PORTLAND PIPE LINE CORPORATION
Safety, Environment, Customer, Community

February 2013

Leading Petroleum Transportation Pipeline Company

Portland Pipe Line Corporation (PPL) is a leading petroleum transportation pipeline company that along with its parent company Montreal Pipe Line Limited (MPL), collectively referred to as PMPL, provide a vital energy link to supply Eastern Canadian refineries with crude oil produced from around the world. Along with a world class deep water pier facility, operations center and tank farm in South Portland, Maine, PPL operates two pipelines, one of which is currently idle, that traverse Maine, New Hampshire and Vermont delivering crude oil to Quebec. The system is capable of delivering up to 602,000 barrels per day of oil to the Canadian market. With a focus on safety and environmental responsibility, PMPL has become well respected in the industry for our commitment to operate with the highest integrity. The safety of our employees, neighbors, and facilities is paramount. Protecting and safeguarding the environment is a top priority incorporated into all of our operations, policies and processes.

History

The PMPL system was established in 1941 to transport crude oil by pipeline from South Portland, Maine, to Montreal, Quebec, as an alternative to direct marine shipments of crude oil into Montreal by crude oil tankers. Since it first opened in the autumn of 1941, PMPL has delivered over 5 billion barrels of crude oil to Canada. It is an energy system that through cooperation and careful planning has been able to protect the environment and deliver oil safely for more than 70 years.

Safety and Environmental Excellence

PPL is proud of its safety record, having operated for over 14 years without a lost time incident and over 8 years without a recordable injury. Additionally, PMPL has had a history of flawless environmental performance, including no significant pipeline or vessel spills in many, many years. PPL is the recipient of numerous distinguished environmental and safety awards, including:

- U.S. Coast Guard Benkert Award for Excellence in Marine Environmental Protection: Gold: 2004, 2000, 1995; Silver: 2012; Bronze: 1997
- American Petroleum Institute (API): 2011 API Safety Award; 2011 Distinguished Environmental and Safety Award (Small Operator); and Environmental Performance Award (2004 – 2009, 2011)

Current Operations and Economic Benefit

- PPL employs 35 employees in the U.S.; 32 are Maine residents
- Approximately 70 ships offload annually in South Portland; Each marine tanker docking at PPL's Pier 2 generates $50,000 in direct economic benefits to Portland Harbor for a total annual benefit of approximately $3.5 million
- Operating with the 24-inch pipeline, PPL transports approximately 150,000 barrels of crude oil per day to Quebec
- PPL annually pays approximately $2 million in Maine State Income Taxes and approximately $1.9 million into the Maine Coastal and Inland Surface Oil Clean-up Fund
- PPL annually pays approximately $1.0 million in local Maine property taxes

Facilities

- Pier 2 Marine Terminal - South Portland, Maine - Constructed in 1956 and upgraded in 2002 with the capability of handling some of the largest and deepest draft vessels on the East Coast with up to 52 feet of draft and 170,000 deadweight tons of cargo
- Tank Farm - South Portland, Maine - Includes 23 external floating roof tanks with a storage capacity of 3.6 million barrels
- Pipelines - Maine, New Hampshire, Vermont - An 18-inch and a 24-inch pipeline stretching 236 miles (166 miles in the U.S. and 70 miles in Canada) from South Portland, Maine to Montreal, Quebec
- Pump Stations - Maine, New Hampshire, Vermont - 6 U.S. pump stations along the right-of-way spaced from 25 to 40 miles apart. The pump stations are located in South Portland, Raymond and North Waterford, Maine; Shelburne and Lancaster, New Hampshire; and Sutton, Vermont

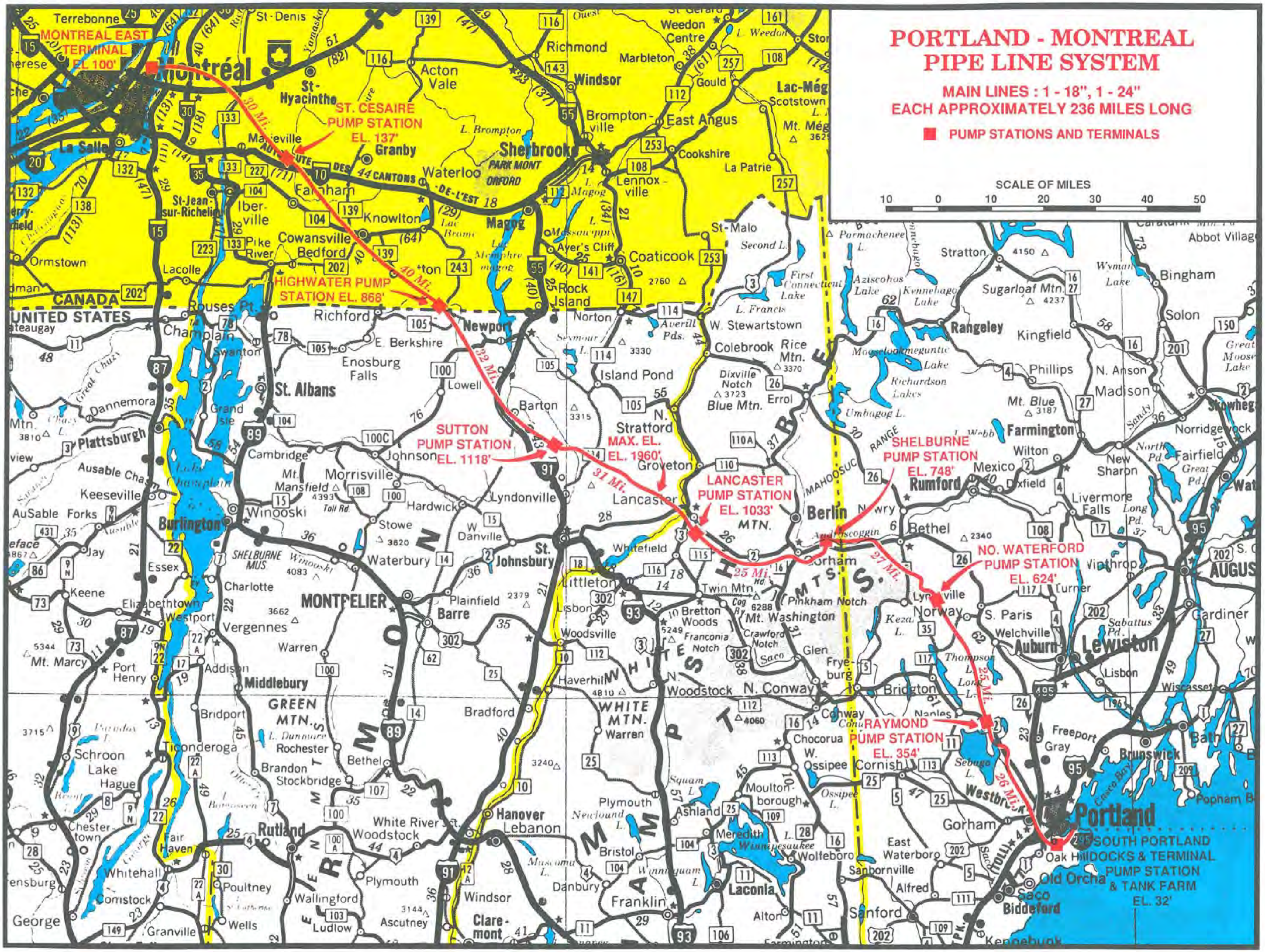
Community

PPL operates the pipeline system in a number of communities throughout Maine, New Hampshire and Vermont, and is committed to being a good corporate neighbor. Relationships with landowners and the public at large, state and federal regulatory agencies, town officials and emergency response personnel are all critical to our continued safe operations. PPL has provided land to the City of South Portland for Bug Light Park and the Greenbelt Walkway and made financial contributions to a number of non profit organizations, including specifically:

- The United Way
- Friends of Casco Bay
- Gulf of Maine Research Institute

PPL maintains the integrity of our assets in such a way as to endeavor to remain an employer of highly skilled Maine residents, a viable component of Maine's energy infrastructure and a key contributor to the economic base of our great State of Maine.

30 HILL STREET, SOUTH PORTLAND, ME 04106: 207.767.0421


PORTLAND - MONTREAL PIPE LINE SYSTEM
MAIN LINES : 1 - 18", 1 - 24"
EACH APPROXIMATELY 236 MILES LONG
PUMP STATIONS AND TERMINALS
SCALE OF MILES
10 0 10 20 30 40 50
MONTREAL EAST TERMINAL EL 100'
ST. CESAIRE PUMP STATION EL. 137'
30 Mi.
HIGHWATER PUMP STATION EL. 868'
40 Mi.
32 Mi.
SUTTON PUMP STATION EL. 1118'
MAX. EL. EL. 1960'
31 Mi.
LANCASTER PUMP STATION EL. 1033'
25 Mi.
SHELBURNE PUMP STATION EL. 748'
27 Mi.
NO. WATERFORD PUMP STATION EL. 624'
25 Mi.
RAYMOND PUMP STATION EL. 354'
26 Mi.
SOUTH PORTLAND DOCKS & TERMINAL PUMP STATION & TANK FARM EL. 32'
CANADA
UNITED STATES
Montréal
Sherbrooke
MONTPELIER
Portland

Contact Information

Headquarters

Portland Pipe Line Corporation
30 Hill Street
South Portland, Me 04106

General Inquiries: 207.767.0421
Fax: 207.767.0442
Emergency: 207.767.3231 (call collect) 24 hours

Website: www.pmpl.com

Dig Safe – Call before you dig: 811

Contact Listing

Mr. Larry Wilson, President
207.767.0420
larry.wilson@pmpl.com

Mr. David Cyr, Secretary-Treasurer
207.767.0450
dave.cyr@pmpl.com

Mr. Tom Hardison, Director of Operations and Maintenance
207.767.0440
tom.hardison@pmpl.com

Mr. Ken Brown, Engineering Manager
207.767.0449
ken.brown@pmpl.com

Mr. Chris Gillies, Product Movement Manager
207.767.0441
chris.gillies@pmpl.com

Maintenance Supervisor – Maine
207.767.0437

Maintenance Supervisor – New Hampshire/Vermont
207.232.7084

PORTLAND PIPE LINE CORPORATION
Safety, Environment, Customer, Community

Dig Safe System, Inc.
It's Smart. It's Free. It's the Law.

