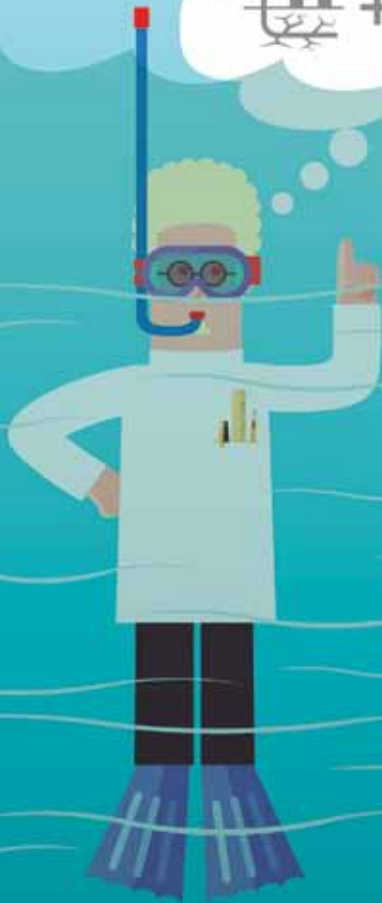
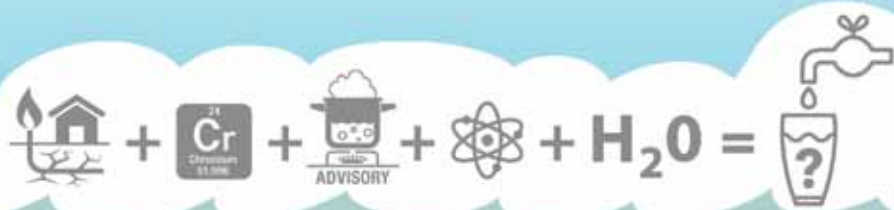


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2016

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**Operator Job Satisfaction  
and Water Quality** (page 14)

**Gaps in Science on  
Hydraulic Fracturing** (page 21)



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# Water Rises Slowly

BY KATHERINE BALPATAKY

**AS I BUS ACROSS** the mighty Fraser River on Route 99 to Whistler, I find myself thinking about water's importance to the Canadian identity. With the federal election behind us and a new government about to be ushered in, we shall soon find out what "change" will mean for water.

This election went a long way toward restoring my faith in the electoral system. While many issues influenced the vote, I was encouraged by the promises to address water and housing in First Nations communities; also by the fact that historic numbers of First Nations, Inuit, and Métis took part in the vote—many for the first time—with a record number of indigenous MPs being elected.

Together the Liberals, Greens, and New Democrats each promised to reverse aspects of omnibus budget Bill C-38 that weakened the environmental assessment process; and to review (Liberal party) or repeal (NDP, Green) C-45's amendments to the *Fisheries Act* and *Navigable Waters Act*. There were a handful of other promises that will likely impact some of our readers, including new Canada Research Chairs in sustainable technology and a new chief science officer.

More urgently, the people I speak to are hopeful for progress with the climate negotiations in Paris, and for investments in our aging infrastructure. Based on these tidings, the 2015 election was

arguably a win for water. But real change comes slowly.

In this issue of Water Canada, we explore a number of topics concerning contaminants and toxic substances that we believe to be relevant to the political agenda. Saul Chernos examines the risks and evidence to support plans to dispose of nuclear waste in an underground repository near Lake Huron (*page 24*). Kathryn Ross describes the first comprehensive assessment of the knowledge gaps affecting decision-makers at federal and provincial levels with respect to hydraulic fracturing in hydrocarbon development and the potential risks for water (*page 21*). Randy Christensen and Elaine Macdonald comment on how national drinking water quality standards may be failing to safeguard Canadians from chromium 6, among other contaminants (*page 10*). We also share the results of a new study exploring the link between the job satisfaction of First Nations water operators and the success of water systems across Ontario (*page 8*).

Though there may be shortfalls in our efforts to protect water, I believe Canada has a very strong ecosystem of water researchers, operators, industry innovators, public servants, and advocates with the will to collaborate and continuously improve. Bottom line: our commonalities are greater than our differences. The change will come. wc

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**PG 8**



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**PG 12**



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**PG 12**



### KATHRYN ROSS

Kathryn is a communications professional at Canadian Water Network.  
**PG 21**

## ABOUT THE COVER

Contaminants that pose risks to drinking water sources in Canada come in many forms. Consider the potential effects of deep-well injected hydrologic fracturing fluids (see page 20), elevated levels of chromium 6 (see page 10), disease-causing bacteria, or radioactive leachate (see page 24). Professionals tasked with protecting drinking water sources—water operators (see page 14) regulators, watershed groups, researchers, and elected officials—each have a role in securing water at the source.

Credit: Donna Endacott

## NEXT ISSUE: JANUARY/FEBRUARY

- **The Top 5: Canada's biggest water projects**
- **Tech companies target new phosphorus targets**
- **The water footprint of hospital**

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## FRONT



The HandyPod floating toilet uses aquatic plants in the digestion process.

# Natural Solutions

## Canada helps build toilets for floating villages in Cambodia. BY JULIE MASIS

**HAVING A TOILET AT HOME** is something most people take for granted. But in Cambodia's O Akol floating village, going to the bathroom involves boating through flooded forests in search of privacy.

The link between poor sanitation and diseases, such as cholera, is not well understood by most O Akol villagers. When darkness falls, people urinate and defecate in the shallow water around their homes—the same water that is used to wash dishes and clothes. When water levels go down, excrement litters the shorelines where children play.

Wetlands Work!, a social enterprise led by an American scientist that designs ecologically engineered water treatment processes, has developed an innovative solution that is changing the lives of the villagers.

The HandyPod is a floating toilet that consists of a blue tarp wrapped around a latrine pan that prevents feces from dropping directly into the lake. The waste enters a tank where bacteria enable anaerobic digestion. Next, a secondary container allows the roots of the abundant, non-native water

hyacinth to further digest the waste. Since the number of communities living along waterways in flood-prone lands is increasing, the HandyPod is showing promise as a sanitation solution.

Wetlands Work! recently received \$100,000 from Grand Challenges Canada, an organization funded by the Canadian government that is focused on international development and public health. The money is being used to bring their toilets to 10 floating villages on the lake, potentially benefiting 10,000 people.

"Providing a solution that addresses access to toilets will go a long way in improving health outcomes in people in that area, and also the dignity of people," said Kenneth Simiyu, a program officer at Grand Challenges Canada. "The beauty of this product is that it is a low-cost toilet that can be made or fitted by local entrepreneurs." WC



Julie Masis is a freelance journalist.

# Benchmarking the Future

Sustainable Development Goals need private-sector action.

**AFTER NEARLY THREE YEARS** of global consultations and negotiations, all 193 member states of the United Nations (UN) have adopted the Sustainable Development Goals (SDGs). The new framework—Transforming Our World: 2030 Agenda for Sustainable Development—consists of a declaration of member nation, 17 SDGs, and 169 targets—many related to water. Global leaders are pledging to, among other things, “end hunger,” “make cities and human settlements inclusive, safe, resilient and sustainable,” and “conserve and sustainably use the oceans” by 2030. Compared to the 2000 Millennium Development Goals, the SDGs are substantially more ambitious.

Although the SDGs are intended to inform national trade and foreign aid, and the priorities of global institutions like the International Monetary Fund and World Bank, the SDGs also acknowledge that effective implementation requires change on the ground. Public interest is part of this, but there is also a strong role for the private sector.

As Lise Kingo, executive director of the UN Global Compact, explained in a recent *Forbes* article: “Businesses today are expected to be part of the solution to our world’s greatest challenges. [...] For companies ready to take on the agenda, the SDGs provide a platform to show responsibility, pursue opportunity and innovation, and inspire other businesses to get on board.”

When viewed from the lens of a business opportunity, the goals represent a clear signal of areas where the private sector can provide meaningful solutions through technologies and services. For example, infrastructure is a crucial component of the sustainable growth of nations—providing access to clean water, addressing sanitation, providing jobs, and empowering citizens. Adequate finance, and particularly private finance, is also understood to be key to addressing externalities and achieving sustainable development. There is a growing body of business leaders and financial actors from accounting bodies, stock exchanges, and central banks who are examining practical steps to integrate sustainable development considerations into financial market reform. The UN Global Compact is one platform for these decisions.

Some critics argue that the goals are lofty and vague, and that the framework lacks an adequate strategy for implementation. Yet the main intent is to draft a shared vision for a desired future. In a recent address at the University of British Columbia, Jeffrey D. Sachs, a world-renowned professor of economics, spoke about the goals and reminded his audience, “nothing is politically impossible.” When it comes to private-sector innovation in overcoming water and other challenges, this has also proven to be true. **WC** —Staff

## Sustainable Development Goals for Water:

Source: sustainabledevelopment.un.org

- #6** Ensure availability and sustainable management of water and sanitation for all.
- #9** Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
- #11** Make cities and human settlements inclusive, safe, resilient, and sustainable.
- #12** Ensure sustainable consumption and production patterns.
- #13** Take urgent action to combat climate change and its impact.
- #14** Conserve and sustainably use oceans, seas, and marine resources for sustainable development.

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**BLOG:** Valerie Jenkinson, CEO of World Water and Wastewater Solutions, talks about how Canadians can assist water operators abroad. [bit.ly/caribwater](http://bit.ly/caribwater)



**VIDEO:** Northwest Territories Minister J. Michael Miltenberger and chief legal negotiator Merrell-Ann Phare discuss the evolution in transboundary watershed governance—lessons from the Mackenzie Basin, hosted by the POLIS Water Sustainability Project. [bit.ly/mackenziebasin](http://bit.ly/mackenziebasin)



**BLOG:** Mikhail Smilovic, PhD candidate at McGill University, shares his narrative exploration of the opportunities to integrate creativity, leadership, and reflection into the engineering curriculum. [bit.ly/createngineer](http://bit.ly/createngineer)





COURTESY: DANIEL / JENNIFER SCHWARTZ

# Raining Research in Berlin

Growing strawberries from recycled greywater at ROOF WATER-FARM in Berlin.

