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GOVERNANCE

8 Bi-national Funding

Water Canada sits down with Mayor Michael Vandersteen to discuss the need for government support for the Great Lakes and St. Lawrence.

BY **ANDREW MACKLIN**

WATER RESOURCES

10 Protecting Water Resources

Understanding the importance of security and emergency management for water across Canada.

BY **SIMRAN CHATTHA**

STORMWATER

12 Setting a New Standard

Developing a new management standard for stormwater systems.

BY **LYNN BARBER**
AND **BRIAN ZUPANCIC**

DRINKING WATER

14 Safe Water for Everyone

Using innovative solutions for water infrastructure to provide safe drinking water for all Canadians.

BY **MARTIN BUREAU**

INNOVATION

16 Keeping Employees Safe

The value of remote monitoring for water operators during the COVID-19 pandemic and beyond.

BY **GREG JACKSON**

ENERGY

18 Tuning up Waterpower

Hydroelectric asset owners look to add capacity to provide more power to the grid.

BY **XENIA HÉBERT**



WASTEWATER

22 The Beast of Bezanson

Demonstrating new bioreactor technology for wastewater treatment in Alberta.

BY **SEAN IRWIN**

24 Poor Compliance

Baby wipe manufacturers fail to meet the requirements for being a truly flushable product.

BY **ROB VILLÉE, BARRY ORR, BROOKE NORTHEY**
AND **SARA TEASDALE**

28 F.O.G. Clogs

Encouraging residents in Markham, Ontario to have greater awareness of the disposal of fats, oils, and greases down the sink.

BY **DANIELLE THOM**

EDUCATION

30 A Few More STEPs

Educating communities about the values of low impact development.

BY **KYLE MENKEN**

DEPARTMENTS

5 Editor's Note

ANDREW MACKLIN on why we need to change Canada's attitude towards water reuse.

6 Front

Canada Joins the Global Ocean Alliance, A "C" Grade for Flood Preparedness

33 People & Events

Appointments, announcements, and event report

34 H2Opinion

COVID-19, Wastewater Monitoring, and Ethics

BY **SIMRAN CHATTHA**

Water is in the Dutch DNA

Given its location, the Netherlands has a history of facing and solving unique water challenges. Perhaps more than any other sector, the water sector is fundamental to Dutch culture and character. With nearly two-thirds of its land situated below sea level, the Dutch have learned to regard water as a friend rather than a foe, and this approach has enabled the Netherlands to develop a dynamic watertech innovation ecosystem.

The Netherlands is finding international partners in Water Technology

The Dutch embassy network in Canada works towards expanding Dutch watertech companies' business opportunities, and enabling key markets, such as Canada, to benefit from these innovations. In order to do so, the Embassy in Ottawa and Consulates-General in Toronto and Vancouver, regularly engage with Dutch companies, knowledge institutes, and organizations.

One such organization is Water Alliance, which is a network of public and private companies, government agencies, and knowledge institutes involved in the water tech sector in the Netherlands. Water Alliance is based at WaterCampus Leeuwarden, the hub of the Dutch water technology sector, and has the ambition to play a sector-uniting role for the rest of Europe as well.



As an innovation ecosystem, the WaterCampus is an excellent example of the way in which the Dutch are seeking to innovate the water tech sector. The WaterCampus brings together a complete chain of innovation for water technology: from first ideas to research & development, from specialized laboratories to a water application centre and various demo sites, and from launching customers to, ultimately, the creation of tangible business.

WaterCampus helps companies to find the best way through the innovation chain to cover their needs and speed up their developments. WaterCampus stimulates cooperation between national and international businesses, knowledge institutes and governments within the water technology sector, in order to create synergy for world class innovation, education and entrepreneurship. This serves to strengthen the global position of the European water technology sector. Additionally, WaterCampus offers a unique research infrastructure, and is a meeting point for scientists and companies from all over Europe. The international cooperation organized and stimulated by WaterCampus Leeuwarden leads to knowledge, talent and entrepreneurship that contribute to solutions to global water problems.

Be inspired by our approach and let's collaborate

Today's water challenges call for cooperation and the exchange of knowledge and expertise. The Dutch water sector invites you to team up to find the best solutions for our changing world.

Visit: www.netherlandsandyou.nl/canada

"We coordinate, stimulate, initiate and connect. We bring market parties together with the ultimate goal of valorisation and export of water technology knowledge and the further reinforcement of WaterCampus as the European Water Technology Hub."

Water Alliance director,
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Pass Me a Pint!

BY ANDREW MACKLIN

THERE IS A NEW BEER available for sale in Calgary, and it's like nothing Alberta has ever seen before. Village ACWA Blonde, brewed by Village Brewery, is a limited run ale produced with reused water.

The partnership between the brewery, the University of Calgary's Advancing Canadian Water Assets (ACWA), and Xylem Inc. is important, as it demonstrates in Canada that wastewater can be cleaned for human consumption.

This was made possible, in part, thanks to Alberta Health Services' Safe Healthy Environments (AHS-SHE), which provided guidance for the creation of the water safety plan for the project. It helped to define what the benchmarks were in order to ensure that the water, once treated, met drinking water standards for the province.

Similar systems are already in use in other global markets, ones where water scarcity precipitates that water reuse is a part of everyday life in order to sustain life. Countries like Israel, Singapore, Jordan, and Saudi Arabia are among the well-known examples of where this technology is in place.

However, there is a stigma around water reuse, not just in Canada, but many first-world countries. These countries have the technology in place for effective treatment of drinking water and wastewater and don't feel the need for water reuse systems, or feel that they have an overabundance of water resources so scarcity is not an issue. The idea of drinking treated wastewater is seen as 'gross' or 'disgusting' despite being commonplace all over the world.

But with the impacts of climate change becoming more and more

severe, regions of some of the aforementioned countries, including Canada, are seeing significant drought periods, creating a real need for a new approach to water reuse. We have already seen this in parts of the United States, where greater acceptance of water reuse has been driven by drought conditions, but it hasn't hit Canadian soil just yet, at least not from my perspective.

So how do we end the stigma? First, I think we need to institute policy and governance around water reuse across the country, just like the work done by AHS-SHE in Alberta. Second, we need to ensure that our municipal water professionals, government officials, and the general public are made aware of the safety of water reuse, with an understanding of just how the technology works. And third, we need champions, people who can help spread the word about the quality of water reuse.

Perhaps it starts with beer. For me, it certainly did. I was skeptical myself about water reuse, until I had a glass of beer at last year's WEFTEC event in Chicago, beer that was brewed in a similar fashion to the Village ACWA Blonde Ale.

So let's raise a glass, and start to educate the rest of the country about the value of water reuse. And if anyone is travelling from Calgary to Toronto any time soon, please bring me back a six-pack of the newest ale from Village Brewery. **WC**

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WaterCanada

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PG. 14

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PG. 18

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PG. 22

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PG. 30

ABOUT THE COVER

Disruptive events come in many forms, from pandemics and chemical leaks, to cyberattacks and system malfunctions.

Is your water system secure and ready for what comes next?

Read more on page 10.

Coming up in the next issue:
NOVEMBER/DECEMBER

THE SCIENCE OF WATER

Drinking Water Regulation



Fuel from Wastewater



Changes to Freshwaters



PLUS: Columns, news and insights, coverage on the industry's biggest events, people on the move, and more.

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CANADA HAS JOINED the Global Ocean Alliance, according to an announcement made by Bernadette Jordan, the minister of fisheries, oceans, and the Canadian Coast Guard.

"Our oceans provide a wealth of opportunity when approached from the position of sustainability and environmental stewardship," said Minister Jordan. "Canada is proud to join the Global Ocean Alliance, working alongside like-minded countries to advocate for our shared vision of sustainable, healthy oceans around the world."

Canada is an ocean nation with the longest coastline in the world. Canadians rely on healthy marine ecosystems to sustain our economy, our food supply, and our coastal communities. But the ocean is a shared resource that requires a global

effort to ensure marine conservation. That is why the Government of Canada is joining other countries to advocate for international action to increase conservation and protection of our oceans by 2030.

The goal of the Global Ocean Alliance is to advocate for the protection of at least 30 per cent of the world's oceans through the establishment of marine protected areas and other effective area-based marine conservation measures by 2030.

"We have made exceptional progress on protecting our own waters, and it is time to move the goal post ahead and reach even farther," said Jordan. "Canadians expect our government to be a global leader in environmental protection, and this partnership is another way we will use our voice, leadership, and resources to protect our oceans and make a difference around the world." **wc**

Share your story about the Canadian water industry with Water Canada!

Email Managing Editor Andrew Macklin at andrew@actualmedia.ca



Report Gives Canada “C” Grade on Flood Preparedness

CANADA'S PROVINCES AND TERRITORIES received a grade of C on flood preparedness in a new report.

The Intact Centre on Climate Adaptation interviewed 139 provincial and territorial government representatives responsible for managing floods, climate-related risks, and emergency services from across all regions of Canada to calculate the grade.

A comparable study completed in 2016 resulted in a national score of C-, suggesting that Canada's preparedness to limit flood risk has showed progress over the past four years.

“Canada is heading in the right direction on flood risk protection,” said Blair Feltmate, head of the Intact Centre. “In light of effectively irreversible climate change, both the challenge and opportunity going forward will be to continue to deploy measures to limit future risk of flooding.”

Key highlights of the study include:

① Alberta, New Brunswick, Newfoundland and Labrador, Prince Edward Island, and Yukon declared that

they have incorporated the impacts of climate change into their floodplain mapping initiatives. British Columbia, Manitoba, Nova Scotia, Ontario, Quebec, and Saskatchewan only collaborate with local governments and agencies regarding the incorporation of climate change into floodplain maps.

② Provinces and territories reported significant strengths in emergency management, particularly related to maintaining flood forecasting and alert warning systems during flood events.

③ Provinces and territories showed diligence in sustainable flood management regarding effort to retain natural infrastructure, such as wetlands, within new community developments.

④ Provinces and territories indicated limited involvement to mitigate flood risk applied to the integrity of critical infrastructure, including electrical systems, telecommunication systems, highway infrastructure, integrity of pipelines, and water supply/wastewater treatment. WC

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NEWS: Durham Region Partners with Ontario Tech to Detect Second Wave of COVID-19 Pandemic.

bit.ly/COVI19SecondWave



NEWS: Beer Made from Reused Water Produced in Alberta.

bit.ly/ReusedWaterBeer



NEWS: Federal Government Announces Funding to Protect Lake Winnipeg Basin.

bit.ly/LakeWinnipegFunding



NEWS: P.E.I. Receives Report on Disaster Response Efforts Following Hurricane Dorian.

bit.ly/PEIHurricaneDorian

Bi-national Funding

Image courtesy of City of Sheboygan

In the town of Sheboygan alone, two water infrastructure replacement projects along the Lake Michigan shoreline will cost \$42 million USD to replace.

Inset: Mayor Michael Vandersteen of Sheboygan, WI.



Call for stimulus funding to protect Canadian and American water resources.

BY ANDREW MACKLIN

IN JULY, 2020, the Great Lakes and St. Lawrence Cities Initiative called on governments on both sides of the border to include water restoration funding as part of the impending infrastructure stimulus packages. Major cities on both sides of the border that are part of the organization include Toronto, Montreal, Hamilton, Windsor, Detroit, Chicago, and Milwaukee.

“We have an immediate opportunity to invest in dozens of important water infrastructure projects in communities across the eight-state, two-province Great Lakes and St. Lawrence region,” said Mayor Walter Sendzik, vice chair of the Great Lakes and St. Lawrence Cities Initiative. “Coastal communities across the Great Lakes and St. Lawrence region are heavily impacted by erosion, flooding and other effects from high lake levels and extreme weather events and Great Lakes water levels are at all-time highs.”

To better appreciate what that entails, and where the immediate needs for funding lie, Water Canada sat

down with the chair of Great Lakes and St. Lawrence Cities Initiative, Mayor Michael Vandersteen of Sheboygan, Wisconsin.