811 Know what's below. Call before you dig.

CONSTRUCTION PRACTICES

TO BE OBSERVED BY OTHERS WHEN ON OR NEAR PORTLAND PIPE LINE CORPORATION RIGHTS-OF-WAY

The guidelines and construction practices listed below shall be followed by other pipeline, utility, construction organizations, and others performing work in the Portland Pipe Line Corporation right-of-way:

1. A minimum distance of 50 feet should be maintained between new structures and nearest pipeline (49 CFR 195.210).

2. Crossings of the pipelines should ideally be 90^{o}, but in no case less than 45^{o}.

3. A minimum vertical distance between lines crossing beneath the pipelines shall be 18 inches. Compaction near the pipelines shall be equal to original soil compaction. Certain soil conditions may dictate additional vertical clearance.

4. Lines crossing over the pipelines shall have an 18-inch minimum vertical clearance with 90% or greater Proctor compaction density or pipeline-approved supports on both sides of the pipeline crossed.

5. Excavation in questionable soils conditions, where shear failure or trench collapse might occur, must be investigated by a soils engineering consultant; and where conditions warrant it, suitable plans for soils stabilization shall be designed and carried out by a qualified engineer.

6. No excavation in the vicinity of pipelines is to be made without a pipeline representative being present. Excavation within five (5) feet of a pipeline shall be done with extreme caution and only by hand digging under a Pipe Line representative's direction. The pipelines and the required separation distance must be exposed for observation during trenchless crossings, for example by directional drilling, to ensure safety and clearance.

7. Where heavy construction vehicles must cross a pipeline, suitable compacted cover and padding shall be placed over the pipeline to provide generally not less than four (4) feet of suitable protective material over the pipeline. Pipe Line representative will locate pipelines for landowner or contractor upon request.

8. In no case shall cover be less than that required by the Department of Transportation, Code of Federal Regulation for transportation of hazardous liquids by pipeline (49 CFR 195.248).

9. All blasting is to be kept to an absolute minimum and shall be done according to good construction practices, using experienced, qualified blasting personnel and only then with Pipe Line approval.

10. Be aware of potential interference between Portland Pipe Line's DC electric rectifier systems and AC power line or power cable networks. If a pole line anchor is placed near a ground bed, contact a corrosion department representative for assistance.

11. Portland Pipe Line is to be notified at least 48 hours before work is performed in the vicinity of its pipelines. In extreme emergencies, when this is not possible, notification should be given at the earliest possible time.

12. No spoil, either of a permanent or temporary nature, is to be deposited on the pipelines.

13. Portland Pipe Line should be notified during initial planning stages for future installations located near pipelines so that the best mutually acceptable design practices are adopted.

14. Projects involving grading or access or utility crossings of Portland Pipe Line Corporation pipelines or rights of way must be submitted to PPLC for review and written approval prior to construction, with supporting documentation to demonstrate that the work will comply with the above requirements.

15. Portland Pipe Line Corporation supports the use of the Best Practices for project planning, design, and construction developed by the Common Ground Alliance and available at www.commongroundalliance.com.

Contact Information:

Director of Operations
(207) 767-0440

Maintenance Supervisor – Maine
(207) 767-0437

Maintenance Supervisor – New Hampshire/Vermont
(207) 232-7084

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DESIGN OF PROJECTS

ON OR NEAR PORTLAND PIPE LINE CORPORATION RIGHTS-OF-WAY

Portland Pipe Line Corporation (PPLC) operates several high-pressure, welded steel pipelines transporting crude oil from a marine terminal in South Portland, Maine to refineries in Montreal, Province of Quebec, Canada. The pipelines are designed, maintained and operated to ensure the safety of the communities and the environment through which they pass.

Construction projects near the Portland Pipe Line Corporation pipelines have the potential to affect the integrity and safety of the lines, both directly and indirectly. Portland Pipe Line Corporation must ensure that the integrity and safety of the pipelines is maintained, from the standpoints of structural strength, hydraulic integrity, corrosion prevention, pipeline accessibility, and regulatory compliance. For this reason, PPLC requires that projects that affect our pipelines or rights of way be submitted for review and written approval by PPLC prior to construction.

This fact sheet has been prepared as a guide to those planning or designing projects near the PPLC rights-of-way. A companion fact sheet, *Construction Practices To Be Observed By Others When On Or Near Portland Pipe Line Corporation Rights-Of-Way,* is also available to land owners and contractors, and must be followed for construction practices near the pipelines. In addition, PPLC supports the use of the Best Practices for project planning, design, and construction developed by the Common Ground Alliance and available at www.commongroundalliance.com.

The design issues presented in this fact sheet are the focus of both PPLC and federal requirements (49 CFR Part 195) to protect the integrity and safety of the pipelines. Project designers are encouraged to contact PPLC early in the project planning stages to facilitate the development of plans that will be compatible with land owner needs, pipeline integrity, and the safety of the public. The basic design requirements are outlined below, followed by a discussion of the application of the requirements to typical projects.

Basic Design Guidelines

- no structures, paved areas, parking areas, trees or deep-rooted vegetation over the pipelines or within the pipeline rights-of-way; new structures should be located at least 50 feet away from the pipelines
- paved crossings of the rights-of-way limited to the least number and as near to perpendicular as possible, and in no case less than 45 degrees to the pipelines
- 4 feet of cover over the pipelines under roadways and near buildings
- 3 feet of cover over the pipelines elsewhere
- 18 inches minimum vertical separation between crossing utilities and the pipelines
- utility crossings of the pipelines limited to the least number and as near to perpendicular as possible, and in no case less than 45 degrees to the pipelines
- proper compacted bedding and support required for all piping and excavations
- non-conductive or electrically isolated piping materials for utility crossings of the pipeline
- non-corrosive fill materials near the pipeline
- controlled superimposed loads on the pipelines (dead load from fill and live load from traffic) to maintain the pipeline pressure rating, avoiding pipeline casings
- controlled construction equipment loads on the pipeline
- controlled induced settlement from superimposed loads to avoid excessive pipeline movements and stresses

Structures, Pavement, and Vegetation
Structures, paved parking areas, trees and deep-rooted vegetation are not permitted over PPLC pipelines or within the pipeline rights-of-way. Such facilities result in applied loads and settlements interfere with or prevent pipeline maintenance, repair and inspection (including aerial surveillance), and increase the safety exposure of the public. For safety and security reasons, PMPL strongly recommends that new buildings should be located at least 50 feet from the pipelines. Trees and deep-rooted plants are prohibited in order to prevent their roots from penetrating and damaging the pipeline protective coatings, increasing the risk of corrosion damage. Paved crossings are limited to the least number possible and as near to perpendicular to the pipelines as possible, and in no case less than 45 degrees to the pipelines.

Pipeline Cover / Depth of Burial
Federal rules specify minimum depths of cover and design loading requirements at various locations. PPLC requires 48 inches of cover under roads and near buildings and 36 inches elsewhere near projects. Where deep cover is proposed, loading and settlement analyses may be required.

Separation Distances for Crossing Utilities
Federal rules specify minimum separations to underground utilities and structures. PPLC requires that utility crossings maintain an 18-inch vertical separation from our pipelines to permit future excavation and welded repairs, and to reduce any repercussions of shifting or thermal movements of either our pipelines or the crossing utility. Where possible, it is requested that 24 inches of vertical separation be provided. Utility lines shall cross under the pipelines to minimize utility disruptions in the event of pipeline maintenance or emergencies, and to avoid interference with or prevention of pipeline maintenance, repair and inspection. Utility crossings are limited to the least number possible, and must be as near to perpendicular to the pipelines as possible, but in no case less than 45 degrees to the pipelines. Utility structures such as manholes, light pole bases and guy wire anchors are not permitted within the rights-of-way, and must be at least 10 feet from the pipelines.

Corrosion Protection
Utility Crossings: The PPLC pipelines are protected by an impressed-current cathodic protection system. Any crossing pipes or utilities that could offer a preferred path of current flow must be constructed of non-conductive materials or must be electrically isolated to protect both the PPLC pipelines and the crossing utility from electrically accelerated corrosion. Examples of crossing utilities include electrical conduits and water, gas, sewer and storm drain lines.

Pipe Casings: Petroleum pipeline companies and federal regulations discourage the practice of providing a steel casing around oil pipelines to protect them from superimposed loading, since the casing interrupts the cathodic protection of the lines and can accelerate corrosion.

Corrosive Fill: Certain fill materials can create a corrosive environment for the pipelines and must be avoided. For example, lightweight cinder fill can accelerate corrosion and is not acceptable. Lightweight tire-derived fill can be acceptable under certain circumstances, provided that the steel-belted tire chips are segregated from contact with the pipelines.

Superimposed Loading
Permanent Loads: The dead load and live load to be imposed on the pipelines must be controlled in order to maintain the rated pressure of the pipelines. As noted above, pipe casings are discouraged for corrosion reasons. If required, lower-density fills, cover slabs, or other approaches can be utilized to reduce the loading to acceptable levels. PPLC can assist in evaluating the acceptability of load- reducing design proposals.

Construction Loads: Construction equipment must not operate over the pipelines unless precautions are taken to control the loads on the pipelines. For example, crane mats and raised equipment crossings have been successfully designed and employed to address construction loads in a variety of soil conditions.

Induced Settlement: Settlement induced by superimposed loading must be controlled to a level that the pipelines can withstand. Geotechnical analysis must be provided for any significant superimposed loading to demonstrate that excessive settlement will not be induced at the pipeline crossing. Load- and settlement-reducing design approaches can be developed for these circumstances.

Accessibility

Utility Crossings: Accessibility of the pipelines must be maintained for both routine and emergency repairs and maintenance. For this reason, crossings by utility lines must be installed below the pipeline and limited to as few as possible, since such crossings can interfere with pipeline excavation and welded repairs. Where crossing are unavoidable, it is preferable that they be located outside of congested and paved areas that would complicate pipeline exhumation at the crossing, should it ever be required. Vertical and horizontal clearances to be maintained at pipeline crossings are discussed above, along with cathodic protection implications.

Paved Areas, Structures, and Vegetation: Federal regulations require that pipelines be accessible for routine and emergency inspection and maintenance. Required inspection include periodic aerial surveillance to monitor third-party impacts and to check for signs of damage, and cathodic protection surveys to verify the level of corrosion protection applied to the pipelines. In addition to their other impacts discussed above, pavement, structures, and trees interfere with or prevent both inspection and maintenance activities, and therefore are prohibited from the right-of-way. Limited paved crossings can usually be accommodated where necessary to allow access to property on opposite sides of the rights-of-way, with prior approval and in concert with the considerations discussed above.