Exploring innovative water management approaches in Germany's capital.

BY KERRY FREEK

**HOW DOES A** truly sustainable city manage its water? In light of a changing climate that has brought water shortages and unprecedented flooding, Germany's research community is trying to answer that question. During a recent trip to Berlin with the German Academic Exchange Service, I visited two pilot sites (and three projects) to see some innovative ideas in practice.

Designed to relieve overloaded municipal wastewater systems and manage water on site, the ROOF WATER-FARM pilot project in Berlin-Kreuzberg envisions fixed buildings as "living liquid structures." On this site, the research team diverts greywater from homes, as well as rain water, to test a combination of biofilters, aquaponics,

and hydroponics techniques to recycle water, grow seasonal food, and produce fertilizer. Environmental engineer Erwin Nolde, who also runs the Water House (adjacent domestic greywater recycling project), said cities must "learn to use urban water as a resource."

Since 2005, the Water House team has also recycled greywater from apartments using a combination of bacteria, air, sand filtration, and ultraviolet light. The treated water is then used by more than 250 people for activities that do not require potable water, such as flushing toilets.

Nolde's on site systems are beginning to prove their worth. By operating

independently of the sewer system, they are not only extending the life of the municipal asset, they are saving residents' money. Berlin has a stormwater utility fee. By decentralizing the service and

By operating independently of the sewer system, they are extending the life of the municipal asset and saving residents' money.

managing rain water on site, the projects have saved the community €5,000 (approximately Cdn \$7,300) per year. As a bonus, the recycled water going back into homes requires less detergent for washing clothes and dishes.



What's next? Though the food-producing greenhouse is currently housed on the ground, the project team hopes to experiment with systems on rooftops in the near future. As for the Water House, Nolde expects to incorporate black water treatment into the system and harvest another resource—energy—for on site use.

Not far from Berlin-Kreuzberg on the River Spree, LURI.watersystems is experimenting with another solution to alleviate stress on municipal systems. Like many cities, Berlin has a legacy of combined overhand sewer overflows during storm events. Concerned about the impact on fragile urban ecosystems, Ralf Steeg, the company's managing director, worked with engineers and universities to develop an underwater tank to capture and store runoff from outflows to the river during storms. After the storm, the collected runoff is pumped back to a nearby treatment plant and tank is automatically cleaned.

Preliminary results show the river's health is indeed improving, Steeg said. And while installing these tanks is not a complete solution for dealing with combined sewer overflows, the technology does have the potential to play a role in a holistic treatment train solution—even with municipal systems, low-impact development techniques, and more permeable surfaces, cities can never capture and treat every drop of rain before it returns to a water source.

Steeg recognizes that the solution is not a cure-all, but it does offer another benefit. In designing platforms that rest on top of these underwater tanks, the company is pinning hopes on the value of providing not only ecosystem protection, but also desirable waterfront locations for outdoor cafes, restaurants, and bars.

On a sunny summer day in Berlin, it wasn't hard to imagine enjoying a cool drink while overlooking a clean river in a sustainable city. **WC**



Ralf Steeg explains the underwater tank concept on the River Spree.



Erwin Nolde explains the treatment process in a domestic greywater recycling facility in Berlin.

Kerry Freek is a past editor of Water Canada. She is currently manager of communications at the Water Technology Acceleration Project (WaterTAP).

# On the Level



Canadian water quality guidelines are weaker than those in other jurisdictions. How we can avoid falling farther behind. BY RANDY CHRISTENSEN AND ELAINE MACDONALD

**DESPITE BEING ONE OF** the world's wealthiest countries and having a relative abundance of clean, fresh water, Canada is plagued by considerable quality and quantity issues with its drinking water. Serious concerns about drinking water management suggest that too little is being done to protect the health and well-

being of Canadians. This is particularly true when it comes to the guidelines for the maximum level of contaminants allowed in drinking water.

The federal government determines, in conjunction with provincial and territorial officials, the level of allowable contamination in drinking water, known

as the Guidelines for Canadian Drinking Water Quality.

Waterproof Standards—a study we co-authored in 2014—found that, in dozens of instances, the Canadian guidelines are weaker than those in other jurisdictions, such as the United States, European Union, and Australia, and are

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at risk of falling farther behind. We also found that, in some instances, Canada has no standard for substances where other countries do.

In the absence of action by the federal government, drinking water protection is not improving; in fact, it is actually getting weaker. The Federal-Provincial-Territorial Committee on Drinking Water (CDW) has proposed doubling the

allowable level for chromium (Cr) from a maximum acceptable concentration of 0.05 milligrams per litre (mg/L) to 0.1 mg/L.

## Drinking water protection is not improving; in fact, it is actually getting weaker.

The most common forms of chromium in the environment are trivalent (Cr-III) and hexavalent (Cr-VI). The Cr-III is considered an essential nutrient, but Cr-VI (also known as chromium 6 or hexavalent chromium) is a human carcinogen and considered extremely toxic. Hexavalent chromium was the contaminant exposed by activist Erin Brockovich, portrayed by Julia Roberts in the eponymous movie.

The chromium drinking water guideline in Canada is intended to protect against the adverse health effects of hexavalent chromium exposure via drinking water. Although small amounts of chromium occur naturally in rock and soil and are released due to erosion, more than 70 per cent in the environment

comes from anthropogenic sources, such as industrial and stormwater releases. In 2013, 72 tonnes of chromium were released to air, land, or water as pollution from facilities reporting to the National Pollutant Release Inventory, and an additional nearly 24,000 tonnes of chromium were disposed in waste like mine tailings.

The CDW's proposal to allow twice as much chromium in Canada's drinking water will put us out of step with our international peers, and this is double the World Health Organization's recommended standard.

The United States, which has a chromium standard equivalent to Canada's proposed standard, is actually expected to strengthen its standard in light of new evidence about hexavalent chromium's carcinogenicity. Canada's chromium standard is only one in a long list of Canada's deficient contaminant standards. Herbicide 2-4-D has been frequently detected in surface water across Canada and is associated with damage to the nervous system, liver, and kidneys. It is also considered a possible human carcinogen. The standard for this substance is 1.5 to three times stronger in other countries than it is in Canada. And although the United States, Australia, and the World Health Organization have set limits for styrene—classified as a possible human carcinogen—Canada has no guideline at all.

There are solutions to this problem, but they require political will. Legislation

could be created to trigger reviews of Canadian guidelines whenever other industrialized countries improve their standards. More crucially, Canada's guidelines must be enforceable. The recognition of environmental human rights, such as the right to water and the right to a healthy environment, also have the potential to remedy weak standards and ensure equitable access to safe, clean drinking water from coast to coast to coast.

Precedent for better protection of Canada's drinking water exists. The arc of drinking water quality progress in Canada—from the creation of drinking water protection areas to the development of the Canadian guidelines themselves—has been one of continuous improvement. We can do better, but our governments must first commit to defending public health and exert the political will necessary to strengthen protection of Canada's drinking water. **WC**



Randy Christensen is a lawyer with Ecojustice and Elaine MacDonald is senior staff scientist.

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# MESSAGE IN A BOTTLE

The problems we're not solving by banning bottled water. BY JESSIE SITNICK AND DALE BEUGIN

**EARLIER THIS YEAR**, researchers released a study examining the University of Vermont's precedent-setting bottled water ban established in 2003. The results: an eight-per-cent increase in plastic bottle waste on campus, and a 25-per-cent increase in the greater campus consumption of sugary, high-calorie drinks. Students simply replaced their bottled-water purchases with higher levels of bottled pop and sports drinks.

Since reducing waste was an explicitly stated goal of the UVM's decision to ban the bottle, these are clearly unintended consequences. But a closer reading of the ban's story reveals a more complex set of motivations was at play. For the university, this decision wasn't only about waste.

## Sustainable water conveyance

According to the university, its bottle ban was directly connected to the development of a more "sustainable beverage system" on campus. Waste reduction was one factor; but the ban clearly didn't measure up on this goal, because it was aimed at only one source of waste.

Sustainable water use was also one of the objectives—and an important one. Using a litre of water—whether for bottling, watering a lawn, or irrigating crops—means it can't be used for something else, and that includes supporting healthy ecosystems. The impacts of depleting and diverting our global water supplies are many and great: soil degradation, water quality deterioration, decline in freshwater species, and limited access to drinking water. And of course, with the degradation

of our freshwater resources, we also lose the economic benefits they afford us.

So should we be concerned about the environmental (and social and economic) costs of taking water out of an ecosystem in order to sell it in a bottle? Yes.

But if our concern stops there, we are missing the boat, especially in Canada, where our water use is among the highest in the world. Banning bottled water is unlikely to change that.

## A public resource rather than a private one?

The university's approach seemed also be connected to social values. The ban coincided with the campus' decision to end its exclusive contract with Coca-Cola and increase investments in "safe, clean [municipal] drinking water across



campus for free.” As a student leader of the ban explained: “We wanted people to be aware of the privatization by companies of public water resources.”

But if we are concerned, philosophically or otherwise, about a company profiting from selling water contained in a plastic bottle, shouldn't we be equally concerned about profits gained from selling water

through our purchases of everyday products, and we do so without paying the true environmental, economic, and social costs of that water use. This is the problem that policy needs to solve.

### A case for ecofiscal policy

The price we pay for our water needs to better match the costs of using it.

This is true both in terms of the water we buy (whether in bottles or embedded in other goods) and what we take from the tap. “Ecofiscal” policy seeks to square that circle.