First of all, can you provide some background on what exactly the organization is?

The Great Lakes and St. Lawrence Cities Initiative is a group of almost 100 mayors from around the Great Lakes and St. Lawrence region. It's a bi-national organization, and it has been in place for about 16 years at this time.

Our major focus this year is infrastructure and erosion mitigation. We are calling on the U.S. Congress and (Canadian) parliament to include funding for water restoration priorities in upcoming stimulus programs. Our priorities are to fund safeguarding drinking water with modernized clean water infrastructure. This includes our wastewater treatment plants, our

water utilities. Many of these systems are very, very old, and some of them are right on the edge of our lakes. And so, they are being challenged by the high water situations, and not only do we need to protect those, but we need to keep up with the replacement (of the infrastructure).

And then, we want to help communities respond to the coastal erosion and the impacts of extreme weather events. The Great Lakes are at one of the highest levels I've ever seen, and it's really causing a lot of problems along the lakeshore: our beaches are disappearing, our bluffs are sliding in to the water, and it's challenging much of the revetments and other things we have to keep the wake in its place. And communities need to respond to that to protect themselves and eliminate some flooding.

What is the greatest need for investment in the Great Lakes and St. Lawrence region?

The most immediate need is the flooding

mitigation. That's the challenge right now because of the high water. We are going to need several years of drier conditions in order for that lake level to subside. We'll also need some years of very cold weather to cut down on the evaporation in the winter months.

Are there specific projects that need to receive targeted funding, or is the focus more on the general need for new infrastructure in certain sectors?

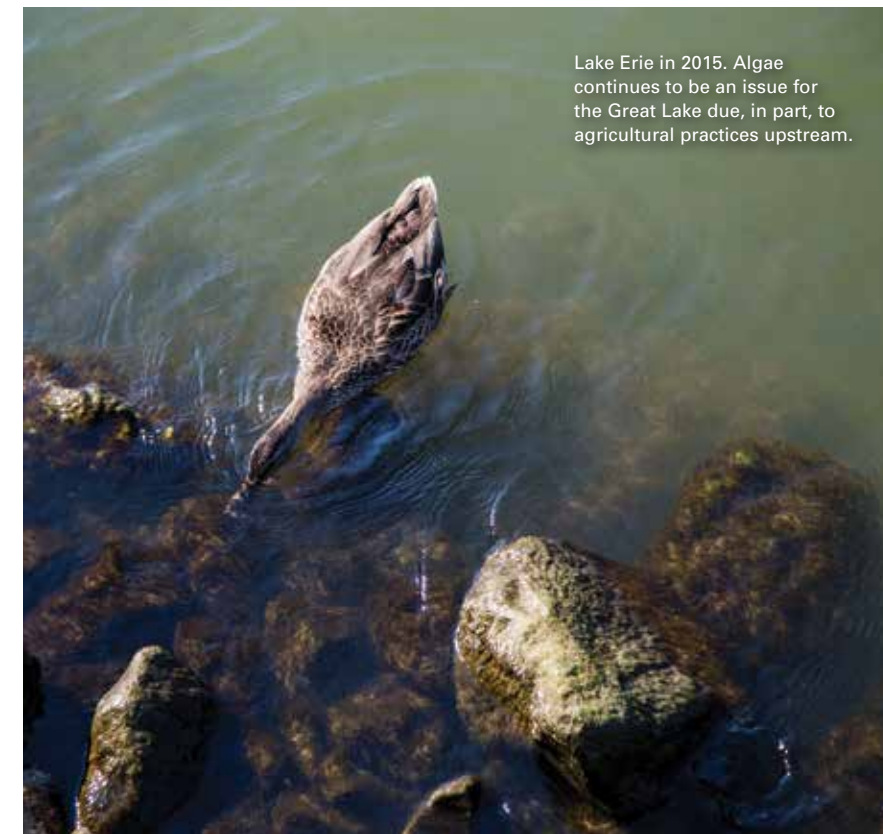
What we did in order to help our discussions out with Congress was that we asked all of the cities that participate to take a survey and give us information on the projects that they have ready to go. And we've specifically identified \$500 million in projects for coastal erosion mitigation. We feel that, given certain formulas, that we create over 400,000 jobs in the region if all of those were approved and under construction.

There's a greater need that we've estimated to be about \$20.5 billion for water infrastructure, including this erosion mitigation, for future projects. Just in my city (Sheboygan is on the west side of Lake Michigan almost 60 miles north of Milwaukee), we've got a 100-year-old water intake to Lake Michigan into our water utility and that needs to be replaced. That'll be a \$29 million project. And on the south side of our city we have a sewer line that's right along the lake's edge, and again that's being challenged by the high water so that needs to be reinforced and re-lined, because the line is about sixty years old. So those are just two projects in this one municipality, and that last one is about a \$13 million project.

How much of this investment needs to look inland, looking at the impacts of the rivers and streams that are feeding into the Great Lakes and the St. Lawrence?

I think that the rivers are going higher as well, so that's causing flooding upstream in many of those rivers.

There is the phosphorous problem, and that's something that goes further. We have to look at convincing people in the agricultural industry to change their practices so not all of that phosphorous



Lake Erie in 2015. Algae continues to be an issue for the Great Lake due, in part, to agricultural practices upstream.

goes downstream and gets into the lake. Lake Erie is the one that is having the biggest problem with that right now, and Lake Erie is a shallower body of water, so it's affecting it much quicker.

There's elements of that problem that exist in Lake Superior, Lake Michigan, and some of the other lakes as well. And so, it's a growing problem that, if we don't address it in these larger lakes, we'll have a bigger problem every year.

Where do you stand right now with trying to get the government to support your funding requests?

The Senate has resisted some of our ask. They feel that they've appropriated quite a bit of money in the first COVID bill, but there were so many restrictions on it, many communities couldn't use that money for some of these projects. They're talking about maybe loosening the requirements that are on those monies. So that may help a little bit, but we still need another program down the road. There's a new project coming out of FEMA called RISK (Risk Mapping, Assessment and Planning or Risk MAP); that might give us a way to fund some of

these projects. And there's also another that's coming through, I think they're calling it STORMS. Both of those could give us some further help but they're probably not going to be approved until the next congressional year. It's nothing that is going to give us an immediate lift to help the economy.

If we don't take care of those erosion and flooding problems it's just going to make things worse. It has been proven that a dollar that has been spent today to prevent these issues is going to save you ten dollars down the road.

It's clear that there is still a lot of work to be done to convince governments on both sides of the border to invest in water infrastructure for the Great Lakes and St. Lawrence region, but thankfully there is a dedicated effort to address these issues amongst municipal leaders.

Thank you to Mayor Vandersteen for taking the time to speak with us. *wc*

Andrew Macklin is the managing editor of Water Canada.

Employees can pose a threat, unintentionally or maliciously, to the organizations they work for. Public Safety Canada has developed a report that can help organizations reduce the threat of insider risk.

Protecting Water Resources

What needs to be done to improve security and emergency management in the water sector? BY SIMRAN CHATTHA

SECURITY IS an important consideration to ensure that the water sector can reliably deliver clean, safe drinking water and to ensure that wastewater is treated to the appropriate standard before being released into the environment. This can become even more important when communities are dealing with a disaster or a “disaster within a disaster.”

To examine security and emergency preparedness in the water sector, Water Canada and the Canadian Water and Wastewater Association (CWWA) brought together three industry leaders during the first Window on Water webinar that took place on July 29, 2020.

The industry leaders included: Rob Pitcher, the manager of cyber engagement at Public Safety Canada, Greg Solecki, the director of crisis leadership—pandemic response at Sandhurst Consulting, and Ian Mcilwham, the compliance manager at the Regional Municipality of Durham.

Increasing security in the water sector

Going into the webinar, one of the

things we wanted to determine was what organizations could do to protect their systems from “threat from within.” In order to that, we first needed to be on the same page about what that meant.

“Insider risk occurs when anyone with knowledge or access to an organization’s infrastructure accidentally or maliciously misuses their access to harm the organization’s employees, customers, assets, reputation, or interests,” noted Rob Pitcher from Public Safety Canada.

Pitcher went on to provide examples of when employees accidentally or maliciously posed a threat to their organizations. One example was of Victor Boden, a wastewater operator in Australia, who became disgruntled when he was passed over for a promotion.

“When he quit the organization, he was allowed to leave with hardware that he used to access different points in and around the community where he lived,” said Pitcher. “Usernames and passwords weren’t changed. The end result was that he was able to open a number of valves in the community and he flooded the community

with millions of litres of sewage.”

This incident caused a significant amount of damage before Boden was found. To help reduce the risk of this type of incident from happening, organizations can implement recommendations provided by Public Safety Canada in a report titled Enhancing Canada’s Critical Infrastructure Resilience to Insider Risk.

In particular, the report recommends that organizations should “develop clear security policies and procedures.” As a part of this process, Pitcher recommended that passwords should be changed anytime sometime leaves the organization or changes their job, even if it is within the same organization.

As was the case in Boden’s example, some employees have intentionally posed a security risk using the access they were provided through their jobs. In other cases, employees have unintentionally posed a risk.

Pitcher provided an example of when there was an attack against a Ukrainian power plant. The attack, which took place in two phases, was somewhat

complicated. However, according to Pitcher, the initial incident that led to the security breach wasn't complicated.

A targeted email was sent to a number of organizations and an individual opened the file that was attached to the email. The file "infected the system," according to Pitcher. "The adversary then moved within the system, did a recon of what the environment was, and developed an attack in the end."

"There's a really good video on YouTube where operators are sitting in the control room trying to run their mouse but there was someone else actually moving the mouse and opening the valves," added Pitcher. "In the end, power was shut off for more than 100,000 people. The incident caused a lot of damage. Two years later, the attackers went back and did it all again. This could have been prevented with some good cyber security hygiene."

In order to reduce the likelihood of this type of incident happening, the report by Public Safety Canada recommends that organizations "develop and promote a culture of security and vigilance by encouraging employees to say something if they see something."

In the case of the Ukrainian power plant, the organization might have been able to act more quickly if the employee had reported that he or she had received an email and opened the malicious file. However, "that didn't happen and it went from A to Z—power was shut down to a whole country. This is an example of how an incident can scale and escalate quickly."

Emergency management in the water sector

Following Pitcher's presentation, Greg Solecki from Sandhurst Consulting spoke about managing the "disaster within the disaster."

"We always have to start with identifying our potential hazards," said Solecki. "That's why some entities were prepared [for the COVID-19 pandemic]."

During the pandemic, some communities have been responding to additional hazards like flooding. "We're talking about evacuations that have to occur because you want to move people outside the danger zone," said Solecki.

However, evacuations can't take place like they have been over the past few

years because the virus that causes COVID-19 spreads when people are close together. "We now have to figure out multiple evacuation sites, multiple reception centres, multiple evacuation routes even," said Solecki.

Incident leadership is an approach that can be used to deal with the disaster within a disaster because it provides a "good way" to organize staff.

"You're really looking at a way of prioritizing your areas of need, looking at problems to solve, objectives, assigning people to those objectives, strategizing them, and going down to the tactical level," said Solecki. "That really gives us an opportunity to organize ourselves and communicate as best we can."

In March 2020, Solecki worked with two First Nations that recognized that they needed some more robust plans. "One First Nation had an integrated water supply with water operators [...] versus another First Nation that had to truck in water all the time," said Solecki.

Something that came up during the discussion about critical infrastructure was that in the event a community needed support during pandemic, it might not get the support right away because most other communities would also be dealing the pandemic.

"We looked at, from the water side, how are you going to get your water? As mentioned, it's a very essential service that all human beings need to stay alive," said Solecki. "We were able to have the right people in the room and talk about that. What happens if a water operator isn't able to make it [to work]? How much water is needed for firefighting and fire supply? What about wastewater? What happens if we need to have some Porta Potties?"

