



Our approach to safety and emergency response

While our ultimate goal is to prevent all spills and releases, we're also committed to providing a comprehensive incident response at any point along our pipeline network. In the event of a leak, Enbridge personnel and contractors have robust and tested emergency response expertise, training, and equipment to ensure a quick and effective response.

How does Enbridge stay prepared for an incident?

In 2014, we held 371 drills, exercises, and equipment deployments across our company to boost our emergency response preparedness.

Do you have an actual plan in the case of an emergency?

We regularly update our emergency response plans, which govern our response for all types of situations, and share them with local first responders.

Do you invest in emergency response training?

From 2012 to 2014, Enbridge invested more than \$74 million in equipment and training to improve our overall emergency preparedness and response capacity.

Do you keep in touch with first responders?

We make in-person visits to municipal officials, first responders, HAZMAT crews, and 9-1-1 dispatchers—particularly those departments that are most likely to respond in the event of a pipeline emergency—to maintain relationships and review emergency preparedness information.

A multi-faceted approach to safety

Enbridge's top priorities are the safety of people, protection of the environment, and the operational reliability of our pipeline systems.

Emergency response is just one component of our multi-faceted approach to pipeline and facility safety, which includes rigorous design and construction standards, robust pipeline maintenance, 24/7/365 system monitoring, inline inspections, and leak detection. We invest heavily each year in tools, technologies, and strategies to keep our pipelines operating safely, reliably, and in an environmentally responsible manner.

Responding quickly and effectively

Our state-of-the-art Pipeline Control Center provides continuous monitoring and control of our liquids pipelines across North America—24 hours a day, 365 days a year—using both human and automated resources.

In the unlikely event of a leak, Enbridge would rapidly dispatch a trained response team, including environmental crews who have a strong understanding of the products we transport.

Under the oversight of federal and state agencies, Enbridge would then clean and restore the affected areas to avoid long-term impact to landowners, residents, and the environment.

Maximizing our preparedness

We have tailored and detailed emergency response plans that govern our response for all types of situations. These plans consider all of the factors that influence the behavior and potential impact of a release including drinking water, flow of running water, air emissions, wildlife and animal livestock, and shoreline impacts.

Enbridge will update emergency response plans to capitalize on the best available prevention and response systems. We will collaborate with local municipalities and their emergency responders to ensure these plans meet local needs and concerns.

A quick and effective response is grounded in being prepared. Enbridge employees in the U.S. and Canada participate in regular emergency-response drills and simulations, many of them involving local first responder groups, to test and improve our preparedness procedures.



Enbridge's full-scale simulation exercise at St. Ignace, Michigan, in January 2012 involved the U.S. Coast Guard and other response partners. The exercise involved practicing oil containment and removal techniques, as well as testing and deploying equipment, such as ice and fire boom and Arctic-specific skimming equipment to promote a safe, speedy and effective response.

Online, interactive training

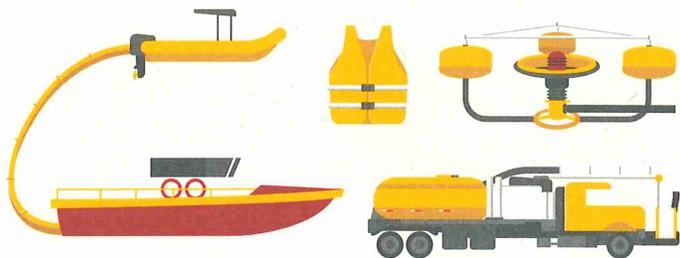
Enbridge's Emergency Responder Education Program, another facet of our public awareness outreach, offers free unlimited online training and pipeline emergency response tactics for first responders near our projects and operations.

We've also expanded this program with a training module targeted specifically at 9-1-1 call center personnel, so that they are equipped, if necessary, to initiate a safe and effective response to a pipeline incident.

Response resources in the region

Enbridge meets annually with first responders, including police, fire, and EMS, along the right-of-way to review Enbridge response procedures, and identify roles and responsibilities of external responders who would support Enbridge in the unlikely event of an incident.

Through our Safe Community grant program, we also sponsor emergency responder groups based near our pipelines and facilities to attend emergency response-focused conferences and expand their knowledge base.



From 2012 to 2014, Enbridge invested more than \$74 million in training and new response equipment, ranging from boom to boats, and deployed them across our systems to improve our overall emergency preparedness and response capacity.



What's changed since Marshall

The Line 6B incident, in July 2010 near Marshall, Michigan, made a lasting impact on how Enbridge operates. The lessons we learned from this incident have ultimately made us a safer company. We've since put in place a wide range of measures to enhance the safety and reliability of our entire North American pipeline system.

What is Enbridge doing to keep its pipelines safe?

Prevention is a key component of our commitment to pipeline safety. Since 2012, we've conducted more than 9,700 preventative maintenance digs and nearly 700 inline inspections throughout our cross-continent crude oil pipeline system. These inspections and digs allow us to monitor our pipelines from the inside and out to ensure they continue to operate safely and reliably.

What about the pipe itself?

We have rigorous design and construction standards, and our specifications for pipe steel exceed industry demands. Our inspectors have unlimited access to our trusted partner's pipe mills throughout the entire manufacturing process.

How do you stay in touch?

We are regularly in touch with local and state officials, emergency responders and 9-1-1 dispatchers, as well as residents along our pipeline systems, to provide information on pipeline safety, how to recognize a potential pipeline leak, the actions to take, and much more.

How much do you invest in safety?

Since 2012, we've spent \$3.78 billion on maintenance, inspection, and leak detection across our crude oil pipeline system.

Boosting safety across the board

The safety of the public and the environment, and the operational reliability of our systems, will always be our Number One priority. As a result of the Line 6B incident, we've since put in place a wide range of measures to enhance the safety and the reliability of our entire North American pipeline system.

Control Center enhancements

We've added staff and enhanced organizational structures at our Control Center Operations (CCO), while also revising and enhancing all CCO procedures pertaining to decision making, pipeline startup and shutdown, leak detection system alarms, and communication protocols.

Exceeding pipe steel specifications

Our specifications for pipeline steel exceed industry demands. We look for higher-quality pipe that undergoes more rigorous, and more frequent testing.

EVRAZ North America supplies the vast majority of our line pipe. In March 2015, Enbridge and EVRAZ made a joint announcement that our two companies will partner on a research and development program, along with industry and academic institutions, to enhance pipeline performance.

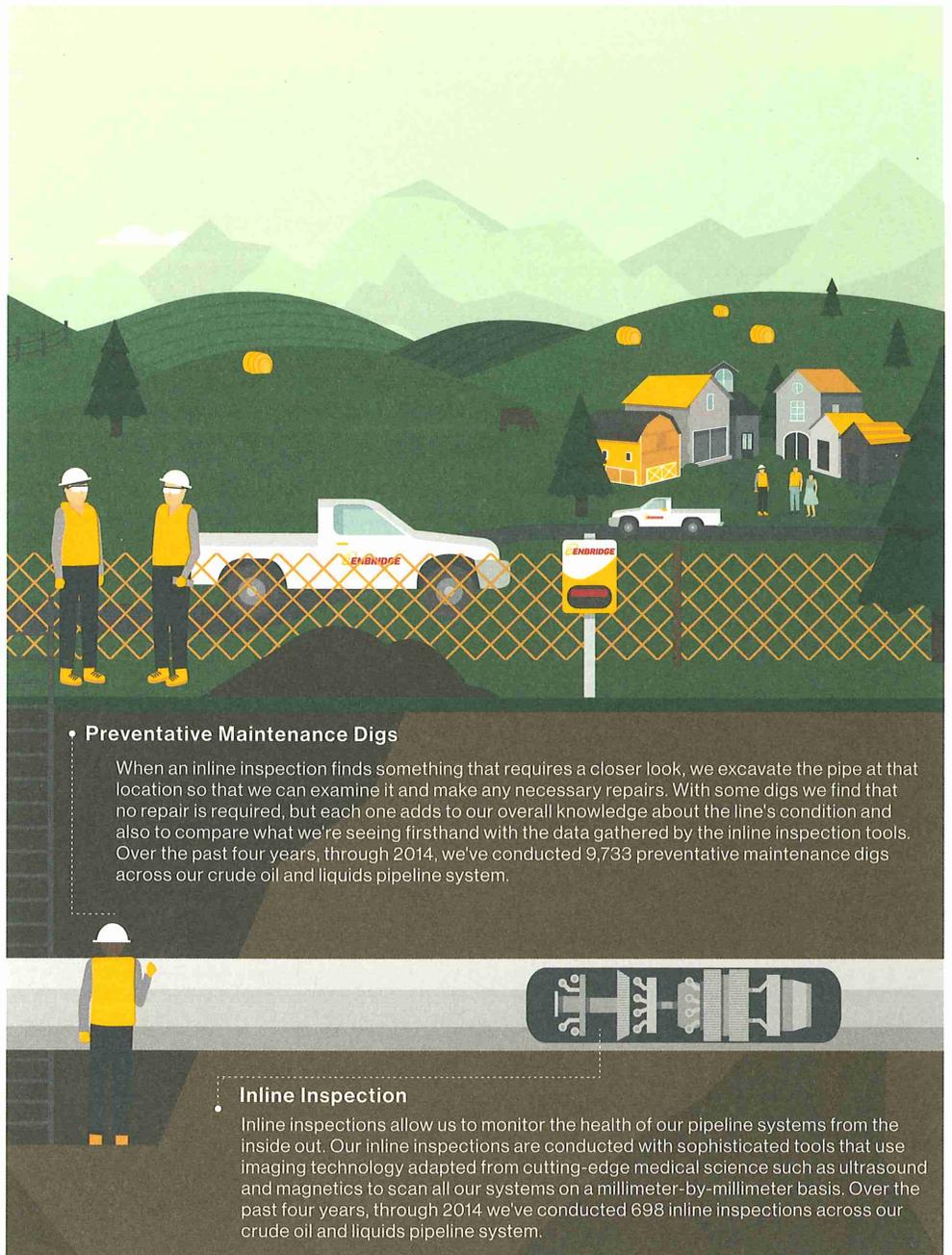
Promoting public awareness

We've substantially reviewed and strengthened our Public Awareness programs in both the United States and Canada to inform the public about how to stay safe around our facilities and pipelines, and how to identify and report potential problems along our systems.

Preparedness is key

From 2012 through 2014, we invested more than \$74 million in equipment and training to improve our overall emergency preparedness and response capacity—both for existing operations and proposed projects.

We also hold frequent exercises, simulations, drills and equipment deployment events across our North American system, as a way of bolstering our emergency response and preparedness efforts. From 2012 through 2014, we held an average of 400 of these events each year to test and hone our readiness in the unlikely event of an incident—381 in 2012, 478 in 2013, and 371 more in 2014.



Preventative Maintenance Digs

When an inline inspection finds something that requires a closer look, we excavate the pipe at that location so that we can examine it and make any necessary repairs. With some digs we find that no repair is required, but each one adds to our overall knowledge about the line's condition and also to compare what we're seeing firsthand with the data gathered by the inline inspection tools. Over the past four years, through 2014, we've conducted 9,733 preventative maintenance digs across our crude oil and liquids pipeline system.

Inline Inspection

Inline inspections allow us to monitor the health of our pipeline systems from the inside out. Our inline inspections are conducted with sophisticated tools that use imaging technology adapted from cutting-edge medical science such as ultrasound and magnetics to scan all our systems on a millimeter-by-millimeter basis. Over the past four years, through 2014 we've conducted 698 inline inspections across our crude oil and liquids pipeline system.

Preventative maintenance digs and inline inspections are core aspects of our proactive inspection program which helps ensure our systems are operating safely and reliably.

Online, interactive training

Enbridge's Emergency Responder Education Program, another facet of our public awareness outreach, offers free unlimited online training and pipeline emergency response tactics for first responders near our projects and operations.

We've also expanded this program with a training module targeted specifically at 9-1-1 call center personnel, so that they are equipped, if necessary, to initiate a safe and effective response to a pipeline incident.



ENBRIDGE'S LINE 5:

A vital piece of Michigan's energy infrastructure

Enbridge's Line 5 moves up to 540,000 barrels per day (bpd) of light crude oil, light synthetic crude oil, and natural gas liquids (NGLs), primarily propane, to Michigan and points beyond. A vital piece of energy infrastructure, Line 5 moves products that heat homes and businesses, fuel vehicles, and power industry throughout the state.

How does Line 5 affect quality of life in Michigan?

The light oil transported by Line 5 feeds the Michigan economy with enough gas to fill 120,000 passenger cars and light-duty vehicles a day, enough diesel to fill 900 semi-trailers a day, **and** enough jet fuel to move 18,500 airline passengers a day.

How important is Line 5 to Michigan refiners?

About 30 percent of the light crude on Line 5 stays in the state, where it powers industry and is refined into gas, diesel, jet fuel, and other products. Without Line 5, Marathon's Detroit refinery would directly lose 28 percent of its refining feedstock—and, because of necessary rerouting of various products on Enbridge's pipeline network, indirectly lose 19 percent more.

What about propane deliveries?

Line 5 delivers 85 percent of the propane that heats Upper Peninsula and northern Michigan homes. Without Line 5, Michigan would have to make up an immediate 2,000-bpd shortfall in propane deliveries—that's enough propane to cook a quarter of last year's burger consumption in the United States.

Does Line 5 move Michigan crude?

Since it entered service, Line 5 has transported about 80 million barrels of Michigan-produced light sweet crude to refineries in the region.

What about heavy crude?

Line 5 does not carry, and has never carried, heavy crude.

Line 5: The facts

Enbridge's Line 5 is essential to Michigan's energy picture, delivering light crude oil, light synthetic crude oil, and natural gas liquids (NGLs), including propane. These products heat homes and businesses, fuel industry, and are used to produce a myriad of consumer goods, from computers to clothing to cellphones.

Line 5 delivers 85 percent of the propane that heats Upper Peninsula and northern Michigan homes. About 30 percent of the light crude moved by Line 5 stays in Michigan, where it powers the renowned Detroit auto industry and is refined into gas, diesel, jet fuel, and other products.

