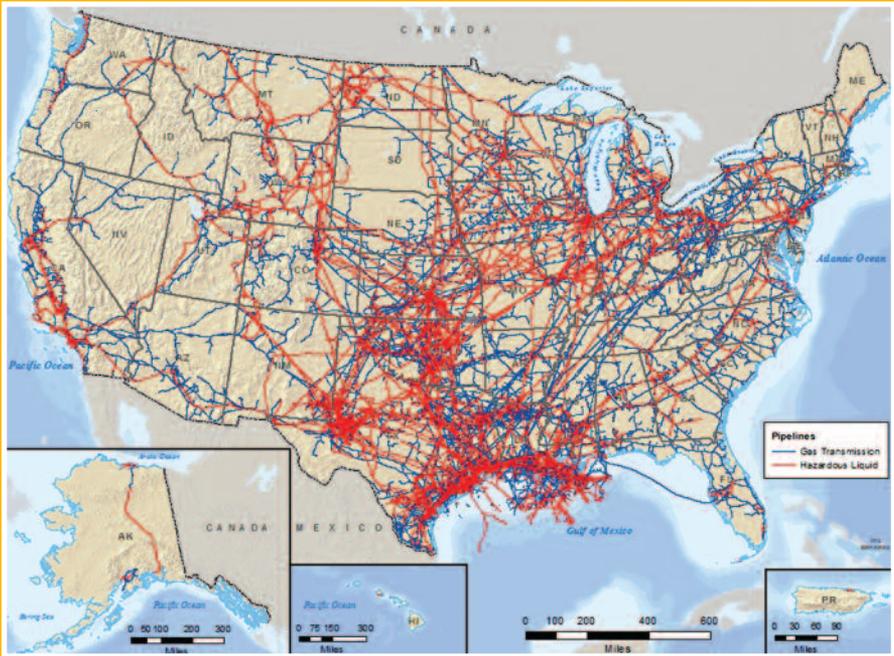


UNDERSTANDING NORTHERN MICHIGAN PIPELINES

A citizen's guide about pipeline identification, spill prevention, emergency response, and safety.

Gas Transmission and Hazardous Liquids Pipelines (2015)



Credit: PHMSA. Map created May 2015.

Millions and millions of miles of pipeline crisscross the United States. These pipelines transport large quantities of commodities that serve a number of our everyday needs such as transportation, heating our homes, manufacturing, and agriculture.

Pipelines are considered to be one of the safest and most efficient means of transporting commodities used to power our homes and businesses. However, they come with risks.

Pipeline accidents can and do happen. When they do, the results are often catastrophic. The consequences of a pipeline oil spill can be disastrous when they occur in our rivers, streams, lakes, or oceans.

Michigan is at great risk from a pipeline spill. After all, water is Michigan's most significant resource.

The Great Lakes and inland waters shape our state, our lives, and our economy. The Great Lakes contain one-fifth of the world's fresh surface water and provide drinking water to 40 million people. Michigan is home to more than 11,000 inland lakes, 36,000 miles of rivers and streams, 5.5 million acres of wetlands, and 3,200 miles of shoreline.

Michigan is also home to over 123,000 miles of pipeline.

Between 2004 and 2013, there were 116 reported incidents on pipelines in Michigan. This includes a July 26, 2010 pipeline rupture that released an estimated 843,000 gallons of crude oil into Talmadge Creek and the Kalamazoo River, a Lake Michigan tributary.

This served as a wake-up call for all of us; a reminder of the risk pipelines can pose. A pipeline rupture would be particularly devastating for Northern Michigan. A pipeline rupture here could contaminate surface and drinking water, harm wildlife, cause significant property damage, and foul our tourism economy.



