship.

The SRDP emerged to tackle concerns like fish deformities and taste, altered river flows, and changing ice conditions. In the past, some of these concerns were examined by researchers using Western science practices. Researchers took that data back to their labs away from the local communities for further assessment. This so-called “helicopter” approach has often been applied in indigenous communities and has created mistrust of scientific researchers because it gives little opportunity for community involvement.



Indigenous communities are committed to their own ways of knowing about the land and water. They have traditions of storytelling using symbols and face-to-face learning. This knowledge forms the basis of their resource-management decisions and wellness. There is much debate on how

There is much debate  
on how to bridge  
these different ways of  
knowing about the world.

to bridge these different ways of knowing about the world, both practically (how do we blend narratives with quantified measurements of phenomena?) and theoretically (what actually counts as knowledge?).

### Six faces of knowledge

Between 2012 and 2015, the SRDP along with partners from the University of Saskatchewan received funding from the Canadian Water Network to explore community concerns about the Slave River and Delta. The Slave Watershed Environmental Effects Program (SWEEP) aimed to address three questions:

- Is the water safe to drink?
- Are the fish and wildlife safe to eat?
- Is the ecosystem healthy?

Community members and research partners met frequently to design the research program, decide on priorities, and figure out how to blend traditional ecological knowledge (TEK) with scientific methods to help answer these questions. A guiding framework that recognized parallels between traditional knowledge systems and common phases of scientific exploration was developed.

The Six Faces of TEK developed by Nicolas Houde at the Université du Québec à Montréal resonated with the partnership and the research team. The six interconnected faces were aligned with an eight-phase model for conducting community-based research as experienced while undertaking the project. The project evolved, it also adapted to respond to the needs of the communities. For example, the SWEEP team produced a video instead of a document to share results when elders indicated their preference for non-written formats. There was a clear parallel between observations made by indigenous people in their daily lives and how these observations inform decisions about resource use and the methods used by researchers to observe and measure environmental changes (collecting and analyzing samples against past and present-day standards). Elders and local people were interviewed. They also shared their knowledge informally while walking on the land with the researchers



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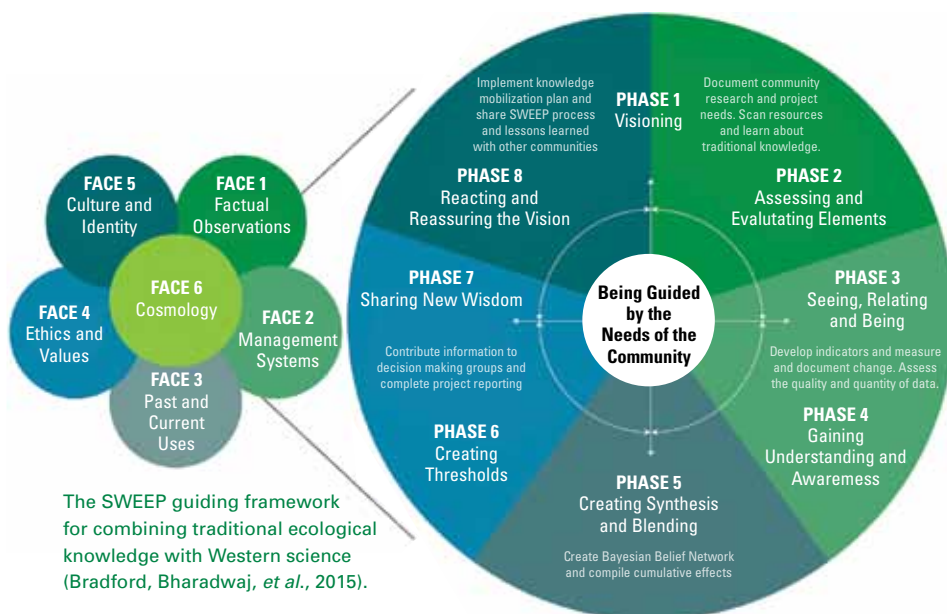
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There is a clear demand for new ways of exploring environmental and sustainability problems that bridge different knowledge systems and enhance participation of citizens among researchers, funding agencies, and related organizations. The SWEEP project and its guiding framework provide one example of a means to ethically bridge knowledge systems, examine problems holistically, and support participation in water stewardship. For other practitioners in the field, it demonstrates it is possible to recognize the values of local and indigenous people and scientists as a step toward reconciliation. WC

to various sites. Local people were also trained to collect data using technical instruments for scientific measurement of different indicators. By drawing on each other's methods for acquiring knowledge, both groups benefitted in understanding the pressures on traditional lifestyles and

ecosystems. By bridging these two modes of learning and simultaneously studying scientific and traditional indicators of the health in the area, those involved in SWEEP were able to come to a more complete understanding of the impacts on the river and delta.



Lalita Bharadwaj is an associate professor and Lori Bradford is a research associate in the School of Public Health with the University of Saskatchewan.

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Treated wastewater effluent exits the natural treatment wetland in Chesterfield Inlet, Nunavut.

Photo: Centre for Alternative Wastewater Treatment

# Wetlands at Work

Using tundra wetlands to treat municipal wastewater in Canada's Far North. BY GORDON BALCH AND BRENT WOOTTON

**THE TREATMENT OF** municipal wastewaters in small northern communities across Canada can be challenging because of harsh climatic conditions, difficult logistical and operational circumstances, competing demands on limited financial resources, and challenges associated with staffing treatment plants in remote communities. These communities are reliant on lagoon systems as a primary method for wastewater treatment.

Lagoon systems (also known as waste stabilization ponds) are relatively inexpensive to build, operate, and maintain, making them one of the most feasible treatment systems employed in the North. Despite their benefits, lagoon systems have their own set of

cold-climate challenges that can make it difficult for some municipalities to achieve the treatment guidelines outlined in the Canada-wide strategy for the management of municipal wastewater.

Cold climates suppress the rate of biological treatment processes, meaning that retention times are typically long and sludge accumulation is enhanced. Long retention times coupled with a decline in the lagoon's holding capacity can mean that some operators must discharge their effluent before treatment targets are reached.