Enbridge supplies the vast majority of crude oil to Marathon's refinery in Detroit, with Line 5 acting as a primary conduit. Line 5 promotes a stable, secure supply of North American light crude, keeping prices down at the pumps.

Moving Michigan crude

Line 5 also moves up to 14,000 bpd of Michigan-produced light sweet crude oil, which enters the Enbridge pipeline network near Lewiston and is transported to regional refineries, including the Marathon refinery in Detroit.

Through its lifetime, Line 5 has carried about 80 million barrels of Michigan-based crude to market.

An energy short fall

If Line 5 were taken out of service, the direct impacts to Michigan's economy would include a loss of 2,000 bpd in Enbridge propane deliveries. That would mean:

- A loss of enough fuel to cook 12 billion eight-ounce, medium-rare burgers a year (a quarter of the American burger consumption in 2014);
- About 24,000 of the 320,000 Michigan homes heated by propane would be affected.

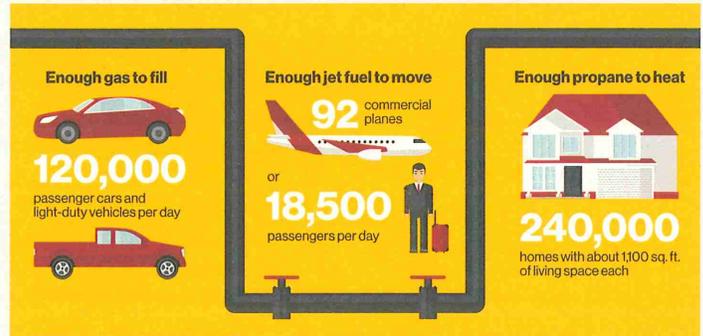
Marathon's Detroit refinery would also lose direct access to about 33,000 bpd of crude oil, or 28 percent of its refining needs. For the Michigan economy, that would mean:

- The loss of about 17,000 bpd of gas, or more than 18 million round trips from Detroit to Ludington State Park in a 2015 Ford Fusion;
- The loss of more than 9,000 bpd of diesel, or 1.8 million heavy truck return deliveries to Chicago; **and**
- The loss of 3,000 bpd of jet fuel, or 280 family vacations per day to Disney World.

Costlier, less efficient alternatives

If Line 5 were taken out of service, the state of Michigan would need to satisfy its energy needs from other markets through less efficient modes of transportation. That would mean an extra 177 fuel transport trucks and 11 propane trucks per day on Michigan's roads, or an extra 65 to 73 cars per day on Michigan's rails, required to pick up the slack. Use of these transportation methods to satisfy the state's energy needs would increase CO₂ emissions by an estimated 325 tons per day in Michigan, based on sourcing refined product shortfalls from the U.S. Gulf Coast.

Line 5 provides Michigan's economy with:



Without Line 5

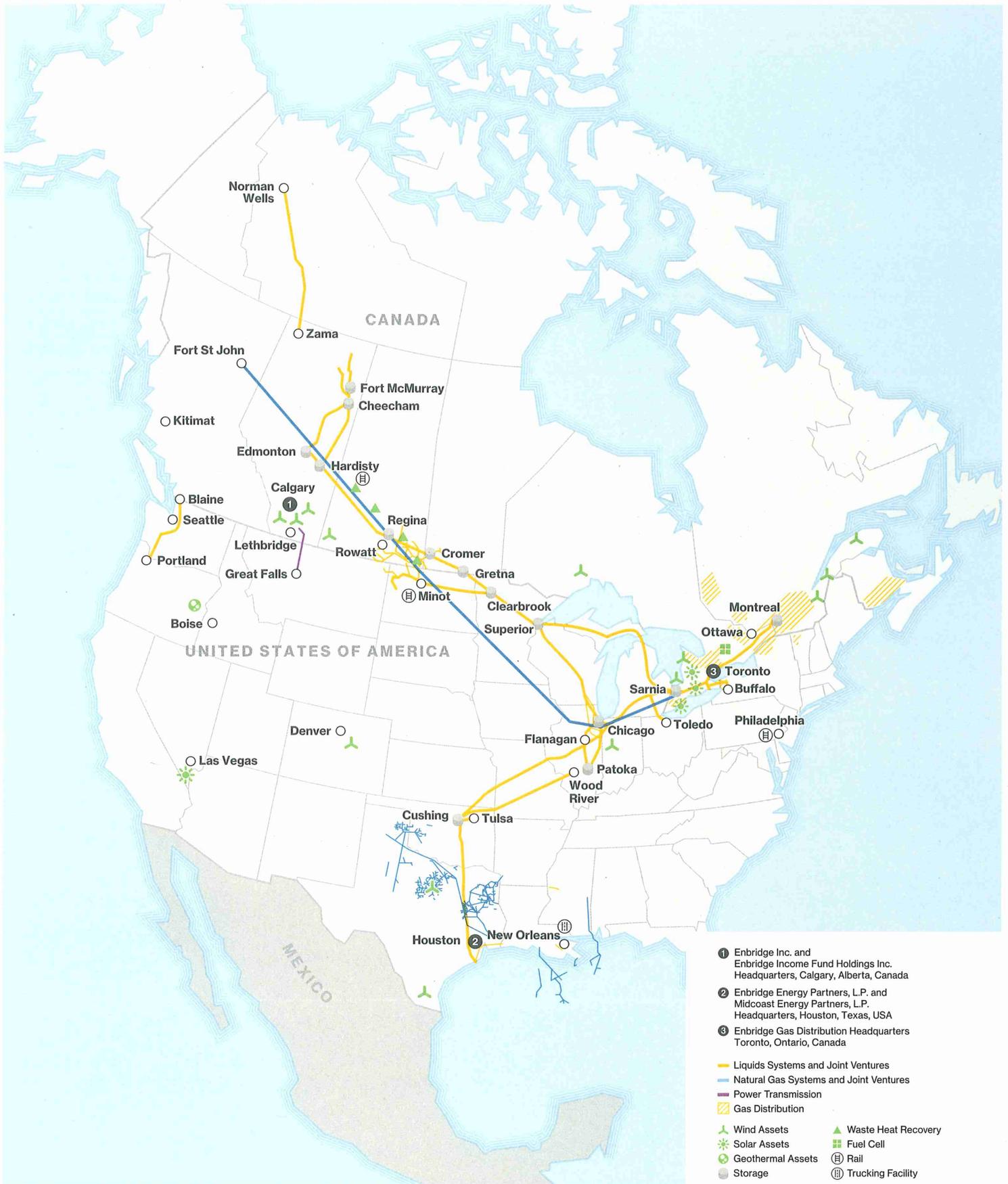
Overall, taking Line 5 out of service (and the necessary rerouting of products on Enbridge's pipeline network) would result in the loss of about 56,000 bpd of available crude supply, and 15,000 bpd of available propane, from the Michigan economy. That's the equivalent of:

- Enough gas to fill 120,000 passenger cars and light-duty vehicles per day;
- Enough jet fuel to move 92 commercial planes (or 18,500 passengers) per day; **and**
- Enough propane to heat 240,000 homes with about 1,100 square feet of living space each.

What is Line 5?

Enbridge's Line 5 is a 645-mile, 30-inch-diameter pipeline that travels through Michigan's Upper and Lower Peninsulas, originating in Superior, Wisconsin, and terminating in Sarnia, Ontario, Canada.

Built in 1953 by the Bechtel Corporation to meet extraordinary design and construction standards, the Line 5 Straits of Mackinac crossing remains in excellent condition, and has never experienced a leak in more than 60 years of operation. We're working hard to keep it that way.





At Enbridge, we believe that energy enables people to live their lives to the fullest.

In just over 65 years, Enbridge has become a North American leader in energy delivery by connecting people to the energy they need—safely and responsibly.

As a transporter of energy, Enbridge operates the world's longest, most sophisticated crude oil and liquids transportation system, delivering an average of 2.2 million barrels of crude oil and liquids every day and moving 15 percent of daily U.S. crude imports. We have a significant and growing presence in natural gas gathering, transmission and midstream businesses, and an increasing involvement in power transmission.

As a distributor of energy, Enbridge owns and operates one of North America's largest natural gas utilities, Enbridge Gas Distribution, serving more than two million customers in Ontario, Quebec, New Brunswick, and New York State.

As a generator of energy, Enbridge is one of the largest wind and solar power producers in Canada, with a growing renewables base in the U.S. We have invested more than \$4 billion in wind, solar, geothermal, power

transmission, waste heat recovery, and a host of emerging technology projects, which together have the capacity to generate more than 2,200 gross megawatts (MW) of zero-emission energy. That's enough to supply the electricity needs of nearly 750,000 homes.

Safety is the very foundation of Enbridge's operations. Over the past four years, we've engaged in the most extensive inspection and preventative maintenance program in the history of the North American pipeline industry. We believe all incidents can be prevented, and we're working hard—through 24/7/365 monitoring, comprehensive prevention strategies, and the use of leading-edge technology—to keep our system as safe as possible.

Enbridge employs more than 11,000 people across the U.S. and Canada. We've earned a place on the Global 100 Most Sustainable Corporations list for seven straight years, we were named No.3 overall on the 2015 Houston Chronicle 100 list, and we're consistently named among Canada's Top 100 Employers.

Find out more at enbridge.com

Enbridge in Michigan: Line 5 and other pipelines

Fueling Michigan's economic engine

Enbridge's energy infrastructure has helped fuel quality of life in Michigan for more than 60 years. Line 5 delivers the products that heat homes and businesses, fuel vehicles, and power industry across the state.

Enbridge's pipelines through Michigan

Line 5

645-mile pipeline carrying light crude from Superior, Wis. to Sarnia, Ont.

Line 6B

293-mile pipeline (235 miles in Michigan) carrying medium and heavy crude oil from Griffith, Ind. to Marysville, Mich. Line 6B was originally constructed in 1969. As of October 1, 2014, Enbridge had fully replaced the Line 6B pipeline. Most of the new pipeline was installed adjacent to existing segments (between Lake County, Ind. and Marysville, Mich.).

Line 17

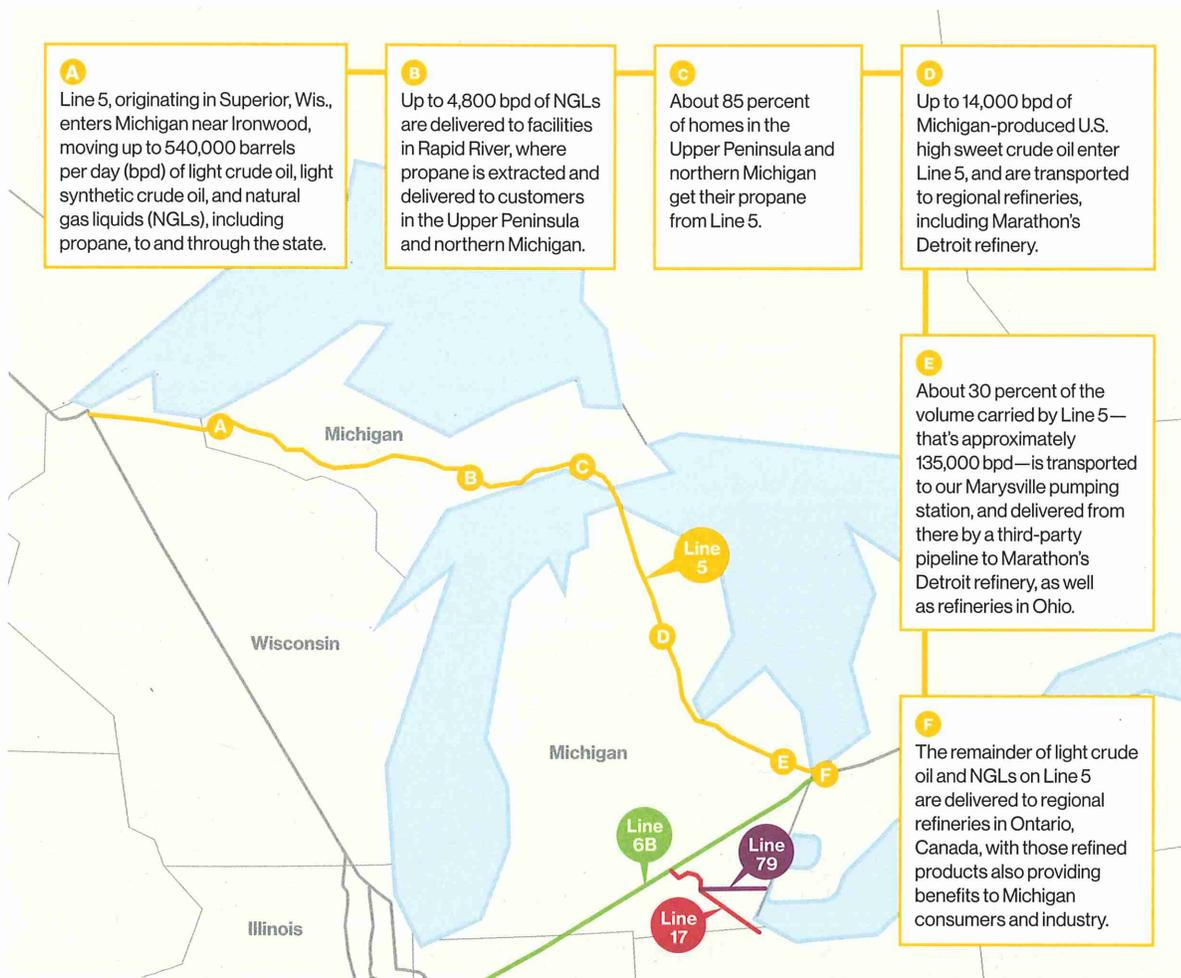
88-mile pipeline, (77 miles in Michigan) carrying heavy crude from Stockbridge, Mich. to Toledo, Ohio.

Line 79

62-mile pipeline, carrying light and heavy crude oil from Stockbridge, Mich. to Romulus, Mich. Line 79 runs adjacent to (or twins) Line 17.

Other Enbridge Pipelines

Enbridge operates the world's longest, most sophisticated crude oil and liquids transportation system.