Once the planning was complete, Solecki's team was able to provide training on how to do things like put on masks on properly, put gloves on properly, and take them off properly as well.

Going forward, communities and workplace will need to continue thinking about how individuals can be protected from the virus that causes COVID-19 given that a second wave is expected in the Fall of 2020. According to Solecki, the water sector will need to keep certain issues in mind, including:

SECURITY RISKS

We asked participants in the Window on Security and Emergency Management webinar about what they felt was the greatest security risk for their operation. Here was what they had to say:

Computer system hack 59.1 per cent

Invasive species introduced in watershed 4.5 per cent

Foreign chemicals introduced into water supply 4.5 per cent

System shutdown due to power loss 13.5 per cent

Data breach of client/resident information 13.5 per cent

Other 4.5 per cent

1 Communications: This includes sharing the same message with both internal and external stakeholders to "keep everyone safe."

2 Physical distancing: Workplaces should consider questions such as: Are employees travelling together? If so, are they wearing masks? Are they wearing gloves? Are they wiping down any areas that are being touched?

3 Personal Protective Equipment (PPE) and Supplies: This includes key supplies that are required to keep businesses and organizations running.

4 Preparing for the Disaster within a Disaster: Some important work has been done to develop business continuity plans and COVID-19 procedures. According to Solecki, this work should be continued as communities have to deal with things like major fires, flooding events, supply issues, and watermain breaks. WC



Simran Chattha is the associate editor of Water Canada.



The CSA Group is developing a new stormwater standard that is intended to help municipalities “reduce risk and improve efficiencies within internal processes and procedures.”

CSA Group

Setting a New Standard

CSA Group aims to help municipalities tackle challenges associated with managing stormwater systems. BY LYNN BARBER AND BRIAN ZUPANCIC

STORMWATER SYSTEMS are a critical component of community infrastructure, but managing them is not always a straight forward exercise. In 2020, the CSA Group started the development of CSA W211, Management Standard for Stormwater Systems, which is a new standard aimed at helping those who operate and/or have authority over municipal stormwater management systems. This brief article illustrates the key challenges with the current national stormwater management landscape and outlines the benefits of this incoming standards to users.

Stormwater systems are often required to meet varying levels of service. Sometimes the system crosses regulatory or jurisdictional boundaries, making joint management difficult. The age and complexity of stormwater systems, and the level of population intensification taking place around them, can also weigh heavily on their effective management within a community. There are other complicating factors at play, like politics, that can misalign with the realities of stormwater systems and their constraints. Similarly, stormwater operators are constantly under environmental impact

scrutiny because of the sediments and pollutants transported through the system to receiving water bodies.

The challenges associated with stormwater system management are further complicated when you consider the current oversight responsibility structure. From system planning to maintenance and monitoring, the management of different aspects of the system typically falls to provinces, territories, and municipalities. It isn't always clear who is in charge of what. This is also true within municipalities where multiple departments have responsibilities related to stormwater. Such discrepancy can lead to disagreements over things like level of service, risk tolerance, maintenance priorities, or water quality targets.

To make matters even worse, stormwater system management is saddled with two major obstacles: changes in rainfall and the lack of standardized methodologies for stormwater system management.

Flooding is a growing problem across Canada. In many communities, the stormwater system is decades old. It is also not typically designed to withstand huge fluctuations in terms of the frequency and intensity of precipitation events. In addition, population intensification, particularly in urban areas with combined storm and wastewater infrastructure, is

Standards have the ability to enact positive, long-term change in the way people and industry act and conduct business.

taxing stormwater systems with higher service demands.

Issues like these lead to more frequent flooding, which in turn leads to property damage, loss of services and critical infrastructure, and health risks. Likewise, flooding presents incredible challenges for stormwater managers in terms of making decisions about where and how to invest in system upgrades and flood mitigation, and generally how to help make the community more resilient to flooding.

The absence of well-defined, consistent

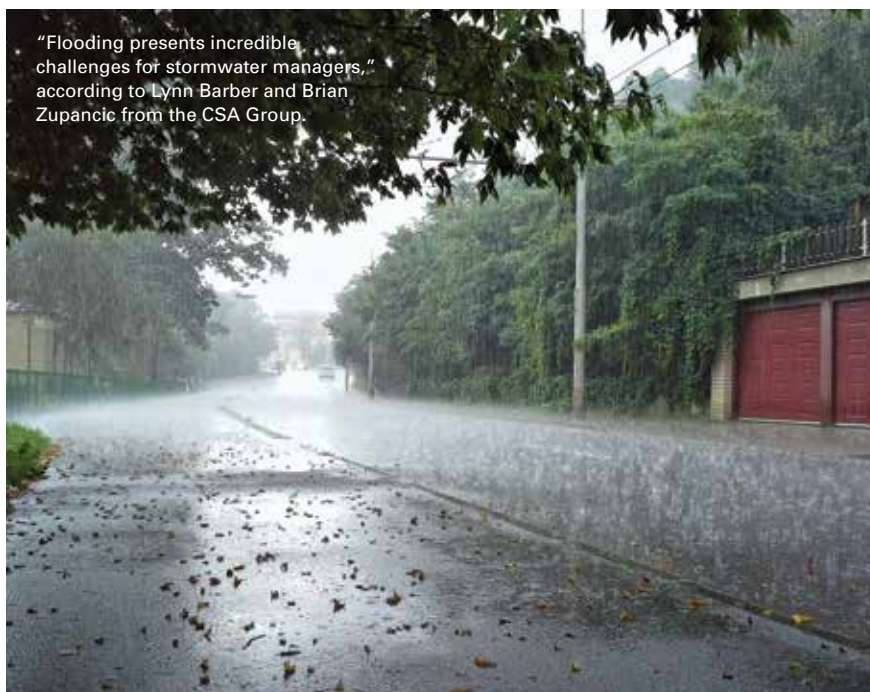
processes that outline the roles and responsibilities associated with stormwater system management, along with other management best practices, are often cited as ongoing challenges faced by operators and regulators alike. Such a process, if implemented correctly, can not only help iron out the kinks that exist in the current responsibility and oversight structure, it can help decision-makers both plan for and respond to flooding.

The new Management Standard for Stormwater Systems being developed by the CSA Group is intended to provide a framework that identifies a set of consistent processes a stormwater system owner can use to control major business processes. It is also intended to support the regulatory framework applicable to a system. The new standard will incorporate concepts from other existing Management Standards (e.g. ISO 14001) tailored to meet the needs of the stormwater sector.

With system resiliency and process improvement as guiding objectives, CSA W211 will, among other things, emphasize the importance of:

- ❶ The key policies and procedures needed for the effective management of a stormwater system.
- ❷ Identifying and mitigating public safety, environmental, and economic risks to the system using proactive and preventative management strategies.
- ❸ Establishing and documenting management procedures.
- ❹ Clearly identifying roles and responsibilities.
- ❺ Ensuring ongoing continual improvement of the stormwater system.

This standard, if adopted by municipalities in their internal policy and guidance documents, is intended to help reduce risk and improve efficiencies within internal processes and procedures. This is especially true for urban stormwater systems as there are limited standards or methodologies for municipal staff and decision-makers to determine acceptable levels of risk



"Flooding presents incredible challenges for stormwater managers," according to Lynn Barber and Brian Zupancic from the CSA Group.

associated with the management of their systems or set appropriate levels of service. The standard takes the high-level approach that what happens in a part of the watershed can impact surrounding municipalities. The standard also calls for communication and awareness with neighbouring municipalities to facilitate the management of their own systems.

To that end, CSA W211 will contain a set of minimum provisions that are intended to be simply and be effectively implemented across stormwater management processes, including system operations and maintenance. Moreover, CSA W211, like many standards, is being developed to be flexible so that it can be broadly applied. It is also being designed to be adaptable as system operators look ahead and see changes on the horizon in terms of climate, land use, and population density changes.

Concluding thoughts

Standards have the ability to enact positive, long-term change in the way people and industry act and conduct business.

The CSA Group's Management Standard for Stormwater Systems is being developed by experts in the field from across Canada, and as such is written to be compatible with existing ways of doing things in local jurisdictions

across the country. Another value is that the standard is being written in a way that will provide requirement-based direction to the user.

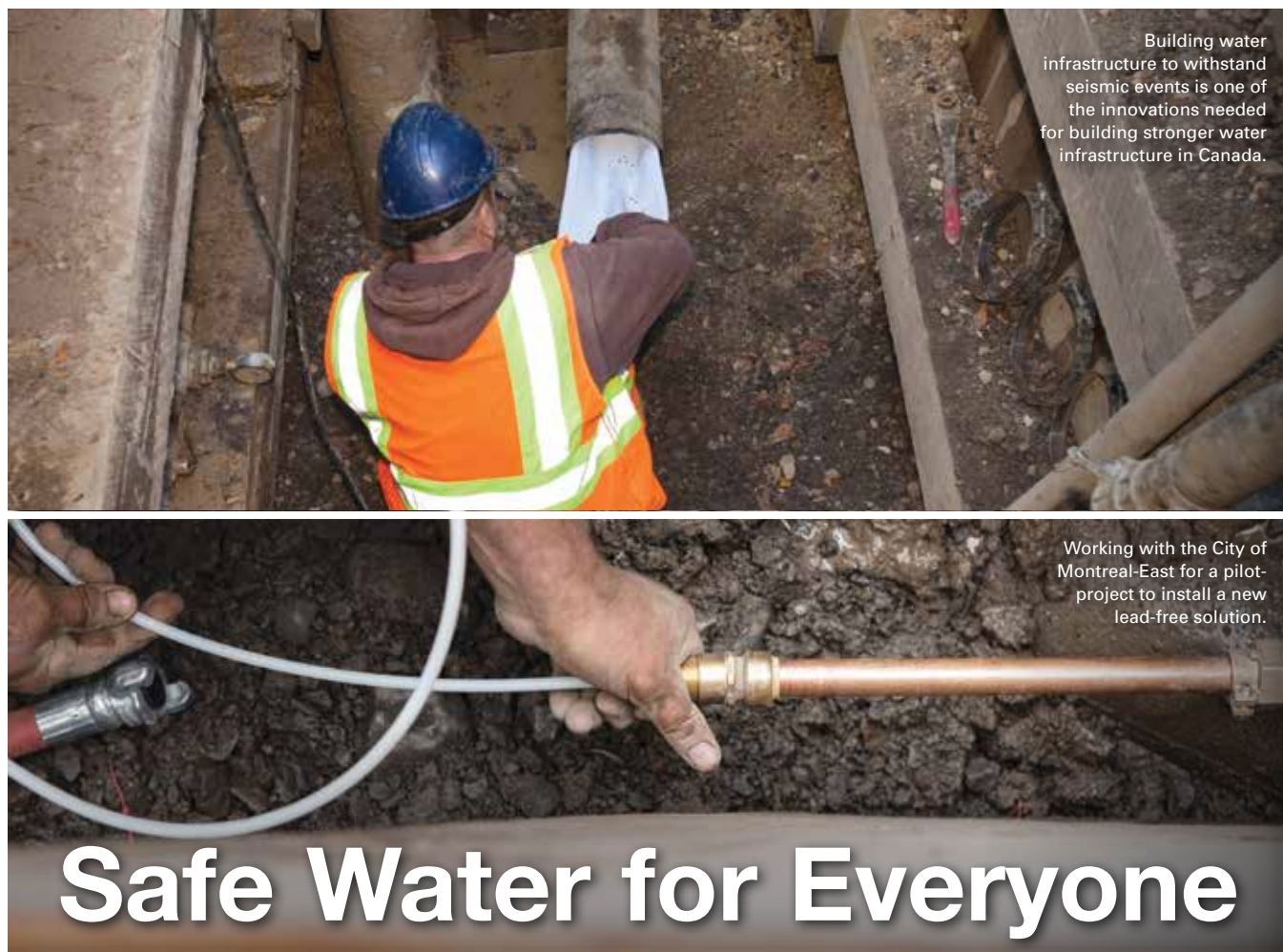
In summary, standards are different than guidance manuals and research documents and should be treated for what they are. Standards are unifying procedural documents that can break down old, inefficient ways of doing things. They can also usher in a common set of expectations that drive efficiency and consistency.

