Sandbagging is slow work requiring hundreds of helpers. There's a better way to do things

Julie Oliver / Postmedia

Geneviève Landry bought a Water Dam after the flood of 2017 to better protect her home on Leo Lane in Cumberland, sharing the $70,000 cost with a neighbour.

When floodwaters rose last month, it took two days for the neighbours to set up the massive water-filled tube because they had never done it before. When officials issued a warning that floodwaters could rise again, it looked as though the deluge might roll right over their investment. There was a collective sigh of relief when it didn't happen.

Was it worth the money and effort? Clearly, when the other alternative was sustaining serious damage to her house, said Landry.

At the height of the flood, some 800 soldiers and reservists and hundreds more volunteers were helping to bag sand, transport it to flood sites and put the bags into position. Between them, they filled and placed about 1.5 million bags of sand. Now the city has to figure out a way to divert all that sand from landfill sites.

Volunteer Rob Marshall stops for a moment in the rain at one of the vulnerable areas around Britannia Bay.

Which raises the question: Why, if we can build skyscrapers and send probes into space, are we still holding back floodwaters with low-tech sandbags and hundreds of workers? Natalia Moudrak, the director of climate resilience at the Intact Centre on Climate Adaptation at the University of Waterloo, would like to know the answer to that.

“It takes forever to do it. You break your back. You need lots of volunteers. And the sand becomes contaminated, so you have to dispose of it,” she said.

Sandbagging was used by the military to build trenches during the First World War. Soldiers are still trained to sandbag efficiently. Sandbagging to prevent flooding works just like sandbagging to build a bunker.

“From a military point of view, sandbagging is an easy, transferable skill. It’s just combating water instead of bullets and explosions,” said Maj. Alastair Klima of 2 Combat Engineer Regiment, based in Petawawa. “It’s quite a useful way to protect entire structures. It’s low-technology. It’s effective.”

A wall of sandbags protects a home on Rue de Versailles. Ashley Fraser / Postmedia

But Moudrak argues there are products that hold back floodwaters with fewer workers, less time and no sand. The one drawback is that they’re more expensive — although they’re designed to be used multiple times.

Moudrak points to a demonstration she saw recently of a rapid-deployment flood mitigation product called Water-Gate, a temporary dam developed by Quebec-based MegaSecur. The flood drill, held by a realty firm on the grounds of one of its Calgary properties, demonstrated how the Water-Gate could deployed around an area the size of

five city blocks by a team of two within the space of a few hours.

Moudrak was impressed. She pitched in with the exercise, and found she could do the work, even in stilettos. The Water-Gate is self-inflating. It rises as floodwaters rush into gill-like compartments in the PVC barrier, creating a strong dam. There's no need of a power supply.

"The water does all the work," said Moudrak. "It's mind-boggling why we don't embrace this made-in-Canada technology. The efficient solution is right under our noses."

The flood barrier business is growing by the day. Gerry Mann is the national sales director of New Jersey-based Portadam, which has produced temporary dams that protect infrastructure for about 35 years. The demand for flood control products has quadrupled in the past six months alone, he said.

"I'm 63. I can't remember this level of flooding in so many different places. The number is probably changing by the day."

Chris Troughton has been a mortgage agent and a limo driver for the Ottawa Senators. He became the Canadian distributor for Floodstop Barrier, a modular system of plastic pods that fit together, after helping friends sandbag in Constance Bay and Gatineau in 2017.

"I figured there had to be a better way to do it. The definition of insanity is doing the same thing over and over again and expecting different results," he said. "You're never going to get rid of sandbags, but if you can reduce their use by 50 per cent …"

Troughton said his website got 20,000 hits during the flooding in Ottawa, and he has produced more than 25 active quotes in the last few weeks— all for people who want flood protection for their homes.

Canadian military hard at work along Bayview Dr as 1RCR from Petawawa beginning assisting with sandbagging in Constance Bay. Wayne Cuddington / Postmedia

Many flood-control companies contend that buying their products makes better economic and environmental sense in the long-run.

Calgary-based Tiger Dam, for example, estimates that a mile of sandbags four feet high would cost more than $2.16 million US and use almost 1.6 million sandbags at a cost of $7.65 US per bag (this price is based on a calculation by the U.S. Army Corps of Engineers and is widely used in the flood protection industry). That's the equivalent of 106 of Tiger Dam's temporary dams at a cost of about $423,000 US, says the company.

But some in the business say convincing municipalities to buy protection in case there's another flood can be a hard sell.