Imagine policies that price water use according to its true costs, including the infrastructure that brings it to your tap, the costs of water as a resource, and the environmental costs of withdrawal. Sure, this is complex. For example, the opportunity costs of pulling water from

one place will be different than pulling it from another. But smart policy can move us in the right direction.

One result of such policies is almost certain: buying a bottle of water will get more expensive. But so will buying a t-shirt, filling up a bathtub, watering a lawn, or installing a public water fountain. This market signal will shape more sustainable choices and drive innovation toward smarter water use in all its many forms.

Of course, pricing water on the scale we're talking about is not as simple or straightforward as banning bottled water. But nothing worth having comes easy—and that includes good policy. WC

Jessie Sitnick is communications director of Canada's Ecofiscal Commission. Dale Beugin is research director of Canada's Ecofiscal Commission. This article is based on a three-part blog series originally published on Medium.com.

Imagine policies that price water use according to its true costs, including the infrastructure that brings it to your tap.

contained in a t-shirt, hamburger, cup of coffee, or any number of the products we buy, in which hundreds of litres of water are embedded?

Banning bottled water seems to miss an important point. We “buy” water in much greater quantities all the time

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## Is job satisfaction of water treatment operators the key to solving the

### First Nations drinking water crisis?

BY ELLIOTT CORSTON-PINE, MATTHEW GREKULA, AND ED MCBEAN

**THE FREQUENCY OF** drinking water advisories (DWAs) in First Nations communities is known to be unacceptably high in Canada. In 2015, 169 DWAs were in effect in 126 First Nations communities. According to Health Canada, 76 DWAs were in effect in 42 First Nations communities in Ontario, with 60 advisories identified in areas north of Sudbury.

In a report led by Richard Harvey published in the *Journal of Water Resources Management—Using Data Mining to Understand Drinking Water Advisories in Small Water Systems*—the authors assessed DWA records in northern Ontario using a data-mining model of DWA records. The authors found that the most important attribute that makes a system likely to have drinking water advisories is the presence or absence of a certified primary water treatment operator. Results also indicated that First Nations communities that employ primary operators with minimal training have a 64-per-cent likelihood of a boil water advisory.

In 2007, Indian and Northern Affairs

Canada published a report, entitled *Summative Evaluation of the First Nations Water Management Strategy*, that highlighted a severe shortage of certified water-treatment system operators in First Nations communities as part of the problem. Approximately 25 per cent of operators in a First

operators. The survey, designed to shed light on the high levels of turnover, showed that the problems associated with hiring and retaining water operators are largely tied to aspects of the job that increase job satisfaction and the role of water treatment operators in the community. Survey questions

Approximately 25 per cent of operators in a First Nation community reported having left their job for either municipal or private industry.

Nation community reported having left their job for either municipal or private industry. Skilled First Nations operators are leaving the communities they are employed in search of other opportunities in related fields.

Given the importance of operators in providing clean water, our team distributed a survey to identify factors influencing the degree of satisfaction among First Nations water treatment

focused on influences of remoteness of the community, community population, level of certification of the operator, time spent as an operator, salary, satisfaction with work, and the specific water issues associated with that community.

Key factors contributing to the challenges of hiring and retaining skilled operator include: operators not being hired from within the community, lack of stability in funding,



changes in management, differences of opinion between operators and band council, the draw of other off-reserve job opportunities, and lack of satisfaction with their work. For many communities, the funding they receive may be insufficient to cover the costs needed to support hiring of new operators, which is another indicator of the challenge of retaining certified operators.

Looking more closely at the survey findings, we found that 64 per cent of operators were certified to the level of their water treatment system in northern Ontario communities, whereas 91 per cent of operators were certified to the level of their water treatment system in southern Ontario communities. Since 91 per cent of survey responses indicated the respondents had worked only in their community, it would suggest that retention of the operators was not a substantial issue, but the operators were reporting on both personal experience and a wider view of circumstances.

The findings indicate that job satisfaction and their perceived role in the community were key factors to success of operations. On average, northern water operators are more satisfied with their jobs (82 per cent), as opposed to 64 per cent in southern communities. Northern operators were generally paid a lower salary, worked fewer hours, and received less paid vacation; yet they were required to address a greater number of water security issues.

Water treatment or distribution system challenges, boil water advisories, and lack of trust with water supplies were the kinds of water security issues cited by survey respondents. In northern communities, 82 per cent of operators were required to address these kinds of issues, with 40 per cent of those experiencing up to four water security challenges in their home community. Comparably in southern Ontario, only 20 per cent of operators reported dealing with these issues. Two was the highest number of water security issues reported among 40 per cent of southern communities surveyed.

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## ASK THE EXPERT

**Figure 1: Northern vs. Southern Operators**

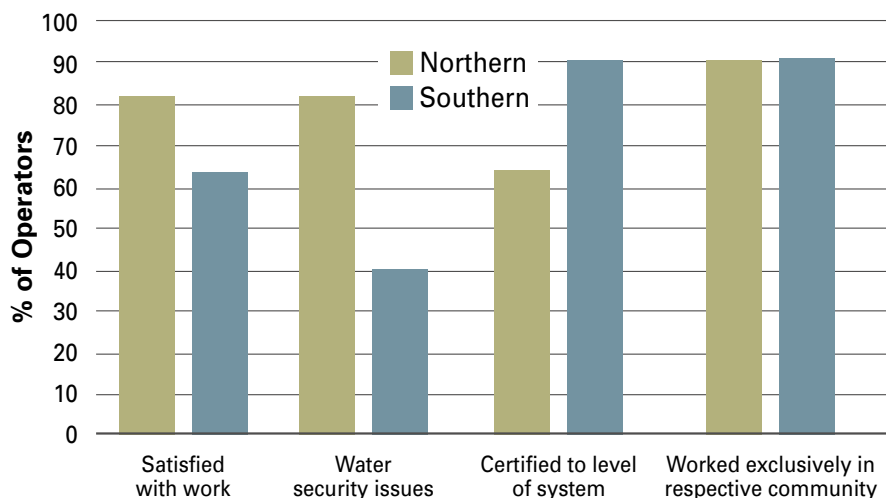


Figure 1 summarizes the main questionnaire findings.

Whereas salaries were cited as affecting job satisfaction by operators in southern communities, this fact did not show up among responses from northern communities. Examples of wage-related responses by southern operators included: “the wages should match those of off-reserve water operators, or it is ridiculous how little I get paid for the work I do.”

Water security was another theme that emerged for northern communities. One operator stated “the community is very important” and “the work is close to home.” It was more frequent for northern First Nation water treatment plant operators to remain employed in their community than their southern counterparts. In fact, 91 per cent of responses from northern operators indicated that they had only ever worked in their respective community and thus chose to remain close to home, with little desire to leave for an opportunity elsewhere. This is partially explained by the remoteness of those communities.

Northern operators tended toward feeling more connected to their community and noted that it would be difficult for them to look elsewhere for work. In comparison, operators in the south, who also stated that they had only been employed as a certified operator in their respective community (91 per cent), indicated

that they would leave for reasons such as community politics, changes in management, disagreements with band council, or more generally, to seek new opportunities. Finding higher paid employment was a common motivation for operators in southern Ontario to leave their position in the community.

A great number of First Nations groups, non-profit organizations, and political figures have raised the profile of the number of boil water advisories on First Nations reserves in recent years, and with good reason. However, it is clear that the capacity of water treatment operators is a crucial component of improving water access to First Nations people. Addressing job satisfaction is especially important for First Nations operators in southern communities; and while providing salaries that are equal to municipal operators is part of this, clearly a more holistic view to supporting operators’ needs is also necessary. *wc*



Elliott Corston-Pine is the facilitator of water needs of First Nations communities (in Ontario) with the University of Guelph. Ed McBean is a professor of water resource in the School of Engineering and Canada research chair in water supply security. Matthew Grekula is pursuing his undergraduate degree.



Credit: Metro Vancouver



Energy-rich materials such as fats, oils, and greases from restaurants and food-processing plants are fed into a co-digester to increase energy production. This generates revenues through tipping fees and prevents these materials from clogging the sewer pipes.



A worker gets ready to feed the trucked liquid waste materials into the digesters.



Pipes carry the trucked liquid waste materials into the digesters.

# FROM TREATMENT TO RESOURCE RECOVERY

How some Canadian utilities are leading the charge in wastewater-to-energy projects. BY EVE KRAKOW

**IN 2005**, a major California wastewater utility faced a dilemma: to cut costs, it would have to reduce its staff through attrition. Instead, Ed McCormick, then manager of wastewater engineering, decided that the utility should increase its revenues by producing energy. By 2012, the

East Bay Municipal Utility District (MUD) in Oakland had become the first wastewater utility in North America to operate as a net producer of renewable energy.

The view that wastewater treatment should be regarded as an opportunity for resource recovery is a trend that is slowly

gaining ground in Canada. Resource recovery can include recycling the water; using biosolids for fertilizer; extracting nutrients like phosphorus, and recovering energy—whether from the treatment process, the effluent, or directly from sewage on its way to the plant.

Many wastewater facilities treat their sludge using anaerobic digestion, a process where micro-organisms break down the organic materials, and many already use at least some of the resulting methane to heat their plants.

McCormick, now past president of the Water Environment Federation, explained how East Bay MUD took

this a step further: by co-digesting the municipal sludge with high-strength organic wastes, such as fats, oils, and waste from food processing, wineries, and poultry farms, it doubled its energy production. In 2011, East Bay installed an energy-efficient, low-emission gas turbine. The utility now produces 30 per cent more energy than it needs and sells the excess back to the electrical grid.

## In the sewers

In Canada, Metro Vancouver is leading the way in wastewater-to-energy projects. "With our co-generating engines and our boilers, we meet nearly all of our plants' heat needs, and from 30 to 50 per cent of our electricity needs at the plants where we generate electricity," said Jeff Carmichael, division manager for utility research and innovation with the city's liquid waste services department. The Lions Gate Secondary Wastewater Treatment Plant, slated for operation in 2020, aims to be energy neutral.