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Industry Links

Company

Portland Pipe Line Corporation:	www.pmpl.com

Associations

Association of Oil Pipelines:	www.aopl.org
American Petroleum Institute:	www.api.org
Canadian Energy Pipeline Association (CEPA):	www.cepa.com
Canadian Association of Petroleum Producers:	www.capp.ca

General Information

Pipeline 101 information:	www.pipeline101.com
Dig Safe:	www.digsafe.com
Pipeline and Hazardous Materials Safety Admin:	www.phmsa.dot.gov

ABOUT CANADA'S OIL SANDS

CAPP CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS

Contents

OVERVIEW

The importance of Canada's oil sands

Canada's oil sands are important to the U.S. economy and energy security. Global demand for energy continues to rise. Canada has the third largest oil reserves in the world and 97% of these reserves are in the oil sands. Canada's oil sands help supply America's energy needs while also creating American jobs and strengthening our broader economic relationship.

The Canadian oil and gas industry fully recognizes that it must also continuously improve its environmental and social performance.

Handy and credible

CAPP is the voice of Canada's upstream oil and natural gas industry – representing companies that produce more than 90% of Canada's oil and gas.

Our research indicates North Americans want a balanced discussion about energy, the economy and the environment. This pocket book is designed to give you fast, easy access to oil sands information that will help you get in on the discussion.

Information is sourced from credible third parties or developed using CAPP data checked against other data sources, including government reports.

Dig deeper

We couldn't cover it all in this little book! So we have provided links to various sources at the end of the book. Go ahead, dig deeper.

More information?

Are you curious about information that isn't covered here? Send your questions to communication@capp.ca.

Updates

The information provided in this book is current as of October 2011. A regularly updated online version is available at www.oilsandstoday.ca.

To order more printed copies of *About Canada's Oil Sands,* email publications@capp.ca

UNIT 1

THE RESOURCE

WHAT ARE OIL SANDS?

The Resource

Canada has the third largest oil reserves in the world. 97% of these reserves are in the oil sands.

Oil sands

Oil sands are a natural mixture of sand, water, clay and bitumen.

Bitumen

Bitumen is oil that is too heavy or thick to flow or be pumped without being diluted or heated. Some bitumen is found within 200 feet from the surface but the majority is deeper underground.

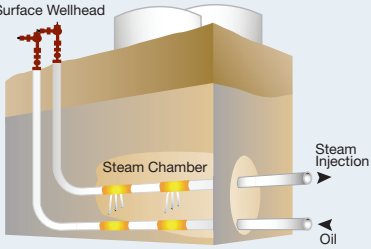
Location

Canada's oil sands are found in three deposits – the Athabasca, Peace River and Cold Lake deposits in Alberta and Saskatchewan. The oil sands are at the surface near Fort McMurray but deeper underground in other areas.

Recovering
the oil

Oil sands are recovered using two main methods: mining and drilling (in situ). The method used depends on how deep the reserves are deposited.

Steam Assisted Gravity Drainage drilling (in situ) method



20% mined

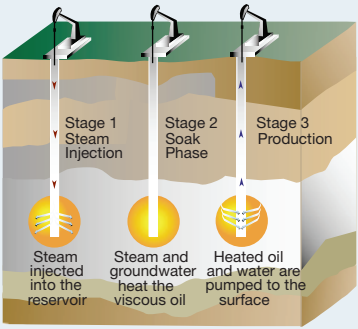
20% of the oil sands reserves are close enough to the surface to be mined using shovels and trucks.

Mining method

80% drilling (in situ)

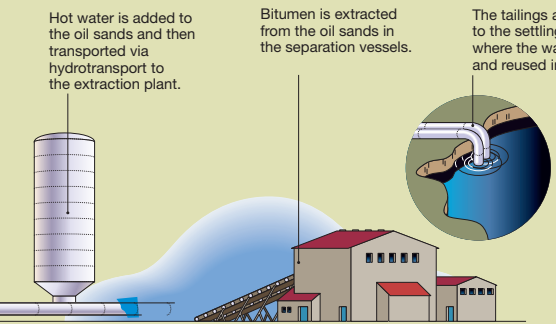
80% of oil sands reserves are too deep to be mined so are recovered in place, or in situ, by drilling wells. Drilling (in situ) methods create modest land disturbance and do not require tailings ponds.

Advanced technology is used to inject steam, combustion or other sources of heat into the reservoir to warm the bitumen so it can be pumped to the surface through recovery wells.



Cyclic Steam Stimulation drilling (in situ) method

Oil sands that lie more than 200 feet below the ground are recovered using drilling methods.



Regulated

Canada's oil sands industry is regulated by various entities, including:

Government of Alberta

PRIMARY RESOURCE JURISDICTION

• Alberta Energy	Resource rights and Crown royalties
• Energy Resources Conservation Board (ERCB)	Project approvals and compliance
• Alberta Environment	Environmental impact assessments, air and water, conservation and reclamation
• Sustainable Resource Development (SRD)	Public land access management, fish and wildlife

Government of Canada

NATIONAL POLICIES AND STANDARDS

• Canadian Environmental Assessment Agency (CEAA)	Environmental assessments
• Environment Canada	Migratory birds, air and water quality, species at risk
• Fisheries and Oceans Canada (DFO)	Fish and fish habitat, species at risk
• Transport Canada	Navigable waters
• National Energy Board (NEB)	Interprovincial and export pipelines

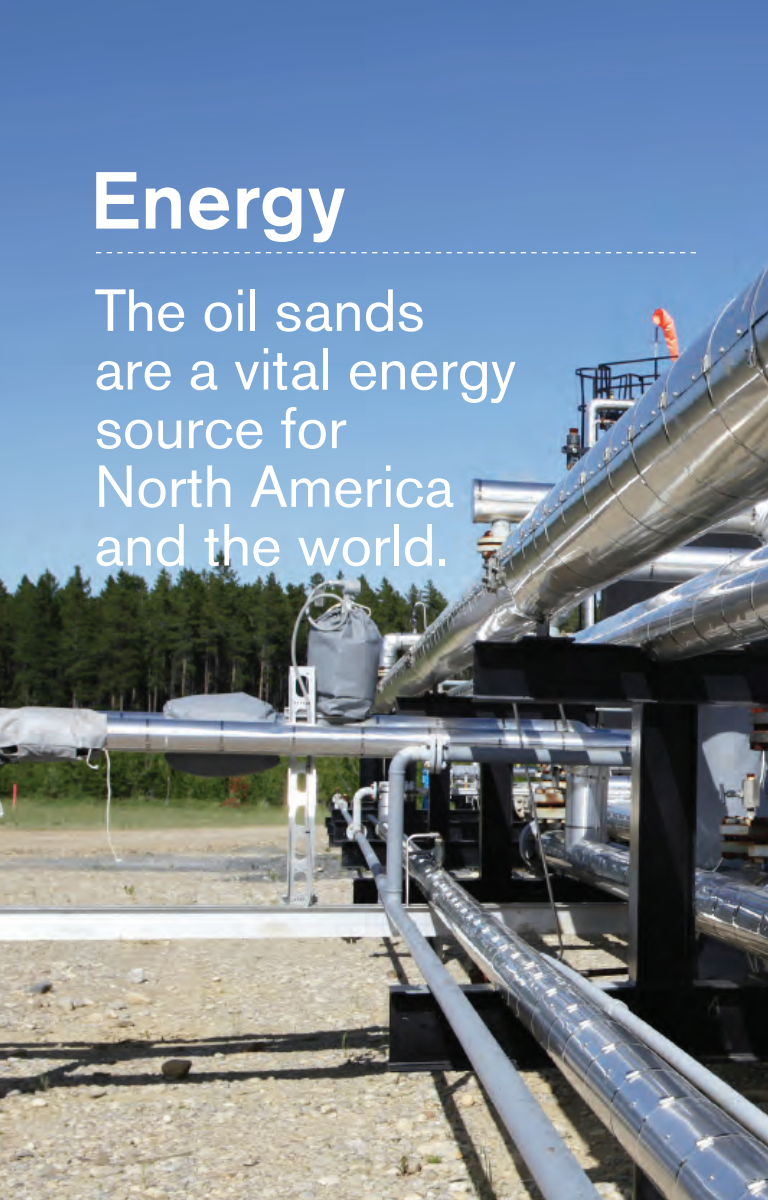
UNIT 2

ENERGY

WHY DOES THE U.S. NEED OIL SANDS?

Energy

The oil sands are a vital energy source for North America and the world.



Global energy **demand**

Global Needs

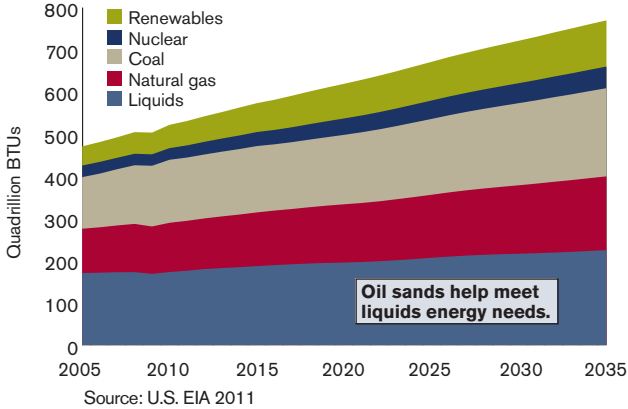
Global demand for energy is expected to increase 53%* by 2035 as economies in both developed and emerging countries continue to grow and standards of living improve.

Source: U.S. EIA 2011 *Growth from 2008 to 2035, Reference Case scenario.

Unconventional Resources

All sources of energy, developed responsibly, will be needed to meet growth in global demand. With conventional oil supply declining, the need for unconventional resources, like oil sands, will increase.

Global Energy Demand (Reference Case scenario)



Source: U.S. EIA 2011

Supplying growing **demand**

Our energy future

The world relies on an energy mix that includes oil, coal, natural gas, hydro, nuclear and renewables. All forms of energy production must increase to meet growing demand.

170 billion barrels

Canada has 175 billion barrels of oil that can be recovered economically with today's technology. Of that number, 170 billion barrels are located in the oil sands.

Source: ERCB and Oil and Gas Journal

Fueling North America

Canada's oil sands are uniquely positioned to contribute to meeting the growth in energy demand. In North America, oil sands production provides secure and reliable supply, reducing reliance on foreign imports and providing economic growth in both Canada and the U.S.

Today, over half of Canada's crude oil production is from the oil sands.

Canadian Production: Barrels/day

Year	1980	2010	2025
Crude Oil (incl. oil sands)	1.5 million	2.8 million	4.7 million
Oil Sands	0.1 million	1.5 million	3.7 million

Source: CAPP 2011

Energy **trade**

World's largest trade relationship

The U.S. and Canada have the closest and most extensive trade relationship in the world. The countries share a large volume of bilateral trade as well as people-to-people contact.