Trevor Wright, Tiger Dam's senior procurement manager, said he's been traveling all over Eastern Canada visiting flood sites, including Constance Bay. It's frustrating, he said. "Our product could have helped and saved communities under water."

Municipalities still rely on sandbags and sand-based systems, said Adam Goldberg, director of New York operations at AquaFence, which has been used around the world. "Sand is dirty and messy. We are able to provide a product that creates no harms after the fact."

Goldberg believes municipalities fear they will bear scrutiny if they choose to pay for a flood protection system. "If you use local sands and trucks, all the money goes back to the local economy. Nobody is going to lose their job if they get sandbags," he said.

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In fact, spending significant amounts of money on flood protection products for a flood that might or might not happen can be politically tricky. Manitoba Infrastructure and Transportation Minister Steve Ashton ended up in hot water after a report by the province's ombudsman said Manitoba "lacked sufficient justification" to buy $5 million in Tiger Dams after civil servants were directed to waive the competitive tendering process in 2014. The opposition called on Manitoba Premier Greg Selinger to remove Ashton from cabinet.

Is Ottawa thinking about buying rapid deployment flood prevention devices for future use? The city will only say that it will be conducting a thorough review of the 2019 flood response, and will be sharing its findings once the review is completed.

Here are some of the solutions developed by engineers to prevent flooding more efficiently than sandbagging.

The Water-Gate, a portable flood-prevention device, in used during 2019 flooding in Rigaud Quebec. jpg

Water-Gate

What is it: Manufactured in Victoriaville, Que. by MegaSecur, the Water-Gate is a PVC barrier that comes rolled up. It is now sold in 37 countries, mostly to commercial, industrial and government clients.

How does it work? The user unrolls the dam, then unfolds the front part which has

compartments that fill with water. A small, galvanized steel plate forms the ballast. As the water accumulates in the gills, the barrier molds to the terrain and forms a dam that secures itself in place. The Water-Gate is "self-rising" and does not need to be filled with water or inflated with air, and it doesn't have to be anchored. Founder Daniel Déry has more than a dozen patents on the product and even demonstrated using the Water-Gate to stop a creek in Texas. Within a half hour, the side downstream of the barrier was completely dry.

Pros and cons: Water-Gate can be deployed quickly by two people without any tools. It comes in various heights and can be put up in any configuration. It's also reusable. "It is too easy to use. People don't believe what this product can do," said general manager Julie Théberge. Costs depend on size, but one Rigaud, Que. homeowner who used it to surround his home from rising floodwaters said he paid $43,000. Water-Gate is one of only four temporary flood barrier products to be certified by the U.S. National Flood Barrier Testing and Certification Program after rigorous testing.

City of Regina crews fill large collapsible lined frames known as HESCO barriers for flood protection in April, 2013. ROY ANTAL / THE CANADIAN PRESS

HESCO Bastion "concertainer"

What is it? HESCO Bastion is a rapidly deployable barrier system for military fortification and flood control using a gabion system — mesh boxes filled with sand or earth. The system has been used in conflict zones since 1991.

How does it work? The metal mesh containers are lined with heavy-duty

polypropylene geotextile. The containers are filled with sand, soil or gravel, usually with a front-end loader. The placement of the barrier is generally very similar to the placement of a sandbag barrier or earth berm except that typically room is needed for the equipment used to fill the boxes.

Procs and cons: The containers are collapsible, so they can be easily transported, both to and from the site after use and are quick and easy for large-scale projects. It's preferable to use a front-end loader to fill the container, but if there is no room to manoeuvre, the filling can be done by hand. HESCO Bastion hit the news on April 30 after a temporary levee failed in downtown Davenport, Iowa, allowing floodwaters from the Mississippi River to spill into portions of the downtown core. The company said its initial investigation suggests that either the road surface beneath the barriers gave way because of flooding or the river crested over the barrier. "Our investigation so far suggests that there was no structural fault of the barrier."

Genevieve Landry and her neighbours spent $70,000 on this inflatable water-filled barrier. jpg

AquaDam

What is it? AquaDam uses floodwaters to create an impermeable barrier.

How does it work? The dam consists of two water-tight tubes inside a woven outer sleeve. When filled with floodwaters, it creates a water-filled barrier.

Pros and cons: The company says its tubes are 10 times faster to install than sandbag dikes, take far fewer people and are typically 25 per cent cheaper than the cost of a

similar sandbag dike. The dams can be drained and stored for reuse. However, the user has to know when the flood will crest. “To use a flood control dam like this requires that you have a reasonable estimate of what the flood crest will be and where the dams need to be placed to hold back this flood crest. AquaDams cannot be topped by water or they can float away,” says the company.