Quick facts on Line 5

- Enbridge supplies the vast majority of crude oil to Marathon's refinery in Detroit, with Line 5 acting as a primary conduit. Regional refineries turn this essential feedstock into gas, diesel, jet fuel, and other refined products
- Line 5 helps to ensure a stable, secure supply of North American light crude, keeping prices down at the pump
- To date, Line 5 has carried about 80 million barrels of Michigan-based light crude to market
- Line 5 does not carry, and has never carried, heavy crude
- Without Line 5, the Michigan economy would lose about 56,000 bpd of available light crude oil, and 15,000 bpd of available propane



The Straits of Mackinac is a special place, and that's why we take extraordinary precautions to continue the safe and reliable operation of Line 5 as it crosses under the Straits. We're keeping a close watch on mussel populations along the Line 5 Straits crossing to ensure the system's safety is not compromised.

What has Enbridge done about mussel concerns at the Line 5 Straits crossing?

In 2014, we retained GEI Consultants Inc. to assess the mussels found along our parallel, 20-inch-diameter Line 5 pipelines crossing under the Straits of Mackinac. GEI's study concluded that mussel populations in the Straits pose no threat to Line 5.

What qualifications do these consultants have?

GEI is a consulting firm founded by Harvard and MIT geotechnical engineers. GEI has 45 years of experience in monitoring and analyzing ecological and environmental habitats, and has experience with underwater structures in the Great Lakes.

What did they discover?

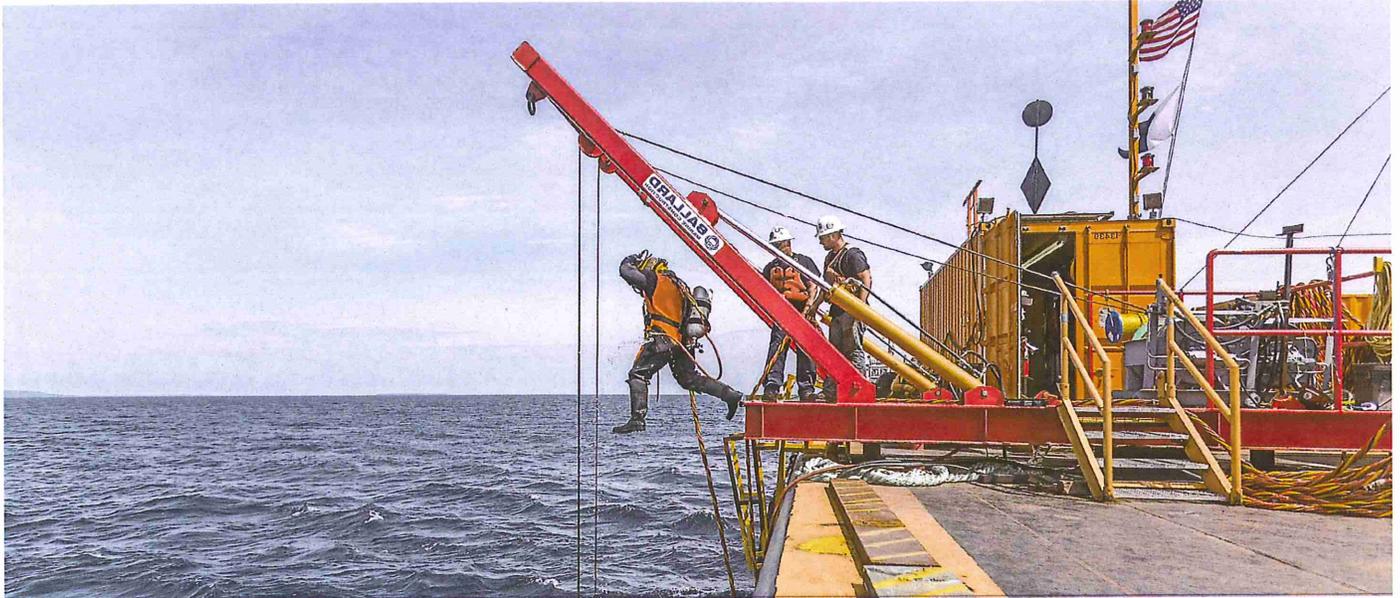
GEI examined mussel samples from nine locations along the Line 5 Straits crossing. No zebra mussels were found in these samples, only quagga mussels. The consultants examined several factors— including mussel weight, mussel secretions, and potential corrosive properties, based on extensive research—and determined that mussels accumulated on Line 5 in the Straits of Mackinac had no impact on the pipeline.

Where can I read the mussel study?

The GEI study can be found online at enbridge.com/Line5

Are you keeping an eye on the issue?

We regularly inspect the exterior of the Line 5 pipe with expert divers and/or remote operated vehicles (ROVs). Another external inspection of the line is planned for 2016 to examine the fiber-reinforced enamel coating, which is widely acknowledged as one of the most robust pipeline protection materials. We're also looking at additional opportunities to study mussels on the pipeline.



GEI Consultants Inc. assessed the mussels found along the Line 5 Straits crossing in 2014, and concluded that mussel populations in the Straits pose no threat to Line 5.

No pressure, no corrosion

The 2014 study by GEI Consultants Inc. found that mussels have not accumulated in such depths to cause pressure on the parallel, 20-inch-diameter lines – nor has the mussels' attachment to the pipeline's external coating caused any corrosion.

The mussel shells are thinner and more fragile than normal, due to the pipe depth and the low concentration of calcium in the Great Lakes—and, as a result, are not able to accumulate in more than a single layer. At an average weight of 1.34 grams per mussel, there is no reason to believe the mussels are putting undue weight on the carbon-steel pipe, which is a minimum of 0.812 inches thick. GEI believes this single layer of mussels may actually serve as a protective barrier for Line 5 against natural underwater elements.

The mussels attach to the line through filaments or strands made of protein secretions. A 2013 study found these proteins do not have a corrosive effect—and they have, in fact, been studied as an anti-corrosive for underwater pipes. In any event, the mussels' attachments had not penetrated Line 5's fiber-reinforced enamel coating, which is widely held as one of the most robust and durable pipeline protection materials.

Existing studies have found cases where zebra mussels have had a corrosive impact on metal under specific anoxic environmental conditions (meaning oxygen is depleted by restricted water movement caused by mud or other physical barriers); these conditions are not present at the Line 5 Straits crossing.

Mussel study details and samples

Zebra and quagga mussels have been studied extensively as an invasive species, creating a wealth of scientific data that GEI researchers were able to draw upon to understand the mussels' potential impact on Line 5.

GEI examined mussel samples from nine locations along the 4.5-mile Line 5 Straits crossing—finding no zebra mussels among any of the nine samples, and finding quagga mussels in each sample.

The full GEI study has been posted online at enbridge.com/Line5

Monitoring for mussel impact

Line 5 is inspected regularly using state-of-the-art inline inspection tools that work like MRI machines, checking for dents, buckles, cracks, or other signs of corrosion. We've completed a total of 25 high-resolution metal loss inspections since the mid-1990s, and no corrosion has been observed along the Line 5 Straits crossing.

Keeping the Straits safe

Enbridge understands how important the Straits of Mackinac are to Michigan residents. The health and the protection of this waterway, and the Great Lakes, are essential to the vitality, sustainability, and economic prosperity of the region—and the state of Michigan.

What is Line 5?

Enbridge's Line 5 is a 645-mile, 30-inch-diameter pipeline that travels through Michigan's Upper and Lower Peninsulas, originating in Superior, Wisconsin, and terminating in Sarnia, Ontario, Canada.

Products moved on Line 5 heat homes and businesses, fuel vehicles, and power industry in the state of Michigan.

Built in 1953 by the Bechtel Corporation to meet extraordinary design and construction standards, the Line 5 Straits of Mackinac crossing remains in excellent condition, and has never experienced a leak in more than 60 years of operation. We're working hard to keep it that way.



The Straits of Mackinac is a special place, and that's why we take extraordinary precautions to continue the safe and reliable operation of Line 5 as it crosses under the Straits. Our primary focus is on prevention of incidents, and we also maintain strong emergency preparedness and response systems that we regularly test and continuously improve. This includes our capabilities to respond to a pipeline emergency during winter conditions.

How can Enbridge respond to a spill in the winter, when there's ice on the Straits?

We have the training, the people, and the resources to respond, within one to two hours, to a winter spill in the Straits of Mackinac. We have equipment positioned near the Straits to enable access, containment, and removal of oil—including equipment tailored to a response in harsh winter conditions.

What about preparation and practice?

We're not only prepared for a winter oil release—we also practice and refine our response on an annual basis. We held a full-scale simulation exercise at St. Ignace, Michigan, in January 2012, involving the U.S. Coast Guard and other response partners. We'll be observing and supporting another winter response exercise on Lake Huron in February 2016, as the U.S. Coast Guard tests winter spill response equipment. Our first responders are also trained by experts in cold-weather oil spill response.

Do you expect to handle a winter oil spill all by yourselves?

In addition to mobilizing our own people and equipment, we would immediately leverage the resources of the U.S. Coast Guard, which has federal jurisdiction in this area. To augment and support our response, we also have signed contracts with oil spill removal organizations—such as Marine Pollution Control and Mackinac Environmental Technology in the Straits region—whose resources can help enable a safe, speedy, and effective response.

Has anyone else looked at your winter response contingencies?

To continually improve our response plans, an independent contractor with spill response expertise was commissioned in early 2015 to evaluate our capabilities to respond to a pipeline emergency during winter conditions. We expect this evaluation will lead to further improvement and enhancement in this area.



PICTURE CAPTION:

Winter spill response: The equipment

Enbridge, along with our contractors, owns response equipment that's based in the Straits, and available for rapid deployment. This equipment includes:

- Remote Operated Vehicles (ROVs) that move below the surface of the ice, detect oil with sensors, and transport equipment below the surface to remove oil;
- Ice drills or augers that cut holes in the ice, so hoses and pumps can be used to suction oil;
- Arctic-specific water skimming equipment that can be used in both open-water and icy conditions;
- Specialized ice and fire boom, deployed to contain oil; and
- Vessels with water cannons that "herd" the oil to containment and collection areas.

Winter spill response: The people

We have two "oil recovery under ice" instructors, trained by Dowcar Environmental, who deliver in-house training at Enbridge. Our first responders regularly practice ice response tactics, and attend specialized training courses focused on response in this type of environment.

Our next real-world learning opportunity will arrive in February 2016, when we support a U.S. Coast Guard simulation exercise at Port Huron, Michigan.

Enbridge also has access to world-class experts in cold-weather oil spill response, and we would engage these organizations in the event of any incident.

Winter spill response: The plans

Ice cover changes the movement and composition of oil, with any potential spread of oil reduced in icy conditions. Ice floes also act as natural boom, with their presence limiting the oil's movement.

The changing properties of oil, and the access obstacles created by ice, are all taken into consideration in Enbridge's emergency response plan developed for the Straits of Mackinac.

We regularly test and continuously improve our response plans alongside local first responders, emergency management officials, and law enforcement.

Keeping the Straits safe

Enbridge understands how important the Straits of Mackinac are to Michigan residents. The health and the protection of this waterway, and the Great Lakes, are essential to the vitality, sustainability, and economic prosperity of the region—and the state of Michigan.

What is Line 5?

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Products moved on Line 5 heat homes and businesses, fuel vehicles, and power industry in the state of Michigan.

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SAFETY IN THE STRAITS: Line 5 Design and Construction

The Straits of Mackinac is a special place, and that's why we take special precautions to continue the safe and reliable operation of Line 5 as it crosses under the Straits. Thanks in part to extraordinary design and construction standards, the twin pipelines under the Straits have not experienced any leaks in six decades of operation.

Who built Line 5?

Bechtel Corporation, which also built the Hoover Dam, managed the engineering, procurement and construction of the Straits crossing.

What's so special about the pipe?

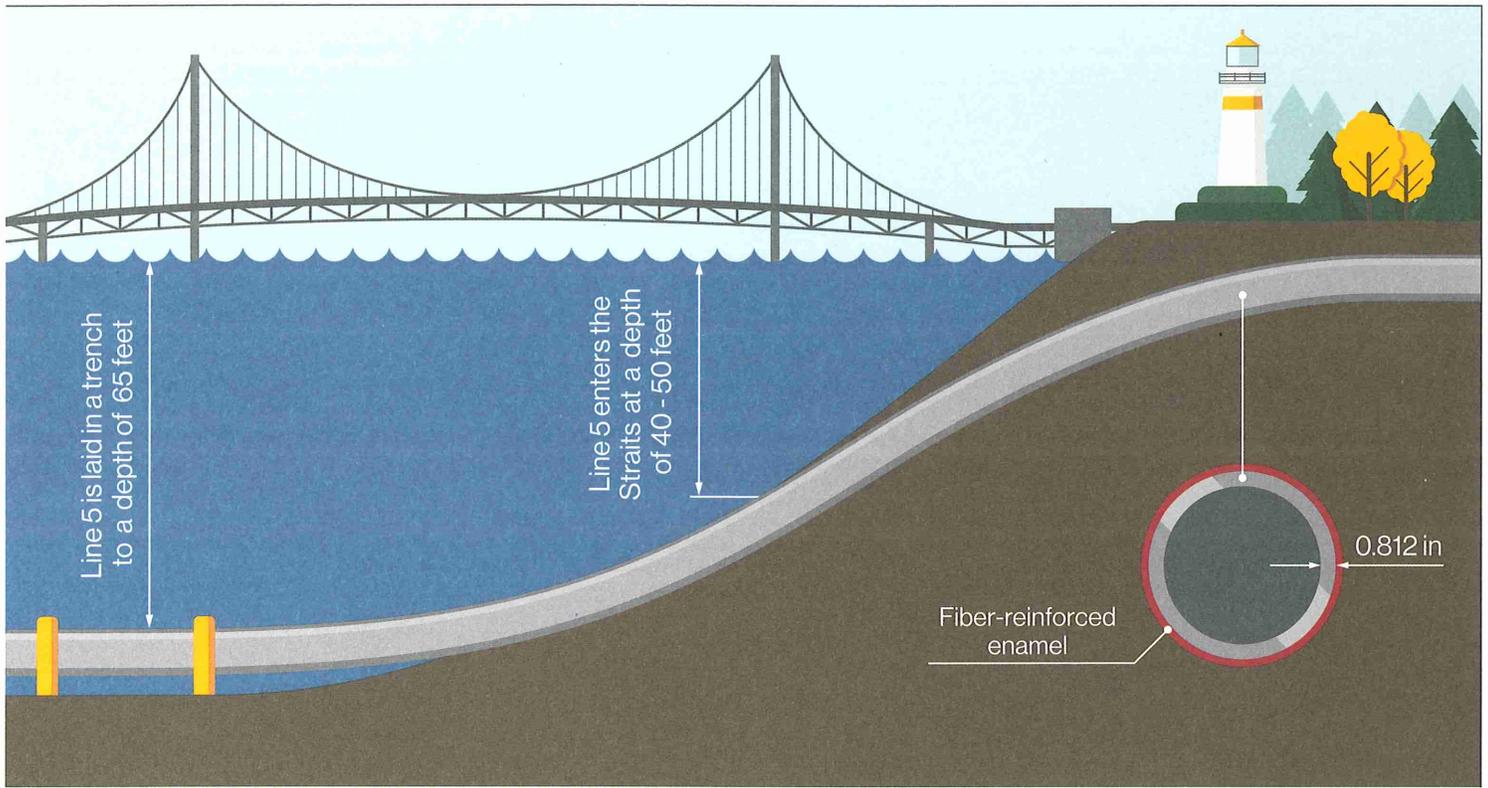
As it crosses the Straits, Line 5 uses heavier-walled pipe—a minimum of 0.812 inches—specially manufactured from molten steel “billets” for added strength. The Line 5 pipeline at the Straits crossing is the thickest walled pipe in our entire North America-wide network.