## Revisiting an old idea

In recent years, there has been renewed interest in assessing the efficacy of wetland treatment in small and remote

Lagoon systems are relatively inexpensive to build, operate, and maintain, making them one of the most feasible treatment systems employed in the north.

northern municipalities. Investigations by the Centre for Alternative Wastewater Treatment (CAWT) at Fleming College and by researchers from Dalhousie

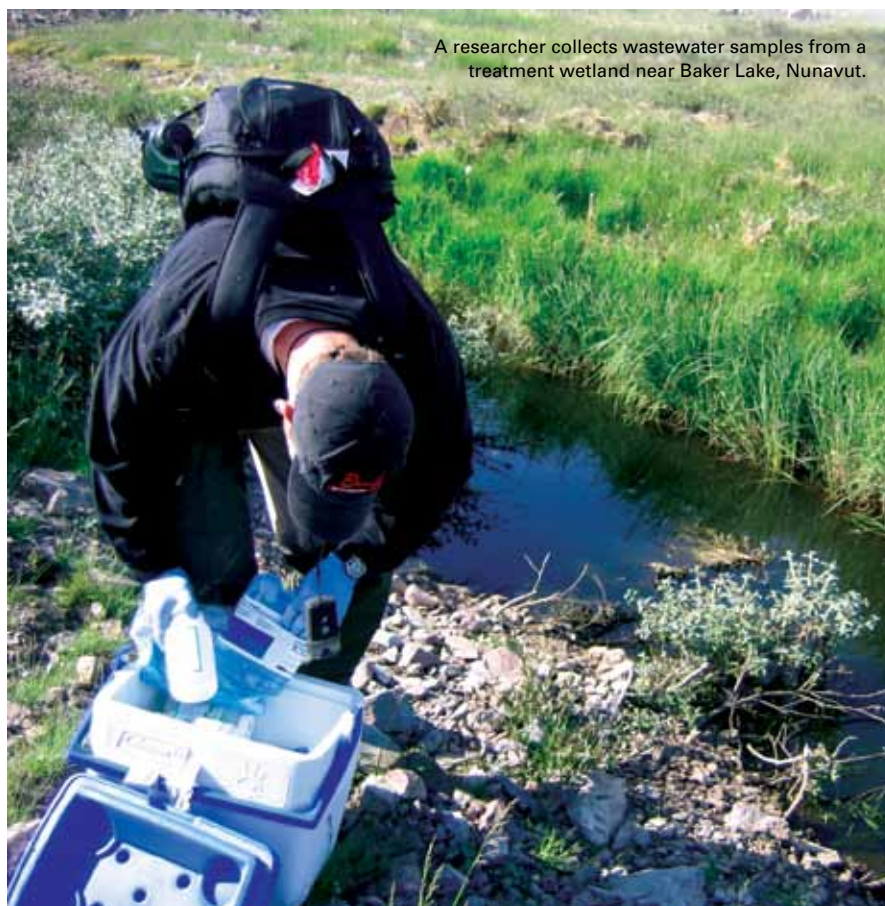


University have confirmed that wetlands can provide augmentative treatment for lagoon effluents. In some communities in Nunavut and the Northwest Territories, this treatment occurs naturally as lagoon effluents are released—either intentionally decanted or exfiltrated—into low areas containing native vegetation.

Studies of northern treatment wetlands by the CAWT have demonstrated that, during the summer months, natural tundra wetlands can provide augmentative treatment that further reduces common wastewater parameters (cBOD5, TSS, total ammonia nitrogen, and others) to levels compliant to the standards in the Wastewater Systems Effluent Regulations under *The Fisheries Act*. Treatment provided by these natural tundra wetlands, however, occurs only during the summer, especially in wetlands situated on permafrost that typically freeze solid. This means effluent must be stored in lagoons until the spring thaw. In Southern Canada, wetlands can be used year round under the right conditions and operating regimes.

### A decentralized approach

Currently, the Northwest Territories, Nunavut, and parts of northern Quebec and Newfoundland and Labrador are exempt from these regulations (recognizing the challenges encountered under these harsh climatic conditions and the need to develop guidelines and strategies specific to these regions). In recent years, the federal government has embraced a decentralized approach to water and wastewater systems in First Nations communities. A protocol was published in 2010 by Indian and Northern Affairs Canada (INAC) that “set minimum standards and codes that must be followed for the design, construction, operation, and maintenance of on-site water and wastewater systems that are to be funded in whole or in part by INAC.” Unfortunately, the protocol is silent



A researcher collects wastewater samples from a treatment wetland near Baker Lake, Nunavut.



A view of the natural tundra wetland providing augmentative treatment to municipal wastewater generated at Chesterfield Inlet, Nunavut.



on wetland systems, and most of the standards and codes in the protocol are incompatible with wetland systems.

In the Arctic, nearly all of the wetlands providing augmentative treatment are unmanaged systems that were either established in response to an influx of nutrients and water from the lagoon effluent, or were naturally present. Treatment efficiency is often

dictated by soil type, vegetation cover, effluent loadings, and hydraulic retention times; all of which vary from community to community.

### An evolution in understanding

Our understanding of treatment wetlands and the processes involved has increased greatly in the past two decades. We have a better understanding

of the key factors influencing treatment efficiencies in both “natural” wetlands and constructed or engineered wetlands within cold climates. What has been serendipitously implemented in some northern communities can now be purposely applied in others. Our growing knowledge, together with wetland design tools such as the United Nations Environment Programme’s SubWet 2.0, can provide wastewater

The federal government has embraced a decentralized approach to water and wastewater systems in First Nations communities.”

managers the information needed to determine if treatment wetlands in their respective communities have the potential to become part of the wastewater treatment strategy. Wetland treatment may not be suitable for all northern communities, but for those that have the space, proper soils, topography, and need, wetlands may present a viable, low-cost component of a wastewater treatment strategy. WC

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Gordon Balch is a scientist with the Centre for Alternative Wastewater Treatment (CAWT) and a professor with the School of Environmental & Natural Resource Sciences at Fleming College. Brent Wootton is the director of applied research at Fleming College and the senior scientist with CAWT.



More information regarding the use of treatment wetlands in Canada's North can be found at [cawt.ca/resources](http://cawt.ca/resources)



## Nick Reid joins Water Canada magazine

**TODD LATHAM**, president of Actual Media Inc., is proud to announce that Nick Reid has joined the firm as a shareholder and managing partner. Nick will take a leadership role with Actual Media's water-related publications and events, specifically Water Canada, the Water's Next Awards, and the Canadian Water Summit. His depth of management experience and industry engagement will also assist Actual Media to further develop its creative agency business and strong role in the infrastructure space with ReNew Canada magazine and the Top100 Projects publications and events.