$1.5 billion* & 300,000 people/day

The U.S. and Canada trade the equivalent of $1.5 billion a day in goods. About 300,000 people cross the shared U.S./Canada border every day.

Source: U.S. Commercial Service

Trade

97% of Canada's energy exports go to U.S. markets.
Source NRCan

Energy is a major part of the U.S./Canada trade relationship. In 2010 energy products, including oil, natural gas and electricity, accounted for $103 billion worth of trade between the two countries.

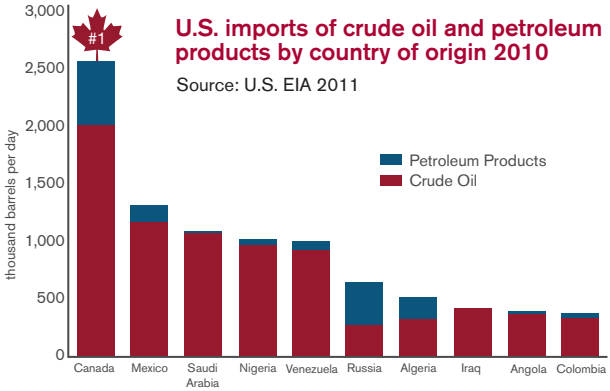
Source: NRCan

* All monetary values are American dollars based on February 2011 conversion rates.

Current energy supply

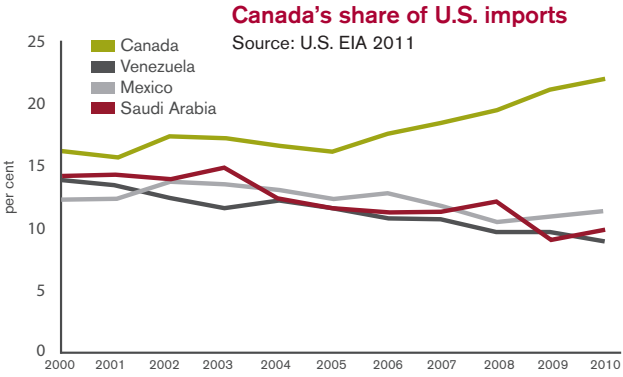
Trusted neighbours

Canada is the largest supplier of crude oil and petroleum products to the U.S.



Security of supply

Canada has abundant resources, production is growing, political stability is high, cross-border infrastructure is robust and environmental standards are high.



Filling the gaps

An opportunity exists for a new pipeline to deliver more Canadian crude oil to the U.S. Gulf Coast, filling the gap created by declining supply from Mexico and Venezuela. Alternatively, this supply gap will be filled by increasing supply from non-Canadian sources including the Middle East.

Source: U.S. Department of Energy

Investment

The majority (79%) of world oil reserves are owned or controlled by national governments. Only 21% of total world oil reserves are accessible for private sector investment, 56% of which are found in Canada's oil sands. Source: CAPP 2011

Markets

Canada has the infrastructure to export crude oil from western Canada to eastern Canada, the U.S. and some offshore markets.

Canada's oil sands industry continues to pursue opportunities for growth in exports to the U.S. and market diversification to new markets in Asia.

Imports

Canada is the largest supplier of oil to the U.S. Oil imports from Canada rose from 16% of total U.S. imports in 2000 to 22% in 2010. Source: U.S. EIA 2011

Industry in **action**

Montana Refining Company, Inc

Refineries in Montana have significant ties to the Canadian oil sands. According to Dexter Busby, Director Government and Regulatory Affairs of the Montana Refining Company, Inc., easy access to a secure supply of heavy crude is critical. “Our refinery is set up to process heavy crude, and 95 per cent of its feedstock is Canadian heavy crude, which includes oil sands oil. We probably couldn’t survive without it.”

Flint Hills Resources

More than 80% of Minnesota’s crude oil is delivered via pipeline from Canada. Flint Hills Resources owns and operates the Pine Bend Refinery in Rosemount, Minnesota. Decades of investment at Pine Bend have helped develop the expertise and necessary infrastructure to process oil sands crude in an efficient and environmentally responsible manner. Today, Pine Bend is a world-class refinery and the upper Midwest’s leading producer of transportation fuels, with a capacity of approximately 320,000 barrels daily.

Read more Industry in Action stories: www.capp.ca/innovation

Energy partners

"Canada – and not the Middle East – is America's number-one foreign supplier of oil. This relationship is a very important part of our current and future energy security and as Americans we can take comfort in partnering with a friend and a nation that shares our interests and values."

David Wilkins, former U.S. Ambassador to Canada

"The United States and Canada have a longstanding history of being trusted neighbors and friends. This is no more evident than in the deep energy relationship between our two countries and given the continuing global uncertainties a relationship that is poised to grow even deeper, to our mutual benefit."

Gordon Giffin, former U.S. Ambassador to Canada

"There's tremendous potential in the oil sands to produce oil for Canada and the United States in large quantities that will make my country safer by not having to buy oil from the Middle East."

Lindsey Graham, U.S. Senator

UNIT 3

ECONOMY

HOW DOES OIL SANDS DEVELOPMENT AND PRODUCTION CONTRIBUTE TO THE U.S. ECONOMY?

Economy

Canada's oil sands industry provides economic benefits across North America.

Economic contribution

Partner benefits

Canada and the U.S. share the world's largest trading relationship. As a result, Americans benefit economically from increased economic activity in Canada. When investment and production ramps up in Canada's oil sands, the pace of economic activity quickens and demand for U.S. goods and services increases.

$45 billion/year

On average, U.S. output of goods and services will increase by $45 billion/year from 2011 – 2035 due to increased demand from oil sands activity.

Source: CERI 2011

Dollars paid for Canadian crude oil are largely reinvested and help drive the North American economy.

465,000 jobs

U.S. employment resulting from new oil sands developments is expected to grow from 21,000 jobs in 2010 to 465,000 jobs in 2035.

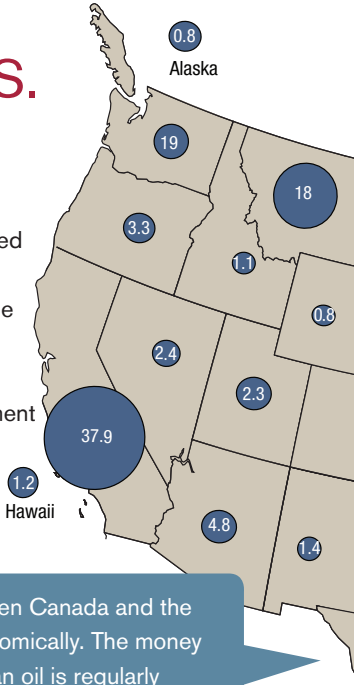
Source: CERI 2011

Jobs
Across the U.S.

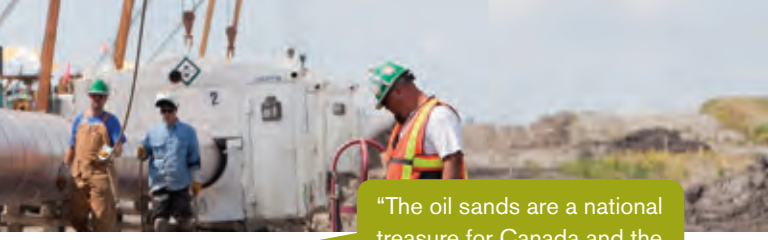
Every U.S. state will benefit economically* from oil sands development and production. Induced impacts to the economy provide significant ripple effects, creating employment in numerous U.S. industries not directly related to the energy sector.

Source: CERI 2011

For every two oil sands jobs created in Canada, one job will be created in the U.S.
Source: CERI 2011



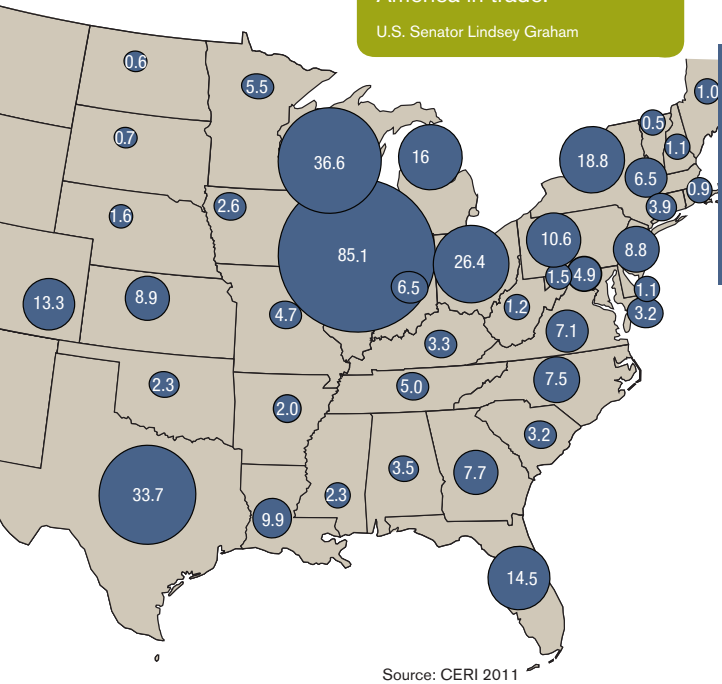
"The energy relationship between Canada and the U.S. is mutually beneficial economically. The money our country spends on Canadian oil is regularly reinvested through the purchase of American goods and services for oil sands projects. American citizens also benefit through their pension and retirement fund investments." - David Wilkins, former U.S. Ambassador to Canada



"The oil sands are a national treasure for Canada and the U.S. The resource is secure and comes from a friendly neighbor. In addition, much of the U.S. dollars spent on Canadian oil come back to America in trade."

U.S. Senator Lindsey Graham

Incremental Employment by State 2010 – 2035
(Thousand jobs)

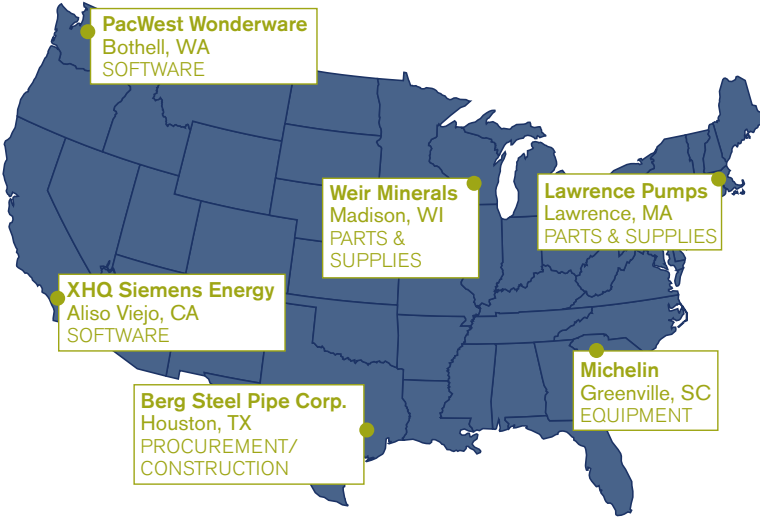


Source: CERI 2011

*Economic benefits are direct, indirect and induced.