Who else was involved?

Merritt-Chapman & Scott, which built the iconic Mackinac Bridge was the underwater contractor for Line 5, and used the same steel as the Mackinac Bridge.

How does Enbridge approach design and construction?

In the midst of one of the most highly regulated and safest industry environments in the world, we look around the globe to apply the most advanced technologies and methods available to our pipelines. We also examine how other industries like medicine and aviation use science and technology to make their own critical infrastructure safe.



The twin lines enter the Straits at a depth of 40 to 50 feet, protecting Line 5 from incidents involving anchors or moving ice packs. The pipes are laid in dredged ditch until the Straits reach a depth of 65 feet. At depths of more than 65 feet, the pipes run above the bed and are secured with screw-anchors.

Heavier-walled pipe, special steel

Before it began operation, Line 5 underwent extensive pressure testing with water (hydrostatic testing) multiple times, at more than twice the maximum operating pressure of the line—and up to four times the typical normal operating pressure of the pipes.

Key safety features in the design of the twin pipelines included:

- Specially manufactured steel, formed from a molten “billet” to produce seamless piping;
- Heavier-walled pipe—at a minimum of 0.812 inches, this is much thicker than required by the line’s operation or today’s regulators and is the thickest pipe in the entire Enbridge system;
- An external coating of fiber-reinforced enamel, recognized as one of the most robust pipeline protection materials, protecting the pipe from water corrosion.

Built to last

In 1953, Enbridge’s Line 5 Straits of Mackinac crossing was built to extraordinary standards, using the finest engineering expertise from across the United States. The Line 5 Straits crossing was built for the underwater environment, and still exceeds today’s standards for pipeline construction safety. The twin pipelines under the Straits have not experienced any leaks in six decades of operation—a testament to their exceptional design, construction, and maintenance regimen.

Bechtel Corporation—one of the most respected firms in the world, with the Hoover Dam among its achievements—managed the engineering, procurement, and construction of the pipeline. The underwater contractor for the Line 5 Straits crossing was Merritt-Chapman & Scott—the same company that built the iconic Mackinac Bridge, and the Line 5 crossing uses the same steel as the Mackinac Bridge.

The design of the Line 5 Straits crossing was co-ordinated, and underwent peer review by engineering specialists from Bechtel, the University of Michigan’s Department of Naval Architecture and Marine Studies, and Columbia University’s Civil Engineering Department.

What is Line 5?

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Products moved on Line 5 heat homes and businesses, fuel vehicles, and power industry in the state of Michigan.

Built in 1953 by the Bechtel Corporation to meet extraordinary design and construction standards, the Line 5 Straits of Mackinac crossing remains in excellent condition, and has never experienced a leak in more than 60 years of operation. We’re working hard to keep it that way.



SAFETY IN THE STRAITS:

Line 5 Operations and Maintenance

The Straits of Mackinac is a special place, and that's why we take special precautions to continue the safe and reliable operation of Line 5 as it crosses under the Straits. Our robust operations and maintenance program is one of many protective measures that we use to help keep the Straits safe.

What's involved in operating a pipeline?

It takes thousands of people dedicated to safety. It takes a deep understanding of the pipeline infrastructure, strict quality standards for the products we move, strict adherence to regulatory requirements, and thorough knowledge of operating pressure in order to preserve the pipeline's strength.

What's involved in maintaining a pipeline?

A robust maintenance program goes hand-in-hand with responsible pipeline operation. It involves harnessing technology to advance our diagnostic strategies, and staying on top of potential issues to ensure the optimal fitness of our pipelines.

How is Line 5 operated and maintained?

Line 5 operates at less than 25 percent of its maximum pressure capacity, which minimizes stress on the heavy-walled, carbon-steel pipe—while also enhancing safety.

What about the products Line 5 carries?

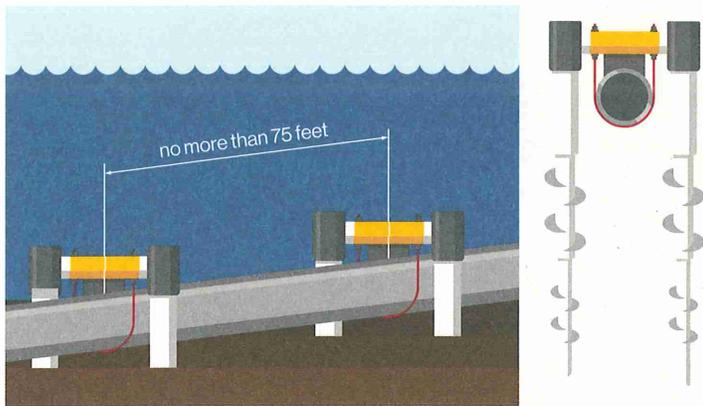
Line 5 carries light oil and natural gas liquids (NGLs), including propane. Every batch of oil that enters our pipeline network has to meet stringent quality standards—for viscosity, density, temperature, and other factors—that are strictly enforced. We also treat the oil we carry in our pipelines to kill any corrosion-inducing microorganisms. Line 5 does not carry heavy oil.

Bolstering its support system

Line 5 is fixed in place to the lake bed with a sturdy screw-anchor support system consisting of 124 underwater anchors.

In 2014, to further promote safety at the Line 5 Straits crossing, we strengthened the line's mechanical support system by completing the installation of 40 additional screw-anchor supports.

These 10-foot-long steel screws are augered into the lake bed on either side of the parallel lines, and hold a steel saddle that permanently supports the lines.



In 2014, we completed the installation of 40 additional underwater support anchors along the Line 5 Straits crossing. The addition of these screw-anchors means that the supports are no more than 75 feet apart.

Low-pressure operation

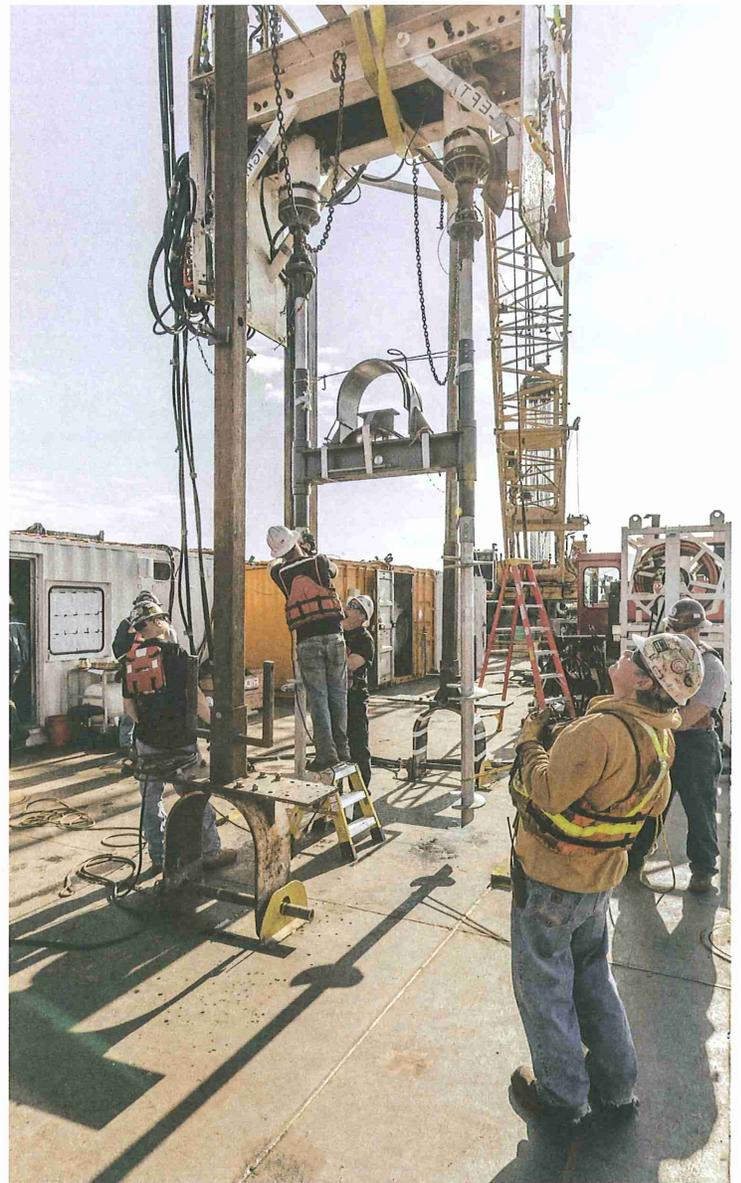
Line 5 operates at less than 25 percent of its maximum pressure capacity. This preserves the strength of the heavy-walled, carbon-steel pipe that forms Line 5, while also enhancing safety.

To use an analogy from Michigan's auto industry, consider this operation akin to taking care of a well-manufactured car by running the engine at low RPMs.

Keeping the Straits safe

Enbridge understands how important the Straits of Mackinac are to Michigan residents. The health and protection of this waterway, and the Great Lakes, are essential to the vitality, sustainability, and economic prosperity of the region—and the state of Michigan.

That's why we've developed a suite of protective measures to help keep the Straits safe. Our robust operations and maintenance program is just one of those measures.



An anchor-screw is prepared for installation on Line 5—August 2014.

What is Line 5?

Enbridge's Line 5 is a 645-mile, 30-inch-diameter pipeline that travels through Michigan's Upper and Lower Peninsulas, originating in Superior, Wisconsin, and terminating in Sarnia, Ontario, Canada.

Products moved on Line 5 heat homes and businesses, fuel vehicles, and power industry in the state of Michigan.

Built in 1953 by the Bechtel Corporation to meet extraordinary design and construction standards, the Line 5 Straits of Mackinac crossing remains in excellent condition, and has never experienced a leak in more than 60 years of operation. We're working hard to keep it that way.



SAFETY IN THE STRAITS:

Line 5 Innovation and Technology

The Straits of Mackinac is a special place, and that's why we take special precautions to continue the safe and reliable operation of Line 5 as it crosses under the Straits. We're harnessing, adapting, and advancing commercially available technology as one of several protective measures that we use to help keep the Straits safe.

How are you using technology on the Line 5 Straits crossing?

We've been working with Michigan Technological University's Great Lakes Research Center (GLRC) to capture advanced underwater sonar images of the Line 5 Straits crossing using an Autonomous Underwater Vehicle (AUV), and to support the deployment and operation of an environmental monitoring buoy.

How will this help boost safety?

Data from both the AUV and the monitoring buoy, which is sponsored by Enbridge, will provide enhanced information to support an already robust pipeline inspection and maintenance program. The Line 5 Straits crossing is the most inspected segment of pipe in our entire North American network.

How will this AUV be used?

Supported by Michigan Tech, this technology is being tested on an investigative and developmental basis. Ideally, this technology will allow us to more efficiently collect information on the underwater topography near and around the pipelines, which will help to better inform our Line 5 pipeline maintenance program.

How does Michigan Tech's monitoring buoy promote general safety?

By measuring wave height, wind speed and direction, air temperature, water temperature and currents in the Straits, this buoy will dramatically improve the accuracy of nautical weather forecasting in the region—and the ability to issue potentially life-saving public warnings.

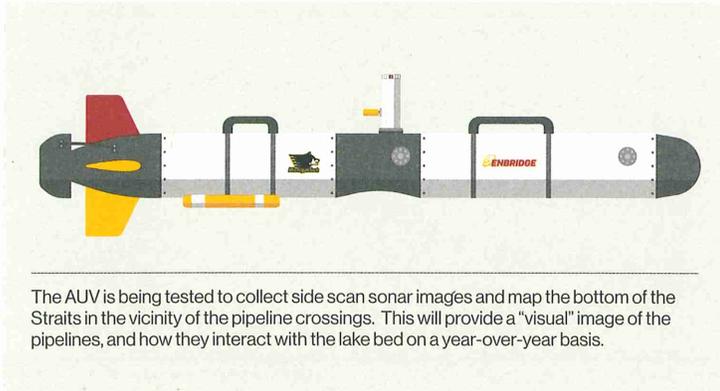
Sonar mapping in the Straits

By testing and enhancing an AUV with Michigan Tech, we'll be gathering important data that gives us an enhanced understanding of how the twin pipelines at the Straits crossing interact with the lake bed on a year-over-year basis.

Real-time data on water currents

We've also sponsored the operation and maintenance costs of a real-time environmental monitoring buoy, deployed in August 2015 by the GLRC in the Straits.

Equipped with acoustic Doppler technology, the buoy reports information on both surface and bottom currents in the Straits, in addition to a host of environmental conditions, for the benefit of everyone who uses the waterway. We expect to use information on currents, in tandem with AUV survey data, to keep the bottom of the Straits near Line 5 hazard-free.