The content for CSA W211 is currently under development. Those interested in providing feedback on the document are encouraged to do so when the Public Review period begins January 2021. Final publication of CSA W211 is scheduled for the fall of 2021. For further information, please contact Lynn Barber (lynn.barber@csagroup.org). WC



Lynn Barber is a project manager, natural resources, at the CSA Group.

Brian Zupancic is a project manager, natural resources, at the CSA Group.



Safe Water for Everyone

Implementing innovative and sustainable solutions for water infrastructure.

BY MARTIN BUREAU

THOUGH THE WORLD was turned upside down with the arrival of the pandemic this spring, we took the opportunity to reflect on ourselves as a company, as a team, and as leaders in environment and water technology, through the good times and the bad. It really solidified what we already knew—that we are truly deeply connected to our customers and our communities and we play an important role in transforming challenges into opportunities.

With or without a pandemic, several issues with our water infrastructure remain, the problem of lead in drinking water being a serious one.

What innovation means to us

When we talk about innovation, we think of it this way: innovative solutions are developed from a need or a challenge that our customers and communities

are facing that has yet to be met. It can be a broad challenge (crumbling water infrastructure and shrinking budgets) to more specific (lead in drinking water). Finding an innovative solution means that there may need to be some changes in processes, in technology and in approach so that it will yield a measurable commercial impact. When it comes to the health and safety of our communities, we believe in listening and learning and, with the support of governments and policymakers, that now is the time to capitalize on innovation to maximize the return on infrastructure renewal programs aimed at the economic recovery.

Turning challenges into opportunities

In a recent *Renew Canada* article,

Michael S. Burke, chairman and CEO of AECOM had three recommendations regarding infrastructure investments that should apply to all projects today, big and small: 1) act now, 2) remove hurdles, and 3) establish flexible procurement. What he is said is that the time has come to review and streamline processes to allow for projects to move ahead with greater speed and efficiency, which should reduce costs in the end and provide better and innovative solutions. This is why we believe in the importance of collaboration with all parties, from the beginning to the end. We are working with various departments of the federal government, provinces, and provinces and municipalities to reduce duplicate efforts, backlogs, and undue administrative burden for solution providers. We want to find ways

to work together and to open doors.

Another challenge is that contracts are often awarded mainly based on (lowest) costs, giving little consideration to environmental or societal impacts, supply chain nature and location, or life cycle analysis, sustainability, and resiliency of the solutions proposed. This can lead to innovative solutions getting cut from the list early on, resulting in status quo project delivery, with municipalities missing out on the incredible long-term and sustainable benefits that would be more cost-effective in the end.

Exceptional circumstances like the post-Second World War Marshall Plan or the current pandemic response offer unique out-of-the-box problem-solving conditions to reevaluate the way we spend taxpayers money. That means getting more for every dollar invested because our society currently does not have the funding capacity to meet all of our infrastructure renewal needs if we continue to use traditional approach. We need to make sure that innovative solutions make it to the table and are seen and heard and given the right amount of attention during the bidding process.

That is where innovative solutions come into play. For instance, the health and environmental issues related to lead service lines and joints in our drinking water infrastructure needs to be explored. Known for centuries to pose serious public health concerns (cf., Pompeii, A.D. 50), hundreds of thousands of Canadians are to this day still exposed to this dangerous water contaminant, and now, innovative solutions are available that could solve rapidly and economically this issue.

Canada a leader in innovative initiatives

Fortunately, Canada is an ambitious country and one that believes in the hard work and ingenuity of its people. The financing of laboratories, high tech equipment and research and development facilities over the years has allowed us to foster world-class talent. As a result of those investments, Canada offers the highest density of educated

workers in the world. The federal government has invested massively over the years in various initiatives and has committed to continue doing so as mentioned in the 2019 report Building a nation of innovators, in which it expresses its ongoing investment in various educational programs as well as the reinforcement of an innovation culture.

In Quebec, initiatives such as the College Centers for the Transfer of Technologies (CCTT), which are applied research centers affiliated with Quebec's colleges, were highly beneficial over the years for businesses, a model that has now been reproduced throughout Canada. The mandate of such college-based centers is to carry out applied research, technical assistance, training, and information dissemination activities to contribute to the development and implementation of technological innovation projects within companies and organizations. This highly flexible and focused network is helping Canadian companies to come up with innovations that benefit us all.

Building on such strengths, key ingredients can be stated for helping companies to innovate and overcome what can feel like the overwhelming challenges posed by our water infrastructure needs.

Leveraging innovative solutions

What has become clear in discussions with our customers and community leaders is that as a starting point we need to rethink the way we fund projects, and the time is now.

1 Encouraging a public-private partnerships (P3s) is an exciting way to accelerate the innovation process while mitigating the risk for all parties. A great example is SpaceX, founded by Elon Musk to revolutionize space technology, where a private company was able to answer some challenges faced by government in funding and managing space vehicle launch. Such P3s would be evaluated based on all costs, short and long term, including maintenance, end-of-life, environmental, and social. Private companies would be held accountable over time to maintain

the infrastructures, while respecting the previously established guidelines by the public entities. This reform would benefit all parties, first and foremost taxpayers.

2 A shift of mentality around innovation will also be required. Governments need to believe and invest in leading companies. Start betting on winners and not hesitate to choose an innovative company that has the capacity to create real value for Canada and the rest of the world. Innovation should become a crucial criterion for decision-making.

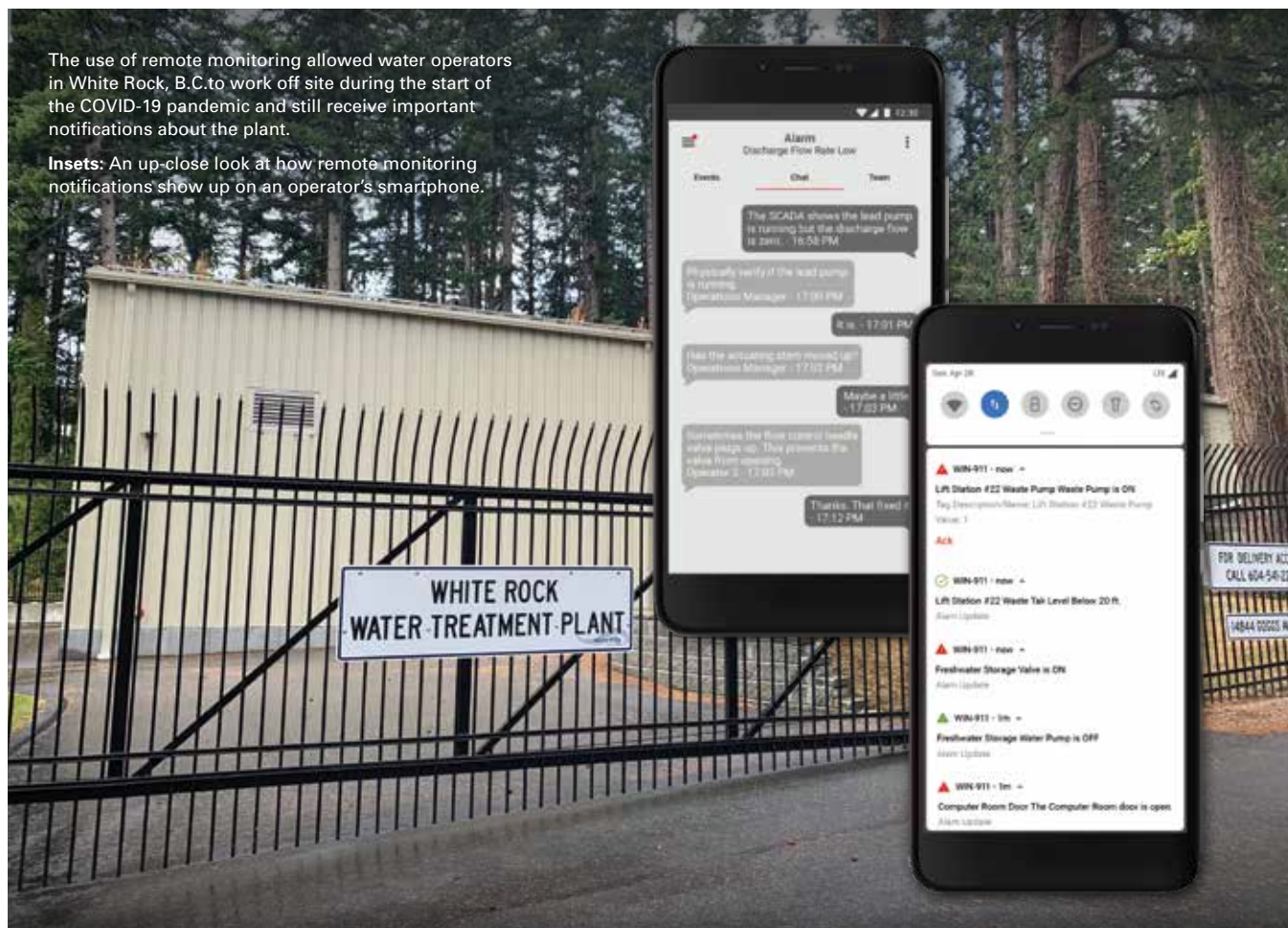
3 Continue to make sizable investments in programs that support the entire innovation cycle (from R&D to commercialization) as well as incentive programs that give a greater leeway to local governments (municipalities in particular) to exert their leadership as part of their responsibilities. An example of a successful program is the Gasoline Tax and Quebec Contribution Program (TECQ) from the Ministère des Affaires municipales et de l'Habitation, originating from an agreement the governments of Quebec and Canada for the transfer to the municipalities of Quebec of part of the revenues from the federal excise tax on gasoline and the contribution of the government of Quebec, which aims at sustainable improvements of their drinking water, wastewater, local roads and other types of infrastructure.

Coming back to innovation, we feel that there has never been a greater opportunity to build on our collective learnings of the past years in the water infrastructure industry. Changing the tender process to include a broader range of criteria such as sustainability and accountability, establishing new collaborations between the governments and the industry, continue to put talent at the forefront, having a long-term vision promoting a better return on investment could all lead to more resilient infrastructures. Changes are inevitable but we can either resist or rise to the occasion. We chose the latter, what about you? WC

Martin Bureau is the vice president of innovation at Sanexen.

The use of remote monitoring allowed water operators in White Rock, B.C. to work off site during the start of the COVID-19 pandemic and still receive important notifications about the plant.

Insets: An up-close look at how remote monitoring notifications show up on an operator's smartphone.



Keeping Employees Safe

Appreciating the benefits remote monitoring while mitigating emergencies.

BY GREG JACKSON

EVERYONE IS DEPENDENT on clean, safe drinking water and fully operational wastewater treatment facilities. To guarantee this, Public Safety Canada deemed you essential workers: “Employees and others needed to operate and maintain drinking water and wastewater/drainage infrastructure.” However, many of you are working remotely because protecting utility employee health is vital for continuing operations and making sure that main breaks, sewer line clogs and flooding doesn’t occur or can be quickly rectified.

With fewer workers onsite how can you ensure your plants don’t experience unanticipated downtime? Let’s explore the issues and solutions that can help you navigate these challenges.

Water Infrastructure

Even before the pandemic you faced many challenges because investments in water utilities, which include supply systems for distributing drinking water as well as wastewater and sewage treatment systems, have not been kept up with need. For example, the 2016 Canadian Infrastructure Report Card found that 35 per cent of Canada’s wastewater infrastructure and 29 per cent of drinking water infrastructure is in fair to very poor condition.

In cities across Canada and around the world, water infrastructure is aging rapidly and encountering failures with increasing frequency. This is challenging under

“normal” circumstances but becomes mission critical during a pandemic.