"Nick will help us grow the water segments of the business, while also elevating the Actual Media brand across his broad network of influence," Latham said.

One of Nick's strengths is his collaborative work with a diverse network of stakeholders in organizations, municipalities, ministries, and industry, seeking opportunities to execute long term strategic initiatives fundamental to the growth of Ontario's water sector. In his past role with the Ontario Clean Water Agency (OCWA), he participated in several stakeholder consultations as the province developed the *Water Opportunities Act* and its Water Sector Strategy.

Nick has an Honours B.Sc., Environmental Science, Biology from Trent University and has enjoyed a long

career in the water sector. From 2002 to 2006, he served as the general manager of the Region of Peel's four main water and wastewater plants, ensuring continuous service to 1.2 million residents under OCWA's largest operating contract. Previous work at OCWA encompassed management of OCWA's IT Division, including support for Ontario's largest implementation of a Wide Area SCADA system for more than 700 water and wastewater locations.

Nick's experience as publications chair of the Ontario Water Works Association's (OWWA) quarterly Ontario Pipeline magazine from June 2009 to January 2015 prepares him for the hands-on work he will be doing with Water Canada. In May 2014, he took on the chair role of AWWA's Manufacturers and Associates Council Subcommittee on the "Low Economic Value of Water," and he presented findings at ACE in Boston. In addition to his new role with Actual Media, he was recently appointed as the executive director of Ryerson Urban Water at Ryerson University. He continues to serve as a director with OWWA and on the advisory committee of the Canadian Water Summit. **wc**

  
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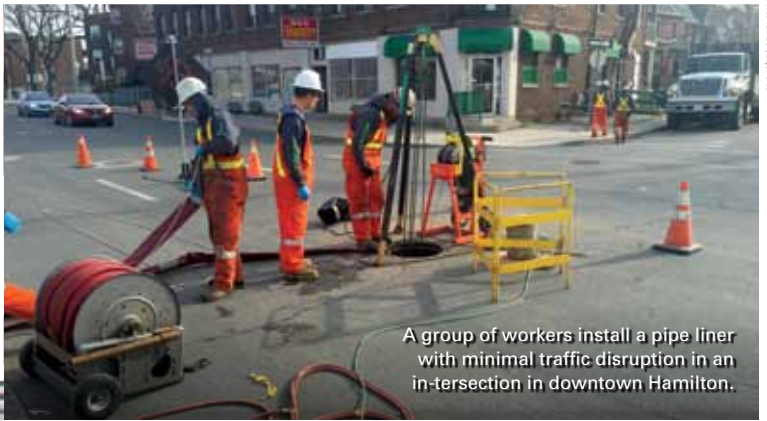


Credit: Chris Lewis, LiquiForce

A customized tool is used to take measurements for lateral for lining through a manhole before installation.



A LiquiForce liner is installed in a residential neighbourhood using "trench-less" technology.



A group of workers install a pipe liner with minimal traffic disruption in an in-intersection in downtown Hamilton.

(Not)

# BREAKING GROUND

Innovators in trenchless technologies are changing the way municipalities replace pipes. BY TRISTAN SIMPSON

## KIM LEWIS HAS A PASSION FOR PIPES.

As chair and CEO of pipe rehabilitation firm LiquiForce, he has an animated way of explaining how the trenchless technology works, and enjoys hearing people's reactions. He recalled a recent project in Hamilton, Ontario, where an elderly woman saw the company truck and came outside to inquire what was going on. Lewis explained that they had just completed rehabilitating sewage pipes in the neighbourhood. "She was shocked," Lewis said. "Why? Because there was no traffic disruption, no shovels in the ground, no nothing. We repaired the pipe and she hadn't even noticed—that's how no-dig technology should be."

Traffic and service disruptions are a familiar scene in most municipalities when it comes to rehabilitating and

replacing pipes. The common practice of digging holes in the road, cutting sidewalks, and tearing up front lawns has a toll on the environment and residents. However, these scenes could soon be a thing of the past for pipe repair.

There are several types of trenchless technologies, including sliplining and pipe bursting, that work better than the traditional dig and replace method; but these aren't entirely shovel-free. LiquiForce's Gravity Program uses the cured-in-place pipelining (CIPP) technology, which Lewis claims is "totally trenchless," by creating a new pipe within the old one. The pipes are inspected using small cameras, then they are cleaned, debris is removed,

measurements are taken, and a custom-engineered liner is seamlessly placed inside the old pipe.

## Finger in the dam

CIPP fixes structural problems and prevents groundwater infiltration of sewer pipes. From the house laterals to the

This is the Star Wars of the construction industry.

treatment plant, the method rehabilitates older pipes without removing any dirt. Since no digging is needed, no trees or roots need to be cut or removed; so the technology significantly cuts down on carbon emissions from machinery and

traffic disruptions while preserving the carbon sinks. A study from the University of Waterloo found that trenchless pipe rehabilitation led to carbon reductions of 90 per cent or greater when compared to open cut repairs.

CIPP started about 50 years ago, but only within the past two decades has it become prominent method for pipeline rehabilitation in Canada. Lewis has been in the pipe rehabilitation business for more than 30 years. The company launched a prototype and later commercialized with help from the Federal Economic Development Agency of Southern Ontario and Provincial Strategic Jobs Investment Fund. Liquiforce's work earned them the National American Society for Trenchless Technology's award for innovative product in 2012.

"If you're not in pipe rehabilitation, you wouldn't know how complicated this technology can be," Lewis said. "When you have hundreds of feet of piping you have to develop special devices that can

make perfect alignments and get the work done right." Those in the industry are constantly trying to improve all facets of the method, from the blasting tools used to clean debris to the high-detailed sensors, as well as intensive training for workers. "This is the Star Wars of the construction industry."

According to Lewis, trenchless services can cut cost of rehabilitating pipes in half. Yet even with these benefits, rehabilitating firms notice a lot of municipalities aren't making pipelines a priority.

"Unfortunately, it's out of sight, out of mind for some municipalities when it comes to pipes," said Geoff Britnell, business development manager with FER-PAL Infrastructure.

Like Liquiforce, FER-PAL takes a trenchless approach when rehabilitating pipes, but deals with drinking water, not sewage. When FER-PAL was established in 1986, it focused on watermain installation. By the 1990s, it moved on to a cement lining form of rehabilitation. In 2002, FER-

PAL was looking for an advantage and took on its own CIPP system.