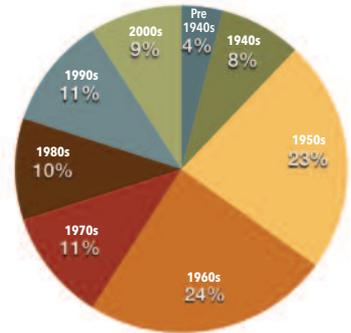
Over 50% of the nation's pipelines were constructed in the 1950's and 1960's during the creation of the interstate pipeline network built in response to the huge demand for energy in the thriving post-World War II economy. Some pipelines were built even earlier. Over 12% of the nation's cross-country gas transmission and hazardous liquid pipelines were built prior to the 1950's. The oldest pipe still in operation in Michigan for hazardous liquids was installed during the 1930's and for natural gas was installed prior to 1940.

The pie charts to the right depict the percentage of pipelines constructed by decade for each of the three types of regulated pipelines.

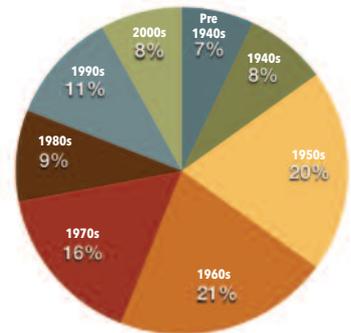
While aging infrastructure is a problem, age alone does not fully indicate the risk of a pipeline rupture. Factors such as type of materials used, installation techniques, seam type, whether corrosion prevention measures were used, and how the pipeline is maintained all impact the likelihood that a rupture could occur. While each of these factors can contribute to a pipeline's risk, an operator properly managing the integrity of its pipeline system can counterbalance the impact of aging and construction materials.

Age Distribution of U.S. Pipeline Infrastructure

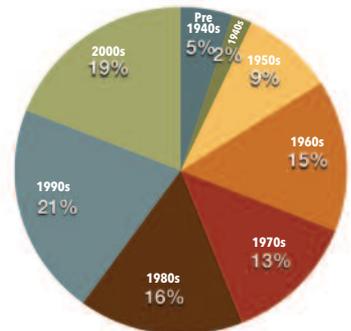
Gas Transmission and Gathering



Hazardous Liquid



Gas Distribution



Credit: PHMSA



There are two main categories of fuel pipelines:
Hazardous Liquid and Natural Gas

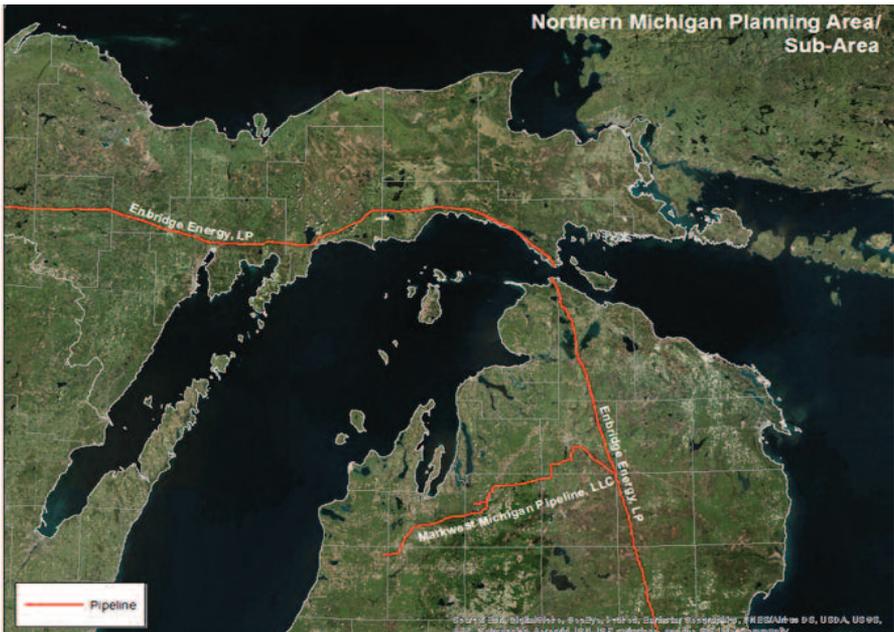
Hazardous liquid pipelines are those that transport crude oil; refined petroleum products such as gasoline, diesel, jet fuel, and home heating oil; highly volatile liquids or natural gas liquids (NGLs) which is butane, ethane, and propane; carbon dioxide; and anhydrous ammonia.