A new report released by the Forum for Leadership on Water (FLOW) urges the Canadian government to make innovative and sustainable urban water infrastructure a top priority for its 10-year, \$180 billion infrastructure plan. FLOW proposed that the federal government’s investment in water infrastructure be used to scale up sustainable solutions to urban water management, ensure water infrastructure will be safe and effective in a changing climate, and position Canada as a global innovation leader in the clean water technology and services sector, including programs for optimization and efficiency. The organization also proposes

that the government continue funding programs that help municipalities implement innovative and non-traditional approaches to upgrading and repairing water infrastructure. These include, but are not limited to, hardware and software technologies to support maintenance management and monitoring and automation ('smart' systems).

State-of-the-art digital technology helps avoid unanticipated risks. These innovations can drive significant economic and environmental improvements, and ensure continuity in service when staff are working remotely, like during this pandemic.

Remote Monitoring

New infrastructure funding yet hasn't been approved and when it does, it will take time to update the country's [infrastructure] systems. In the meantime, the need to reduce costs associated with support maintenance of the aging infrastructure is increasing the adoption of smart water management technology, including remote monitoring.

A recent report by Bluefield Research, "Focus Report, Water Industry 4.0: U.S. & Canada Digital Water Market Forecast, 2019-2030," presents an analysis of the U.S. and Canadian digital water market. This report cites that annual capital expenditures for digital water solutions will rise from \$5.4 billion in 2019 to \$10.8 billion in 2030, setting the stage for more advanced monitoring and management of critical infrastructure.

Under increased and unprecedented pressure to do more with less, and to find new means of paying for infrastructure, water owners and operators recognize that it is essential to understand and optimize the capacity of their assets. One way they can do this is through the use of remote monitoring and notification software, which allows fewer people to monitor many more assets using devices that people already have, such as smartphones and tablets. Uninterrupted remote availability is essential to ensure that systems can be continuously monitored, even without staff onsite or with very few people working at the facility.

Upgrading your monitoring system might even be funded through Infrastructure Canada's new Clean Water

and Wastewater Fund. In addition to delivering support for provincial, territorial, and municipal water and wastewater priorities, the federal government will fund up to 50 per cent of eligible costs for projects, such as optimization and improved asset management, including studies and pilot projects related to innovative and transformative technologies.

The benefits of utilizing a remote monitoring and notification software system via a mobile app include:

- ① Streamlines decision making. Push notifications let you quickly see what is wrong, send an acknowledgment, and monitor alarm condition changes in real-time, right from your smartphone.
- ② Promotes team problem solving. Chat helps your entire team converse, brainstorm, and share solutions on-the-fly, from wherever they are—whether in the plant, at home, or on the road.
- ③ Work more efficiently. Team Visibility shows you who has seen an alarm as well as who has acknowledged it, reducing guesswork and redundant responses.
- ④ Multiple communication channel support. Ensuring resiliency through voice notification and SMS messaging in the event of internet connectivity issues.

Remote monitoring in action

For 40 years, White Rock's almost 20,000 residents depended on private utility companies that owned and operated the city's water infrastructure. After realizing more transparency and greater investments were needed, the city acquired the utility in 2015. Since then, White Rock has taken many steps to improve the water quality, including increasing water storage capacity by 33 per cent, investing nearly \$12 million to construct a water quality treatment plant, and completing a health-mandated secondary disinfection throughout the entire distribution system.

Along with the new water treatment facility, the community relies on three reservoirs, four pump stations and four

pressure release valves to ensure the water coming into residents' homes and businesses is safe.

Prior to purchasing and operating the utility in 2015, very little investment was made to infrastructure upgrades. The utility operated on an old SCADA platform utilizing robotic voice remote software that ran on unreliable phone lines. This caused many problems, including providing inaccurate telemetry and overflowing reservoirs.

Remote monitoring upgrade

In 2018, White Rock began implementing a Water Master Plan that coincided with the water quality treatment plant construction. City leaders knew this was the perfect time to upgrade the SCADA platform and integrate a more robust remote monitoring and notification software system. After thorough research, the city selected the GE iFIX Dual SCADA and WIN-911 Interactive as a solution, to push critical plant alarms and event details to remote workers via SMS Text Message.

"We needed a modern software notification system that could dependably monitor the city's water quality, levels, pump stations, electrical components and flow controls; we didn't have this with the previous software," commented Chris Zota, IT manager at the City of White Rock.

Implementing the latest alarm notification platform has provided a centralized and unified system that integrates well with the SCADA platform. Additionally, it improves safety, reduces workers response times and delivers information quickly.

"COVID-19 forced all of our workers offsite from March through June", Zota added. "Because of the system, we received important notifications via our tablets or smart phones and were able to fix any problems remotely, ensuring emergencies didn't occur and avoiding any unplanned downtime." wc



Greg Jackson is CEO of Austin, TX-based WIN-911.

The 84-megawatt Pine Falls hydroelectric station is one of 15 hydropower assets owned by Manitoba Hydro, which in total can generate over 5,600 MW of clean power for the province.

COURTESY, MANITOBA HYDRO

Tuning Up Waterpower

Optimizing existing infrastructure to send more power to the grid.

BY XENIA HÉBERT

CANADA HAS GENERATED ELECTRICITY

from the kinetic energy of flowing water since the days of the horse and buggy. And while our energy systems have of course utterly transformed since the 19th century, the individual components at the heart of every waterpower station—such as the turbine runner and shaft, and the generator rotor and stator—remain largely similar. With regular care, hundreds of such stations have been reliably and affordably doing their thing, for decade after decade, without so much as a blip.

That said, many of the waterpower stations within Canada's extensive fleet are now entering their golden years. And even the best-cared-for and most durable generating units eventually need a tune up or outright replacement.

"This equipment has a life, like the engine in your car," explained Mike Martelli, Ontario Power Generation's president of renewable generation. Martelli oversees the crown corporation's 66 waterpower stations, with a collective capacity of about 7.5 gigawatts of renewable electricity.

"From time to time, you have to change your car's oil," Martelli said. "But if you keep it long enough, you eventually have to change the engine as well."

Metaphorically speaking, that's exactly what is happening at a number of Canadian hydroelectricity producers. They've embarked upon a series of revitalization projects to overhaul, replace, and upgrade equipment and infrastructure. In doing so, some are finding hundreds of fresh megawatts, or more, of generation capacity at their existing sites.

As provinces move to introduce climate policies that reduce fossil fuel combustion in electricity generation, transportation, industry, buildings, and elsewhere, they will seek out new power with ultra-low greenhouse gas emissions. Which is, of course, exactly what waterpower offers.

"Almost every Canadian waterpower generator is preparing for the inevitable decarbonisation and electrification of the economy, and examining the opportunity to leverage as much additional capacity

as they can from existing waterpower stations," explained Anne-Raphaëlle Audouin, president of WaterPower Canada, the national trade association for hydroelectricity producers in Canada.

"There are thousands of megawatts of potential new waterpower generation capacity waiting to be harnessed in Canada, just from refurbishing and redeveloping existing generation units and sites," added Audouin. "The additional hydroelectricity produced can be delivered at a lower cost than most—if not all—other options for new supply."

Ontario retools its fleet

Ontario Power Generation (OPG) serves roughly half of the province's electricity load. A good number of its 66 waterpower stations came online in the 1950s; many are more than a hundred years old.

That's the case with Ranney Falls, a small early-20th century station on the Trent River, which flows into Lake Ontario. Following a system-wide assessment, OPG opted to expand the facility to produce more power from the

same site, explained Martelli. The utility extended the existing dam by 40-feet and built a new powerhouse—and, in doing so, literally doubled the generation capacity at the site.

A new hydroelectric turbine runner boosted Ranney Falls' total capacity from 10 to 20 megawatts; the original powerhouse still hosts two original five-megawatt generating units that date to 1922. After receiving upgrades in 2006, it's still going strong and will continue to do so, long into the future.

"The beauty and the benefit of these improvements is that we're getting more energy and capacity from the same water. We are not disturbing the environment, we're making use of existing infrastructure and technology improvements to squeeze out more energy," said Martelli.

Martelli reckons that the company has achieved an impressive additional 600 megawatts of capacity at existing sites in the past 20 years, and there's more to

come: "I suspect there is at least another 500 megawatts out there waiting to be harvested in Ontario."

Manitoba pours on the power

In 1914, the Winnipeg Electric Railway company began building the Great Falls Generating Station on the Winnipeg River to supply juice to its streetcar network. After a pause in construction following Canada's entry into World War I, the power plant's generator units first began humming in 1923. Today, it's one of the Crown utility's oldest generating stations and is still providing valuable service.

The utility began an overhaul program more than 30 years ago, explained Manitoba Hydro spokesperson Bruce Owen. "Some of our plants could be described as 'legacy,' and replacing these units, either in part or in whole, gives us an opportunity to introduce modern equipment that increases the amount of electricity we generate, while also keeping things safe for our staff."

In the case of Great Falls station, Manitoba Hydro ordered new, more efficient turbine components to be designed and manufactured to fit the exact available space. It also installed new power transformers to handle the increased generation capacity.

More recently, Manitoba Hydro removed and replaced unit four's original draft tube liner, a tube mounted at the exit of a runner that receives water after passing through the turbine. The utility replaced the original unit with a higher-output turbine runner and components.

"The work required us to cut and extract 10 sections of unit four's draft tube liner, each 30,000 pounds, via overhead crane, and replace it, too," said Owen.

The overhaul extended unit four's life by another 40 to 50 years, and increased power output capacity by 30 per cent, from 20 to 26 megawatts. Manitoba Hydro did similar work on unit three at Great Falls about a decade ago, increasing its output by approximately 16 per cent.



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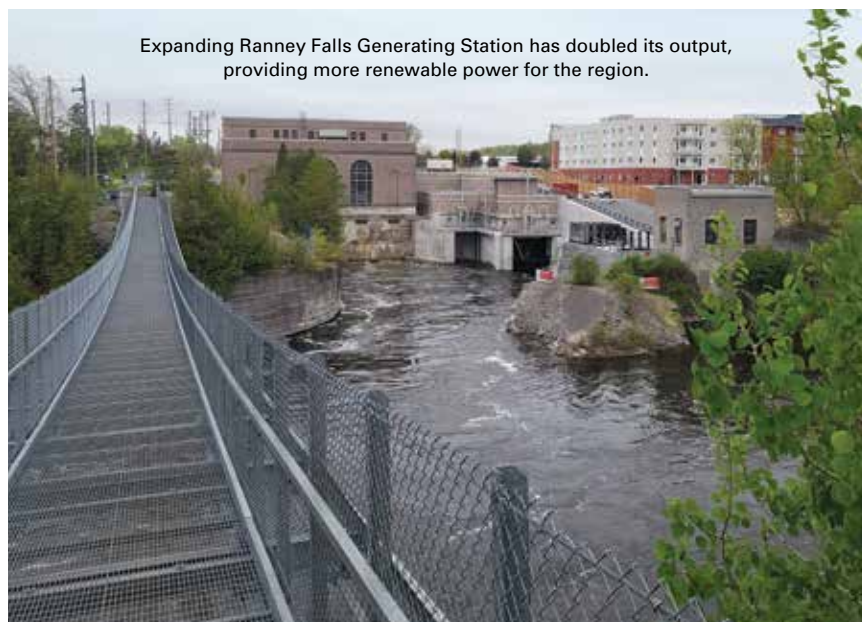
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Expanding Ranney Falls Generating Station has doubled its output, providing more renewable power for the region.

Some refurbishments call for only modest teams and equipment. Others are daunting, such as installing new turbine runners at Kelsey Generating Station, on the Nelson River, about 90-kilometers northeast of Thompson.

Manitoba Hydro built Kelsey to supply electricity to Thompson, and to mining and smelting operations in the area. The utility connected the generating station to the province's electrical system in 1961, six years after its completion. The rehabilitation job was so extensive that the crown corporation needed to build a 60-person construction camp on site in 2006, prior to work starting.