"Maintaining pipes should be a major concern for cities. You rely on clean water like you rely on energy or transportation," Britnell said.

Cities like Flint, Michigan are feeling the impact of bad pipes. The city has been in a state of emergency since the lead from the pipes began seeping into its tap water. Now residents are forced to use bottle water and filters.

What's happening in Flint is an example of why pipes need to be considered one of the priorities, Britnell said. "The second you take water away from a municipality, you turn it into a Third World country." WC



Tristan Simpson is an editorial intern with Actual Media.

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The completed low-impact development (LID) project is low maintenance and will help lower the demands of the city's sewer systems.

**Inset:** The concrete median in Mississauga that was targeted for LID to capture stormwater and increase groundwater infiltration.

## Municipalities are slowly shifting toward cost-recovery models for stormwater management.

BY JAMES CARELESS

**RAISING CAPITAL** to build new infrastructure and repair existing assets is a serious headache for Canadian municipalities. According to the 2016 Canadian Infrastructure Report Card, about 12 per cent of this infrastructure is in poor or very poor condition and will require \$141 billion to replace. Fortunately, a modern rate-paying system for stormwater services that provides the means to address these challenges is gaining traction with an increasing number of Canadian municipalities.

The “stormwater utility approach” is a rate-setting systems that aims to offset the costs of stormwater infrastructure expansion and repair. Brianne Czyzpyha, a stormwater management specialist working for the City of Victoria, explained that “the fees are based on characteristics specific to each property that relate to the impact on the stormwater system.” The greater the impact the user has on the city's sewer systems, the more they pay. The approach is gaining traction in fast-

growing cities like Mississauga, Ontario, which implemented the stormwater utility approach in January 2016.

“With more people living here and more businesses operating here, the amount of water running off impervious or hard surfaces, such as rooftops and parking lots, is increasing,” said Jeremy Blair, the City of Mississauga's storm drainage programming engineer. To address this challenge, the municipality initiated a stormwater financing study in 2013 that evaluated various financing models based on city-wide applicability, fair allocation to property owners, effort to administrate, and the environmental benefits, among other things. Based on this analysis, the city opted to implement a stormwater utility charge. Blair said this decision is also practical for addressing heavier rainfall events due to climate change. “These changes mean there is more stormwater entering the city's drainage system than ever before, causing costly wear and tear on our

already aging infrastructure,” he said.

### Calculating the costs

Whereas in many traditional dedicated stormwater rate-paying systems a flat rate fee is charged through property taxes (based on property size, street frontage, volume of water consumed, or a development charge), the stormwater utility system is a calculation of factors that will contribute to rain ending up in the sewer system. Although the calculations used by each municipality differ, a common approach is to include a measure of the property's impervious surfaces (roofs, compacted gravel driveways and walkways, and other runoff areas where rainwater is not absorbed by soil) and diversions that channel precipitation into natural water bodies. The lot size, usage, and property classification—whether commercial, industrial, recreational, or residential—can also affect how the municipality assesses the impact on the stormwater system.



"The data [on each property] is gathered from a combination of satellite imagery, GIS files, and property information provided by the municipality," said Carl Yates, the general manager of Halifax Water. With this data, a city can create a reasonable model of stormwater infrastructure usage by all water ratepayers, fairly apportioned on a lot-by-lot basis on a cost return basis. If the municipality decides to implement a rate increase in response to maintenance or construction costs, everyone gets charged a proportionally justifiable way.

Blaire said the stormwater charge for each property in Mississauga is calculated by multiplying the number of stormwater billing units assessed to the individual property by the city-wide stormwater rate. "A single stormwater billing unit is equivalent to the average total impervious area (267 square metres) found on a detached single family property in Mississauga," he said. The 2016 stormwater rate is \$100 per billing unit. The new fee is expected to raise approximately \$33 million this year (excluding accrued revenue to be collected in 2017). These funds will be invested in the city's stormwater system, which has a 2016 replacement value of \$1.97 billion.

### Resource recovery

"The stormwater utility is a more fair and equitable method to charge for stormwater services," Czipyha said. "All properties in the city now contribute, similar to the water and sewer utilities, whereas in the past, tax exempt properties did not contribute. [...] Lastly, and most importantly, the city is now able to offer incentives for properties that manage rainwater more sustainably." Incentives are offered for properties that use cisterns, rain barrels, bioswales, infiltration chambers, green roofs, and permeable paving to manage stormwater runoff. WC



James Careless is a freelance writer based in Ottawa.



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Workshop participants work in teams to develop asset management plans.



An example of a groundwater well used to supply water to small water system users.



A typical building containing the equipment used to treat and clean the water within a small water system.



Participants in a workshop learn about improving the financial and managerial capacity of small water system owners and trustees.

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# Financial Resilience

Building small, sustainable water systems with new funding models and better asset management. **BY JODI GARWOOD**

**APPROXIMATELY 15 PER CENT** of British Columbia's population relies on a small water system to deliver water to their home. These individuals and families—most whom are living in rural or remote communities—depend on small water systems to protect their health, quality of life, and the environment. However, these systems experience more water quality advisories than larger systems and often struggle to maintain the infrastructure associated with their water supply due to financial and operational challenges.

To help address the risks facing small water systems, the BC Water & Waste Association (BCWWA) is launching a pilot project to help build the financial and management capacity of up to 40 systems across the province. The pilot will run from January 2016 to March 2017 and consists of regional workshops, webinars, and one-on-one coaching support from industry professionals.

In recent years, a number of reports have reviewed the state of small systems in British Columbia, including *Fit to Drink* (2008) by the B.C. Ombudsman; *Recommendations for Addressing Key Small Water System Challenges* (2013) by the UBCM Small Systems Working Group; and *Are Our Water Systems at Risk?* (2015) by the BCWWA.

These reports point to the need to build capacity among small water-system owners so they make informed decisions that advance financial sustainability, operational resilience, safety, and the need to build understanding and support among users so they understand the relationship among rates, levels of service, and risks to public health.

"Many small water systems face difficult challenges in meeting current treatment standards due to lack of access to financing for the required infrastructure," said Denny Ross-Smith, executive director of the Small Water Users Association of BC. "While local health authorities have made progress by offering advice and assistance where possible, small systems do not qualify for government infrastructure financing programs unless they are acquired by a regional district or municipality. The result is a large number of boil water notices. While many are short term, the most concerning are the long-term advisories, and in some cases, some communities have faced advisories for more than 10 years."