Businesses

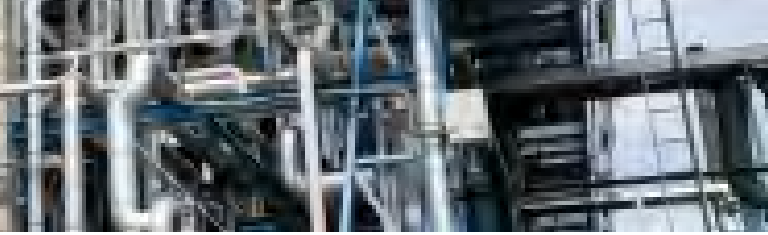
Examples of American companies supplying Canada's oil sands



1000 companies

At least 1000 American companies supply goods and services to Canadian oil sands and pipeline companies.

Source: CAPP



Industry in **action**

The **Caterpillar 797** is one of the world's largest trucks with the capacity to haul up to 400 tonnes* per load. As of 2009, 200 of these trucks had been purchased for use in Canada's oil sands, giving an economic boost to four U.S. states.

- **Engine made in Indiana**
- **Cab is fabricated and engine installed in Illinois**
- **Largest frame component is cast in Louisiana**
- **Giant Michelin® tires made in South Carolina**

OIL SANDS MINING TRUCK

Canadian Natural Resources Limited

Canadian Natural, a large oil sands producer, owns and operates the Horizon Oil Sands facility in Fort McMurray, Alberta. The company has 283 contracts with American suppliers valued at more than $515 million, with 31 contracts valued in excess of $1 million each.

* All tonnes in this booklet are metric.

Industry in **action**

Phoenix Heli-Flight, Fort McMurray, AB

Helicopters are commonly used in the Fort McMurray oil sands region for activities such as exploration, surveying and transporting employees to remote areas. Helicopters also assist in wildfire suppressions and medical evacuations. Phoenix Heli-Flight has served the region for 19 years. Its fleet of helicopters uses equipment and services from Texas, Massachusetts, Colorado and North Dakota. "Vendors in the U.S. provide us with 100% of our high-tech equipment, 75% of our support equipment and 60% of our maintenance and overhaul services. The innovative and amazing folks we deal with in the U.S. are a key part of our success," said owner Paul Spring.

Pine Bend Refinery, Rosemount, MN

The Flint Hills owned Pine Bend Refinery (introduced in the Energy unit on page 17) primarily refines Canadian heavy oil. The facility employs more than 900 fulltime staff, and at any given time, an additional 200 to 2,000 contractors are on site. According to Flint Hills Director of Communications, Jake Reint, "Without Canadian crude, our refinery would not be here."

Read more Industry in Action stories: www.capp.ca/innovation

UNIT 4.1

ENVIRONMENT: AIR

HOW ARE AIR AND GHG EMISSIONS AFFECTED BY OIL SANDS?

Air

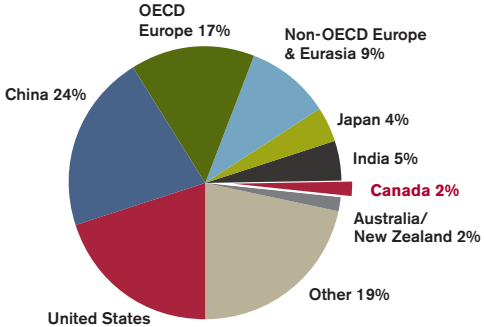
Canada's oil sands industry continues to reduce GHG emissions intensity.

Since 1990, GHG emissions associated with every barrel of oil sands crude produced have been reduced by 29%.

GHG emissions

Canada, with 0.5% of the world's population, produces 2% of global greenhouse gas (GHG) emissions.

Global Energy Related Emissions by Region - 2009



Source: EIA

45 million tonnes

Oil sands' total GHG emissions in 2009 were 45 million tonnes. Source: Environment Canada 2011

6.5% of emissions

Oil sands account for 6.5% of Canada's GHG emissions and just over 0.1% (1/1000th) of global GHG emissions. Source: Environment Canada 2011

GHG emissions

Carbon dioxide (CO_2) is a GHG. CO_2 is emitted into the air by burning fossil fuels for electricity generation, industrial uses, transportation and for heat in homes and buildings.

Wells-to-Wheels

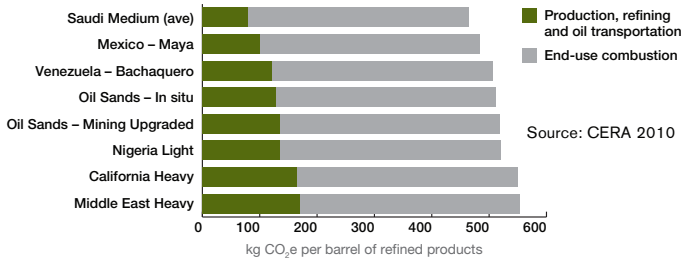
Measuring CO_2 emissions from the start of oil production (wells) through to combustion (wheels) is called a wells-to-wheels or life-cycle analysis.

Intensity

Oil sands crude has similar CO_2 emissions to other heavy oils and is 6% more intensive than the U.S. crude supply average on a wells-to-wheels basis.

About 80% of oil-related CO_2 comes from combustion – including automobile exhaust.

Wells-to-Wheels CO_2 emissions from various sources of crude

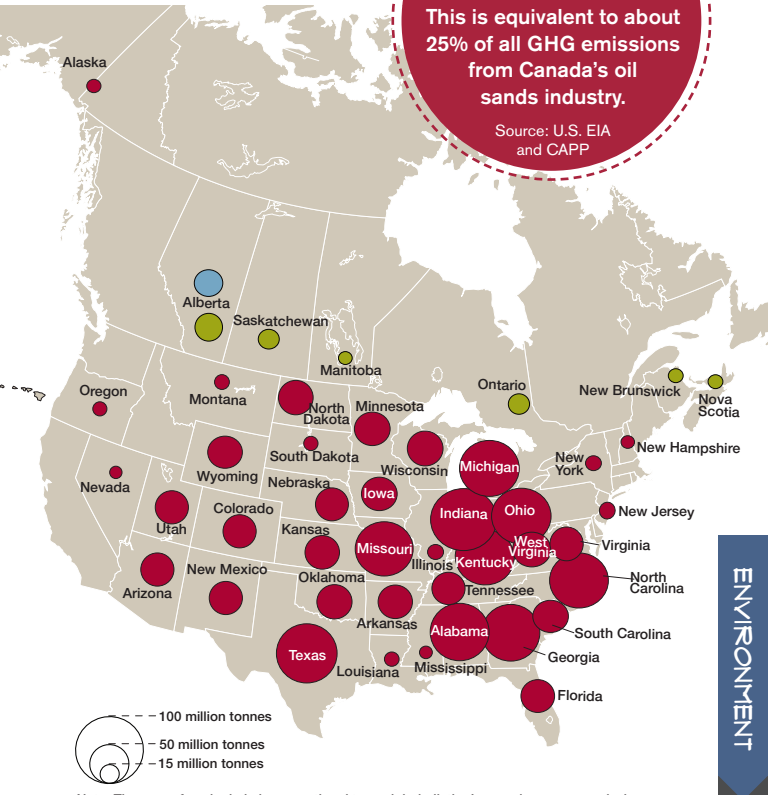


Source: CERA 2010

GHG emissions – Coal-fired power and oil sands 2009

A single coal fired power plant in Illinois emitted 10.8 million tonnes of GHGs in 2009. This is equivalent to about 25% of all GHG emissions from Canada's oil sands industry.

Source: U.S. EIA and CAPP



Note: The area of each circle is proportional to each jurisdiction's greenhouse gas emissions.

- Canadian oil sands
- Canadian coal-fired power generating plants
- U.S. coal-fired power generating plants

Sources: U.S. DOE/EIA & Environment Canada 2009

GHG regulations

Regulated

Of the top five sources of imported oil to the U.S. (Canada, Mexico, Saudi Arabia, Nigeria and Venezuela) Canada is the only country that currently has GHG regulations in place.

Source: U.S. EIA

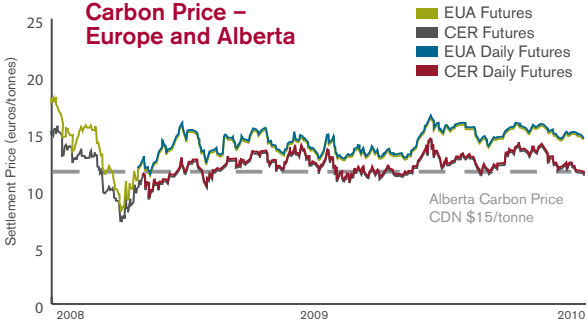
12% mandatory reductions

The Government of Alberta implemented GHG regulations in 2007 (the first jurisdiction in North America to do so) requiring a mandatory 12% reduction in GHG emissions intensity for all large industrial sectors including existing oil sands facilities, or a payment in lieu (current carbon price is $15/tonne).

Since 2007, these regulations have resulted in GHG reductions of 23 million tonnes, an equivalent of taking 4.8 million cars off the road.

Carbon price

Alberta's carbon price is similar to European daily futures carbon credit system. The current carbon price in Alberta is $15/tonne. Oil sands producers are required to pay into a technology fund if they do not meet the emissions reduction targets.



Source: ICE Futures Report

CCS

The Federal and Provincial governments are investing approximately $3 billion to help make Canada a global leader in carbon capture and storage (CCS) technology. Industry and government are cooperating to demonstrate the commercial and technical viability of CCS in Canada.

Source: Alberta Environment

Air quality

24 hours/365 days

The Wood Buffalo Environmental Association (WBEA) monitors the air in the oil sands region in and around Fort McMurray – the centre of oil sands production – 24 hours a day, 365 days a year. Monitoring is science-based, transparent and credible. WBEA's air quality monitoring network is one of the most extensive in North America. Air monitoring information is available in real time at www.wbea.org.

Improving or static

Data collected over the past 10 years at monitoring stations across Alberta indicate an improving or static trend in air quality across the province. Source: WBEA and CASA

No deterioration

Based on analysis of average concentrations of common air pollutants, air quality has generally not deteriorated in the Wood Buffalo region even with an increase in emissions-associated activities and population growth. Source: WBEA and CASA

Air quality in Fort McMurray is better than several North American cities – including Toronto, Dallas and Seattle – benchmarked by the Alberta Clean Air Strategic Alliance (CASA) and WBEA.