Five of Kelsey's seven generating units underwent extensive rehabilitation work. The utility installed more efficient turbine runners, replaced steel liners, and rewound the generators' rotor and stator assemblies. The Kelsey overhaul increased the station's capacity by 84 megawatts.

That's the equivalent output of a sizable new waterpower station—except, of course, no new generating station was needed to make it.

Refreshing a piece of Quebec's history

Since 1934, when water first roared through its six massive turbines, the Rapide-Blanc generating station has reliably produced clean and renewable electrons.

In the almost nine decades that have

since passed, engineers have fastidiously maintained all of Rapide-Blanc's parts to keep the 209-megawatt station running flawlessly. But eventually, even the best-loved equipment will reach the end of its service life.

Hydro-Québec, a provincial crown utility, is poised to begin a major \$610 million overhaul of Rapide-Blanc. The project will last seven years, and involve swapping out the station's massive generating units, refurbishing its intake gates, draft tubes, switchgear, control gear, auxiliary mechanical equipment, auxiliary transformers, and the station building.

"Fifty-five per cent of our plants are more than 40 years old," said Simon Racicot-Daignault, Hydro-Québec's senior director of generation and maintenance. He oversees all the of utility's generating stations and dams.

"We need to be really strategic to make sure we invest at the right time. That is going to become more and more important with the decarbonization of the grids in the United States Northeast underway," he said.

Racicot-Daignault said that reliability is a key factor when deciding which stations to work on next. "We have a very rigorous diagnostics program, every single asset is frequently evaluated by our team," he said. "Reliability is really key for us, especially in today's world with the energy transition ongoing and the coming of new renewable sources."

Racicot-Daignault believes waterpower will play a key role in decarbonization, because other renewable energy resources are variable.

Of course, the dollars and cents need to add up as well. "When we have an aging fleet like ours, we need to be confident we can do the refurbishments and still produce electricity at the same price," said Racicot-Daignault.

Hydro-Québec has completed preliminary work at Rapide-Blanc; the big job is now underway and will continue through to 2026. Les Québécois consider their crown utility something of a provincial treasure, and widely regard Rapide-Blanc as an important heritage asset. The Rapide-Blanc project is the current focus of what will be at least a decade of refurbishments and upgrades around the entire Hydro-Québec system; the utility will complete the last of the current wave of projects around 2022.

And for all of them, the utility will be keeping social license front-of-mind. "We always look at the social acceptability of a given proposal," Racicot-Daignault noted. "If you are [going to be] putting more water through a station, you need to make sure you have the social license to do so."

Hydro-Québec has long partnered with the Cree in the James Bay region. "When we do an expansion, it is always in conjunction with the Indigenous people," said Racicot-Daignault. "We are on their territory, and need to agree on how we do it, and how we are going to treat the river."

The utility doesn't necessarily plan on building new green field generating stations for the foreseeable future; investments in existing plants tops the list. Decisions regarding the need for more power production will be made around 2022, in accordance with local and export demand.

Meanwhile, there is a lot of work ahead, and nobody will even know it's underway. "Ideally, you would never stop the turbine units," said Racicot-Daignault. "As long as you run, life is good." WC

This story originally appeared in the May/June 2020 edition of our sister publication ReNew Canada.

Xenia Hébert is the communications and event coordinator at Waterpower Canada.



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The BEAST of Bezanson



The two 1,200-litre bioreactors installed in Bezanson, Alberta.

Inset: The exterior of the system, as shown in its environment in northern Alberta.

New innovations in wastewater treatment. BY SEAN IRWIN

THE BEAST (Bioelectrochemical Anaerobic Sewage Treatment; Tartakovsky et al. 2018) is a novel sewage technology developed by the National Research Council (NRC) Canada. The process involves using an electrically conductive medium such as carbon pellets to create a surface upon which anaerobic bacteria can form a biofilm. A low voltage (1.4-volt) is then applied to the carbon pellets creating an electron flow and enhancing the ability of the anaerobic bacteria to metabolize organic waste. The anode becomes the final electron acceptor for the microbes' energy metabolism pathways.

To pilot test this technology, two 1,200-litre bioreactors have been installed in a cargo container in Bezanson, Alberta (a community of 500 people located 400-kilometres northwest of Edmonton), where they draw directly from municipal wastewater. The pilot project is a partnership between the County of Grande Prairie, Elkan Environmental

Engineering, and the NRC with support from the Grande Prairie Regional Innovation Network (GPRIN). The ultimate goal is to install a 24-cubic-metre scaled-up version of the BEAST (presently under construction) to treat Bezanson's wastewater and reduce the amount of sludge that is entering the community's sewage lagoon while developing a system that can be applied to other northern and remote communities.

The bioreactors have presented an opportunity to test other wastewater technologies as well. Two other technologies were used to analyze the effluent from the BEAST for carbon waste: a biosensor consisting of a microbial fuel cell (MFC) provided by the NRC and an L50 PeCOD (photoelectric chemical oxygen demand) analyzer (supplied by Guelph, Ont.-based

Mantech Inc.). The results of the biosensor analysis will be presented by the NRC in a separate publication. The effluent from the BEAST was analyzed over a five-month period using these technologies. Initially only Reactor A was used, but at eleven weeks the second reactor (Reactor B) was connected in series. The flow-rate through the bioreactor(s) was increased

The ultimate goal is to install a 24-cubic-metre scaled-up version of the BEAST to treat Bezanson's wastewater.

from 72-to-1560-liters per day, resulting in a wide range of organic wastes entering the reactors.

The PeCOD analyzer uses a photoelectric process to oxidize the soluble organic carbon and create an electron flow. This electron flow can

be quantified to give a measure of the amount of carbon waste in the effluent. A complete sample analysis with calibration takes approximately 30 minutes. The majority of the effluent samples had a low visual turbidity and none of the samples were filtered prior to analysis.

The chemical oxygen demand (COD) and five-day biochemical oxygen demand (BOD₅) of the effluent were also analyzed by a commercial lab, ALS Environmental, using standard APHA procedures (APHA, 1995).

The figures demonstrate a good correlation between the PeCOD values and both the COD and the BOD₅. As well, the BEAST consistently produced effluent that contained less than the provincial standard of 25 mg/L of carbonaceous waste as measured by the BOD₅ test. This was especially true for flow rates less than 1,200-litres/day. The two data points circled on the graph of the PeCOD values plotted against the laboratory BOD₅ values were "outliers" with unusually high BOD₅ values. One possible explanation for these high values is that the effluent flow from Reactor B varies depending on the pump that is feeding it from Reactor A. The pump is controlled by a float. When the pump is activated the increased effluent flow from Reactor B may include organic sediments that have settled in the effluent line.

In conclusion, the PeCOD provided a rapid analysis and demonstrated a good correlation with COD and BOD₅ values from a commercial lab. The PeCOD calibration procedure seems underestimate the COD values of municipal wastewater which may be corrected in the future by adjustments to the standard calibration curve. With further research it may be possible to reduce the number of BOD₅ tests required by provincial regulators by providing alternative testing measures which are faster and more cost-effective, such as the PeCOD COD analyzer. WC

Sean Irwin is the acting chair of science at Grande Prairie Regional College.

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Baby wipes continue to be flushed down toilets even though the wipes do not break down when they are disposed of in this way.

Poor Compliance

Wipe manufacturers of baby wipes aren't producing truly flushable products.

BY ROB VILLÉE, BARRY ORR, BROOKE NORTHEY, AND SARA TEASDALE

AN AREA OF CONCERN for both wastewater systems and the environment in general is the manufacturer's lack of transparency with the consumer. This includes the absence of clear and prominent Do Not Flush (DNF) on-package labeling, as well as the totally absent information that almost all baby wipes are made of plastic or synthetic (regenerated cellulose) fibers. While other products like laundry detergent pods have consistent warning labels across the brands, the Association of Nonwoven Fabrics Industry (INDA) and its members have fought against such commonality for their baby wipes. Regarding the fiber composition, clothing labels list the fiber types so that the consumer can make an informed purchasing decision. In baby wipes this information is not available to the consumer on the packaging ingredients label and, at best, takes considerable effort to get that information from the brand owner.

After examining 120 individual packages of wipes, it is clear that

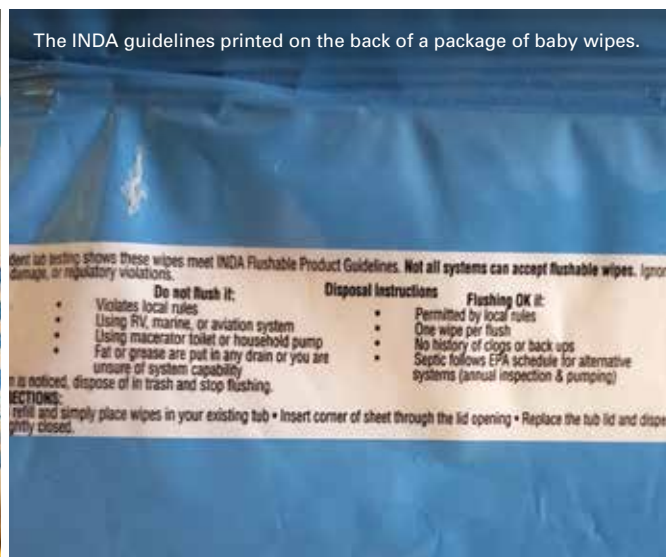
manufacturer's compliance with the INDA/EDANA (Association of the Nonwoven Fabrics Industry (INDA) and The European Disposables and Nonwovens Association (EDANA)) 2017/2nd Edition Labeling Code of Practice (CoP) (2) could easily be categorized as abysmal. More than two-and-a-half years after the manufacturers agreed to the CoP, and close to a year after it was implemented, only 10 per cent can be considered in compliance with the placement, size, and contrast requirements for the DNF Symbol, and almost 40 per cent of the products still do not carry any DNF symbol at all, on either the top or front panel, as required by the CoP. Although the other 60 per cent of the packages showed some sort of compliance with the CoP, typically having a DNF symbol on the top panel, very few also comply with the CoP requirements regarding DNF symbol size and contrast. And none carry the optional, detailed disposal language allowed by the CoP.

In response to the growing plastics in

the marine environment problem, the European Union (EU) issued a Single Use Plastics Directive in 2018 and confirmed it in 2019. In the directive, personal use disposable wipes, such as baby wipes and flushable wipes, were categorized as single use plastics. He adapted definition of plastics therefore covers polymer-based rubber items and bio-based and biodegradable plastics regardless of whether they are derived from biomass or are intended to biodegrade over time. Since this definition covers "plant-based" or regenerated cellulose fibers, it brings almost all "flushable" wipes and baby wipes under its scope. "Flushable" wipes contain 20-30 per cent regenerated cellulose fibers like rayon, viscose, lyocell, Tencel, etc. and baby wipes are either plastic, regenerated cellulose or a combination of those fibers. As part of the EU recommendations, starting in July 2020, these products are going to be required to be labeled that they contain plastics, and a consumer education program regarding their proper disposal initiated.



A container of laundry pods showing the clear warning symbols. These are the kind of symbols that should be adopted for baby wipes, including one that tells people not to flush the product.



The INDA guidelines printed on the back of a package of baby wipes.

The lack of consumer understanding of the Do Not Flush (DNF) instruction stems from various issues with packaging requirements, including the lack of uniformity in the placement, size, and specifically the color of the DNF symbol, along with varying levels of compliance of the INDA/EDANA CoP for DNF labeling by individual manufacturers. Additionally, the inability of INDA/EDANA to force, or enforce, compliance from even its members, raises serious

proper disposal method for our products is one of the most important things we can do to help ensure that only those products designed and marketed to be disposed of via the toilet are flushed. This is why we created the labeling Code of Practice and the “Do Not Flush” symbol which accompany the Guidelines.