In late March 2015, the province's Ministry of Health approached BCWWA to develop the training pilot to help address the financial and operational challenges facing many small water systems.

"Healthy community environments where we live, work and play depend on safe, clean drinking water. Clean drinking water is so much more than just building the right technology," said Tim Lambert, executive director of health protection for the Ministry of Health. "It's about skilled people running the day-to-day operations and their future challenge to ensure drinking water systems are managed and governed to keep communities healthy and desirable places to live."

To assess their current levels of risk and needs—and to help secure alternate funding sources—system owners must have a comprehensive view of their financial and asset inventories, as well as access to training and resources to ensure management best practices.

"Our research shows that many communities in B.C. are vulnerable, as they have not set aside sufficient reserve savings to cover unexpected operating and maintenance costs and plan for long-term system sustainability," BCWWA CEO Tanja McQueen said. "Smaller communities have greater gaps than their larger counterparts, as costs are shared amongst a small base of users. This pilot project will give small system representatives the practical tools they need to create financial and asset management plans to help protect against future funding shortfalls and infrastructure failure."

The BCWWA is a not-for-profit association that represents more than 4,700 water professionals responsible for ensuring safe, sustainable, and secure water, sewer, and stormwater systems in British Columbia and the Yukon. To recruit participants for the regional workshops taking place throughout the pilot project, the BCWWA is

working with local health authorities and regional districts to reach small water systems that may benefit. The association is also collaborating with organizations that have done similar work in this area in the past, such as the Small Water Users Association, the Sustainable Infrastructure Society, and regional districts.

The first workshop will take place in Courtenay, British Columbia in early 2016 with more than 10 small water systems from around Vancouver Island. The BCWWA is accepting applications from small water systems from across the province who may be interested in participating in future workshops. For more information, visit [bcwwa.org/sws](http://bcwwa.org/sws). WC

Jodi Garwood is a technical communications specialist with the BC Water & Waste Association



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The speakers panel at Action Canada's public dialogue on November 6, 2016 at the UBC Robson Square Theatre included (L-R) Ayesha Harji, Taylor Martin, Kevin Quinlan, Patricia Ross, Deborah Curran, and Nathanael Johnson.

CHUCK ANDERSON/CHARTER

## Report from the British Columbia's public dialogues. BY TAYLOR MARTIN

**THIS PAST YEAR** saw prolonged drought across Western Canada. People are waking up to the strains on our natural resources, from climate change to urbanization and industrial intensification. Some point to California as a worst-case future, and many demand government action to protect Canada's water. But few have talked about the importance of regulating groundwater—the invisible resource that provides drinking water to almost 10 million Canadians. Worse, our legislative toolkit is an incomplete patchwork that limits our ability to act. At *Our Groundwater, Our Future*—part of the Creative Disruption dialogue series presented by Action Canada—an interdisciplinary panel tackled British Columbia's groundwater challenges.

### B.C.'s legislative context

British Columbia's *Water Act* was enacted in 1909 and is ill suited to

regulating 21st-century water usage. Deborah Curran, the Hakai Professor in environmental law and sustainability at the University of Victoria, described how little the B.C. government knows about groundwater resources. The existing licensing system requires few groundwater users to monitor or report their activities.

But this is changing. The new *Water Sustainability Act*, taking effect in 2016, modernizes the province's groundwater regulation in two key ways. First, groundwater licensing will occur in the context of place-based water sustainability plans, taking into account competing industrial, residential, and environmental demands on a region's limited water resources. Second, the new act allows British Columbia to review and amend licences in response to

changing conditions. Crucially, the plans will supersede existing water rights and no compensation will be paid to license holders whose licences change under the new act. Curran spoke passionately

The dialogue revealed that, while engaged and concerned, people feel lost.

about the potential for different levels of government to come together at the watershed scale to find solutions.

### Regulation not enough

Better coordination among municipal, provincial, and federal governments is a crucial step according to Patricia Ross, a city councillor and deputy mayor of

Abbotsford. However, she argued that without enforcement and monitoring the worst offenses will continue. With water sustainability plans devolved to the regional level, Ross called for increased capacity for oversight and accountability at the provincial and federal levels. Individuals have a responsibility, too, with half of the province's summer water usage going toward watering lawns.

### The role of the public?

The audience was eager to learn more about how individuals could help affect change. The discussion hit three themes. First, people wanted to know what they could do to reduce their water consumption. The answer: get rid of your lawn and replace it with artificial grass (or a vegetable garden, suggested an audience member). Second, who should be lobbied for meaningful change? Start with your city councillor and water utility, Curran said; advocate for metered water and

block-pricing models. Third, people were concerned about groundwater use in liquefied natural gas fracking. The best data on groundwater use comes from the BC Oil and Gas Commission, but groundwater licensing in those industries remains a very different process than the rest of the province. Such a fragmented approach sets the stage for future conflict.

The dialogue revealed that, while engaged and concerned, people feel lost. Though they want to push for change, they don't know where to start or what should be their priorities. This highlights a lack of accessible information and transparency in the management of groundwater.

### The Future of Groundwater Management

With the *Water Sustainability Act*, British Columbia has adopted a leading groundwater management framework. However, locally developed watershed

sustainability plans will be meaningless without accurate data. Truly sustainable and adaptable plans require real-time monitoring at the watershed level. Data must be standardized, interlinked, and available across jurisdictions to enable a big-data approach that will bring innovative solutions to groundwater supply and demand challenges. Finally, we must engage citizens in accessing data about their own usage. An informed and empowered public will drive groundwater sustainability by modifying their behaviour. It is citizens who can hold governments at all levels to account for the responsible stewardship of our precious water resources. WC



Taylor Martin is a 2015-'16 Action Canada Fellow.



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A communal, decentralized sewage treatment system is constructed in Shakespeare, Ontario.



Al Christie/Adam Thompson



A view from the inside of the communal sewage treatment building.



# Remote Control

Communal water systems may be a viable solution for remote locations and harsh conditions in Canada.