Next, Metro Vancouver wants to help municipalities use energy from sewers to heat nearby buildings. "There's enough heat in sewage in our area to heat roughly 700 high-rises," Carmichael said. A Sewer Heat Policy, approved by the Greater Vancouver Sewerage and Drainage District board in October 2014, set out "some simple rules about how we, private industry, and our municipal partners can take advantage of this resource." Vancouver's Southeast False Creek Neighbourhood Energy Utility, which already uses thermal energy captured from sewage to provide heat and hot water to buildings, serves as an example.

In Quebec, Réseau Environnement, the province's division of the American Water Works Association, is developing a best practices program to help wastewater utilities optimize their systems and become a water resource recovery facility (*Station de récupération de la ressource en eau*, or StaRRE).

"We identify performance objectives that are stricter than what's required by current legislation and potential areas for optimization, then we provide the tools to achieve these objectives," project manager Alain Lalumière said. Performance objectives will cover the quality of the effluent as well as the utility's biosolids management, energy balance, and carbon footprint. Lalumière expects the program to be piloted in at least one municipality by the end of the year.

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In light of Quebec's goal of banning organic waste from landfills by 2020, the government is supporting the construction of several facilities to treat organic waste, which can also include municipal sludge. Quebec City, for example, is planning to build an anaerobic digestion plant to treat its municipal sludge and food waste

or biogas per year. A spokesperson said the city is still studying how it will use the biogas produced.

### Making the transition

In Carmichael's experience, while some resource recovery initiatives do break even, it takes the right conditions. With sewer heat, for example, it only makes economic sense if the building is located near a major sewer line. A bigger driver is reducing greenhouse gas emissions, as you replace fossil fuel.

But the biggest challenge, he said, is perhaps not economic. "We had never considered cleaning up our biogas and selling it to a natural gas company because it's just not done. It's not something our lawyers are used to. It's not part of our mandate. But that's the utility of the future."

In the United States, McCormick estimated that hundreds of utilities are in the design, construction, or operational phases of this transition and that thousands more are in the conceptual planning stages. "It's a real sea change in the industry," he said. "All the leaders are going that route." WC

The utility produces 30 per cent more energy than it needs and sells the excess back to the grid.

together. Currently, sludge from the city's two wastewater facilities is pumped to an incinerator. Once the new plant is built, the sludge will be pumped directly to the anaerobic digesters instead. The plant will produce digestate (for agricultural use) and up to 8.3 million cubic metres

economic sense if the building is located near a major sewer line. A bigger driver is reducing greenhouse gas emissions, as you replace fossil fuel.

But the biggest challenge, he said, is



Eve Krakow is a freelance writer based in Montreal.



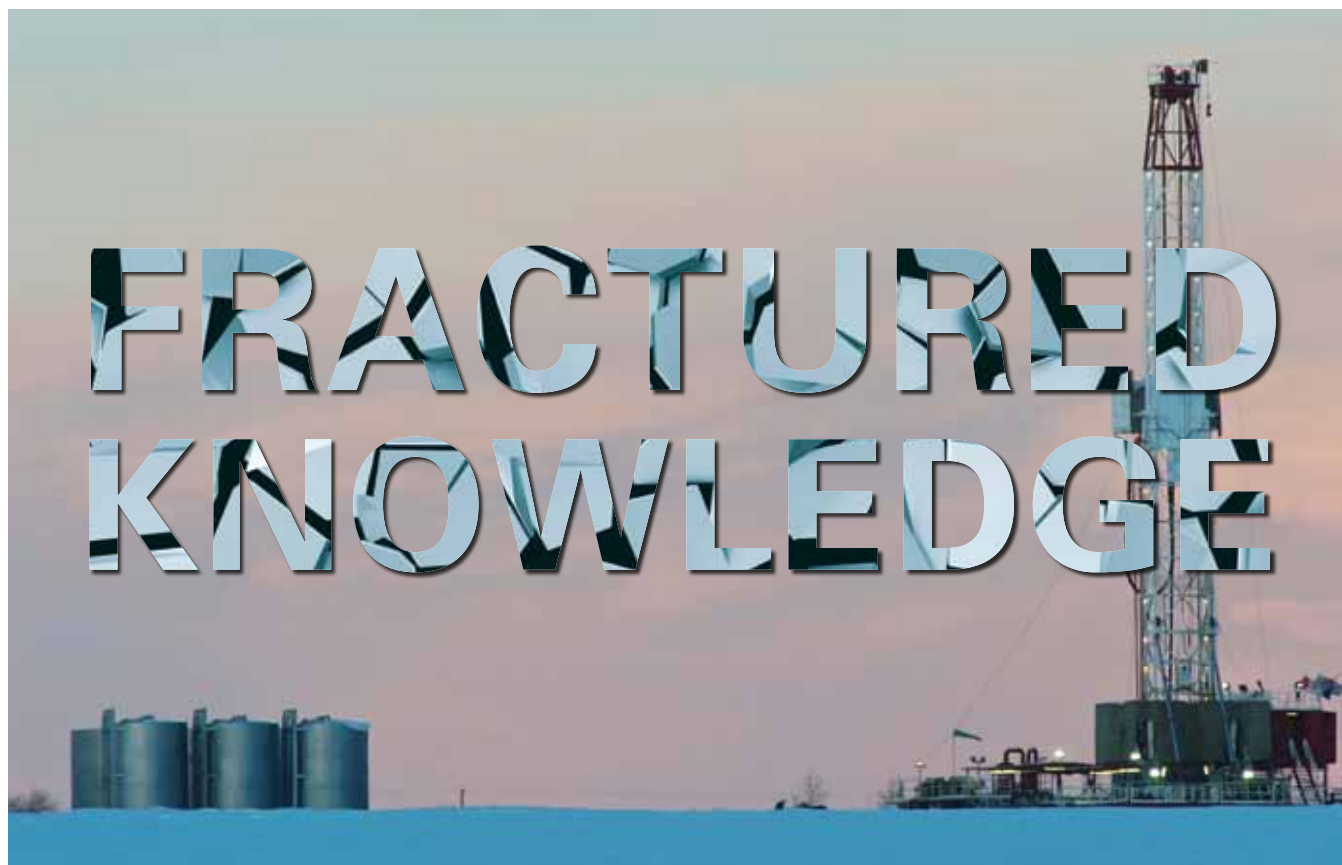
**Video:** Public input on the Lions Gate Secondary Wastewater Treatment Plant at [bit.ly/lionsgategwwt](http://bit.ly/lionsgategwwt)

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## Experts weigh in on what is known and unknown to inform decisions about hydraulic fracturing in Canada.

BY KATHRYN ROSS

**THE RAPID RISE** in the development of unconventional oil and shale gas reserves over the last decade has been accompanied by elevated discussion and debate on the topic. Across Canada, the issue has had a polarizing effect: some praise the shale gas revolution, others seek an outright ban on the practice, and many are across the spectrum. Provincial and territorial governments are equally divided across Canada in how they are managing the industry and addressing the public's concerns.

Central to the majority of conversations about hydraulic fracturing is the issue of water—its use, management, protection, and its ecological and socio-economic importance.

Hydraulic fracturing is used to maximize the extraction of underground resources, including oil and natural gas. Research surrounding the ability to properly assess the risks associated with the practice is relatively new, but it is an area of growing importance for decision

makers, communities (particularly Aboriginal communities), industry, government, and non-governmental organizations. These risks can include water use, induced seismicity, and the presence of contaminants, among others.

One of the driving discussions with respect to whether or not hydraulic fracturing activities are sustainable is the amount of water used. Water requirements for hydraulic fracturing vary greatly based on the geologic formation, the techniques used, and the number of operations in a given area, ranging from no water used (carrier fluids or gases are substituted), to volumes as high as 80,000 square metres per well. The fate of wastewater—whether it is returned to the watershed or becomes a consumptive use—is another important dimension of

the water balance.

With respect to contaminants, it's the risks associated with wastewater that are the greatest concern. These risks primarily relate to the handling, storage and eventual disposal of recovered fluids. Hydraulic fracturing wastewater consists of what is first injected, and later what

Options for water conservation, recycling, and reuse exist, but can also have other implications.

returns to the surface (typically 25 to 70 per cent of the total injected volume). The quality of the injected water in addition to chemical additives and constituents leached from the formation, combine to form variable "flowback water" quality. The portion of wastewater that does not return to the surface is also a potential risk.



Options for water conservation, recycling, and reuse exist, but can also have other implications, such as requiring additional treatment, handling activities and energy inputs, and leading to the increased concentration of dissolved constituents, including contaminants in the eventual waste streams.

### Identifying gaps of importance to decision makers

The Canadian Water Network (CWN) recently funded five projects from 2014 to 2015 that focused on where the knowledge gaps are most directly connected to the questions behind decisions involving water and hydraulic fracturing activities.

"One major concern is the risks of surface spills of highly saline water," said Dr. Greg Goss, professor at the University of Alberta, who led one of the CWN projects, a review of hydraulic fracturing wastewater management practices across four North American basins.

Goss lists other concerns, such as truck or pipeline spills, and a general lack of information about what is being transported. "The health effects, treatment costs, and remediation techniques all depend on what is in the water, and there is currently insufficient transparency in the chemical constituents used in hydraulic fracturing," he said. His team's report noted that Environment Canada and Health Canada have compiled a list of more than 800 substances known or suspected to be used in hydraulic fracturing in Canada, 33 of which have been assessed as toxic.

Dr. Michael Quinn from Mount Royal University, who led the CWN-funded project on landscape impacts of hydraulic fracturing development on watersheds, points to the fact that the source of the water used in hydraulic fracturing is one area of concern. "If freshwater is removed from the surface [ponds, lakes, streams] then there is less available for ecological function and other water

users," he said. "Lower surface water volumes may also lead to increased concentrations of contaminants." If the water used in hydraulic fracturing is from deep underground, he added that there may be heavy metals, salts, and radioactivity that create the potential for contamination.