Natural gas pipelines transport natural gas which is primarily methane and other gases including ethane, carbon dioxide, and butane.

There are more than 2.6 million miles of pipelines that stretch across the U.S. to transport approximately 65% of the energy we consume.

The majority of the pipelines throughout the country are natural gas service, transmission, and distribution lines. Only seven percent of the total pipeline mileage is used to transport hazardous liquids. Approximately 5% of the pipelines in Michigan transport hazardous liquids.

The majority of pipeline infrastructure in Michigan is located in the Detroit Metro area in Wayne and Oakland Counties. There is only a small percentage of pipelines in Northern Michigan. In fact, there are only two major crude oil pipelines in Northern Michigan. One is owned and operated by Enbridge Energy, Limited Partnership and the other by MarkWest Energy Partners.





Crude oil is classified as light, medium, or heavy, which refers to the oil's relative density based on the American Petroleum Institute (API) Gravity. The measure reflects how light or heavy a crude oil is compared to water.

API Gravity	
Light Crude	Higher than 31.1°
Medium Crude	Between 22.3° and 31.1°
Heavy Crude	Below 22.3°

In general, if an oil's API Gravity is greater than 10°, it is lighter than water and will float on it. If an oil's API Gravity is less than 10°, it is heavier than water and will sink.

Oil Sands

The term oil sands refers to a particular type of nonconventional oil deposit that is found throughout the world. Oil sands, sometimes referred to as tar sands, is a mixture of sand, clay, other minerals, water, and bitumen. The bitumen is a form of crude oil that can be separated out from the mixture. In its natural state, it is very dense and highly viscous. In order to transport the oil sands, the natural bitumen is processed or diluted. There are three categories of processed/diluted bitumen:

- **Upgraded bitumen or synthetic crude oil (SCO)** – produced from bitumen at a refinery that turns the heavy oil into a lighter material.
- **Diluted bitumen (Dilbit)** – bitumen that is blended with lighter products, typically natural gas condensates. Typically, the blend is 25-30% condensate and 70-75% bitumen.
- **Synthetic bitumen (Synbit)** – a combination of bitumen and SCO, resulting in a product that closely resembles conventional crude oil.

Canada is the largest supplier of oil and petroleum products to the U.S. and Alberta, Canada has one of the largest oil sands deposits in the world. U.S. imports of Canadian crude oil derived from oil sands increased from roughly 0.6 million barrels per day in 2005 to 1.2 million barrels per day in 2013.

TYPES OF PIPELINE INCIDENTS



There are two types of pipeline incidents: leaks and ruptures. A leak is a slow release of a product whereas a rupture is a breach in the pipeline that may occur suddenly. In general, leaks are more common, but cause less damage as opposed to ruptures that are relatively rare, but can have catastrophic consequences.

“Material, welding, and equipment failure is the number one cause of pipeline incidents”

There are a number of causes of pipeline incidents including corrosion, excavation damage, incorrect operation, material/weld/equipment failure, and natural force damage (i.e., Hurricane Katrina).

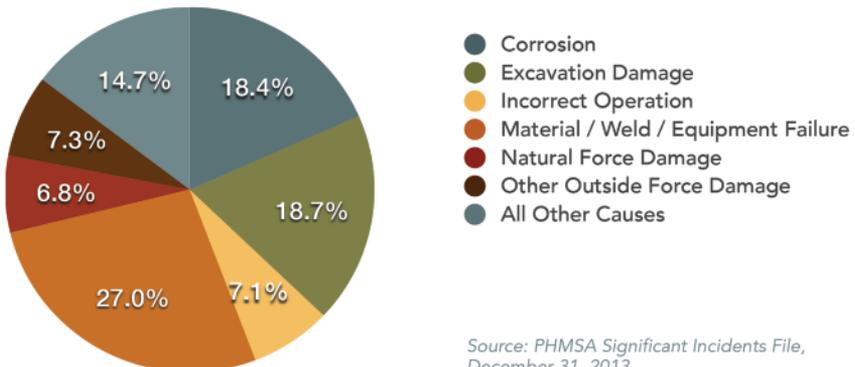
Material, welding, and equipment failure is the number one cause of pipeline incidents, with excavation damage the second cause.