BY IRENE HASSAS

**TYPICALLY**, when a small community's conventional water system approaches the end of its lifespan, the community either has to replace it with a water treatment system in every household

(such as septic systems) or implement the “big pipe system” to service the community as a whole. One of the key objectives for decision makers is to put in place a cost-effective system that will meet effluent quality standards but can also be operated and serviced by the existing staff to minimize third-party involvement. Recently, buzzwords like “communal,” “distributed,” “decentralized,” and “cluster systems” are gaining popularity among the consultants, developers, and decision makers who understand the advantages of these systems.

Over the past couple of decades, there has been dramatic progress in the advancement of technologies to fit small systems, but the key to success has been in the development of sophisticated levels of automation within a number

of different types of packaged plants. Minimizing the requirements for the operator and lowering the cost of the control systems have finally made the use of communal and prepackaged treatment systems practical for remote communities with a small resource base.

## Small-town Ontario

When the Town of Shakespeare—located in the county of Perth East, Ontario and home to approximately 1,000 people—hired a consulting firm to identify the best solution for delivering future wastewater services, a decentralized approach was recommended. The community's septic systems were set to expire, compounded by flooding and a variety of other technical issues that impelled the town council to search for an alternative solution.

According to the 2011 Census, more than 6.3 million Canadians (19 per cent) were living in rural areas, which are defined as areas with fewer than 1,000 inhabitants and a population density below 400 people per square kilometre.

John Donders, project manager at Aslan Technologies, said options were limited since it was an “off-grid, small” municipality. “They were forced to either replace their existing septic systems or implement the big pipe concept with a pump station connected to another county,” he said.

This was the first wastewater system Perth East had considered, and so all available options were reviewed from technological, financial, operational, maintenance, and site considerations to meet their existing needs and for future growth. The decision was made to move ahead with an Aslan Technologies integrated solution that utilized a sequencing batch reactor (SBR) system as the core treatment, “saving the town approximately \$2.4 million in avoided costs of 9.1 million for the piping extension to connect the town to a larger centralized municipal system,” said Wes Kuepfer, Perth East’s manager of public works. By installing a local communal

system, it also meant that user fees were retained in Perth East.

### Northern exposure

Another area where small systems can prove to be appropriate is in small resource communities in the North. In 2012, Northwest Territories Power Corp. (NTPC) embarked on a project to replace its Bluefish Hydro dam at the headwaters of the Yellowknife River. This three-year project was one of the largest construction projects in the history of the utility. In 2011, NTPC acquired a membrane-based system from Aslan Technologies in collaboration with other consulting and technology companies to address the drinking needs for residents and camp personnel. “Recent stats show that there are close to 300 remote communities across Canada, and most of these could benefit from turn-key, simple, and easy to operate water systems,” Aslan Technologies president Mike Myers said. “The advantage is that they are designed,

built, and transferred to the site in an enclosure, such as a container.”

For NTPC, the small system was equipped for colder climates with insulation and heating features, along with remote monitoring sensors that are crucial for minimizing systems outages, site visits, complexities, and any unforeseeable challenges resulting from climate and site conditions. For Shakespeare, the cost efficiencies of a communal system made this option attractive.

Across Canada, there are many towns, villages, and temporary settlements in need of a cost-effective, durable, and hands-free water solutions. “Thinking small” may be the key. *WC*



Irene Hassas is the director of strategic planning and partnerships with Aslan Technologies Inc.



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"Woven Together" by British Columbia-based, Salish Coast First Nations artists Susan Point and Thomas Cannel is made up of four eye motifs and butterfly images that symbolize the ability to accept change.

# Small Change

The need for new approaches in effluent strategies for small communities.

BY RODDY BOLIVAR

**THE CANADA-WIDE STRATEGY** for the Management of Municipal Wastewater Effluent (2009) and the Wastewater Systems Effluent Regulations (2012) were developed through the Canadian Council of Ministers of the Environment to promote health and environmental protection, and provide for regulatory clarity across Canada. As communities and the private sector act to address and meet the standards set in this strategy and these regulations, there is a growing recognition that the historic processes for rehabilitation of existing systems and bringing new smaller systems online in rural and remote First Nations communities must evolve. Small systems will have a big role in that evolution.

For small communities, the strategy claims to be committed to the development of alternative approaches and flexibility, yet it focuses almost entirely on financial challenges. Since the delivery of wastewater services is, in the end, a community function, it may be helpful to consider alternative and more flexible approaches from the municipal point of view. There are a few areas of consideration:

## Staff resources

Small and mid-sized municipalities and First Nations communities have limited staffing resources—both in terms of the

number of people doing the job and, in some cases, their level of understanding and awareness of new approaches. Partnership or resource-sharing with larger adjacent municipalities or other small municipalities is a viable option. For example, the Federation of Canadian Municipalities' Municipal Community Infrastructure Partnership Program promotes resource sharing between First Nations and neighbouring municipalities. The strategy could also benefit small communities through the provision of best practice guides, process flow charts, public engagement guidelines, and other tools that would support and extend their capabilities.

## Land-use policy

Provincial land-use policies—developed with a focus on control of new growth within community planning boundaries—have acted as the equivalent to servicing boundaries. Disconnecting planning boundaries from service boundaries to promote decentralized solutions would enable small communities to explore the best opportunities based on their existing development pattern and growth (or contraction) realities. For instance, there are times when bending historic approaches to wastewater service boundaries could be used to promote economic revitalization, such

as a new communal system serving only the historic commercial core of a community.

### Regulatory flexibility

Generic regulation and reporting requirements can have a disproportionate financial impact on small communities. The 2009 strategy's risk-based implementation plan and effluent sampling frequency requirements recognize these challenges faced by small communities. Regulations may also tie understanding of a problem to known (at the time) solutions and may stifle innovation. Allowing some additional flexibility in meeting and reporting on regulatory requirements could promote innovative technical and management solutions that are well suited to the capabilities of small communities.

### Purchasing practices

Purchasing practices at all levels of government have been based on detailed engineering definitions of the capital components of a project followed by a low-tender selection approach. New engineering and purchasing models, such as integrated project delivery, design-build, or public-private-partnerships, may not be well suited to small communities. A strategy-led service provider certification could help small municipalities acquire an increased level of confidence in a servicing implementation process.

The challenges—and opportunities—facing small communities in meeting effluent regulation are many. The new technologies, service models, and financing approaches being offered by industry will provide some of those opportunities. Flexibility and new tools will also be important as communities of all sizes address wastewater management challenges. All they need is a little wiggle room to be realized. **wc**



Roddy Bolivar works independently to advise clients on how policy and strategy can play an important front-end role to drive needed change in water and infrastructure management.