"This water contains the chemicals and materials added to make the fracking process effective, along with additional contaminants that are picked up deep below the surface of the earth," Quinn said. "The final source of potential surface water contamination is from leaks or spills of hydraulic fracturing fluids at or near the surface."

Dr. Cathryn Ryan from the University of Calgary and her team completed a project on the subsurface impacts of hydraulic fracturing, looking at contamination, seismic sensitivity, and groundwater use and demand management. "Our report raised two major subsurface concerns. The first was induced seismicity caused



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either by deep well injection of flowback water or by the hydraulic fracturing stage itself,” Ryan said, “The other major concern is fugitive methane gas migration from leaky well casings.”

Many unknowns still exist: “We don’t really have a good sense of how far even small subsurface methane leaks will travel over time, or along which pathways,” she said, “Scientists rely on good, objective data, and in this case we have little good data by which to draw conclusions about the issue of methane in water walls. A big issue is that almost all of the groundwater methane data are from domestic water wells, which are very poor sampling instruments.”

### Practical opportunities in a pool of potential risks

Together, the five projects have highlighted many contamination concerns and unknown risks associated with water and hydraulic fracturing; however, the results also identify some

practical opportunities to move the knowledge base forward.

Although the research community has struggled to keep pace with the rapid pace of industry advancements, it is crucial that leading science underpin decisions about hydraulic fracturing. Given the complex set of questions and knowledge gaps, ensuring that relevant knowledge can effectively support decisions requires strategic prioritization. This includes consideration of what the most important short and long-term needs are for decision-making, and how the current knowledge base relates to those priority decisions. In light of the importance of the decisions being made and the challenging nature of the debate, trust in the sources of knowledge is fundamental.

### The upside of down

In 2013, investment in oil and gas extraction and closely related industries accounted for more than one-third

of business investment in Canada. At current production levels, the oil and gas sector directly accounts for about 5.3 per cent of Canadian GDP. Currently, falling oil and gas prices have slowed the pace of development, and while it is difficult to predict the long-term trajectory for the industry as a whole, continued development of unconventional reserves in Canada can be expected going forward. This slowdown in pace is an opportunity to focus on research most needed by decision makers.

Within the vein of deciding where and when hydraulic fracturing makes sense, understanding human and environmental health risks and contamination concerns becomes a vital part of the priorities, research direction, and the decision-making process. WC

Kathryn Ross is a communications professional at Canadian Water Network.

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## Experts weigh in on a contentious plan to store nuclear waste underground in 450-million-year-old limestone near Lake Huron. BY SAUL CERNOS

**A PLAN TO BURY** low and intermediate-level radioactive waste in a deep geologic repository roughly one kilometre from Lake Huron on the site of the Bruce Power nuclear plant near Kincardine, Ontario has created unease around the Great Lakes and raised questions about placing a potentially high-stakes facility so close to a major water body.

Ontario Power Generation (OPG) wants to permanently store 200,000 cubic metres of waste, including protective clothing and mop heads and used filters, resins, and reactor components, in steel containers inside a 40-hectare rock

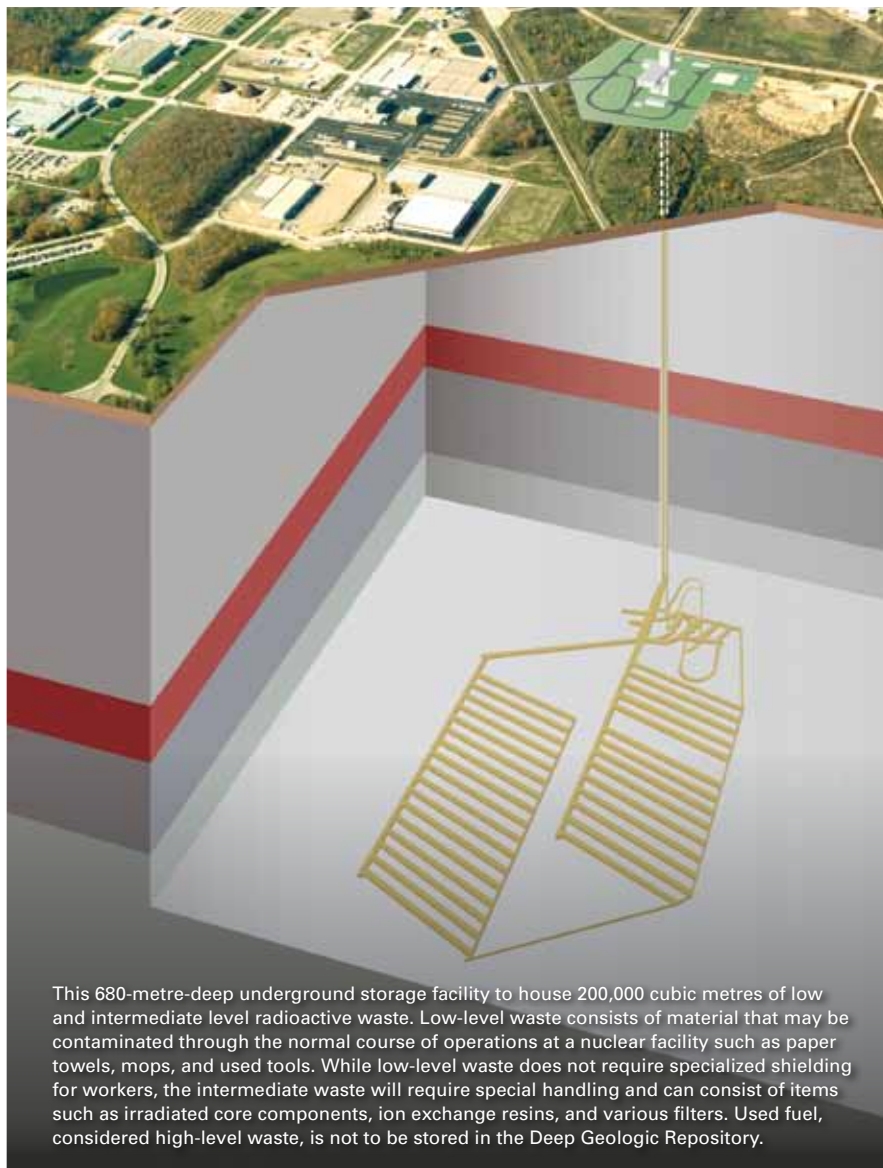
chamber 680 metres underground within 450-million-year-old, geologically stable limestone. Picture 75 football fields at the bottom of two vertical mine shafts deeper than Toronto's CN Tower is high.

In recommending approval earlier this year, a federal review panel representing the Canadian Environmental Assessment Agency and the Canadian Nuclear Safety Commission expressed confidence a repository would present no significant adverse effects to Lake Huron or the other Great Lakes. "It would be the first of its kind in North America, and it is the first of its kind in the world to

propose using limestone as the host rock formation," panel members wrote in their 432-page report. Taking the view that the risks associated with surface storage are greater than with underground storage, the panel supported OPG's assessment of the underground geology and its proposed containment system. "The host rocks of the Cobourg Formation are very old and have remained stable under nine glaciations over the past one million years," the panel wrote. "It would take a water particle at the repository depth in undisturbed rock approximately 10,000,000 years to move one metre."



An aerial view along Lake Huron, Kincardine Ontario Canada.



This 680-metre-deep underground storage facility to house 200,000 cubic metres of low and intermediate level radioactive waste. Low-level waste consists of material that may be contaminated through the normal course of operations at a nuclear facility such as paper towels, mops, and used tools. While low-level waste does not require specialized shielding for workers, the intermediate waste will require special handling and can consist of items such as irradiated core components, ion exchange resins, and various filters. Used fuel, considered high-level waste, is not to be stored in the Deep Geologic Repository.

Several local councils in the Bruce region, including the Municipality of Kincardine that would be paid as host,

A federal review panel expressed confidence a repository would present no significant adverse effects to Lake Huron or the other Great Lakes.

have endorsed the \$1-billion project. However, with opposition growing and U.S. state legislators and municipal

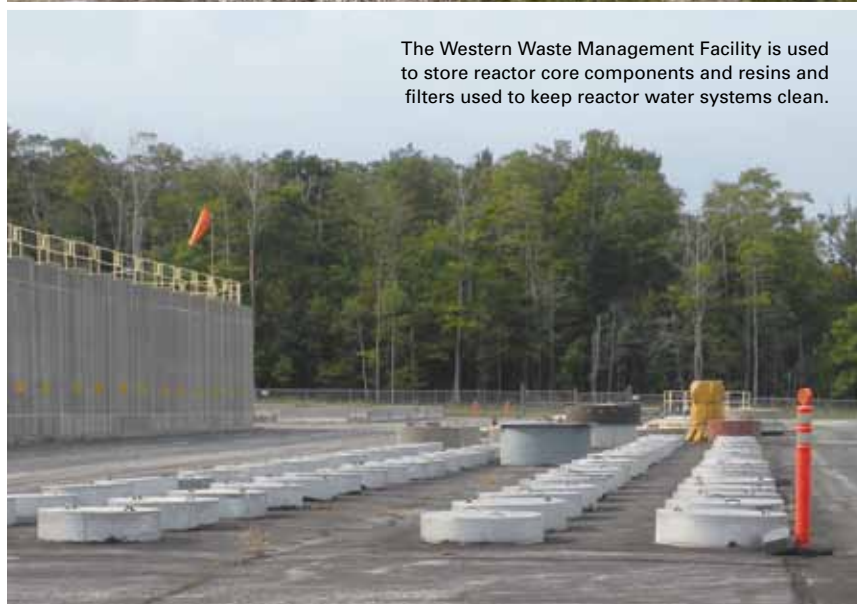
politicians on both sides of the border contending that a repository would pose an unacceptable risk to the entire watershed and the drinking water of millions of people, federal environment minister Leona Aglukkaq postponed a final decision until after the October 19 election.