Industry in **action**

Imperial Oil Limited

Generating steam for the drilling (in situ) process creates greenhouse gases. In 2005, Imperial's Calgary research centre developed Liquid Addition to Steam for Enhanced Recovery. This new technology makes the process more efficient, reducing GHG emissions by 25%.

Canadian Natural Resources Limited

At Canadian Natural's Horizon mining facility, CO_2 is being injected into tailings before they reach the storage ponds. The CO_2 helps tailings settle faster and accelerates the water recycling process. Not only does this reduce the size of Canadian Natural's tailings pond but, when capture facilities are installed, it is expected to eliminate over 200,000 tons of CO_2 emissions every year.

*For more information on tailings ponds see page 42.

Read more Industry in Action stories: www.capp.ca/innovation

UNIT 4.2

ENVIRONMENT:

WATER

HOW DOES OIL SANDS PRODUCTION IMPACT WATER RESOURCES?

Water

Canada's oil sands industry recycles water and continues to look for ways to reduce fresh water use.

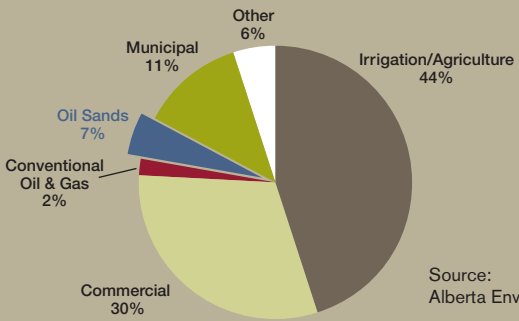
Water use

Strict regulations restrict water withdrawal when river flow is low.

The Alberta Government closely regulates the use of water. Large water users must apply to divert fresh water from its original source. The amount of water allocated is based on sustaining Alberta's groundwater and surface water.

Each sector applies for their water needs and the government allocates water based on these applications. For example, in 2009 irrigation and agriculture represented 44% of the total provincial allocations, the oil sands industry 7%. But not all of that water was actually used. The oil and gas industry uses less than 1/3 of its total water allocation per year.

Alberta Water Allocations – 2009



Source:
Alberta Environment

Athabasca River

The Athabasca River is the main source of water for oil sands mining projects.

0.5%

In 2009, the oil sands industry withdrew 21 barrels of water/second (total of 670 million barrels) from the Athabasca River. This is 0.5% of average total river flows and about 3.4% of the lowest weekly winter flow.

Source: Alberta Environment

The Athabasca River is Alberta's third largest river with a total flow of 90 million ft³ of water/second (equivilant to 16 million barrels of water/second).

Water supply

Northern Alberta, where oil sands operations occur, accounts for about 85% of Alberta's water supply — the Athabasca River alone accounts for 17%.

Source: Alberta Environment

All river basins south of the Athabasca River together account for 15% of Alberta's water supply and support 88% of water allocation demand.

Water use

0.5 barrels

Drilling (in situ) currently requires an average 0.5 barrels of fresh water for every barrel of oil produced. Source: CAPP 2009

2 – 4 barrels

Mining currently requires between 2 – 4 barrels of fresh water for every barrel of oil produced. Source: CAPP 2009

80 – 95%

Oil sands producers recycle 80 – 95% of water used.

Source: Alberta Environment

1.1 billion barrels

Oil sands fresh water use in 2009 was approximately 1.1 billion barrels. This water was used to produce half of Canada's oil supply.

Source: CAPP 2009

1.1 billion barrels is equivalent to about 84% of the City of Seattle's annual water consumption.

Water **quality**

Regulated

Alberta Environment prohibits the release of any water that does not meet water quality requirements.

Assessment

In 2010, the Royal Society of Canada (similar to the U.S. National Academy of Sciences) commissioned an Expert Panel of Canadian Scientists to review and assess evidence relating to several perceived environmental impacts of the oil sands, including the impact of the oil sands on regional water supply.

Results

"Current evidence on water quality impacts on the Athabasca River system suggest that oil sands development activities are not a current threat to aquatic ecosystem viability."

Source: *The Royal Society of Canada*

Water monitoring is currently being reviewed by both the federal and provincial governments. Canada's oil sands industry supports improved water monitoring.

Tailings ponds

Tailings

After the oil sands have been mined, oil is separated from the sand and sent for further processing. “Tailings” are the leftover mixture of water, sand, clay and residual oil.

Settling ponds

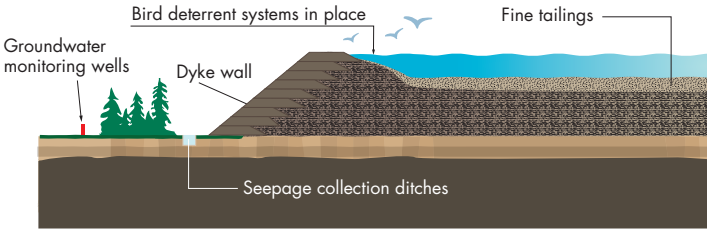
Settling or tailings ponds are large engineered dam and dyke systems designed to store tailings.

Recycling

Tailings ponds are also used as settling basins that enable water to be separated and recycled. Oil sands producers recycle 80–95% of water used, reducing use of fresh water from the Athabasca River and other sources.

Seepage

Several methods are used to limit and manage seepage from tailings ponds. For example, ditches around tailings facilities capture seepage that is pumped back into the tailings ponds.



Fine tailings

After separation, the middle layer has the consistency of yogurt. This combination of water and clay can take up to 30 years to separate and dry out. New technology accelerates this drying time to months instead of decades which speeds up reclamation.

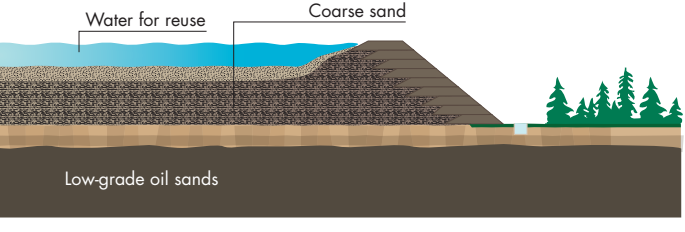
Reclamation

Regulations require all oil sands operators have plans in place to convert fine tailings to reclaimable landscapes. This will speed up the process of reclaiming tailings ponds.

Birds

Residual oil can be found floating on the surface of most tailings ponds. This poses a threat to waterfowl that land on the pond. Several mechanisms are in place to deter birds from landing, including air cannons and radar/laser deterrent systems.

Oil sands operators are investing more than $1 billion in tailings reduction technology.



Industry in **action**

Suncor Energy

Wapisiw Lookout is Suncor's first tailings pond, put into service at the company's mining project in the 1960s. Formerly known as Pond 1, the area is the first tailings pond to be reclaimed to a solid surface. It is currently undergoing reclamation and will include both wetland and dry landscapes.

Industry in **action**

Devon Canada

Devon's Jackfish drilling (in situ) project doesn't use any water suitable for human consumption or agriculture for steam generation. 100% of water used is drawn from deep formations and is too salty to be used for other purposes. More than 80% of the water is recycled back through the process.

Imperial Oil Limited

Imperial's Cold Lake drilling (in situ) operation has reduced its per barrel water use from 3.5 barrels in 1985 to 0.5 barrels today by recycling more than 95% of the water it uses.

UNIT 4.3

ENVIRONMENT: LAND

HOW DOES OIL SANDS PRODUCTION IMPACT THE LAND?

Land

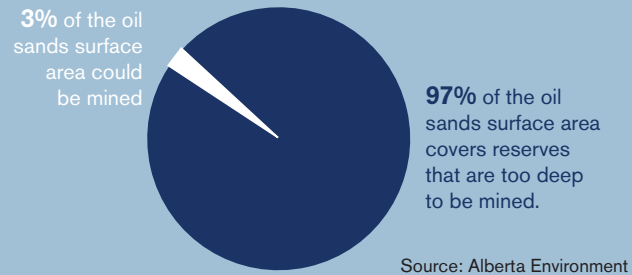
Canada's oil sands industry is committed to reducing its footprint, reclaiming all land affected by operations and maintaining biodiversity.

Land impacts

Alberta's oil sands lie under 54,900 sq. miles of land. Only about 3%, or 1,850 sq. miles, of that land could ever be impacted by the mining method of extracting oil sands.

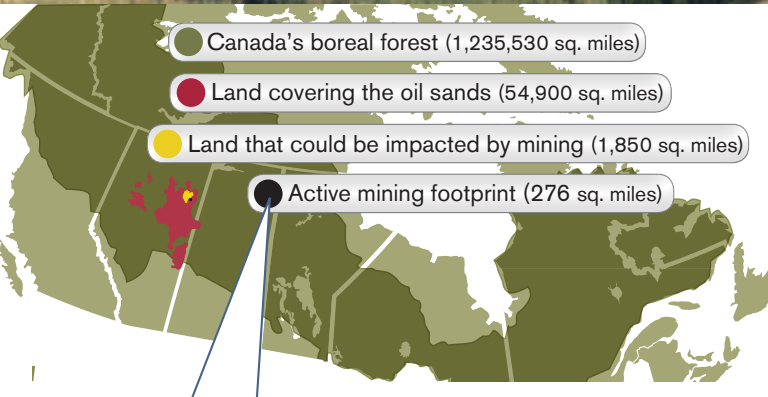
The remaining reserves that underlie 97% of the oil sands surface area, are recoverable by drilling (in situ) methods which require very little surface land disturbance (drilling (in situ) facility shown in above image)*.

Oil Sands Land Use



Source: Alberta Environment

*For more information on how oil sands are extracted, see pages 6 and 7.



How big is 276 sq. miles?

Area (sq. miles)	City proper	Greater metropolitan
Austin, Texas	260	4,280
Toronto, Ontario	240	2,750
Chicago, Illinois	230	10,870
Oslo, Norway	180	3,440

The size of Florida?

Some organizations claim the oil sands are destroying an area the size of Florida (approximately 58,670 sq. miles). In fact, the total mining footprint covers an area about 0.5% the size of Florida and 10% of that land has been or is being reclaimed. The total area that could be impacted by mining is about 3% the size of Florida.

Source: Alberta Environment

Land reclamation

Law

Alberta law requires all lands disturbed by oil sands operations be reclaimed. All companies are required to develop a reclamation plan that spans the life of the project.