Pipelines are considered to be low risk/high consequence meaning that incidents are relatively rare considering the total mileage of pipelines and the volume of product transported, but when incidents do occur, they often have dire consequences.

The Pipeline and Hazardous Materials Safety Administration (PHMSA), the federal agency responsible for pipeline safety, keeps track of pipeline incidents throughout the country. In the last two decades, pipeline safety has generally improved as there has been a downward trend in serious accidents. A serious accident is defined as an accident where there was a fatality or a number of injuries.

While there has been an overall downward trend in the last 20 years, there has actually been a slight increase in significant accidents for hazardous liquid pipelines in the last few years.

All Reported Incident Cause Breakdown National, All Pipeline Systems, 1993-2012



Source: PHMSA Significant Incidents File, December 31, 2013



Releases of products carried through pipelines can impact the environment and may result in injuries or fatalities as well as property damage. The risk associated with pipelines varies depending on a number of factors such as the product being transported in the pipeline, size and operating pressure of the pipeline, as well as the population and natural resources near the pipeline.

The risks associated with hazardous liquid pipelines depend primarily on the commodity and the characteristics of the surrounding area. Some hazardous liquids, such as propane, pose a near-term hazard of fire or explosion. Other releases, such as crude oil, have greater risks for the environment in both the short and long term.

Crude oil spills can result in harm to human health and the environment, including injuries or fatalities to fish and wildlife and contamination of drinking water supplies. Waterfowl populations often experience direct mortality or significant injury from oil spills. For example, oil coats bird feathers reducing their buoyancy, and when birds groom themselves, they ingest the oil which injure their internal organs. Additionally, oil on the surface of the water blocks sunlight, damages fish eggs, and impacts plankton, a primary food source for numerous fish and wildlife species. Oil can linger in the environment for many years, even after a cleanup, continuing to affect fish, wildlife, and humans. In addition to the environmental impacts of a spill, the potential economic impact of an oil spill in our region – from property damage to a decrease in tourism – would be substantial.

For natural gas pipelines, the greatest risk is associated with fires or explosions caused by ignition of the natural gas. This can cause significant property damage and injuries or death. Additionally, the release of natural gas, primarily methane which is a very potent greenhouse gas, contributes to climate change.



PIPELINE SAFETY

Despite being the safest way to transport oil and gas products over long distances, pipelines come with an inherent risk. It is the responsibility of pipeline operators to take measures to minimize the risks associated with the transportation of oil and gas through pipelines. Operators can help prevent an oil spill by using proper construction materials and techniques along with monitoring, maintenance, and inspection practices.

Operating Pressure

Pipelines are designed to a specific strength based on the intended operating pressure. The Maximum Operating Pressure (MOP) is the maximum internal pressure at which a pipeline or pipeline segment may be continuously operated.

Corrosion Prevention

Pipeline operators employ a number of methods to prevent corrosion on pipelines including exterior coatings, cathodic protection, and corrosion inhibitors.

Shut-off Valves

Shut-off valves can be instrumental in reducing the amount of product released in the event of an accident and the subsequent damage caused by a release.



Monitoring

The flow of oil and gas through pipelines are monitored for problems. Most pipelines use a Supervisory Control and Data Acquisition System (SCADA) which is a computer system that collects information from sensors along the pipeline route. The sensors can measure a variety of conditions including temperature, flow rate, and pressure.