The AUV is being tested to collect side scan sonar images and map the bottom of the Straits in the vicinity of the pipeline crossings. This will provide a "visual" image of the pipelines, and how they interact with the lake bed on a year-over-year basis.

Keeping the Straits safe

Enbridge understands how important the Straits of Mackinac are to Michigan residents. The health and the protection of this waterway, and the Great Lakes, are essential to the vitality, sustainability, and economic prosperity of the region—and the state of Michigan.

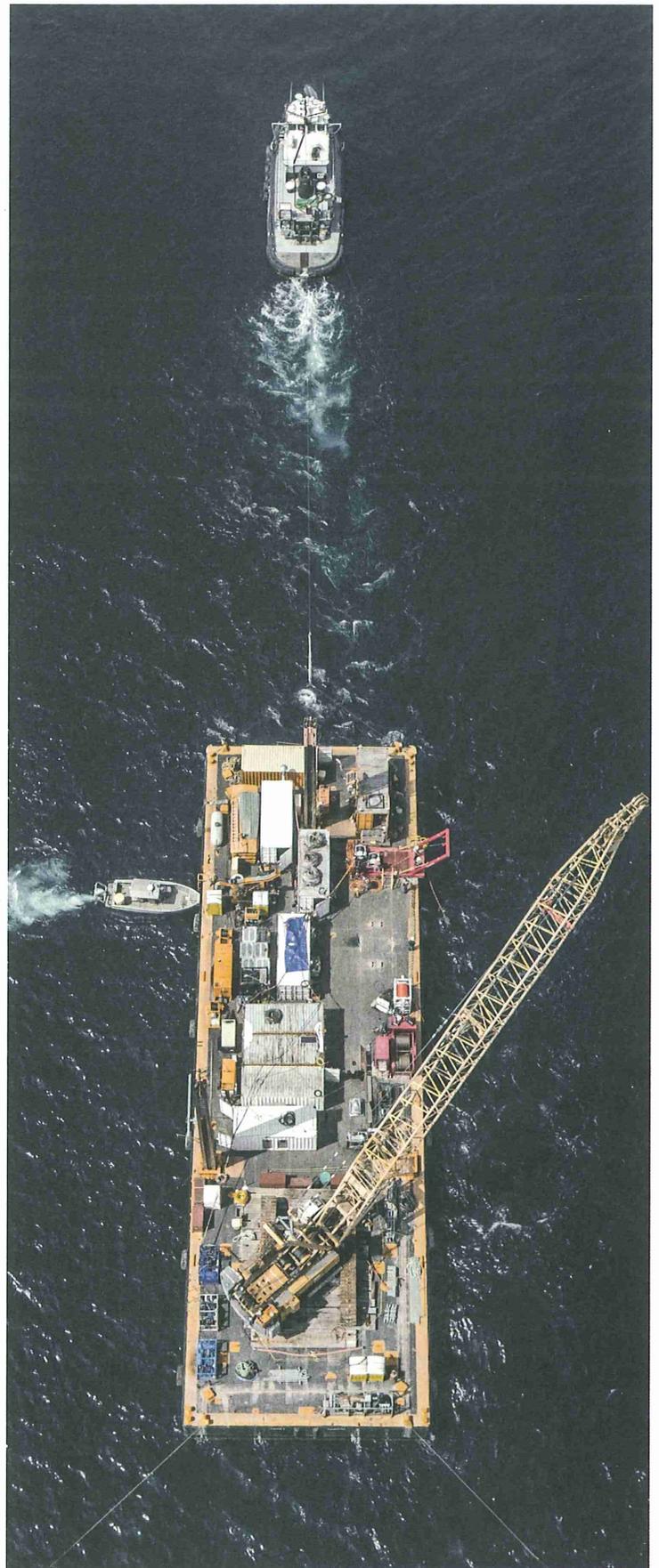
That's why we've developed a suite of protective measures to help keep the Straits safe. One of our primary strategies is harnessing, adapting, and advancing commercially available technology in the interest of safety.

What is Line 5?

Enbridge's Line 5 is a 645-mile, 30-inch-diameter pipeline that travels through Michigan's Upper and Lower Peninsulas, originating in Superior, Wisconsin, and terminating in Sarnia, Ontario, Canada.

Products moved on Line 5 heat homes and businesses, fuel vehicles, and power industry in the state of Michigan.

Built in 1953 by the Bechtel Corporation to meet extraordinary design and construction standards, the Line 5 Straits of Mackinac crossing remains in excellent condition, and has never experienced a leak in more than 60 years of operation. We're working hard to keep it that way.





SAFETY IN THE STRAITS:
Line 5 Inspections

The Straits of Mackinac is a special place, and that’s why we take special precautions to continue the safe and reliable operation of Line 5 as it crosses under the Straits. Our proactive inspection program is one of many protective measures that we use to help keep the Straits safe.

What is your proactive inspection program?

We regularly examine our entire pipeline system from the inside out—and the Line 5 Straits crossing is the most inspected segment of pipe in our entire North American network.

How do you inspect the inside of the pipe?

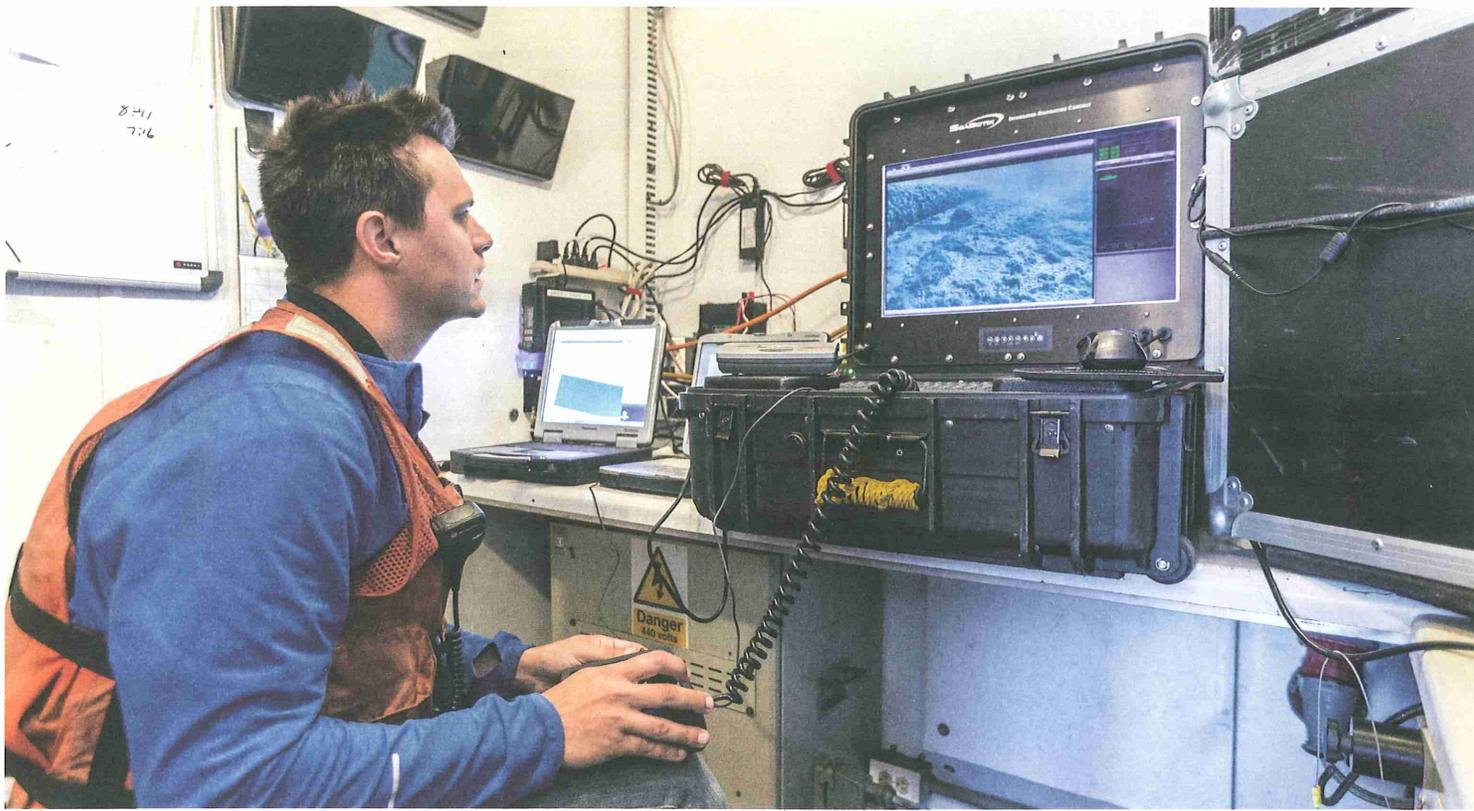
We use inline inspection tools which run through the pipe and examine it from the inside, inch by inch. These tools will alert us to any pipeline features that may require further analysis or maintenance.

What about the outside?

Using expert divers, Remote Operating Vehicles (ROVs), and an Automated Underwater Vehicle (AUV) that maps the bottom of the Straits, we keep a close eye on the pipe and its immediate environment.

How often do you inspect the pipe?

At the Line 5 Straits crossing, we thoroughly evaluate the pipe’s interior every two years, which is twice as often as federal regulations require. In addition, visual inspections of the exterior of the pipe, using a diver and/or remote operated vehicle (ROV), occur twice a year.



A Remote Operated Vehicle (ROV) examines the lines beneath the Straits.

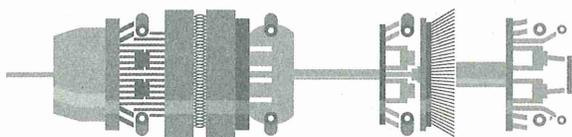
Keeping the Straits safe

Enbridge understands how important the Straits of Mackinac are to Michigan residents. The health and the protection of this waterway, and the Great Lakes, are essential to the vitality, sustainability, and economic prosperity of the region—and the state of Michigan.

That's why we've developed a suite of protective measures to help keep the Straits safe. Our inspection program is just one of those measures—allowing us to monitor the fitness of our pipelines from both the inside and the outside, with regular inspections that exceed regulatory requirements.

Interior inspections

Our sophisticated inline inspection tools use imaging technology, with a level of detail similar to that of MRIs, ultrasound and X-ray technology in the medical industry, to scan our pipelines on an inch-by-inch basis.



We conduct some of our in line inspections using highly specialized "smart pigs" that employ either ultrasound technology to detect crack-like features, or Magnetic Flux Leakage (MFL) technology to detect metal loss features that could be corrosion. These tools are similar to MRI machines, and help us determine whether or not further investigation, or preventative maintenance work, is required.

Exterior inspections

We regularly inspect the Line 5 Straits of Mackinac crossing using expert divers who examine and report on the condition of the Line 5 crossing and its underwater supports.

We also use ROVs to examine the twin lines as they travel under the Straits. These inspections offer a thorough examination of the pipe's exterior and its immediate environment, and are carried out twice a year.

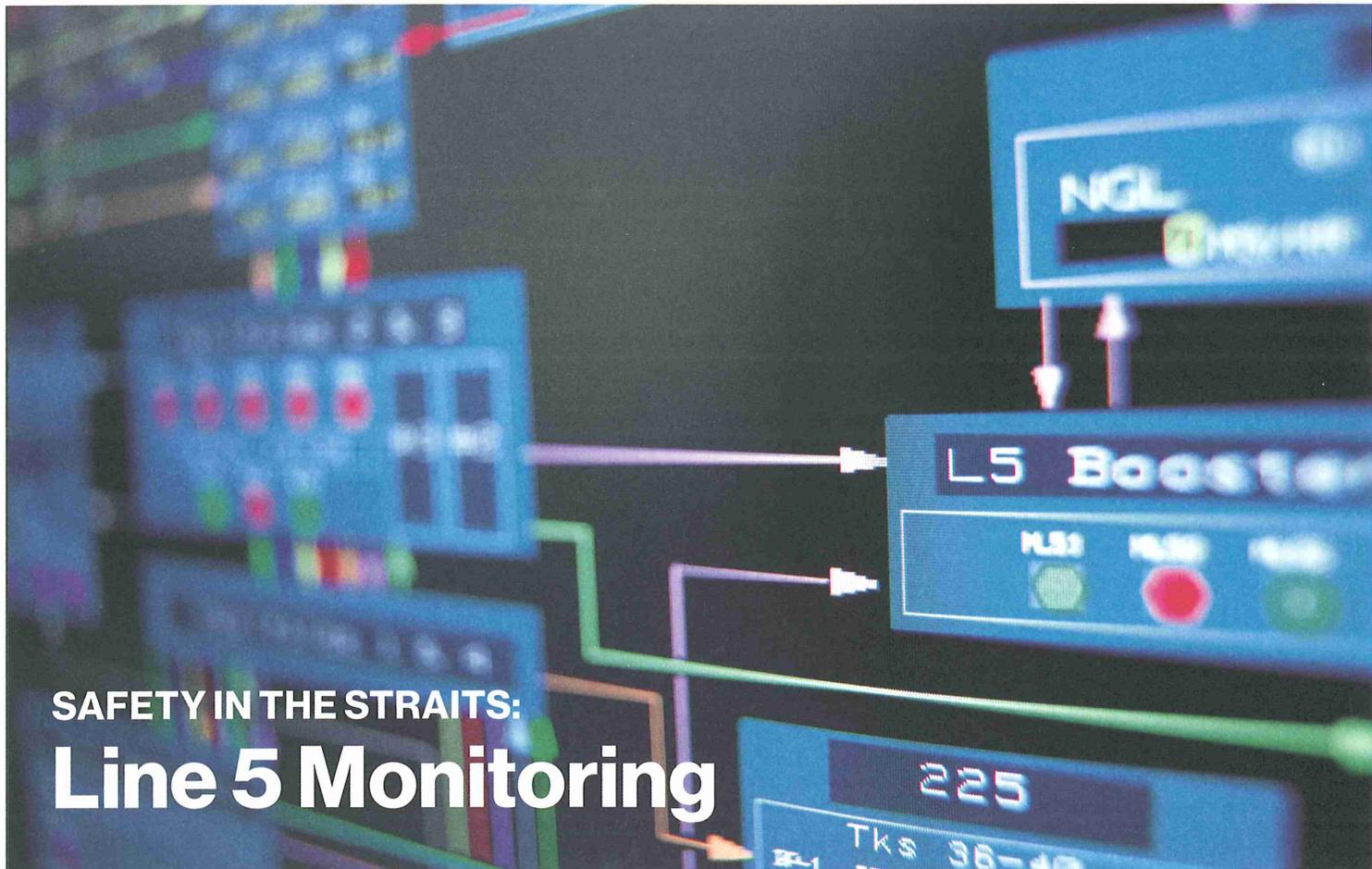
We've also partnered with Michigan Technological University to test and enhance an Autonomous Underwater Vehicle (AUV) that maps the bottom of the Straits near the Line 5 crossing—and will help complement and validate the information gathered by the ROVs.