Certification

Reclamation is an ongoing process during the life of a project. Companies apply for government reclamation certification when vegetation is mature, the landscape is self-sustaining and the land can be returned to the Crown for public use.

Process

The reclamation process involves monitoring, seeding, fertilizing, tree planting, seed collecting, topsoil salvaging and replacing. It also involves significant landform creation and contouring. Source: OSDG

It can take up to 80 years for a conifer tree to grow to maturity.

94%

An Alberta Biodiversity Monitoring Institute (ABMI) report states that the Lower Athabasca region's living resources are 94% intact.

Source: Alberta Environment

0.02%

0.02% of Canada's boreal forest has been disturbed by oil sands mining operations over the past 40 years.

Source: Alberta Environment

10%

Since operations began in the 1960s, approximately 10% of the active mining footprint has been or is being reclaimed by industry. Reclaimed land will be certified by government when it can be returned to public use.

Source: Alberta Environment

34,750 sq. miles

In Alberta alone, approximately 34,750 sq. miles (or about 24%) of the boreal forest is protected from development (includes National Parks, etc.)

Source: CAPP 2010

34,750 sq. miles is about the size of South Carolina.

Industry in **action**

Syncrude Canada Ltd.

In 2008, Syncrude received the first reclamation certification in the Canadian oil sands industry for the 257 acre area known as Gateway Hill. This area was planted in the early 1980s. To date, Syncrude has reclaimed 22 per cent of its total disturbed land.

ConocoPhillips Canada

Trees take a long time to grow from seed. A really long time. ConocoPhillips' Faster Forests program is speeding up the reforestation of oil sands mining sites. Based on recommendations from a University of Alberta study, the company is planting spruce, birch and aspen seedlings with a 4 inch plug of soil and established roots. The program started in 2009 and continues to evolve with plans to include other types of vegetation. Several companies are piloting similar aggressive reclamation programs.

Read more Industry in Action stories: www.capp.ca/innovation

DIG DEEPER

Learn more about the oil sands industry.

Alberta Biodiversity Monitoring Institute (ABMI)
www.abmi.ca

Alberta Chamber of Resources
www.acr.alberta.com

Alberta Energy
www.energy.alberta.ca

Alberta Environment
www.environment.alberta.ca

American Petroleum Institute (API)
www.api.org

Cambridge Energy Research Associates (CERA)
www.cera.com

Canadian Energy Research Institute (CERI)
www.ceri.ca

Canadian Environmental Assessment Agency
www.ceaa.gc.ca

Canadian Association of Petroleum Producers (CAPP) www.capp.ca
www.canadasoilsands.ca

Centre for Energy
www.centreforenergy.com

Clean Air Strategic Alliance (CASA)
www.casahome.org

Department of Fisheries and Oceans
www.dfo-mpo.gc.ca

DIG DEEPER

Energy Resources Conservation Board (ERCB)
www.ercb.ca

Environment Canada
www.ec.gc.ca

International Energy Agency (IEA)

www.iea.org

National Energy Board (NEB)
www.neb-one.gc.ca

Natural Resources Canada
www.nrcan-rncan.gc.ca

Oil Sands Developers Group (OSDG)
www.oilsandsdevelopers.ca

Sustainable Resource Development (SRD)
www.srd.alberta.ca

The Royal Society of Canada
www.rsc.ca

Transport Canada
www.tc.gc.ca

U.S. Energy Information Administration (U.S. EIA)
www.eia.doe.gov

Wood Buffalo Environmental Association (WBEA)
www.wbea.org

Email us your questions: upstreamdialogue@capp.ca

NOTES

NOTES

CAPP CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS

The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP's member companies produce more than 90 per cent of Canada's natural gas and crude oil. CAPP's associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP's members and associate members are an important part of a $100-billion-a-year national industry that provides essential energy products.

CAPP's mission is to enhance the economic sustainability of the Canadian upstream petroleum industry in a safe and environmentally and socially responsible manner, through constructive engagement and communication with governments, the public and stakeholders in the communities in which we operate.

www.capp.ca
www.oilsandstoday.ca
communication@capp.ca

CANADIAN ASSOCIATION
OF PETROLEUM PRODUCERS

OCTOBER 2011 2011-0006

National Academy of Sciences

Transportation Research Board Study of Pipeline Transportation of Diluted Bitumen

Pipeline and Hazardous Materials Safety Administration Briefing

July 23, 2012

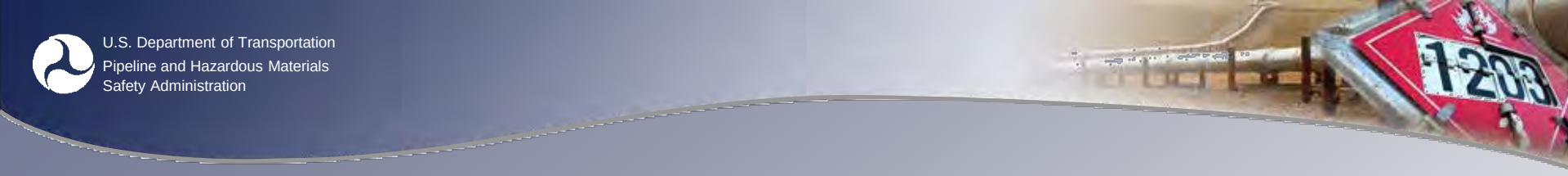
Pipeline and Hazardous Materials Safety Administration (PHMSA) Briefing

Linda Daugherty
Deputy Associate Administrator for Policy and Programs

Alan Mayberry
Deputy Associate Administrator of Field Operations

Jeff Gilliam
Director of Engineering & Research

July 23, 2012

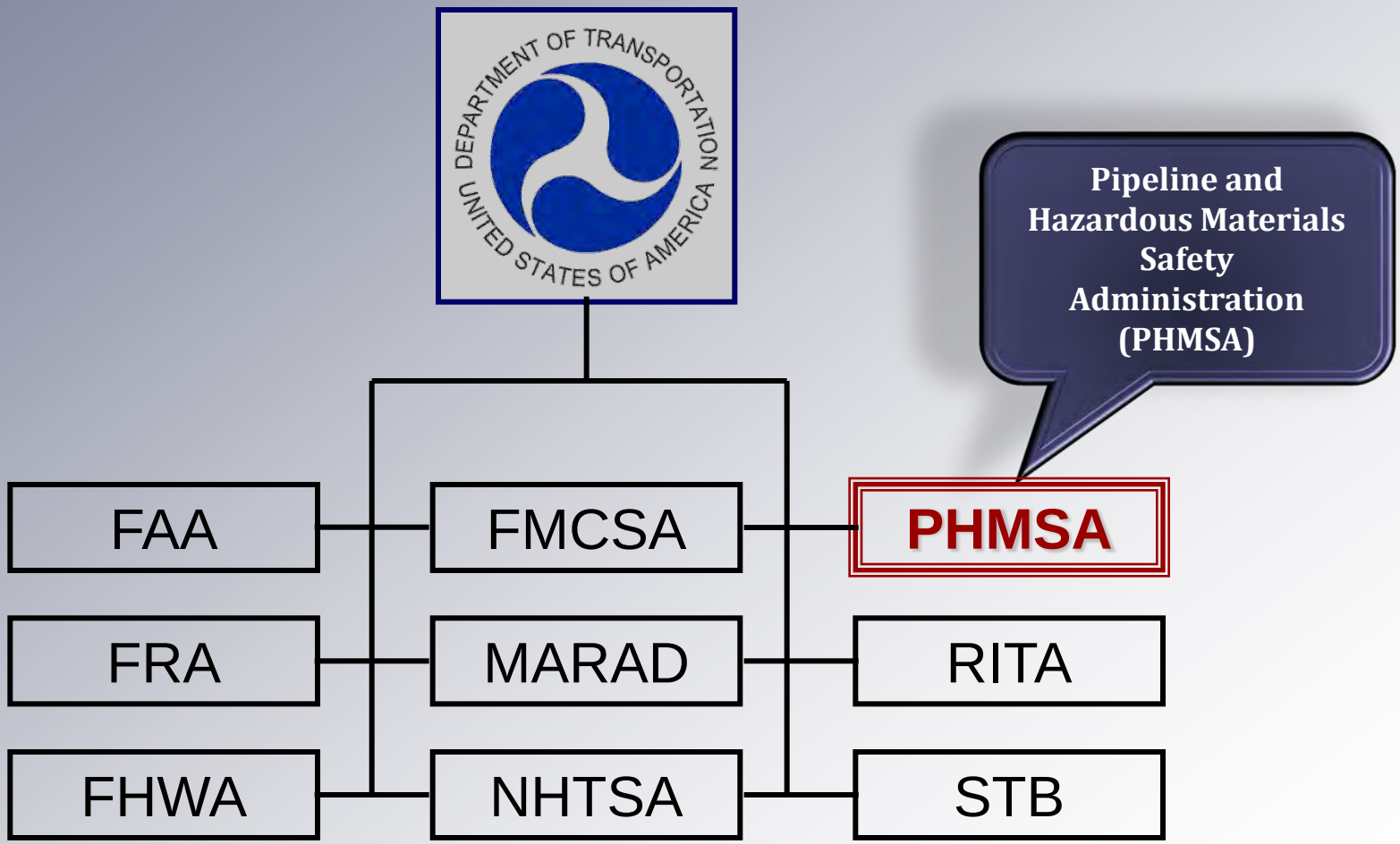


Overview

PHMSA - Overview

- Who is PHMSA?
- PHMSA overview?
- What is PHMSA – OPS - Mission?
- Where is PHMSA Located?

Who is PHMSA - DOT/PHMSA?