However, based on the study often cited by INDA “Forensic Evaluation of Non-Dispersables New York City Law Department”, where baby wipes make up

63.5 per cent of the wipes recovered, this talk is just that: talk but no action. Although this study does not look at the education portion of these promises, it certainly shows that the labeling

portion based on the CoP is far from what is promised by INDA, and the results of that non-compliance are showing up as baby wipes in the sewer systems.

Even more egregiously, “flushable” wipes (which are often made by the same manufacturers that produce baby wipes) contained plenty of flushing instructions, whereas the baby wipes that are not designed to be flushed contained minimal instruction, if any. On baby wipes packaging, the most common disposal instruction was “Do Not Flush” in, at best, two-millimetre-high text. Most commonly this instruction was found on the bottom panel where it is not readily seen. Only nine packages

had this instruction on the top panel. By comparison, flushable wipes universally had the instruction: “Only Flush One Wipe at a Time” on the packaging. In fact, many packages go way beyond that and have paragraphs or charts informing the consumer under what condition(s) these products should, or should not, be flushed. This often includes not flushing them in basement or household pumps; which is curious because the Household Pump test is one of the seven tests a flushable-labeled product must pass according to the manufacturer’s own guidelines, INDA/EDANA Guidelines for Assessing the Flushability and Disposable Nonwoven Products 3rd Edition/GD3(4) and 4th Edition/GD4(5).

The international wastewater organizations do not consider the terms “flushable”, or “sewer safe” wipe, as a valid confirmation that these products can be safely disposed of via the toilet since the test methodology (GD4) used by the manufacturers was created unilaterally by the manufacturers over the objections of the North American wastewater industry. In October 2019, the UK Advertising Standards Authority, in an action with Kimberly Clark, agreed with the wastewater industry that basing the word ‘flushable’ solely on the manufacturer created INDA/EDANA GD4, when there were other accreditations such as the UK Water Industry Standard (WIS) available, was misleading. The inclusion of this flushable wipe language is simply an

It could be argued, that many have gone to great lengths to hide that baby wipes are not to be flushed as a method of disposal.

concerns that the wipes manufacturing industry can effectively regulate itself. Both the INDA website www.inda.org and the Introduction to the CoP contain wording that promises the help of the brand owners to properly and clearly label non-flushable products and provide consumer education:

The labeling Code of Practice (2017) includes guidelines on when and how to use the ‘Do Not Flush’ symbol. For products that have a high likelihood of being flushed, but that are not designed to be flushed, the “Do Not Flush” symbol should appear clearly on the packaging as outlined in the labeling Code of Practice.

We believe educating consumers on the

example that manufacturers can, and do put detailed instructions on their packaging when it is in their own best interest to do so.

The instructions on flushable wipes go far beyond that and essentially indemnify the manufacturer unless this is a brand-new home and you have never washed your dishes (fat or grease are put in any drain...). The absence of any of these instructions, or conditional flushability instructions, are noticeably absent from toilet paper, which is universally understood to be flushable by the consumer.

During the negotiations for the 2017 CoP, the manufacturers resisted a common DNF symbol citing "brand individuality" as the reason. However, existing commercial products already have the same, across brands, Do-Not-Do-Something labeling that could be used as a model for baby wipes packaging. That product is the Laundry Detergent Pod category. In this category, all the manufacturers have large symbols with

bold red lines, and a written instruction that starts with the word "WARNING." This universal red circle with a slash symbol immediately catches the eye of the consumer and is reinforced by the word "WARNING."

The manufacturers could have greatly improved how they convey that baby wipes are not flushable just by complying with the labeling CoP they agreed to in 2017. However, based on this study, they have not. In fact, it could be argued, that many have gone to great lengths to hide that baby wipes are not to be flushed as a method of disposal. Manufacturers should instead convey to consumers that these products are not flushable by agreeing to adopt a warning design similar to the Laundry Detergent Pod category. In addition, manufacturers should adopt a truly transparent ingredient label, similar to the clothing manufacturers, that lists the fiber type(s) contained in the substrate or expand the current European labeling

on the Kimberly Clark Huggies wipes to include that it contains plastics in addition to the 65 per cent cellulose/wood pulp already listed. Another option would be to adopt the European Union Single Use Plastic labeling requirement (Proposed for 2020).

However, if they do not make these changes, it appears that the only effective remedy will be through a regulatory/legislative process that modifies the INDA Labeling CoP and makes proper labeling mandatory. **wc**



Rob Villée is a retired executive director of a utility based in New Jersey, USA, Barry Orr is the sewer outreach and control inspector for the City of London. Brooke Northey and Sara Teasdale were summer students at the City of London.

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Educating people on how F.O.G.'s should be disposed was an important part of the public education campaign.

Inset: Stu Wardle conducts effluent sampling for the City of Markham in early 2019.

F.O.G. Clogs

Educating the community on the proper disposal methods for fats, oils, and greases.'

BY DANIELLE THOM

FROM DAMAGE to private property and public infrastructure, to harmful impacts on the environment and human health, sewer backups and surcharging caused by the improper disposal of fats, oils, and grease (F.O.G.) have impacted communities throughout the country. To combat this issue several municipalities have encouraged their residents to put F.O.G. in their green bins and garbage cans instead of down drains.

But how effective have these calls to action been? The hidden nature of residential F.O.G. disposal habits makes it difficult to measure the success of educational campaigns. When used alone, traditional measurements of success such as city-wide resident surveys are not accurate because they do not provide enough quantitative data to make acute changes to educational tactics.

To overcome this barrier, the City of

Markham chose to implement a pilot project before the City-wide launch of our F.O.G. Clogs Campaign. This pilot compared the implementation of four educational strategies in seven pilot communities through a unique three-step evaluation method. Using this information, we have created the most efficient, economical campaign possible for our city. The campaign strategies that we have developed since the pilot project for our community will not be effective in all municipalities across the country, but we hope that our evaluation method will be a useful tool for other municipalities as they plan their F.O.G. awareness campaigns.

The evaluation method

Step 1: Pre-education monitoring

Pre-education monitoring measured residential F.O.G. disposal habits before

the implementation of any educational strategies. This created a baseline of both qualitative and quantitative results by using four tools in each pilot community:

- 1 **Resident Focus Groups:** Discuss knowledge of F.O.G. products, F.O.G. disposal habits, and barriers to proper F.O.G. disposal.
- 2 **Online Resident Surveys:** Measure household knowledge of F.O.G. products and F.O.G. disposal habits.
- 3 **Baseline Effluent Sampling:** Test for total oil and grease (T.O.G.) twice, using the average value as the baseline monitoring number.
- 4 **Baseline Green Bin Waste Audits:** Weigh green bins and green carts in each community, and then subtract the weight of the bin or cart. Use this value as the baseline monitoring number.

Step 2: F.O.G. disposal education administration

Once pre-education monitoring was completed, each pilot community was classified as either a multi-residential community (MR) or a single-detached home neighbourhood (SD). This distinction was made so that we could give each group-specific F.O.G. disposal instructions on educational handouts.

Once the two groups were made, we administered one of four education tactics to each community:

- 1 **Education administration & F.O.G. kit distribution (MR):** Present tenants with an educational handout and distribute a kit containing a F.O.G. collection cup, sink strainer and sponge to each household.
- 2 **Education administration & F.O.G. collection cup distribution (MR & SD):** Present residents with an educational handout and distribute a F.O.G. collection cup to each household.
- 3 **Education administration only (MR & SD):** Distribute an educational handout to each household.
- 4 **No education administration or F.O.G. resource distribution (MR & SD):** Control group.

Step 3: Post-education monitoring

After the F.O.G. educational materials were distributed the pilot communities, post-education monitoring was undertaken in the same manner as the pre-education monitoring. Like pre-education monitoring, this involved using a combination of residential surveys, two effluent samples, and one green bin waste audit in each pilot community. These results were then compared to the pre-educational monitoring results. An educational tactic was deemed as successful if:

- Residential surveys showed an increase in general F.O.G. knowledge.
- Effluent samples showed a decrease in T.O.G. levels, and.
- Green bin audits showed an average increase in green bin weight.

Pilot program conclusions

Upon the completion of the pilot program, it was concluded that education alone

(i.e. Option C) was the most efficient method of F.O.G. public outreach for residents living in the City of Markham. This was the only method wherein all three criteria of success were met.

With this knowledge, we chose to create an educational campaign focused on developing diverse avenues of communication rather than purchasing large amounts of campaign materials. Our core messaging was streamlined to three target actions (wiping, scrapping, and pouring F.O.G. into an organics bin), and extra time was spent to create cheeky campaign commercials with an air of local “viral-ness”. These core messages and commercials were conveyed through several forms of citywide media including:

- Weekly city page
- Monthly city page
- Static displays
- Public and staff boards
- Community centre washroom posters
- F.O.G. branded swag (cups, sponges, sink strainers)
- Markham Like Magazine
- Campaign commercials
- Cineplex VIP Markham pre-show campaign commercials
- Portal landing page
- Paid and organic social media
- City of Markham eNews & eBlast
- Digital marquees
- Electronic information boards
- Mayor & Council newsletters and social media content
- F.O.G. photobooth
- Mobile signs
- Education booth at city and community events
- Miller waste truck decals
- On-hold messaging (City Contact Centre)

General conclusions

By carrying out an extensive pilot project, we were able to launch a tailored educational campaign dubbed the “F.O.G. Clogs Campaign”

in April 2019. In the year that has followed, we have seen the following benefits in our diverse communities:

- Average 55 per cent decrease in residential sewer backup calls received by the City of Markham Contact Centre.
- Average 15 per cent decrease of F.O.G. found in effluent samples from pilot project communities.
- Average two per cent increase of total organics weight in pilot project communities.
- 4,683 F.O.G. cups given to residents;
- 160 Get to Know H2O presentations (with F.O.G. being a topic) to +3,900 attendees.
- Over 200,000 commercial views by residents (social media, website, Cineplex).
- Over 14,000 residents at education booth, with F.O.G. being the main focus.
- 103,147 visitors to the F.O.G. Clogs Campaign website.
- Regularly contacted by households and condo owners for F.O.G. handouts and kits.
- Contacted by schools to include F.O.G. into presentation material for Get to Know H2O.
- General interest and discussion at our education booth at City and community events;
- Discussions with residents on ways to reduce F.O.G. and proper disposal.
- Waterworks Operations and Maintenance section has noticed a decrease in F.O.G. related residential backups.

Moving through 2020 and into 2021, we plan on executing a second wave of F.O.G. educational efforts and re-evaluating the efficiency of our approach using our three-step monitoring system. WC

Danielle Thom is the water conservation program assistant for environmental services at the City of Markham.



Permeable pavement and raingarden at the Ray Twinney Recreation Centre in Newmarket



The bioswale created at Forest Glen Road in Newmarket.

A Few More STEPs

Understanding the economics of low impact development. BY KYLE MENKEN

MUNICIPALITIES ACROSS CANADA

face a familiar list of stormwater management challenges: aging and inadequate stormwater infrastructure, the threat of increasing flood damages, climate change, and the unintended consequences of past urban development. A business-as-usual approach to stormwater management planning will result in continuing degradation of our waterways, increasing flood risk due to climate change, and a mounting infrastructure deficit. A fresh approach is needed to meet these challenges.

STEP Water advocates for a strategic, watershed-based planning approach that augments or replaces existing grey, end-of-pipe stormwater infrastructure with green infrastructure, including low impact development (LID) practices and natural assets such as forests and wetlands. Lately, STEP has turned its attention to tackling the barriers preventing this wider-scale LID implementation.

Technical feasibility and performance are not the main obstacles preventing the needed change in stormwater management planning. Rather, the costs required to make this transformation form the greatest obstacle. Significant investment is needed to transform our stormwater systems, and risk-averse municipalities unfamiliar

with LID are hesitant to make these investments without knowing that they are worthwhile.

STEP's partners have begun tackling these obstacles. The first step in any cost-benefit analysis is, of course, ensuring that cost projections are reasonable and comprehensive.