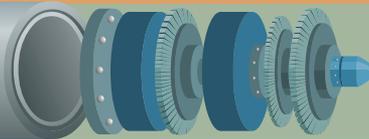


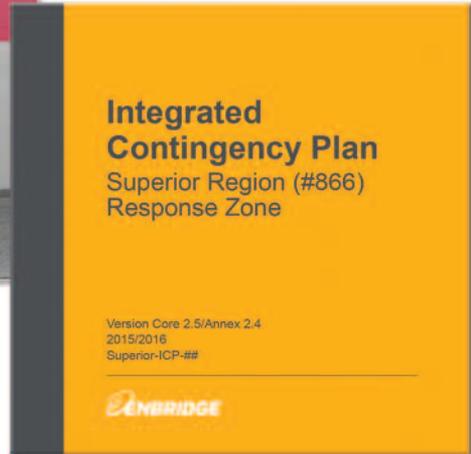
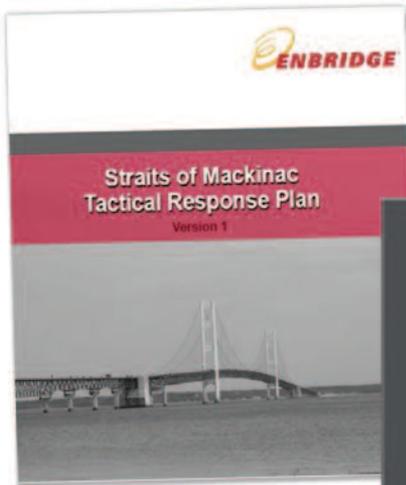
Leak Detection

Pipeline operators are required to have a means to detect leaks on their pipeline systems in order to ensure that all product going into the pipeline eventually reaches its destination. There are many different leak detection methods. One method is through direct monitoring of pipeline flow and/or pressure for evidence of a leak. This may also involve measuring the intake and outtake volumes looking for product lost. In addition, pipeline operators are required to conduct regular patrols of pipeline right-of-ways. By law, petroleum pipeline routes must be patrolled at least 26 times a year.

Internal Inspections

Pipeline operators use "smart pigs" that are sent through the buried pipe to evaluate the condition inside and clean the pipe. Smart pigs are advanced inspection tools that use sensors to identify and locate anything out of the ordinary.





Emergency response planning is a critical component of pipeline operations. It allows pipeline operators and spill responders to establish practices and procedures to manage emergency situations and mitigate the environmental impacts of a spill.

By law, operators of oil pipelines are required to develop response plans that outline their planning, training, and response to an oil spill. Planning elements include a determination of a worst-case discharge, pipeline operator contact information, an inventory of oil spill equipment and supplies, and a spill response training program and exercise schedule.

For the Great Lakes, and Northern Michigan in particular, the following plans provide guidance in the event of an emergency: the U.S. National Oil and Hazardous Materials Contingency Plan (NCP), the U.S. Coast Guard District 9 Area Contingency Plan (ACP), the Federal Region 5 Regional Contingency Plan, and the Northern Michigan Sub-Area Contingency Plan.

EMERGENCY RESPONSE EXERCISES



Response readiness goes beyond equipment. Personnel must be trained to react quickly and efficiently in the event of a spill. To achieve this, drills and simulations are regularly conducted by pipeline operators in coordination with Federal, State, and Tribal government representatives as well as local community members.

These events vary in size and scale, and can be planned in advance or be unannounced. Some events are small and occur regularly and some are large and intensive. There are table-top exercises and full-scale drills in which a large emergency response team is activated, and more than 200 people, including governmental agencies and community organizations, rehearse the response to a large spill.



*Putting out boom during the Indian River simulation exercise.
Credit: Fritz Lug, MLive*

The exercises bring together key people who will need to work in tandem, should a real life emergency occur. The exercises also provided an opportunity to identify deficiencies in the emergency response plan. Exercises provide areas of improvement to focus on to make sure we are as prepared as possible to respond to an oil spill.



Indian River simulation exercise.