What is Line 5?

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SAFETY IN THE STRAITS: Line 5 Monitoring

The Straits of Mackinac is a special place, and that's why we take special precautions to continue the safe and reliable operation of Line 5 as it crosses under the Straits. Our 24/7/365 monitoring program is one of many protective measures that we use to help keep the Straits safe.

How do you monitor Line 5?

We use both human and automated resources to monitor the Line 5 Straits of Mackinac crossing around the clock.

Who watches Line 5?

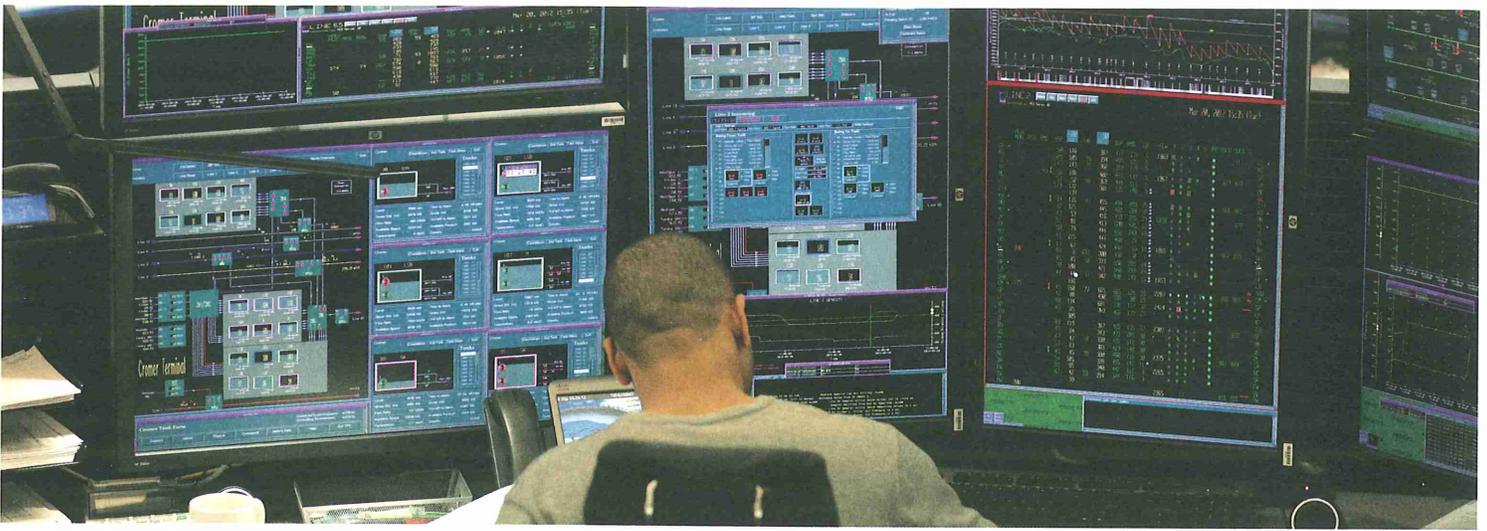
Dedicated two-person teams of specially trained controllers at our operations center—one directly monitoring, the other supporting—keep a watchful eye on Line 5, on a 24/7/365 basis, to ensure smooth operations.

What if there's a problem?

Upon detection of a problem, our staff can immediately close remotely controlled isolation valves, with full closure occurring within three minutes of activation.

What does Enbridge's 24/7/365 monitoring program involve?

Overlapping computerized modelling systems monitor pressure, temperature, and other key information from thousands of points along our pipeline network. They use this data to detect small features in the pipe that may require underwater inspection by a diver or Remote Operated Vehicle (ROV), or that could indicate a leak. We back this up with visual surveillance on our network, including aerial and ground patrols.

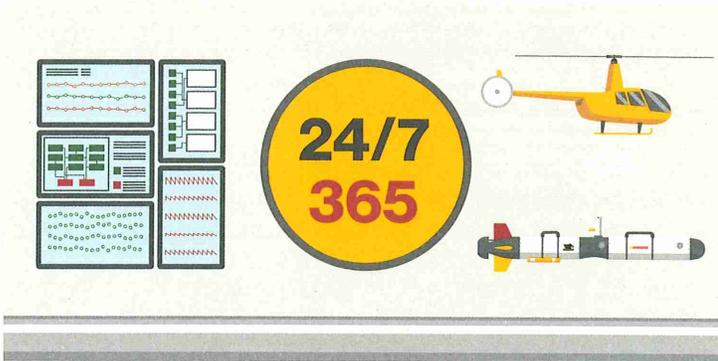


Jim is one of the controllers dedicated to Line 5. These screens provide continuous, real time information on Line 5 that allow Jim and the rest of our Pipeline Control Center team to monitor the line 24/7/365.

Ongoing 24/7/365 monitoring

Line 5 is monitored 24/7/365 by two Enbridge controllers at our operations center—one directly monitoring, the other supporting. These controllers undergo a comprehensive six- to nine-month training program before they are qualified to operate consoles independently.

Upon detection of a possible problem, our specially trained staff can close remotely controlled isolation valves immediately, with full closure occurring within three minutes of activation to isolate the affected section of the line.



We monitor Line 5 around the clock, using both human and automated resources such as real-time computer modelling, aerial surveillance and inspection tools, as part of our commitment to safe operations.

Automated protection systems

Our automated monitoring systems also keep a watchful eye on Line 5, as well as other Enbridge pipelines. Each system has a unique focus, and uses different technology, to provide overlapping protection. They include:

- Controller monitoring, or Supervisory Control and Data Acquisition (SCADA), that identifies operational changes, vapor concentrations, and equipment vibration levels;
- Computational pipeline monitoring, which keeps track of pressure, temperature, and other key data from thousands of points along our pipelines; and
- Acoustic emission inline inspections, with sensitive acoustic devices that "listen" for leaks from within the pipeline.

Keeping the Straits safe

Enbridge understands how important the Straits of Mackinac are to Michigan residents. The health and the protection of this waterway, and the Great Lakes, are essential to the vitality, sustainability, and economic prosperity of the region—and the state of Michigan.

What is Line 5?

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Built in 1953 by the Bechtel Corporation to meet extraordinary design and construction standards, the Line 5 Straits of Mackinac crossing remains in excellent condition, and has never experienced a leak in more than 60 years of operation. We're working hard to keep it that way.



The Straits of Mackinac crossing and Line 5

What is
Line 5?

Built
to last

Staying
safe

Enbridge in
Michigan

Benefits for
Michigan

Questions
and answers

The Straits of Mackinac are a truly special place. The health and the protection of these waters are essential to the vitality, the sustainability, and the economic prosperity of the region.

We understand how important the Straits and the Great Lakes are to Michigan residents—because, for more than 60 years, we've been part of the Michigan community. Since 1953, Enbridge's employees and contractors have lived and worked across the state as colleagues, neighbors, and friends.

Safety is at the very foundation of our business. It's one of our core company values, and our people live it every day. Our Line 5 Straits of Mackinac crossing has never experienced a leak in more than six decades of operation—and we're working diligently to keep it that way. We believe all pipeline incidents can be prevented, and we back up that belief with vigilance and hard work.

In this brochure, we present an overview of Line 5—its extraordinary design and construction, which still exceed today's industry standards; the ongoing measures we take, including 24/7/365 monitoring, to promote its continued safe operations and protect the environment; and its role in heating homes and businesses, fueling vehicles, and powering industry in the state of Michigan.



Being a good neighbor is our goal. Staying safe is our highest priority.

More information on Line 5 is available at enbridge.com/line5, while greater detail on our Michigan operations can be found at enbridge.com/michigan. Our Facebook and LinkedIn channels feature regular updates on our operations in Michigan, and elsewhere.

Thank you.

A handwritten signature in black ink, appearing to read 'Brad Shamla'.

Brad Shamla
Vice President,
U.S. Pipeline Operations

Line 5 is an Enbridge pipeline that was built in 1953. The line runs for 645 miles from Wisconsin, under the Straits of Mackinac, through Michigan to Sarnia, Ontario. It was built to high safety standards, and Enbridge maintains Line 5 with regular inspections, and the introduction of new measures that help ensure the line continues to safely transport the light crude oil and natural gas liquids that help to fuel quality of life for people in Michigan.



Line 5 at a glance



Inspection

The pipeline is regularly examined using state-of-the-art inspection tools.



Safety

Line 5, along with the rest of our pipeline system, is monitored 24 hours a day.



Pipeline Contents

Line 5 transports natural gas liquids (NGLs) and light crude oil. It does not carry, and has never carried, heavy oil.



Operations

The line is operated at less than 25% of maximum pressure capacity for enhanced safety.



540,000 85%

barrels of NGLs, including propane, and light crude moved per day on Line 5

of Upper Peninsula and northern Michigan homes are heated by the propane carried on Line 5

24/7/365

Line 5 is monitored around the clock by both human and automated resources

Enbridge's Line 5 Straits of Mackinac crossing was built for an underwater environment, and still exceeds today's standards for pipeline safety. In 1953, it was built to extraordinary standards, using the finest engineering expertise from across the United States. The twin pipelines under the Straits have not experienced any leaks in six decades of operation—a testament to their design, construction, and maintenance regimen.

The Bechtel Corporation, the University of Michigan's Department of Naval Architecture and Marine Studies, and Columbia University's Civil Engineering Department were involved in the engineering, design, and construction process. To promote the safety and integrity of the crossing, support anchors have been constructed and placed along the section of Line 5 that runs beneath the Straits of Mackinac. While federal regulations allow for a span of up to 140 feet between underwater support anchors, Enbridge committed to further enhancing the safety of the crossing by placing additional anchors beneath the Straits crossing. Today, underwater supports are no more than 75 feet apart.



Key safety, design and operation features help to ensure Line 5's ongoing integrity.

The Straits crossing is comprised of two 20-inch parallel pipelines which are secured deep underwater.

Hydrographic surveys, test boring and echo soundings of the area were used to find the safest location for the pipes.

The pipes are heavier-walled (a minimum of 0.812 inches), the thickest in our North America-wide system, and still exceed today's regulatory requirements.

The pipes consist of specially manufactured steel—the same steel used to build the iconic Mackinac Bridge.

The pipes are coated from the outside with waterproof enamel, then made even stronger with a fiber wrapping.

The pipes never operate at maximum pressure. Less than 25% of the pipe's capacity is used to ensure safety.

Bechtel Corporation, which built the Hoover Dam, managed the engineering, procurement, and construction of the pipeline.

The line is regularly inspected by divers, Remote Operated Vehicles (ROVs), Autonomous Underwater Vehicles (AUVs), and in-line inspection tools.

Safety is important to everyone—especially the people who live, work, and play along pipeline routes.

We place the highest priority on the safety and reliability of our pipelines, including Line 5, through industry-leading operations, monitoring programs and technology.

Harnessing technology

As we do with all our pipelines, we work hard to operate, inspect, and maintain Line 5, so we can fix potential issues before they happen. We've invested millions of dollars into the best monitoring and inspection practices. We've also partnered with Michigan Technological University's Great Lakes Research Center to test and enhance a state-of-the-art Autonomous Underwater Vehicle that maps the bottom of the Straits, using sonar technology to ensure the terrain near Line 5 is hazard-free.

Knowing how important the Great Lakes are, we pay special attention to the Straits of Mackinac. While the likelihood of a leak in the Straits is extremely low, we understand that the consequences would be significant. We rely on both human resources and technology to constantly monitor the continued safe operation of Line 5.

24/7 monitoring

In 2011, Enbridge opened a new, modernized Control Center. The center is specifically designed to enhance the safety and reliability of pipeline operations. How? By using the latest in computer modelling technology and by creating the best conditions to support our operators as they conduct critical around-the-clock operations and monitoring.

Being prepared

While prevention is key, Enbridge also maintains a significant focus on emergency response and preparedness. In the case of the Line 5 Straits crossing, we've developed a Tactical Response Plan working with the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA). This plan has been tested through a full-scale emergency response exercise, involving key stakeholders that include the United States Coast Guard and local emergency management officials.

To learn more about how we work, visit enbridge.com/line5

\$74 million

invested in company-wide training and incident response equipment between 2012 and 2014

371

company-wide emergency response exercises, drills, and equipment deployment events held in 2014



In August 2015, Enbridge sponsored the deployment of a monitoring buoy, in partnership with Michigan Tech, that measures water conditions, currents and other weather information to provide real-time data regarding the Straits of Mackinac.

What else are we doing to stay safe?



Increasing the frequency of our inspections



Reducing the average underwater span lengths to no more than 75 feet



Developing a water current modeling study to examine the effect of currents on the pipelines



We've had a presence in Michigan for nearly as long as Enbridge has been in existence.

live and work in communities across Michigan, we want to make our communities safer, healthier, smarter, greener, more enriching, and more inspiring.