Life-cycling costing made (relatively) easy

Developed in 2013, the STEP Life-Cycle Costing Tool (LCCT) needed a refresh. In addition to updating line item costs and costing algorithms, the updated version's back end is open for users to modify, from financial assumptions to design specifications. It only takes a few basic inputs to generate realistic life-cycle costs for several BMP practices. The intent of the tool is to help users understand and calculate the cost of potential LID practices in the early planning and design phases. The LCCT is available for free at sustainabletechnologies.ca.

"As municipalities across Canada turn to LID practices for stormwater management, accurate life-cycle cost estimation will become critical for gaining buy-in from municipal councils and other funding agencies. Municipalities new to LID can capitalize on STEP's experience with the financial side of LID implementation by adapting

the LCCT to suit their needs" said Phil James, senior manager at Credit Valley Conservation.

Initial sensitivity analyses considering several LID municipal projects implemented in the Greater Toronto Area show that the tool gives results, to within ± 14 per cent of contractor bids on several STEP-led projects. STEP hopes to conduct more sensitivity analyses and make regular updates to the tool based on user input. "We're taking a new approach to updating our guidance and tools. Rather than releasing an update every five or 10 years, we're making efforts to provide more frequent updates based on user input, industry trends, and new research," said James.

An essential part of this strategy is sharing the tool with consultants. This collaboration has already produced results for both parties. STEP gets comments and feedback from industry professionals, and the consultants get a useful tool. "When it comes to providing my clients with preliminary cost estimates for green stormwater infrastructure design projects, the STEP team's Lifecycle Costing Tool is tough to beat," said Bill Trenouth, water resources engineer and project manager at AECOM.

This update to the LCCT was driven by the need to provide current, realistic

costing for two economics-focused STEP projects: CVC-led Making Green Infrastructure Mainstream and LSRCA-led Achieving Sustainable Stormwater Management.

Making green infrastructure mainstream

Most cities have limited space for stormwater management, especially in areas developed before stormwater management controls became common. This leaves municipalities with few options. They can wait for scheduled road reconstruction projects and package them together with LID retrofits, create redevelopment policies which require source controls, or purchase land for stormwater ponds.

The first two options could take decades to produce results and purchasing land for stormwater ponds is an expensive proposition.

Technical feasibility and performance are not the main obstacles preventing the needed change in stormwater management planning.

“Our research indicates that municipalities could save significantly by incentivizing private property owners to retrofit their properties for improved stormwater management, rather than working on public property only” said Kyle Vander Linden, program manager at CVC. “Not only are there potential cost savings available, but these retrofits could take place relatively quickly, allowing us to realize significant gains—including reduced overland flood risk when designed properly—in a timely fashion. As the predicted effects of climate change take hold, preparing for predicted increases in rainfall and extreme weather should happen sooner rather than later.”

This technical and financial feasibility study looks at retrofitting 13 industrial and commercial properties in south Mississauga, Ont. with communal LID infrastructure. Many properties in the study area suffer from regular nuisance ponding and the resulting eyesores and

maintenance burdens. Some have even incurred significant flood damages in the recent past.

“The updated LCCT allows us to make accurate comparisons between the public and private property scenarios, because the tool uses the same unit costs and methods to evaluate all options” said Vander Linden. “We hope to begin releasing our findings early in 2021. Stay tuned!”

Achieving sustainable stormwater management

This comparative study examines the use of scale (municipal versus watershed) and integration (municipal public property only versus public and private property) to achieve optimal SWM performance at the greatest cost-efficiency. The study is testing the hypothesis that improved environmental outcomes can be realized at lower capital and operating costs via a watershed-based approach to SWM that includes siting centralized and distributed green and grey infrastructure on both publicly-owned and privately-owned properties.

LSRCA selected the East Holland River watershed as the study area for the project. This watershed includes a mix of urban and rural land use, is undergoing growth and intensification, and falls within multiple municipal boundaries, making it an ideal test case.

The project team first developed a continuous simulation model called LSPC and calibrated it to represent current hydrology and water quality conditions within the East Holland River watershed. This current state model was then linked to SUSTAIN (System for Urban Stormwater Treatment and Analysis), a future state model developed by the U.S. EPA. SUSTAIN is a process-based decision model that continuously simulates thousands of stormwater management scenarios to generate cost-benefit curves, with benefits including reduction in phosphorus loads and water quantity. Ensuring accurate life-cycle costs for the SWM features is a critical aspect of the project, necessitating the

update to the LCCT described above.

“We’re developing a pilot LSPC-SUSTAIN model that will help municipalities within the East Holland River sub-watershed adopt a cross-jurisdictional approach to stormwater management,” said Ben Longstaff, general manager at LSRCA. “LSPC-SUSTAIN looks for spatial configurations of LID practices and other stormwater measures which provide the most stormwater quantity control and quality treatment per dollar. We are fostering next steps for municipalities to use this tool for developing equitable cost-sharing and payment for ecological service arrangements agreements to rehabilitate their shared watersheds.”

Existing SWM practices will serve as the Baseline Condition. Potential new, retrofit, and re-purposing SWM approaches will provide Optimization Options under multiple scenarios (e.g., growth, climate change, uptake rates, etc.). Optimization options include LID, natural assets (wetlands, forests, open fields, etc.), and conventional grey infrastructure on both public and private lands.

The project also calibrates the SUSTAIN models with previously established risk management flood models (developed in HYMO and HEC RAS) to provide reasonable flood-damage curve estimations. The results can be used to calculate the cost-benefit for flood risk reduction. The project team is also working toward methods for gauging the co-benefits of LID implementation, for example air quality improvements and urban heat island reduction.

Stormwater management planning needs a shakeup to avoid the outcomes we can expect with a business-as-usual approach: increasing vulnerability to flooding and continued degradation of our waterways. These two STEP projects have the potential to be transformative. **WC**

Kyle Menken is a technician in integrated water management at Credit Valley Conservation.

APPOINTED



MELANIE
NADEAU

Melanie Nadeau, P. Eng., has been appointed chief executive officer of the Centre for Ocean Ventures and Entrepreneurship (COVE).

"We are delighted to have been able to attract Melanie Nadeau to this position," said Jim King, chair of the COVE board. "She has an impressive balance of skills and experiences both nationally and internationally. We are confident she will lead COVE to even greater success."

Nadeau has extensive experience in strategic planning, operations, and stakeholder relations. She served in the Royal Canada Navy, led technology programs in Ottawa for Natural Resources Canada, and held increasingly senior positions at Emera Inc. since joining the company in 2011.

"Canada's ocean sector holds enormous potential for our region and our country," said Nadeau. "I am grateful for the opportunity and excited to lead COVE in its next stage of growth."



CHANDRA
SHARMA

The Niagara Peninsula Conservation Authority (NPCA) announced that the Board of Directors has offered current C A O - S e c r e t a r y

Treasurer, Chandra Sharma, a permanent tenure with the organization.

This decision was based on feedback from board members as well as senior staff. "It was important that staff be given the opportunity to provide input as they work with her every day, and ultimately the Board wanted to ensure they felt supported, validated, and had confidence in her abilities," said **Brenda Johnson**, chair of the NPCA Board.

"We were happy to hear that the staff felt as strongly about her leadership skills as the Board did, and we are pleased to confirm Chandra's permanent appointment as Chief

Administrative Officer-Secretary Treasurer," added Johnson.



CATHERINE
GRENIER

The Board of Directors of the Nature Conservancy of Canada (NCC) announced that **Catherine Grenier**

has been unanimously chosen as the organization's next president and chief executive officer.

"We are delighted to welcome Catherine to the Nature Conservancy of Canada," said **Elana Rosenfeld**, chair of NCC's Board of Directors. "Catherine's deep understanding of conservation, community engagement, and non-profit management is essential as we embark on a new strategic plan to implement our vision for the future of conservation in Canada."



MATT
ENGELHARDT

SHARC International Systems Inc. (SHARC Energy) announced that it has hired **Matt Engelhardt** as its chief operating officer.

"I am very excited to join the SHARC family," said Engelhardt. "I believe the opportunity for growth in wastewater heat recovery is significant and SHARC Energy's technology is at the forefront providing a cost effective, environmentally friendly system to a wide range of potential customers."

In his role as chief operating officer, Engelhardt will be using his skills, experience, and knowledge to support SHARC Energy in organizing its operations.



NICK
MOCAN

C.F. Crozier & Associates Inc. (Crozier) has announced the appointment of **Nick Mocan** as president.

"Nick has over twelve years of experience in civil engineering with a focus on water resources for land development and municipal infrastructure projects,"

according to Crozier's website. "Nick is skilled in evaluating and directing multi-faceted projects from preliminary studies to construction implementation. His technical skills in civil and water resources engineering are supported by a respected reputation for expediting project approvals through various agencies at the municipal, provincial and federal levels, as well as conservation authorities."

Nick will succeed **Chris Crozier**, founder and chief executive officer, who has held the presidency since the company's inception in 2004.

Dr. **Andrew Sanderson** has been named chief medical officer for the Water Environment Federation (WEF).

As chief medical officer, Dr. Andrew Sanderson will guide and assist WEF in providing reliable medical information to wastewater utility managers and workers, as well as conduct research and serve as a spokesperson on medical issues for the sector. He will be supported by a graduate student from Howard University.

"Clean water is a critical natural resource and public health issue," said Dr. Sanderson. "I am excited to partner with the Water Environment Federation to ensure the health and safety of its members and communities around the world." WC

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Where do we draw the line with wastewater monitoring?

BY SIMRAN CHATTHA

LOOKING AT THE HEADING, you are probably wondering why I am writing about ethics in the context of COVID-19 and wastewater monitoring. Let me explain.

I started thinking about the connection after seeing a tweet published by Charles Fishman, author of *The Big Thirst*, on August 27, 2020. In it, Fishman noted that there was “some big news out of the University of Arizona (@uarizona): UA scientists & staff found a coronavirus outbreak on campus *before it happened*—and seemed to have snuffed it out. How in the world do you do that? You use wastewater testing.”

Natasha Jansen, a wastewater professional working in Ontario, retweeted the tweet with a comment that said “interesting case study. The ethics of wastewater monitoring will be a more and more important topic.”

Ethics is a topic that is currently top-of-mind for me. As a part of my MBA program, which I started in August 2020, I took a class on Decision Making with Models and Data. An example that came

up during class was that a major bank in Canada recognized it could use the data it had to predict what people would purchase and when they would purchase it (e.g. groceries on a Sunday). However, the bank decided not to conduct that experiment because it recognized that making those predictions would be too intrusive.

Knowing this example, I wondered: is monitoring wastewater for the presence of SARS-CoV-2, the virus that causes COVID-19, too intrusive? Should you monitor wastewater for the presence of the virus because you can? Or are there other factors that you need to take into consideration?

From here I started drawing from what I learned during my course on Business Ethics. During that course, the professor, Michael Ryall, highlighted virtue ethics, which is an approach that says “some acts are intrinsically evil” and that individuals should “do good and avoid evil.” While discussing virtue ethics, Professor Ryall explored questions like “what is the context?” and “what is the intention?”

Now, back to my original question.

Is monitoring wastewater for the presence of SARS-CoV-2 too intrusive? What is the context we should be considering? What is the intention behind monitoring wastewater in this case?

I think it is evident that the information gathered through wastewater monitoring was used to “snuff” a coronavirus outbreak. This in turn meant that some individuals would not suffer the negative health effects of COVID-19 because the virus would not be spread to them under the conditions at that time. Given these factors, I think that monitoring wastewater was ethical in this case since it was intended to “do good.”

This does not necessarily mean that wastewater monitoring is always ethical. There may be cases where wastewater monitoring is unethical. At this point though, I am not aware of examples of the latter. WC

Simran Chattha is the associate editor of *Water Canada*.

A blue-tinted photograph of a water treatment plant. In the foreground, there's a large horizontal pipe with a flange. In the background, a large vertical pipe with a valve is visible, along with other industrial equipment and structures. The overall scene is industrial and technical.

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