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CH2M has named **Peter G. Nicol** president of its water business. He is responsible for CH2M's \$1.4-billion global water business, including leading more than 5,000 water professionals in 175 offices in more than 50 countries worldwide. He is responsible for overseeing consulting, program management, design, design-build, and operations solution for government, civil, industrial, and energy clients. With more than 35 years of experience, he has played key roles on numerous water and wastewater projects in Canada and around the world and is actively involved in numerous industry and advocacy organizations.



Roy Brouwer

The University of Waterloo has announced the appointment of **Roy Brouwer** as the Water Institute's new executive director. He has joined

the university from Vrije Universiteit (VU) in The Netherlands. He is a water economist, with seven years as head of the department of environmental economics at VU Amsterdam. Prior to joining VU Amsterdam, he was chief economist at the Dutch water ministry for five years. He will continue as visiting professor at the Swiss Federal Institute for Aquatic Science and Technology in Zürich and as editor-in-chief for the Elsevier journal, *Water Resources and Economics*. Brouwer's primary research interest is in water resource economics, including the economic valuation and modelling of water resources, and the design and evaluation of policy instruments to support sustainable water management.



A.J. Leitch

Aquatic Informatics Inc., which offers software for water data management and analysis, has appointed **A.J. Leitch** as VP of customer success. She will lead the professional services, training, and support teams and will be responsible

for post-sale customer success and optimizing client satisfaction. Prior to joining Aquatic Informatics, she worked for 11 years at Creo, which became part of Eastman Kodak Company, a leader in imaging and software technology for computer to plate and digital printing.



Brent McGovern

**Brent McGovern** has been appointed as commissioner of Saint John Water. He is a professional engineer with experience leading industrial water treatment operations. He previously served as deputy commissioner of Saint John Water and managed the One Stop Development Shop at the time of his appointment. McGovern is a member of the Water Reuse Association, American Water Works Association, and Water Environment Federation. He has also been active in the Atlantic Canada Water and Wastewater Association and has received a number of awards from his peers for outstanding leadership in customer service and utility management.

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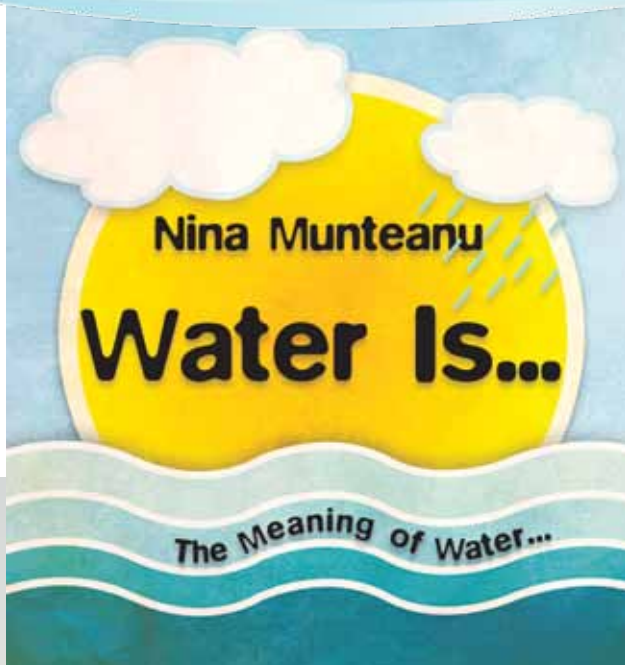
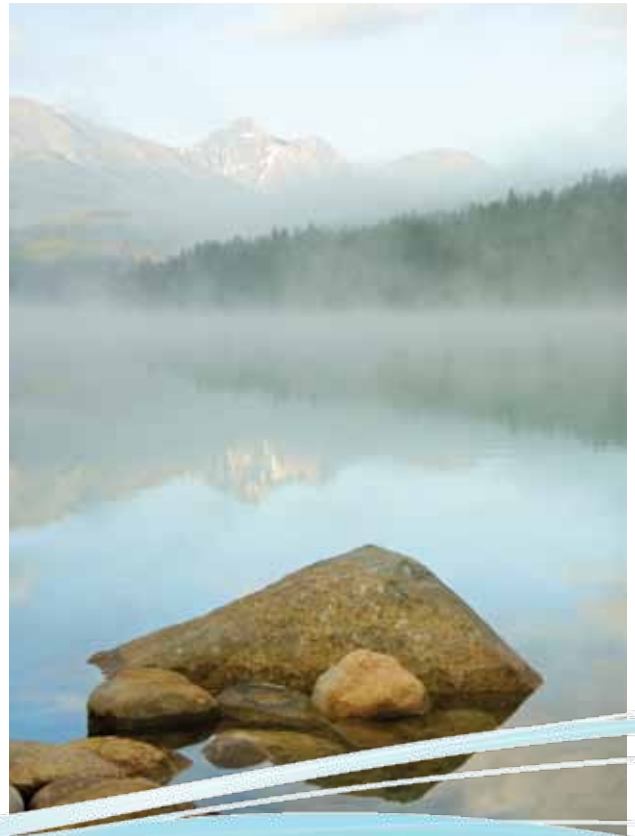
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Nelson  
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Nestlé Waters North America has appointed **Nelson Switzer** as VP and chief sustainability officer. He has more than 15 years of experience in environmental and social sustainability in Canada, the United States, and Europe, specializing in sustainability strategy development, integration, and implementation. Having held pivotal roles at PricewaterhouseCoopers, Centrica plc North America, and the Royal Bank of Canada, he is a known leader in the field of sustainability. He is also former executive in residence at the Ivey School of Business and Adjunct Lecturer at the University of Waterloo.

## RELEASED

Action Canada released a new report entitled, "Our Groundwater, Our Future—From Data to Innovation. The report makes recommendations for

municipal, provincial and territorial, and federal governments to reduce the uncertainty of groundwater supplies and achieve coordinated action in order to sustainably manage the resource. "Canada is a country that perceives itself as water rich, yet one quarter of Canadian municipalities experienced water shortages between 1994 and 1999. In communities that depend on groundwater, the figure is even higher," the report stated. The recommendations call on governments to expand the collection of data on existing groundwater resources; for provincial and territorial governments to each empower a centralized body to oversee groundwater; and for greater groundwater policy and planning integration across all levels of government. Crucially, it is recommended that the groundwater data collected be made publicly available in order to foster both public and private sector innovation.