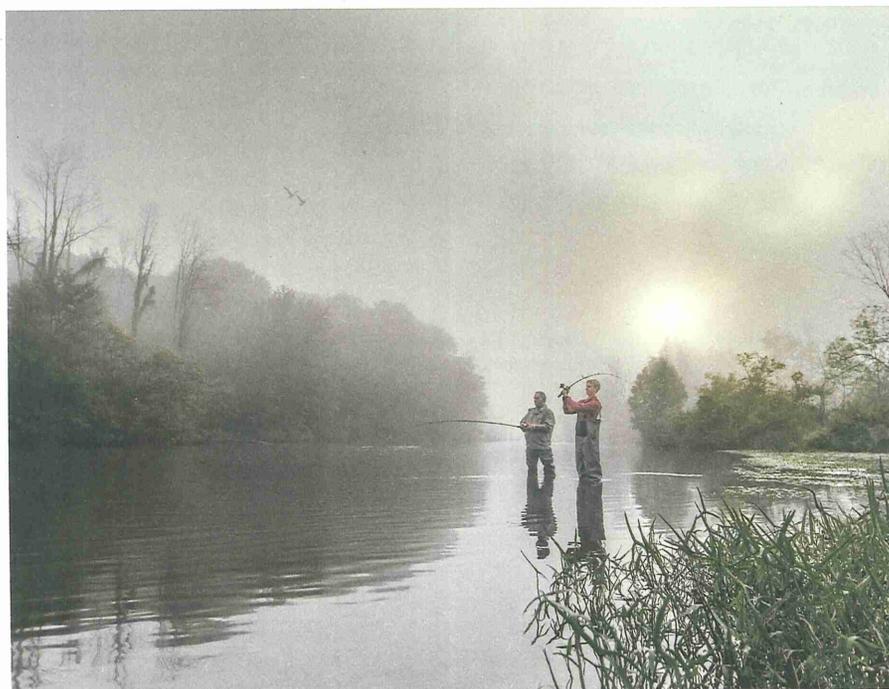
Since 1953, Enbridge's employees and contractors have lived and worked in communities throughout Michigan as colleagues, neighbors, and friends.

Enbridge is committed to enriching the communities near our projects and operations. From investing in the conservation of local trails to donating our retired fleet vehicles to fire departments, search-and-rescue teams, and EMS providers across Michigan, we know that being a good neighbor means being essential to the fabric of a community.

Our Line 5 pipeline transports petroleum products, such as natural gas liquids (NGLs) and light crude oil, that are refined into fuels vital to everyone who lives and works in Michigan.

We adhere to a strong set of values—integrity, safety and respect—that reflect what is truly important to us. Enbridge has been part of Michigan life for over 60 years—and with 250 employees and contractors, we hope to be a part of it for many more.

We work hard to live up to that "good neighbor" status in a variety of ways—economically, socially, and culturally. As a company, and as individuals who



Enbridge has approximately **250 EMPLOYEES AND CONTRACTORS** in Michigan



LINE 5 ALSO DELIVERS NATURAL GAS LIQUIDS, including propane, which are used to heat homes, make vehicles and tires for Michigan's renowned auto industry, and produce consumer goods like computers, clothing, and medical equipment

ENBRIDGE TAXES IN 2014 ACROSS MICHIGAN



Sales-and-use taxes



Property tax



85 percent of homes in the Upper Peninsula and northern Michigan get their propane from the NGLs transported on Line 5.



30 percent of the light crude oil transported on Line 5 stays in Michigan. Primary customer is the Detroit auto industry—Ford, Chrysler and GM.



Since 1999, Enbridge's Line 5 has transported nearly 80 million barrels of Michigan-produced crude oil. That works out to an average of approximately 14,000 barrels each day.

Here are answers to the most common inquiries about Line 5.

Over the summer, Enbridge sat down with residents from communities in the Upper and Lower Peninsulas to talk about Line 5. We are very thankful for the opportunity and their feedback. Participants raised some great questions and concerns that we wanted to share more widely throughout the state. We hope this information is helpful to others in Michigan who value the Great Lakes and want to know that Enbridge is operating Line 5 safely.

What does Enbridge do to ensure the safety of Line 5?

A dedicated team monitors the line constantly. Enbridge also conducts internal inspections via an MRI-like tool known as a “pig” that travels the line recording data on the pipe’s thickness and looking for cracks, dents or signs of corrosion. We keep an eye on the outside of the pipeline with the help of divers and, in partnership with Michigan Tech, use an Autonomous Underwater Vehicle to visually inspect the line. We perform these inspections twice as often as federal pipeline regulations require.

Is Line 5 deteriorating?

Line 5 was built for the underwater environment, with nearly one-inch-thick steel walls and fiber-reinforced enamel coating. It was built by Merritt-Chapman & Scott, the same company that built the Mackinac Bridge, using the same kind of steel. Like the bridge, the intention has always been to operate and maintain it carefully to maximize its lifespan. Recent inspection reports show that Line 5, from an engineering and integrity perspective, is like new and in excellent condition.

How can you convince me that you care about Michigan.

Safety is one of our core values. The people who live near our pipelines expect us to operate safely, and the protection of the public and the environment is our highest priority. More than 250 Michigan residents are employed or contracted with Enbridge, and they all play an important role in maintaining the safety and reliability of our pipelines and facilities.

Enbridge is the same company that caused a giant spill in Marshall. Why would this be any different?

We regret the spill in the summer of 2010 that caused oil to flow into the Kalamazoo River. Those were the darkest days in our company’s history and we will never forget the lessons of Marshall. Since then, Enbridge has transformed its approach to safety, investing heavily in enhanced monitoring, safer pipelines, and more staff to keep operations safe.

Does Line 5 transport heavy crude oil?

Line 5 carries light crude oil and natural gas liquids, including propane, which power manufacturing, heat homes, and fuel our cars. It does not carry, and has never carried, heavy oil.

Line 5 transports products that benefits other states or countries.

Does it benefit Michigan?

Line 5 delivers 85% of Northern Michigan’s home heating fuel. It also transports roughly 14,000 barrels per day of crude oil produced in Michigan. About 30% of all the crude oil carried by Line 5 stays right in Michigan, powering, manufacturing and producing the gas that keeps cars running. Enbridge paid \$22.4 million in property and sales-and-use taxes in Michigan in 2014.

Some have called for Enbridge to permanently remove Line 5. Why hasn’t it been done?

A lot of people and businesses depend on the light crude oil and natural gas liquids delivered by Line 5. Without it, the state’s access to affordable, secure energy would be compromised.

What would happen if there were a leak or spill?

If there is a change in pressure or flow, Enbridge can remotely shut off flow in three minutes and activate trained responders. A response plan, which reflects input from the U.S. Coast Guard and Environmental Protection Agency, is in place, and local emergency responders are trained on it and prepared to respond if an incident were to happen.

For more information on Line 5, go to enbridge.com/line5 We hope that these important questions and answers will be the beginning of a larger dialogue throughout the state.

Enbridge helps to provide a secure, sustainable and reliable supply of energy to Michigan, and across the U.S. and Canada.

Millions of North Americans count on the energy we deliver daily. Providing safe and reliable infrastructure is the very foundation of our business. That's why our top priority is the protection of people and the environment. Our strategic investments in infrastructure upgrades help ensure the reliability and safety standards that all communities expect.

Enbridge transports, distributes and generates energy. We play a central role in providing heat and light for homes, offices and factories; fuel for vehicles and airplanes; and many other essential products and services that support prosperity and quality of life for millions of people.

Energy transportation

Enbridge operates the world's longest crude oil and liquids transportation system, delivering over 2.2 million barrels per day to customers in the U.S. and Canada.

Energy distribution

We own and operate one of the largest natural gas distribution companies in North America, Enbridge Gas Distribution.

Energy generation

We have invested more than \$4 billion in wind, solar, geothermal, power transmission, waste heat recovery, and a host of emerging technology projects that, together, have the capacity to generate more than 2,200 gross megawatts (MW) of zero-emission energy—that's enough to supply the electricity needs of nearly 750,000 homes.

We believe that working towards lower-impact energy solutions is in everyone's best interest. Our portfolio of renewable energy projects is diversified and growing.

A North American company

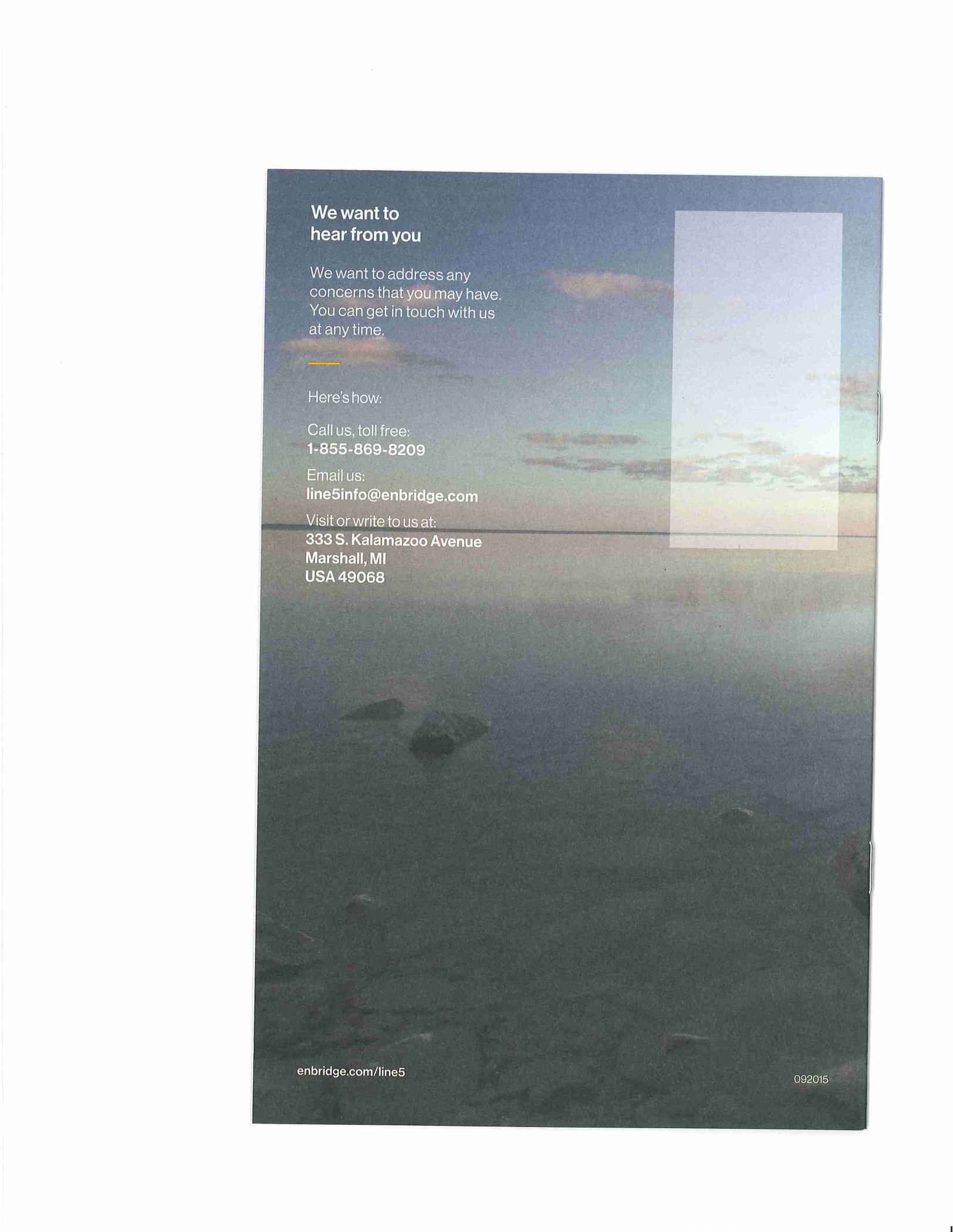
We employ about 11,000 people across the U.S. and Canada. Enbridge has been included on the Dow Jones Sustainability North America and World Indices in each of the past three years. Enbridge Inc. common shares trade on the New York and Toronto stock exchanges.

Enbridge in Michigan

We've had a presence in Michigan for almost as long as Enbridge has been in existence, with our roots in the Great Lakes State stretching back to 1953. Today, Enbridge's five wholly owned or operated pipelines that travel through Michigan—Line 5, Line 6B, Line 17, Line 79, and Vector Pipeline—carry oil, natural gas, and NGLs (including propane), and provide significant economic benefits to the state. Enbridge paid more than \$22 million in property and sales-and-use taxes in Michigan in 2014.



<p>1 Enbridge Inc. and Enbridge Income Fund Holdings Inc. Headquarters, Calgary, Alberta, Canada</p> <p>2 Enbridge Energy Partners, L.P. and Midcoast Energy Partners, L.P. Headquarters, Houston, Texas, USA</p> <p>3 Enbridge Gas Distribution Headquarters Toronto, Ontario, Canada</p>	<p>— Liquids Systems and Joint Ventures</p> <p>— Natural Gas Systems and Joint Ventures</p> <p>— Power Transmission</p> <p>— Gas Distribution</p> <p>▲ Wind Assets</p> <p>★ Solar Assets</p> <p>⊕ Geothermal Assets</p> <p>● Storage</p> <p>▲ Waste Heat Recovery</p> <p>■ Fuel Cell</p> <p>⊕ Rail</p> <p>⊕ Trucking Facility</p>
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**We want to
hear from you**

We want to address any
concerns that you may have.
You can get in touch with us
at any time.

Here's how:

Call us, toll free:
1-855-869-8209

Email us:
line5info@enbridge.com

Visit or write to us at:
**333 S. Kalamazoo Avenue
Marshall, MI
USA 49068**



BILL SCHUETTE
ATTORNEY GENERAL
STATE OF MICHIGAN

March 11, 2016

Cynthia Hansen
Senior Vice President
Operations Liquid Pipelines
Enbridge Energy
10201 Jasper Avenue N.W.
Edmonton, Alberta
Canada T5J 2J9

Re: Enbridge Line 5 Pipelines at the Straits of Mackinac

Dear Ms. Hansen:

As you know, the State of Michigan has previously requested and received from Enbridge various information related to Enbridge's Line 5 pipelines at the Straits of Mackinac. We appreciate Enbridge's past cooperation in that regard.

We write now to request additional information for several reasons.

- First, and foremost, as explained in the 2015 *Michigan Petroleum Pipeline Task Force Report*, the State and its citizens have serious, continuing concerns about potential risks to Michigan's environment and economy presented by the Straits Pipelines.
- Second, much of the information referenced in Enbridge's June 27, 2014 response to the State's initial request was made available through a read-only data portal, severely limiting its usefulness. As noted in the *Task Force Report*, we do not agree with Enbridge's assertion that all the documents in question constitute critical energy infrastructure information protected from public disclosure under applicable law or "confidential business information." On the contrary, as referenced in the list of additional documents requested in Attachment A and in the list of read-only files requested in Attachment B, many of these documents can and should be provided to the State in unrestricted form.