OPG said it will proceed only with the support of the Saugeen Ojibway Nation, whose traditional lands

encompass the Bruce site. “We’re in discussions with their leadership and we’re coming to understand each other,” said Jerry Seto, emphasizing that the utility would respect a consensus-based community decision. However, even if the Bruce plan is withdrawn, waste from nuclear facilities must go somewhere. Furthermore, the Nuclear Waste Management Organization, an industry-funded body, is looking to store highly radioactive used fuel bundles, and sites under preliminary consideration include ones also close to the Great Lakes and other waterways.



Intermediate-level waste storage at OPG's Western Waste Management Facility in Kincardine, Ontario.



The Western Waste Management Facility is used to store reactor core components and resins and filters used to keep reactor water systems clean.



Intermediate-level waste is more radioactive than low-level waste and requires shielding to protect workers during handling.

How safe is it, then, to store radioactive waste near water within even the deepest, most stable containment systems? David Shoosmith, a University of Western Ontario chemistry professor who designs containment systems for used nuclear fuel, said OPG's proposal for low and intermediate-waste is sound because it calls for multiple barriers deep beneath the water table in rock that's been seismically inactive for millennia. "The primary quality you require is that the water's hardly moving through that location," he said. Should an unprecedented geological or other catastrophe occur, he believes contamination would be marginal. "The amount of radioactivity that would be in this particular repository would be a tiny fraction of what was distributed in the recent Japanese disaster," he said. "It would disperse and probably not give you much of a signature."

Frank Greening, a retired nuclear chemist, worked for OPG and its predecessor, Ontario Hydro, analyzing materials not dissimilar from some of those included in OPG's current disposal plan. He sees little trouble burying low-level wastes but takes issue with the categorization of some labelled intermediate. "Ion exchange resins that are used for the cleanup of the heat transport water in the reactor are loaded with Carbon-14 and Cobalt-60," he says. "Carbon-14 has a half life of 5,700 years and can potentially convert into gaseous form and escape through ventilation shafts. OPG hasn't adequately addressed this kind of scenario."

John Sass, a geophysicist retired after three decades with the U.S. Geological Survey, supervised the drilling of hundreds of exploratory wells, and even in the deserts of the American southwest he never met a borehole that wasn't wet. While agreeing the probability of an earthquake disturbing a repository at the Bruce site is extremely low, Sass doesn't consider rock at any depth totally impermeable. "There's going to be some pathways for water to move," he said. "No container that I know of has been designed or built that will withstand the elements for millennia. Sooner or later, they're going to be worn down by water and by whatever is in the water, and



they'll release some of the radioactivity.”

Hydrogeologist Wilf Ruland, who consults for various clients, filed a report with the review panel in which he raised technical concerns, such as pressure gradients and the effectiveness of particular barriers. He also decried the information flow as dysfunctional,

No container that I know of has been designed or built that will withstand the elements for millennia.

with his own questions modified by the panel before being submitted to OPG. “In some cases this meant that our questions were so altered that the proponent’s responses were of no benefit in addressing our original questions. In other cases it [...] was difficult or impossible for us to determine if our questions were ever submitted or

responded to by the proponent.”

Still, he supported the proposal, saying the bedrock beneath the Bruce site is low enough in permeability to be suitable and that the waste would be safer underground than above ground, assuming that the regulatory authorities ensure no shortcuts are taken in design, construction, disposal, closure, and post-closure monitoring. “Certainly,” he wrote, “the proposed repository is vastly superior to the current method of storage/disposal at the ground surface, where the wastes are vulnerable in various ways and the potential for water contamination is much higher.”

While scientific opinions vary considerably, nuclear energy constituted 16.8 per cent of Canada’s energy mix in 2014, according to the Canadian Electricity Association, and its ongoing

generation can only add to existing stockpiles of waste. With even low and intermediate levels of radioactivity proving controversial across the Great Lakes, higher levels associated with fuel bundles stand to exacerbate matters.

Ultimately, Ruland believes the best way to deal with nuclear waste is to not produce it in the first place, but he acknowledged it’s not that simple. “Significant amounts of radioactive waste already exist and will continue to be produced before Canada’s fleet of reactors have completed their active lives and are potentially decommissioned,” he told Water Canada. “Those wastes need to be disposed of.” **wc**



Saul Chernos is a Toronto-based writer and frequent Water Canada contributor.



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# Fracking License Runs Dry

British Columbia rescinds water license used in hydraulic fracturing.

BY WALLY BRAUL, MIRA GAUVIN, AND HARRY DAHME

ON SEPTEMBER 3, 2015, the British Columbia Environmental Appeal Board (EAB) rescinded Nexen's water license in Northeast British Columbia. The license was issued in May 2012 and since then, the licensed water has supported Nexen's fracking operations. Shortly after the license was issued, the Fort Nelson First Nation appealed on technical and Aboriginal consultation grounds.

The decision comes after two preliminary rulings and a long *de novo* hearing, involving numerous highly technical reports and many expert and lay witnesses, which concluded in early 2014. The highly detailed decision has far-reaching implications and will likely inform the growing body of fracking litigation in Canada.

## Flawed technical methodology

Prior to receiving its license, Nexen withdrew substantial volumes of water from the Tsea watershed to service its nearby fracking operations under two consecutive one-year "*approvals*" issued pursuant to section 8 of the Water Act. Rather than continue to rely on one-year approvals, Nexen sought a five-year-term water license.

Nexen's license and its supporting Water Development Management Plan were designed to address the data-sparse nature of the shallow Tsea watershed. Unlike other water licenses and approvals, the license regime used adaptive management principles that, for example, prescribed water withdrawals attuned to hourly water variations, required ongoing studies of possible effects on habitat, and called for annual reviews to revisit and

adapt withdrawal parameters.

The EAB described the license regime as "novel" and stated that "Nexen's section 8 approvals imposed far less onerous requirements than the license." This general endorsement, however, was not sufficient to overcome two fatal methodological problems: misuse of hydrometric models and inadequate environmental impact assessments. These problems, the EAB concluded, created undue risk.

## Flawed consultations

The Crown's review of the license application and associated consultations took around three years. The EAB found that the Crown from 2009 to 2011 was "genuinely willing" to consult with the Fort Nelson First Nation (FNFN), albeit in a way that was



“not perfect.” The EAB stated, for example, that the Crown should have as a preliminary matter consulted with the FNFN to “discuss the process itself.” Moreover, once the review process unfolded, it lacked transparency over the respective roles of the Crown, Nexen, and the FNFN. The Crown was further criticized for untimely updates and “mixed messages.”

“The Panel finds that the Crown failed to consult with the First Nation in good faith. Based on the internal Ministry correspondence and the Manager’s rationale, the Panel finds that by April 2012, the Manager intended to issue the license regardless of the promised meetings, and had no intention to substantially address any further concerns or information that may have been provided by the First Nation. The Panel finds that this conduct was inconsistent with the honour of the Crown and the overall objective of reconciliation.”

### Ancillary Findings

The EAB made numerous findings that arguably did not necessarily affect the outcome of the appeal. These ancillary findings, however, have considerable practical relevance for informing future Crown, Aboriginal and industry strategies.

### Cumulative Effects

The FNFN argued that the Crown’s consultation should go beyond the proposed withdrawals and consider how the myriad of existing and proposed oil and gas activities in Northeast British Columbia cumulatively affect treaty rights to hunt, fish, and trap. The EAB agreed with Crown and Nexen arguments that the Water Act did not authorize such a broad scope of impact assessment.