The WaterFence is a portable flood barrier developed in Norway. jpg

AquaFence

What is it? Developed in Norway, the AquaFence is a portable barrier constructed out of marine-grade laminate panels fixed to any hardscaped surface, such as pavement.

How does it work? The bottom panel of the barrier forms a seal to prevent water seepage. The company has been in business in North America since 2007 and clients include the military, industrial and commercial clients, municipalities, airports and the New York Port Authority. The barriers are reusable and pack flat into crates. The AquaFence comes in various heights, from four to nine feet. A four-foot fence costs $325 US per linear foot. A six-foot fence costs $575 US a linear foot.

Pros and cons: Four people can deploy 100 linear feet in an hour, and the fence can be taken down at the same rate. The AquaFence V1200 has been certified by the U.S. National Flood Barrier Testing and Certification Program. However, this product is not usually cost-effective for residential use. Although the barriers themselves have never failed, they can be breached if water crests over the top of the barrier.

A Tiger Dam tube is used to protect homes from flooding in Kelowna, BC, in 2018. jpg

Tiger Dam

What is it? These temporary dams consists of elongated flexible orange tubes that are filled with water.

How does it work? The tubes can be stacked and joined to form a pyramid-like structure, then filled with water by pump, a fire hydrant or even a garden hose. The tubes are capable of being stacked up in a pyramid formation and can be linked together seamlessly for miles in almost any shape. Tiger Dams have had a broad range of uses, ranging from subway systems to nuclear power plants.

Pros and cons: Two Tiger Dam products been certified by the U.S. National Flood Barrier Testing and Certification Program. The dams cost about a third of the price of sandbags for the first use and are free after that, said spokesman Trevor Wright. They are reusable and roll up after use.

Floodstop barrier in use in San Francisco. jpg

Floodstop barrier

What is it? Designed by a British engineer, this is a modular system of plastic blocks or "pods" that fit together. The system won the UK Emergency Planning Society's Most Innovative Product of the Year in 2009. The North American market is supplied by a manufacturer based in Minnesota.

How does it work? The pods fit together with sealing connecting keys. They can be either self-filling or pre-filled with water to provide ballast. The blocks seal to the ground with a foam gasket base. Last month, Pierrefonds-Roxboro, a borough in Montreal, used the system to seal off a 100-foot stretch of waterfront to prevent floodwaters from overflowing into the street and entering into sewers. Customers in the U.S. have ranged from homeowners to the World Trade Center in New York and power companies who use the barriers to protect generating stations. The two-foot high barrier, which covers the equivalent of 2,500 sandbags, costs about $83 US per foot, while the three-foot high version, which covers the equivalent of 4,500 sandbags, costs about $171 per foot.

Pros and cons: The system works best on a hard surface such as pavement, although it can be used on grass. A 100-foot length can be set up in 25 minutes. The pods are multi-functional, and some municipalities use them as road traffic delineator barriers when they are not used for flooding. The pods are also recyclable. However, they're bulky and require storage.

Sandbagging machine

What is it? There are a number of machines on the market that automate bagging sand, such as The Sandbagger. The Chicago-based company sells between 80 and 100 a year, about 90 per cent of those to military and construction companies, says company president Tim Vandergrift. The Department of National Defence has purchased some of the units and the City of Gatineau bought one in 2017 during the last flood and two more since then, he said.

How does it work? The Sandbagger has both gravity-fed and automated models, powered by a 13-horsepower motor that uses an auger and agitator to increase the speed of the sand coming through the chute. The fastest model, the four-bag motorized version, can produce 1,600 sandbags an hour. The operator starts and stops the flow of sand using a foot pedal. The cheapest model in The Sandbagger line is the two-chute gravity bagger at $5,625 US. The most expensive is the four-chute mechanical at $20,785 US.

There are six patents on The Sandbagger design, but it is not the only bagger on the market. The Burcham Bagger has a number of models including the Ultimate Bagger, which costs $31,250 US and has a conveyor belt, filling 1,200 bags an hour with a crew of four. The Superior Sandbagger creates a seamless, tubular sandbag, reducing the need to build a dam by placing sandbags one at a time.

Pros and cons: The Sandbagger is a multi-use product, and can be used to bag compost and gravel as well. There is still the disposal of sand and bags to be considered when flooding is over.