Call 811 before you:

- plant a tree
- add a fence
- conduct any excavation on your property

One of the best ways to protect yourself and your family if you live near a pipeline is to learn how to become the eyes and ears on the ground to help protect the pipeline from damage. This means not only behaving responsibly yourself on and near the pipeline easement, but also making sure that when you see something happening that might damage the pipeline, or notice anything that indicates a problem with the pipeline, you contact the pipeline operator.

One of the leading causes of pipeline incidents is third-party damage, often by a contractor, landscaper, or homeowner. Before you plant a tree, add a fence, or conduct any excavation on your property for any reason, call 811—it's the law.

811 is a free, national service created to help protect home and business owners from unintentionally damaging underground utility lines while digging. The one-call system coordinates with pipeline companies to mark the location of underground lines before you dig.



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The ability to recognize a pipeline leak is a critical factor in pipeline safety. While pipeline leaks are unlikely, they can be dangerous and require caution and immediate action to protect people, property, and the environment.

Here are some signs of a pipeline leak.



Smell

- An odor similar to gasoline or diesel fuel
- An unusual skunk or “rotten-egg” odor



Sight

- Dirt being blown or appearing to be thrown into the air
- A white vapor stream or mist-like cloud over the pipeline
- Unexpected frost or ice on the ground
- Water bubbling or being blown into the air
- Dead or dying vegetation in an otherwise green area
- Discolored snow or vegetation
- A dry area in a wet field
- Flames coming from the ground or appearing to burn above ground
- Liquid on the ground
- Oily sheen on water surfaces



Sound

- Hissing, gurgling or roaring sound





In the event of a pipeline leak

If you suspect a pipeline may have a leak, leave the area immediately in an upwind direction. If you see a release of oil or another hazardous liquid, **immediately call the following three numbers:**

- **911** to notify local authorities
- **800-292-4706** to notify State authorities (Michigan Pollution Emergency Alert System)
- **800-424-8802** to notify Federal authorities (National Response Center)

If it is possible to identify the pipeline operator, call the pipeline company as well. All pipeline markers provide the name of the operator, the emergency number, and the product being transported.

Pipeline markers are placed along pipeline routes to identify the general location of a pipeline. They are found where a pipeline intersects a street, highway, railway, waterway, and at other prominent points along the route. Markers can vary in size, shape and color, but all markers include important information about the pipeline including the product transported, the pipeline operator's name, and the operator's emergency contact number to report pipeline problems.



PIPELINE MARKERS

This marker is the most common. It contains operator information, type of product, and an emergency contact number. Size, shape, and color may vary.

AERIAL MARKERS

These skyward facing markers are used by patrol planes that monitor pipeline routes.

CASING VENT MARKERS

This marker indicates a pipeline (protected by a steel outing casing) passes beneath a nearby roadway, rail line, or other crossing.

EMERGENCY NUMBERS

for Northern Michigan Pipelines

Antrim County

DCP Midstream	1-888-204-1781	<i>For all emergencies</i>
	1-800-435-1679	<i>Hazardous liquid emergency number</i>
DTE Gas Company	1-800-947-5000	

Charlevoix County

DCP Midstream	1-888-204-1781	<i>For all emergencies</i>
	1-800-435-1679	<i>Hazardous liquid emergency number</i>
DTE Gas Company	1-800-947-5000	
TransCanada	1-800-447-8066	

Cheboygan County

Enbridge Energy	1-800-858-5253	
DTE Gas Company	1-800-947-5000	

Emmet County

Enbridge Energy	1-800-858-5253	
DTE Gas Company	1-800-947-5000	
TransCanada	1-800-447-8066	



**If you see a release
of oil or another
hazardous liquid
call 911**

OUR MISSION:

The Tip of the Mitt Watershed Council speaks for Northern Michigan's waters. We are dedicated to protecting our lakes, streams, wetlands, and groundwater through respected advocacy, innovative education, technically sound water quality monitoring, thorough research and restoration actions. We achieve our mission by empowering others and we believe in the capacity to make a positive difference. We work locally, regionally and throughout the Great Lakes Basin to achieve our goals.



For more information about pipelines in Northern Michigan, visit our website:
www.watershedcouncil.org

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