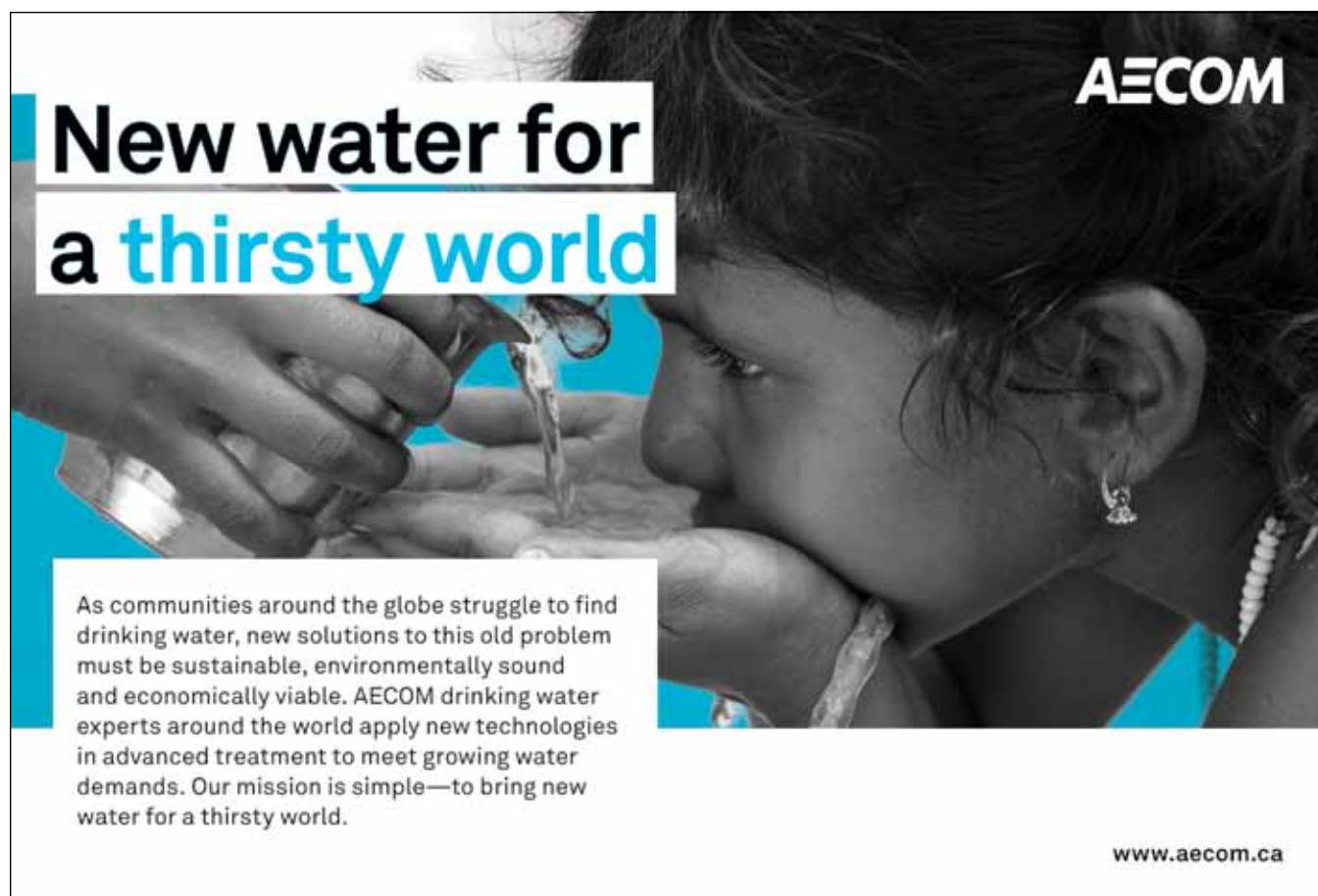
### The Precautionary Principle

The FNFN argued that the scientifically sound application of the *Water Act* should comply with the “precautionary

principle.” Essentially, the precautionary principle would put the legal onus on Nexen and the Crown to demonstrate that the proposed withdrawals would not be harmful. In other words, the onus would shift from the appellant FNFN (to prove a serious concern) to the respondents Nexen and the Crown to disprove potential harm. The EAB rejected the FNFN argument.

### Scoping Treaty Rights

The EAB acknowledged that the Crown was “generally aware” that the First Nation holds treaty rights in the Tsea area, but failed to identify “... exactly where, when or how the First Nation’s members exercise treaty rights ...”. The EAB further held that the Crown should have considered “which species of fish, animals or plant are used” by the FNFN. In short, the EAB expected the Crown, at an early stage, to undertake a comprehensive research project, the findings of which would be used to scope relevant treaty rights and consultations.



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### Environmental Assessment

A central issue in the hearing concerned the degree of scrutiny that should be applied to review potential environmental impacts. The EAB agreed with the FNFN that a much deeper form of impact assessment should have been conducted prior to the issuance of the license. Indeed, the EAB set out a long list of environmental baseline and impact assessment studies that should have been required by the Crown and completed prior to the issuance of the license. The Crown and Nexen argued that such studies should be required only if the project was “reviewable” under the B.C. Environmental Assessment Act, which was not the case here.

These arguments were not addressed directly by the EAB. Rather, the EAB’s reasoning was based on section 10(1)(c) of the Water Act. This provision, which enables the Crown to require “information” from applicants, was interpreted liberally to mean that it could require the above-noted studies. The EAB’s reasoning may leave future license applicants uncertain as to whether, after filing an application, they face a lengthy and costly requirement to conduct an environmental assessment not otherwise required under the Environmental Assessment Act.

At the time of writing this (October 13, 2015) neither Nexen nor the Crown have announced whether they will seek judicial review of the British Columbia Appeal Board decision. **WC**



Wally Braul is a partner in Gowlings’ Advocacy Group, based in Calgary and Vancouver. He was legal counsel to Nexen on this matter. Mira Gauvin is a partner in Gowlings’ Montréal office, practising in the area of environmental law. Harry Dahme is a partner in Gowlings’ Toronto office and past leader of the firm’s Environmental Law Group.

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Roundtable experts tour the 67-acre Lakeview Water Treatment Plant that draws water from Lake Ontario, with a capacity to treat 1150 million litres per day.



Indra Maharjan talk about the need for collaboration; and Nick Reid, right, from Ontario Clean Water Agency.



(L-R) Donald Cipollone, Aquasoft-Best Water Ltd.; Aziz Ahmed, Ministry of Environment and Climate Change; Bill Chihata, York Region.



Iman Hashemi, OCWA.



Katherine Balpataky peers into the ozone generator.



The Lakeview Water Treatment Facility serves eastern Mississauga and Brampton, and Bolton.

# H<sub>2</sub>O-Zero

## The path to energy neutrality in drinking water treatment

BY KATHERINE BALPATAKY

**ON A BRIDGE** overlooking the operations floor of the Lakeview Water Treatment Plant in Mississauga, Ontario, a group of water experts gathered to discuss the energy efficiency of the system amidst an orchestra of mechanical sounds. Assembled by Water Canada in partnership with the Independent Electricity System Operator (IESO), the experts—including operators, consultants, energy auditors, regulators, and technology providers—addressed the opportunities, barriers, and innovations in water treatment and energy efficiency. Consensus is that the opportunities are huge.

For the past four years, the IESO saveONenergy program for homes, businesses, and industrial facilities has provided incentives, rebates, training, and support for Ontarians to achieve energy savings. And although certain sectors in the province are aggressively improving energy efficiency, the drinking water sector has not kept pace. While there has never been a comprehensive study on energy use in water treatment in Ontario, U.S. studies and anecdotal evidence suggest that energy use accounts for 60 to 80 per cent of a drinking water facility's operating budget; and that drinking and wastewater treatment and conveyance can account for up to 35 per cent of a municipality's total energy budget.

Indra Maharjan, a program manager of energy conservation with the Ontario Clean Water Agency (OCWA), said he has conducted more than 200 energy assessments in water treatment plants across Ontario and that many parts of the province



have not started energy conservation activities. “It almost always depends on the leadership with the municipality and operating authority,” he said. “If the municipality has energy champion, then you may see some projects getting off the ground; but there are always multiple stakeholders they have to convince.” The group agreed that the sector as a whole is very risk averse.

Regulators and those reporting to them explained that over the last 14 years, the sole focus of operators has been on water quality compliance. In the aftermath of Walkerton, the bar of compliance has been set very high, and anything less than 100 per cent is viewed as suspect by the public. While compliance and public health are imperative, compliance need not be compromised to achieve greater energy efficiency.

### A state of good repair

The most inexpensive way to implement energy conservation in a water treatment plant is through maintenance. However, this is not as simple as it may sound. “Nothing is more important than maintaining the systems properly,” said Iman Hashemi, a process and energy optimization specialist with OCWA. “It becomes a conversation about what the standard of care entails.” He explained that detailed, validated, and quantified data to evaluate the maintenance approach are needed in order to properly optimize the maintenance regime—something few systems in Ontario have. In most cases, the operator maintains the system the way his or her predecessor has done, rather than draw upon data and analytics. If the plant is compliant from a water quality perspective, there are no questions asked. Energy optimization is as much a shift in the culture as it is in the nature of the work.

### Performance-enhancing data

“The opportunities around data are phenomenal,” said Nick Reid, executive director of strategic partnerships with OCWA. “The fact that more sensors will be available is an advantage as it increases our capacity to optimize the processes and functions they measure.”

Bill Chihata, program manager of energy conservation and demand

management in York Region, explained that analytic tools enable operators to integrate water process and energy data to compare the system’s performance day-to-day, week-to-week, and so on. Along these lines, Hashemi said there are numerous analytical tools on the market, but basic-level analysis can be achieved with a standard supervisory control and data acquisition (SCADA) system. Most municipalities need support to get started.

### Transparency, collaboration, competition

At present, there is no central location housing information about energy usage of drinking water treatment plants and no common standard for measuring energy intensity. There is no mechanism for an operator to compare their performance with others or to determine whether their plant is above or below average. The only option is to look across municipal hydro bills—but even these are not always comparable. The group had mixed opinions about establishing a standard for benchmarking, because every treatment plant is unique and the factors affecting energy intensity are many. “When it comes to benchmarking, I see more value in teams inside a plant or a transmission group looking at their data to understand the system,” Hashemi said. Chihata, on the other hand, sees the value in benchmarking across York Region facilities as part of the region’s conservation strategy. “If we are an energy hog, we need to do something about it,” he said.

The group noted that fear of revealing less-than-adequate operations is a barrier toward greater transparency. They felt strongly that benchmarking efforts should remain voluntary.

### Building the business case

Return on investment is a crucial aspect of upgrades. For starters, capital decisions must be approved by councils, most of whom are looking for benefits realized within an election cycle with a preference for “visible” projects like parks. Therefore, proposals require quantifiable estimates of cost savings and, in some cases, benefits to the community. The challenge is that there are no hard



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savings to be gained from doing the necessary monitoring. Then, there are matters of scale: "When you have smaller systems—smaller blowers and pumps, etc.—their power consumption is less, and so are the opportunities for savings," Reid said.

Most small municipalities are already strapped with dwindling revenues due to shrinking populations and water conservation measures, and councillors are generally reluctant to raise rates because they fear the pushback from voters. Consumer awareness of water-energy challenges is at the root of the solution. The group agreed that many of these challenges are reduced when there is also an incentive to improve the numbers.

### Next generation

Opportunities exist to pursue practices like heat recovery and co-generation with wind, solar, or hydro turbines; to reduce energy use when it is most expensive;

or for energy storage to avoid peak demand. In Ontario, however, only a few large municipalities appear to be eyeing these options, mostly through pilot projects. For smaller municipalities, the economies of scale do not support these kinds of investments—at least not yet. Energy costs or emissions targets could change this. "We are always looking 20, 30, and 50 years into the future. Give me a target date for net-zero, and I will get there," Chihata said. "We are building the roadmap to energy neutrality."