## AWARDED

The Federation of Canadian Municipalities (FCM) announced the recipients of the 2016 Sustainable Communities Awards, showcasing best practices in local environmental management, including water. The awards acknowledge Canada's municipalities as drivers of innovation, delivering local actions that lead to national results. Municipalities were recognized for delivering innovative solutions in the following six categories: brownfields, energy, neighbourhood development, transportation, waste, and water. The District of Sechelt's new Water Resource Centre was a recipient in the water category. The odour-free facility that turns wastewater into high-quality reclaimed water and class-A compost, located in the middle of the town of Sechelt, has exceeded the treatment capacity of the two older wastewater treatment plants it replaces.

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L-R: Tim Blacker, Eric Proietti, Lyle Clarke, and MPP Arthur Potts.



Ontario Research and Innovation Minister Reza Moridi.

Inset: L-R: Barb McMurray and John Neate.



L-R: Peter Gallant, Howie Honeyman, Pete Pigott, and Lyle Clarke.

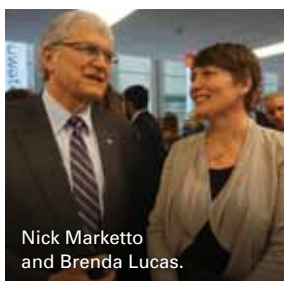
## CleanTech North 2015 Winter Forum Toronto, ON

On December 17, 2015, Canadian water clean-tech entrepreneurs and investors gathered in the Gowling WLG office at First Canadian Place for the CleanTech North Winter Forum. Research and Innovation Minister **Reza Moridi** acknowledged the importance that business opportunities in clean technologies—particular water technologies—are for the future strength of the Canadian economy. “The global market for water technology is now \$560 billion, and it is expected to double in the next four or five years,” he said. “So Ontario has developed a comprehensive water sector strategy to ensure our province holds a place in the world. And our government has supported over 100 water sector projects in the past.”

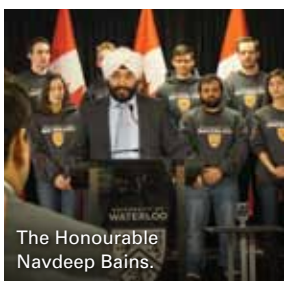
GreenCentre Canada executive director **Pete Pigott**, WaterTap CEO **Peter Gallant**, and Forward Water Technologies CEO **Howie Honeyman** were part of a panel moderated by **Lyle Clarke** to discuss the rise of Ontario’s clean-tech leadership. The panel fielded questions from new start-ups and discussed the opportunities to build a cluster of Ontario’s water-tech companies and various groups that exist to support them in their R&D, commercialization, and acceleration.

“Ontario’s clean-tech sector employs 65,000 people and generates \$8 billion in annual revenue,” Moridi said. “A large part of this sector is water innovation technology. With 20 per cent (one fifth) of the world’s water supply in Canada, we have developed a wealth of ideas to conserve, protect, and ensure access to this precious resource. For Ontario these ideas are about more than environmental, they represent other opportunities.”

All Credits: Actual Media



Nick Marketto and Brenda Lucas.



The Honourable Navdeep Bains.



L-R: The Hon. Navdeep Bains, Prime Minister Justin Trudeau, and Feridun Hamdullahpur.



L-R: Geoff Riggs, David Rudolph, and George Sousa.

## Southern Ontario Water Consortium Waterloo, ON

Around a hundred excited students screamed as Prime Minister Justin Trudeau entered the room in the Science Teaching Complex at the University of Waterloo to deliver a funding announcement of \$12 million for the Southern Ontario Water Consortium. On January 14, 2016, he made the funding announcement on behalf of the Government of Canada, through the Federal Economic Development Agency for Southern Ontario (FedDev Ontario). He was accompanied by **Navdeep Bains**, the federal minister of innovation, science, and economic development and the minister responsible for FedDev Ontario.

This investment will enable SOWC’s Advancing Water Technologies (AWT) program to help Ontario small to medium-sized enterprises leverage research facilities and academic expertise to develop and demonstrate water technologies for successful introduction to the market. The AWT program is a new catalyst for business-led collaborations in the water sector.

**Brenda Lucas**, executive director of the SOWC, said, “Supporting the development and adoption of new approaches will not only support growth in the technology sector, but will help us to meet pressing challenges in water management and energy reduction and climate change resilience.” About a hundred clean-tech entrepreneurs, water managers, researchers, and municipal leaders attended.



# Water Technologies Symposium 2016

April 6 - 8, 2016, Fairmont Banff Springs

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**\$550!**

Building on the enormous success of the previous eight Water Technologies Symposiums, the Environmental Services Association of Alberta (ESAA) is pleased to announce WATERtech 2016 — the 9th annual Water Technologies Symposium. WATERtech 2016 will be the premier water technology transfer event for environmental professionals.



**Keynote Luncheon guest**  
**Rick Mercer**

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- Regulatory Updates - Federal and Provincial
- Disposal Zone Characterization
- New Technology
- Sampling
- Modelling and Mapping
- Cumulative Effects
- Data Analysis
- Alberta Updates
- Regulatory Related



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## [www.esaa.org/watertech](http://www.esaa.org/watertech)

Details and agenda are available on the website

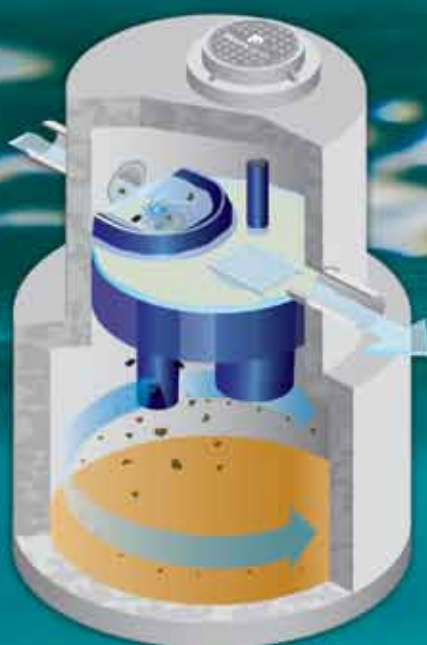
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