- Third, there is a need to update our previous information requests to address subsequent events and conditions.
- Fourth, as again noted in the *Task Force Report*, additional issues and concerns regarding the Straits Pipelines have arisen since Enbridge responded to our previous information requests.
- Finally, as you are aware, the State is in the process of implementing the *Task Force Report* recommendations to conduct independent risk and alternatives analyses for the Straits Pipelines. The additional information requested here will also be needed by the contractors who ultimately conduct those analyses.

For all of these reasons, we request that Enbridge, provide the State of Michigan with copies of all of the documents identified in Attachments A and B to this letter. The additional documents requested in Attachment A are organized by the following topics:

1. In-line pipeline inspections.
2. External pipeline inspections with remotely operated vehicles.
3. Pipeline integrity and replacement.
4. Pipeline operating pressure.
5. Effects of mussels attached to the Straits Pipelines.

As noted above, Attachment B identifies certain files included in the read-only web portal referenced in Enbridge's June 27, 2014 response that the State believes do not constitute legally protected critical energy infrastructure information and that the State accordingly requests Enbridge to provide in unrestricted form.

Please provide the requested documents within 30 days of the date of this letter. As a practical matter, because of the volume of documents requested and the very large size of some of the files, it may be most efficient to provide some of them by means of one or more external hard drives, like those used to transmit copies of videos of the 2012 external pipeline inspections.

Cynthia Hansen
Senior Vice President
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If Enbridge would like to discuss this request for information, please contact Assistant Attorney General Robert Reichel at 517-373-7540. Thank you for your attention to this matter and your anticipated cooperation.

Sincerely,



Bill Schuette
Attorney General
Department of
Attorney General



Keith Creagh
Interim Director
Department of
Environmental Quality



William Moritz
Interim Director
Department of
Natural Resources

RPR:neh

Attachments

ATTACHMENT A

Additional Documents Requested by the State of Michigan

1. **In-line pipeline inspections**

- a. All reports of , and data collected in, each in-line inspection of Line 5 conducted to date, including, without limitation, those listed in Tables 2 and 3 of Enbridge's *Operational Reliability Plan- Line 5 and Line 5 Straits of Mackinac Crossing*, accessed at <https://www.enbridgepartners.com/~media/7FDCBAC7A8FE4705A2729F3D1B51B6B3.ashx>
- b. Any and all assessments, evaluations or reviews of the in-line inspections referenced in 1.a. by Enbridge or by third parties.
- c. All reports of, and data collected in, any excavations or field assessments resulting from in-line inspections, including, without limitation, those referenced at page 8 of Enbridge's June 27, 2014 response.

2. **External pipeline inspections with remotely operated vehicles.**

- a. All film, videos, or other documentation of remotely operated vehicle inspections of the Straits Pipelines listed in Table 2 of Enbridge's June 27, 2014 response, except the video of the 2012 inspection already provided at the time of that response, plus those of any subsequent inspections.

- b. Any and all assessments, evaluations, or reviews of the external pipeline inspections requested in 2.a. by Enbridge or third parties.

3. Pipeline integrity and replacement

- a. The current version of Enbridge's procedure PI-69, Procedure for Pipeline Replacement Assessments referenced at page 3 of Enbridge's June 27, 2014 response.
- b. Any and all documents relating to Enbridge's application of procedure PI-69 to Line 5 as described at page 3 of Enbridge's June 27, 2014 response.
- c. Any and all other documents describing the procedures and criteria that would be used by Enbridge to determine whether and when to repair or replace any portion of Line 5, and Enbridge's application of those procedures and criteria to Line 5.

4. Pipeline operating pressure

- a. Any and all documents supporting Enbridge's statement at page 12 of its June 27, 2014 response that "Enbridge...[has] operated the [Straits Pipelines] over the years at approximately 25% of their Maximum Operating Pressure."
- b. Any and all documents relating to changes made by Enbridge to allowable operating pressure for the Straits Pipelines.

5. Effects of mussels attached to the Straits Pipelines

- a. Any and all documents relating to effects that the attachment of mussels to the Straits Pipelines have on Enbridge's ability to perform external inspections of their condition and measures, if any, taken by Enbridge to overcome those effects.
- b. Any and all documents relating to the effects that the attachment of mussels to the Straits Pipelines and potential secretions from mussels may have on the physical condition and integrity of the Pipelines and measures, if any, taken by Enbridge to monitor or mitigate those effects.

ATTACHMENT B

Documents Requested from the Web Portal

Folder A1b

Files 3.1.2 and 3.1.3 Dredging Reports 1953- not labeled Critical Energy Infrastructure Information (CEII)

File 3.6.1 Management Change Form 2012- not labeled CEII

Files 3.7.2-3.7.3 Construction Reports- not labeled CEII

Files 3.8.1-3.8.12 Construction Progress Reports- not labeled CEII

Files 3.13.4- 3.13.17 Contract Agreement regarding Cathodic Protection-not labeled CEII

Folder A1d

Files 5.1-5.12 Construction Photos- not labeled CEII

Folder A2

Files 6.1- 6.15 Underwater Inspection Reports and Span Logs- labeled CEII but only shows history of spans.

Files 6.16- 6.19 Span Logs- not labeled CEII

Folder A3

Files 7.1- 7.8 Underwater Visual Inspection Reports, anchor design- not labeled CEII

Folder A4

File 8.3 Procedure for Pipeline Replacement Assessments- not labeled CEII

Folder C1

Files 12.1- 12.7 In Line Inspection Reports- not labeled CEII

Files 12.8.1- 12.8.19 ROV Inspections Pipeline Support Surveys-
Labeled CEII but only shows history of spans, supports

Folder D2

File 13.1 Summary of Pipeline Control Measures- not labeled CEII

File 13.2 2013 Spill Modeling Report- not labeled CEII

Folder E1-E3

File 14.2 Emergency Response Action Plan- not labeled CEII and
referred to as “for public use” in June 2014 Enbridge response, p.20

Files 14.3- 14.5 Response Times, Equipment and Manpower- not labeled
CEII

Folder E 4

Files 15.1- 15.11 Cleanup Cost Estimates – not labeled CEII

Line 5 Conclusions from 9/30/15 Cheboygan Talk

Regarding Enbridge

Enbridge's position that all parts of Line 5 are in "great" condition is not supported by publicly available data and is contradicted by data released in Enbridge's 2014 Operational Reliability Report¹.

Enbridge continues to wage a very expensive, data free PR campaign while making vague promises to back it up with engineering data. This approach coupled with Enbridge's operational failures that led to the rupture of Line 6b creates the impression that they cannot substantiate their position that Line 5 is not an imminent hazard.

Enbridge claims to have completely changed their culture of poor operational discipline and biased engineering assessments. This is also the position of the Association of Oil Pipelines (AOPL) but cultural change in an industry that has avoided accountability for decades is very difficult to implement. Real disclosure of Enbridge internal assessments of the condition of Line 5 that admit a 62 year old steel pipe is not "like new" is needed to build trust.

Regarding the Michigan Public Service Commission (MPSC) and Governor's Task Forces

The MPSC played a very active role in supervising the design and evolution of Line 5 from its inception in 1953 through 1993 resulting in publically available documentation of its configuration and meaningful operating restrictions. After 1993, the MPSC gave up meaningful oversight of Line 5 and little is publically available about how it is currently configured.

The MPSC last set operating pressure restrictions for Line 5 in 1963 based on new pipe. Since then the agency not reexamined this issue to determine the effects of extensive reconfiguration and 62 years of corrosion on Line 5.

Based on the limited publicly available information, it appears as if Enbridge has submitted significant data to the MPSC for examination by the original pipeline Task Force that data is being held by the Attorney General under a confidentiality agreement. It is not known how much of this data was reviewed by the original Pipeline Task Force but it is certain that any committee composed of non-experts will not be able to correctly interpret such information and will not reach meaningful conclusions.

Regarding the non-Straits Sections of Line 5

From an original capacity of 120,000 bbl/d with no pump stations in Michigan to a maximum of 565,000 bbl/d with 19 pump stations to its current 540,000 bbl/d with 12 pump stations and using drag reduction technology, Line 5 has been extensively reconfigured. Line 5 can now be considered as twelve separate pipelines that have not faced outside review since 1963.

The rupture of Line 5 near Crystal Falls in 1999 due to coating failure and corrosion as well as other documented maintenance activities leads to the conclusion that Line 5 is significantly corroded. This conclusion is supported by data in Enbridge's 2014 Operational Reliability Report. Richard Kuprewicz, a noted pipeline expert, has said the section along US-2 is a most likely failure point. I support that conclusion but suspect the sections where Line 5 crosses the Indian River are also compromised.

Safe operation of any old pipeline depends on careful In Line Inspection (ILI using smart pigs) and unbiased interpretation of that data to make repair/replace decisions in real time then implementing them. Enbridge failed on all three of these tasks on Line 6B. It is not known if Line 5 has been

Line 5 Conclusions from 9/30/15 Cheboygan Talk

completely reexamined using current good practice and how much risk Enbridge is willing to accept when a cash flow of about two million dollars a day is at stake.

Encroachment of habitation on the Line 5 Right of Way raises significant questions about whether adequate safety factors exist to prevent loss of life in these areas.

Regarding the Straits Sections of Line 5.

Enbridge claims these pipes are in "like new" condition, an extremely improbable claim for any steel structure that has been submerged for 62 years. No publicly available data exists that would support this claim

It is known that washout of the support bed, encrustation by mussels, and currents that greatly exceed the original design bases have subjected these pipes to stresses not contemplated by the original pipeline designers. How much stress is locked up in Line 5 due to this abuse cannot be determined by Enbridge or anybody else.

The protective coating system of the Straits sections of Line 5 consisting of two layers of fiberglass saturated with plasticized coal tar and wrapped with oaken lagging for abrasion protection has apparently failed. The bottom of the pipe may well be subject to significant abrasion and corrosion because of this.

Even though the Straits sections of Line 5 have pipe with very thick walls, the combination of locked up stress and corrosion make it impossible to determine how safe this pipe is from the public record. It is certain that the original design safety factors agreed to between the MPSC and the Lakehead Pipeline Company no longer apply.

Conclusion

Significant recent ruptures of aging pipelines with resulting damage to the environment and loss of life makes it unclear if the industry has the knowledge and the will to operate safely.

It is my professional opinion that Line 5 which is well past its likely design life of 50 years, has been extensively reconfigured to operate well beyond its original design parameters, and has not been subjected to significant public scrutiny for a very long time should be thoroughly examined by licensed experts using all the information that exists under MPSC auspices.

Given the uncertainty and lack of urgency resulting from the political nature of such an examination it is my opinion that Line 5 should be derated to its original design capacity of 300,000 bbl/d and restricted to non-oil cargos (eg LPG, NGL's and Propane) because of the imminent hazard it presents until thorough review by licensed experts can take place.

Legal analysis by attorneys from FLOW suggest the State of Michigan has the authority to order such restriction and may be failing in its public trust duty to protect the public and environment .

ⁱ Enbridge Energy Limited Partners, Operational Reliability Plan, Line 5 and Line 5 Straits of Mackinac Crossing", 2014, <https://www.enbridgepartners.com/~media/7FDCBAC7A8FE4705A2729F3D1B51B6B3.ashx>.

Governor Snyder and Attorney General Schuette:

A confluence of events has led me to the conclusion that I would be ethically and professionally remiss if I did not contact you regarding the direction your Pipeline Advisory Board has taken in its considerations of Enbridge's Line 5 and other pipelines.

On Thursday, January 28th I was travelling to Cedarville to give a talk about Line 5 at the request of the Les Cheneaux Watershed Council. As I drove north on I-75, National Public Radio was alternating between stories about both the current Flint water crisis and the 30th anniversary of the Challenger disaster. In both cases, technically ignorant, bottom line focused, schedule driven managers ignored sound technical advice and caused unnecessary and tragic losses.

I have been studying the engineering and maintenance issues that lie at the center of the controversy regarding the safety of Line 5 in particular and vintage pipelines generally for over a year. Your Pipeline Advisory Board is currently taking comments on a Request for Proposal to examine the risks associated with the Straits sections of Enbridge's Line 5. Unfortunately, I have concluded based on Enbridge's publically released data, my own calculations and other sources that other sections of Line 5 are equally if not more hazardous to Michigan, its residents, quality of life and economy. Specifically, the sections of pipe from Rapid River to St. Ignace and Mackinaw City to Wolverine present a unique threat to our Great Lakes. These sections of Line 5 lie in close proximity to Lake Michigan and they cross numerous waterways that drain into the lake. This conclusion was supported in a recent conversation with noted pipeline expert, Richard Kuprewicz.

Governor Snyder, your Pipeline Safety Board is only looking at one small section of Line 5 and this is wrong! The Board should not limit the scope of its activities to only the Straits sections of Line 5 while ignoring the miles of rusty, thin walled, 30" pipe that is buried near the shores of Lake Michigan and numerous inland lakes and streams including the vulnerable Indian River crossing. Either a catastrophic rupture or a slow, undetectable leak at these locations would damage Pure Michigan[®] just as much as a similar scenario under the Straits. Your Pipeline Safety Advisory Board must be redirected, through a revised Executive Order, if necessary, to focus on the imminent hazard of Line 5 all across the State of Michigan including under the Straits.

Governor Snyder, please give this warning your prompt consideration. Once again, as in Flint, as with the Challenger at Cape Canaveral and as shown by Enbridge in its devastating release into the Kalamazoo River, bureaucratic process has produced a nonsensical result. I have volunteered a great deal of my time to study the Line 5 issue and do not want to see a meaningless study that will not address the most important questions, or a pipeline failure while the proper study is completed. I stand ready to travel to Lansing at my own expense and present the case made in this letter to you, Attorney General Schuette, the Director of the Department of Environmental Quality, or other involved officials.

Please let common sense and your duties as Governor prevail and order your Pipeline Safety Advisory Board to take a holistic and fully transparent look at Line 5 everywhere it touches our State of Michigan.