Municipal procurement processes are another area where innovation is required to support best-in-class energy efficient upgrades. It is important to ensure a pump with advanced sensors is not in the same category as a basic one in the eyes of the procurement officers. Education is needed to ensure the added value is recognized.


As far as ministerial approvals goes, certain improvements are already in place to enable a more flexible approach

to achieving pathogen removal credits. Still, the regulations could still go farther toward a performance-based model. "Fifteen years ago, we were nowhere near where we are today in terms of our understanding of the opportunities," said Sal Schillaci, VP of sales and marketing at Eco Water Canada Ltd. "Twenty years from now, this may be a moot conversation. We may have only scratched the surface, but we are taking the right steps."

*This article captures ideas shared during the first of two expert roundtables hosted by Water Canada and IESO. The results of the second roundtable, focused on wastewater and energy efficiency, will be featured in the next issue of Water Canada. WC*



Katherine Balpataky is Water Canada's editor.



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## HIRED



Rahim Kanji

**Rahim Kanji, MBET, P. Eng** has joined Southern Ontario Water Consortium as manager of industry partnership development. Most recently with Kontek Process Water Management, Rahim has spent the past 10 years in various roles including systems commissioning, technical sales, commercialization, industry liaison, and project management.



Colin Little

**Colin Little** has recently been hired by the Lower Thames Valley Conservation Authority as their new agricultural specialist, stationed in the Chatham, Ontario office. Little will be work with the Greening Partnership-LTVCA staff to assist landowners with farm stewardship projects to help in reducing phosphorous run-off into Lake Erie.

## APPOINTED



Dan Fazekas

Atlas Copco Construction Equipment Canada announced the appointment of **Dan Fazekas** as

technical sales representative. VP and business line manager Michael Marion said, "Dan has over 15 years' experience in both the steel and construction equipment industries. We believe that his previous experience, in conjunction with his strong customer focus and dedication, position him well to bring further growth to the Construction Tools business in Ontario and Manitoba."



(L-R) Ellen Greenwood, Greenwood Associates and co-chair EID committee ; Skip Willis Award recipient Ellen McGregor, Fielding Chemical Technologies; Marc Charbot, CH2M and chair EID committee.

## AWARDED

**Ellen McGregor**, CEO and president of Fielding Chemical Technologies, was awarded with the annual Errick Skip Willis Award for outstanding leadership and a track record for raising awareness of and creating action to enable the environmental industry sector in Ontario. McGregor received the award at the Ontario Environment Industry Association (ONEIA) Environment Industry Day gala.

More news items can be found at [watercanada.net/topics/news](http://watercanada.net/topics/news)

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The Ontario Pavilion at WEFTEC showcased 39 water-tech companies from Ontario.

## Water Environment Federation's Annual Technical Exhibition and Conference Chicago, IL, USA

A total of 89 Canadian water companies showcased their products and services in booths on the exhibition floor at the Water Environment Federation's annual Technical Exhibition and Conference in Chicago (WEFTEC). The five-day event, which started on September 26th, is the largest conference of its kind in North America. Over 22,000 people attended. 2015 WEFTEC featured a panel session on overcoming trade barriers, an Ontario Pavilion, and a business-to-business breakfast aimed at fostering partnerships, designed to enable formal and informal discussions. The Ministry of Economic Development, Trade and Employment together with Ontario's Water Technology Acceleration Project (WaterTAP) and the Ministry of Research and Innovation hosted an Ontario Pavilion to showcase the province's muscle in the water-tech sector. A total of 39 Ontario water companies held booths at the event, with 12 inside the Pavilion.

## BLOOM Water Innovation Forum Mississauga, ON

On September 16, 2015, 165 producers, solution providers, and government representatives in the food and beverage industry participated in the BLOOM Water Innovation Forum. Topics such as rising water rates, sewage surcharges, and research and development were discussed. The Forum featured exhibitors, speakers, and panel discussions with industry leaders, including Kevin Jones, President & CEO of BLOOM, Kevin Bossy, President of Bishop Technologies Inc., and Brent Holmes, Plant Manager of Maple Leaf Foods. The event focused on how Ontario's food and beverage producers can seize the opportunity to improve water and resource management to become leaders in efficient production.



Actual Media Publisher Todd Latham and environmental activist Erin Brokovich.

Credit: Laurie Spence

## Remediation Technologies Symposium 2015 Banff, AB

The Remediation Technologies Symposium (RemTech) is always a favourite for environmental professionals. It's not just the beautiful setting in Banff, Alberta or the cocktail receptions and networking events—it's the depth of the technical sessions. If you wanted to learn about aerobic bioremediation of petroleum hydrocarbon plumes in saline groundwater, or in situ monitoring of free metals in sediment porewater, this was the event for you. Meeting environmental icon **Erin Brockovich** was a bonus. In its 14th year, the 2015 RemTech had over 630 delegates and 88 presentations in five different program streams.



Robert Haller, Executive Director and Anita Wilson, Event & Sponsorship Coordinator from CWVA at Après Ski reception sponsored by Idexx at the first annual National Water and Wastewater Conference.

Credit: CWVA

## National Water and Wastewater Conference Whistler, BC

On October 14 - 16, 2015, 400 water professionals ascended the scenic Sea-to-Sky Highway to Whistler to attend the 2015 National Water and Wastewater Conference. Sunday guests enjoyed a native Potlatch ceremony at the Squamish Lil'Wat Cultural Centre. The Monday opening plenary welcome was delivered by **Robert Haller**, Executive Director of the Canadian Water and Wastewater Association and **Nancy Wilhelm-Morden**, Mayor of Whistler. It was the first time the CWVA partnered with the Canadian Association for Water Quality to host the event, promoting a 'one water approach.' The technical program included topics such as extreme events, problematic 'flushable' products, benchmarking performance, water conservation, fluoridation, and asset management.



Credit: ONEIA



(L-R): Hon. Glen Murray, Ontario Ministry of the Environment and Climate Change; Irene Hassas, Aslan Technologies; Alex Gill, ONEIA.

## Ontario Environment Industry Association's Environment Industry Day Toronto, ON

On October 20, 2015, the Ontario Environment Industry Association (ONEIA) hosted Environment Industry Day at the Ontario legislature. Dozens of cleantech companies attended the Queen's Park event to discuss issues of concern and raise the visibility of Ontario's environment sector. Several senior officials attended, including **Glen Murray**, minister of the Environment and Climate Change; **Elenor McMahon**, MPP for Burlington; **Tim Hudak**, MPP Niagara-west; and Green Party of Ontario leader **Mike Schreiner**. ONEIA convened its water working group, among others, to present position papers on member priorities.

## World Water-Tech North America Toronto, ON

In its third year, the World Water-Tech North America summit, supported by WaterTAP Ontario, took place in Toronto from October 6 to 8, 2015. The summit brought in more than 50 speakers including many international experts. The focus was on city resilience and advanced technologies for strengthening urban water networks, covering issues such as smart metering, innovative financial models, and accelerating development and commercialization. **Daiene Vernile**, MPP Kitchener Centre, provided the welcome, and **David L. Sedlak**, co-director of the Berkeley Water Center, was a keynote speaker.



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## Five strategic priorities to take Ontario's water sector to the next level.

BY BRENDA LUCAS AND PETER GALLANT

**IT'S BEEN FIVE YEARS** since Ontario's government made a bold commitment to achieve North American and global leadership as an innovator in water technologies with the *Water Opportunities and Water Conservation Act* (2010). In that time, Ontario's water sector has made real progress, and Ontario technologies are poised to address some of the world's most difficult water-related challenges.

Organizations such as the Southern Ontario Water Consortium (SOWC) and the Water Technology Acceleration Project (WaterTAP), along with innovative water technology companies, leading academic institutions, supportive government partners, and progressive utilities and end users, have made Ontario's water sector the subject of international recognition.

But there is more work to be done. To maintain and extend Ontario's leadership in this critical sector and address barriers for innovation and growth, SOWC and WaterTAP, along with industry leaders, have identified five strategic priorities:

**① Create the utility of the future in Ontario:** Set a goal that Ontario wastewater utilities will maximize energy recovery, nutrient extraction, and water reuse. The next generation of water utilities will be energy neutral and will focus on the service of delivering clean water, ensuring its continual availability without degradation of quality.

**② Implement the vision of the *Water Opportunities Act*:** Continue to build on the bold vision of 2010 through advancing the changes that were intended by proposed municipal water sustainability plans, setting performance indicators and targets, expanding upon already mandated conservation plans to include water as well as energy, creating the most progressive building code in North America, and setting minimum standards for water efficiency on appliances.

**③ Emphasize sustainable and resilient infrastructure:** Align funding programs and asset management requirements to support financial and environmental sustainability and resilience, and enable rather than stifle new approaches and technologies. Identify, promote, and invest public dollars in projects that promote cost-effective, green, and sustainable approaches before considering "hard" solutions.

**④ Enhance networking for innovation/technology development, early adoption and commercialization:** Formalize a reference customer network of early adopters and demonstration sites for clean water technologies and mobilize Ontario's vast public sector assets as a platform for the testing, demonstration and adoption of innovative water technologies.

**⑤ Inspire a broader audience and promote Ontario:** Enhance efforts to profile Ontario's leadership and reputation through success stories and sharing of information. Establish regular events for profiling Ontario's water innovation successes through joint initiatives of government and key stakeholders including the private sector to solidify the province's leadership role and enhance collaboration across the innovation ecosystem.

If these broad strategic goals resonate with other individuals or groups, we invite them to adopt the messaging as a framework. Coordinating and focusing our efforts can help turn ideas into action and provide economic, social, and environmental benefits for Ontarians. *wc*

Brenda Lucas is the executive director of the Southern Ontario Water Consortium. Peter Gallant is the president and CEO of WaterTAP Ontario.

Have a response? Send your letters to the editor to [katherine@watercanada.net](mailto:katherine@watercanada.net)





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