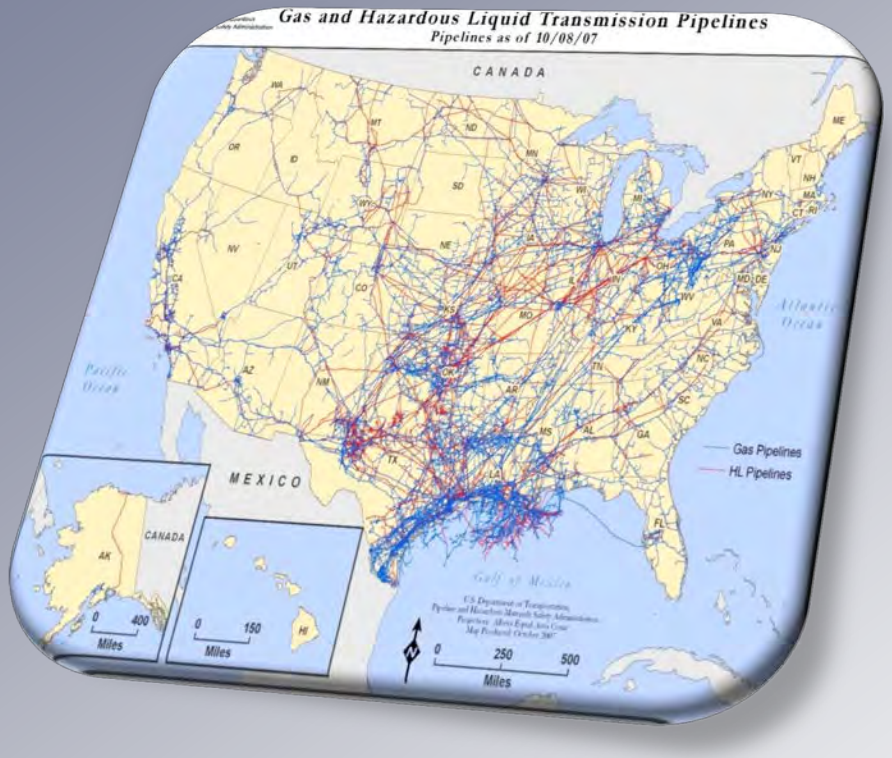
PHMSA

Office of Pipeline Safety

Office of Hazardous Materials Safety

- Chief Counsel
- Public Affairs
- Contracts/Procurement
- Human Resources
- Civil Rights
- Training Center

Mission
Office of Pipeline Safety



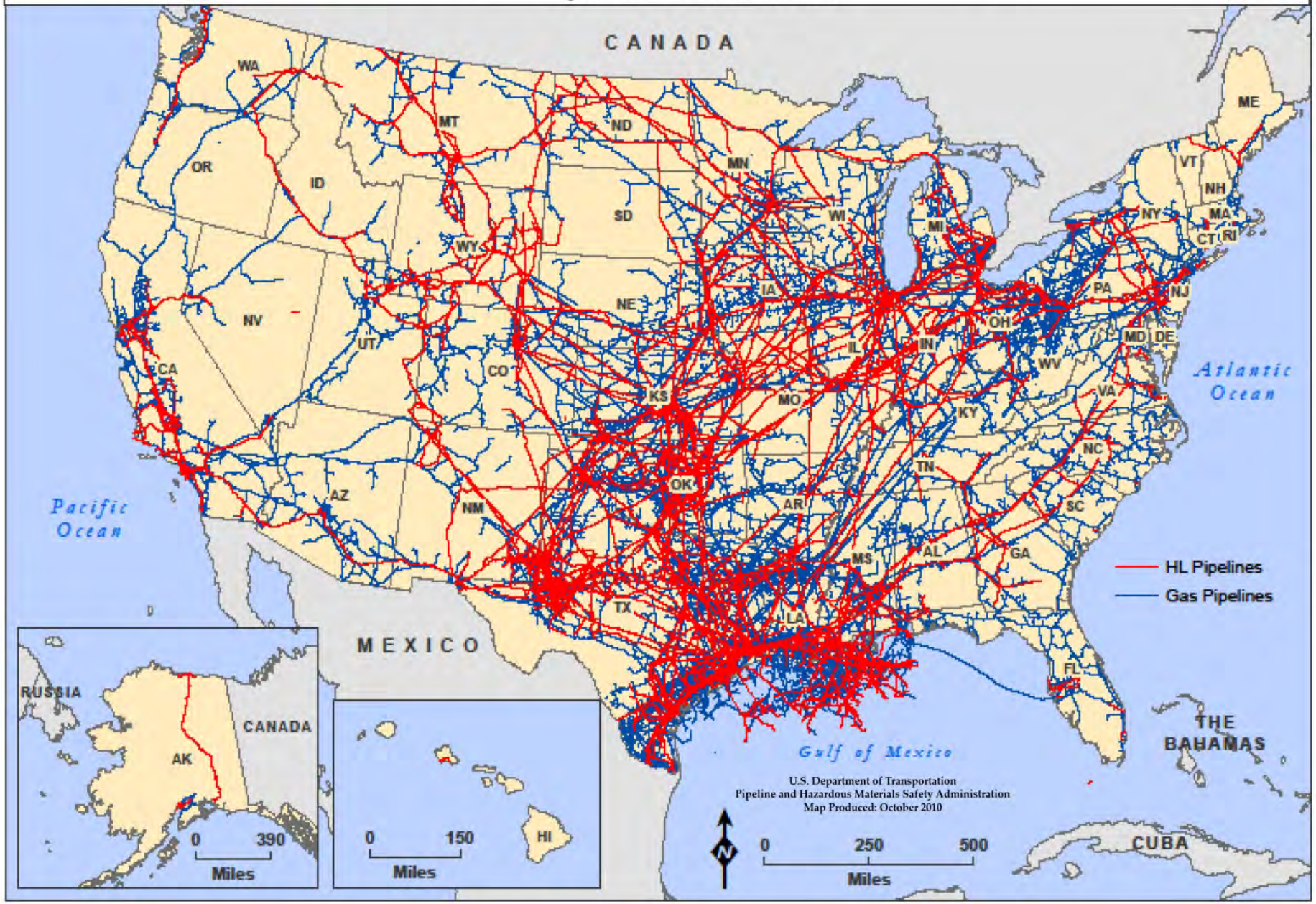
" To protect people and the environment from the risks inherent in transportation of hazardous materials – by pipeline and other modes of transportation"

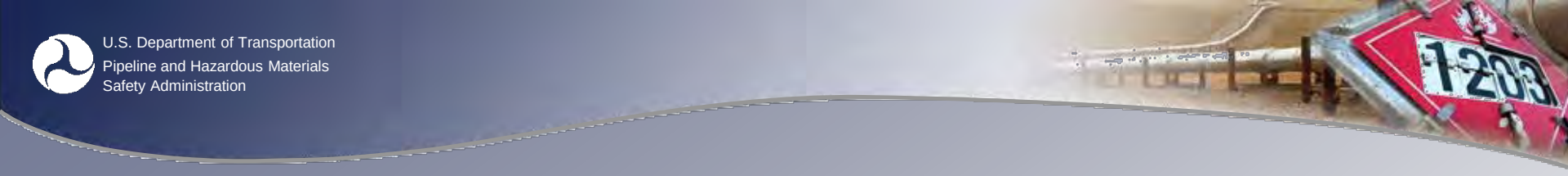
US Pipeline Transportation Network

- **Onshore and offshore Hazardous Liquid pipelines (certain exceptions);**
- **Onshore and offshore Gas Transmission and Gathering pipelines (certain exceptions);**
- **Natural Gas Distribution mains and service pipelines (primarily by States);**
- **Propane distribution system pipelines;**
- **LNG facilities both gasification and liquefaction.**

Hazardous Liquid and Gas Transmission Pipelines

Pipelines as of October 2010

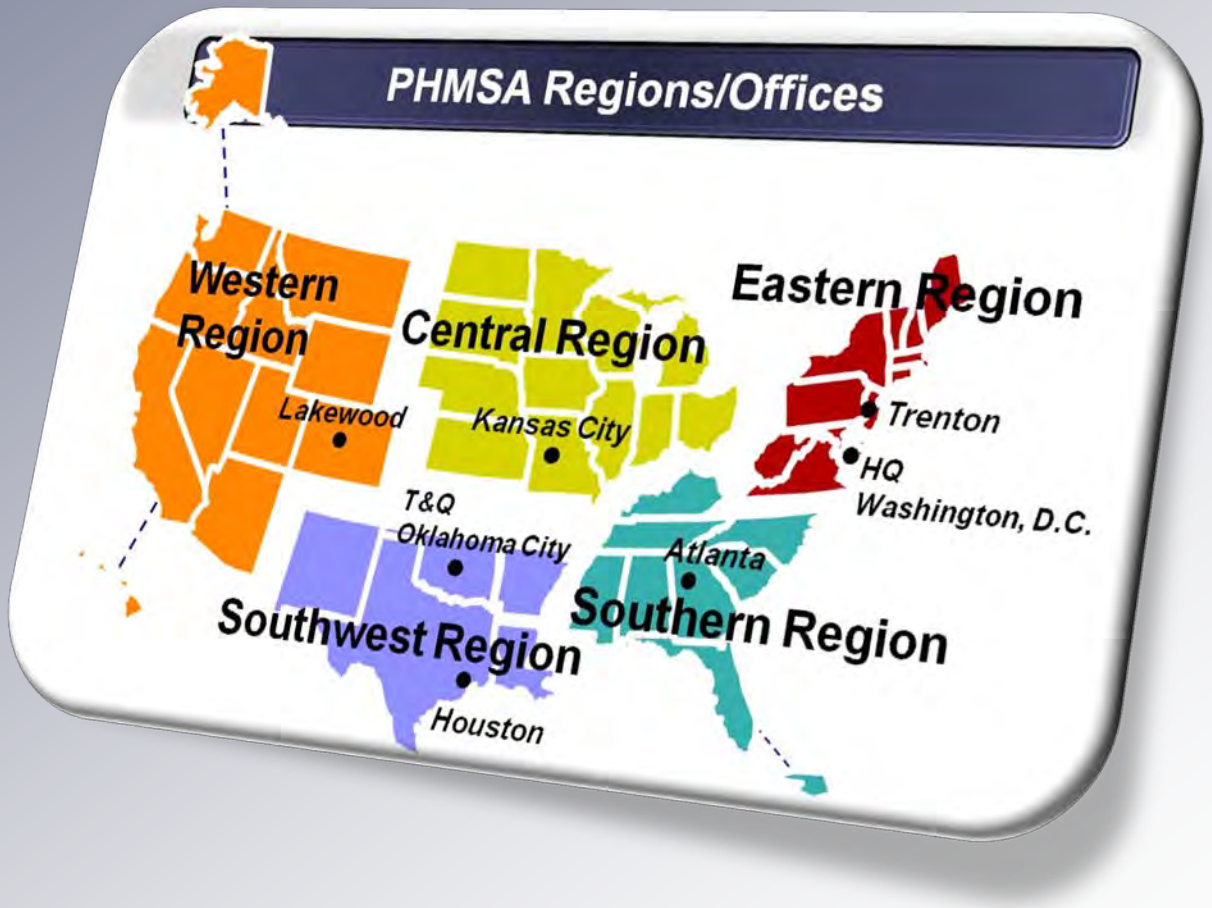




Pipeline System Components

Pipeline	Mileage	% Total	Operators	% Total
Hazardous Liquid	173,396	7	306	12
Gas Transmission	317,516	13	939	38
Gas Distribution	2,035,253	80	1,245	50
(main)	*1,200,803*	*48*		
(service)	*834,450*	*32*		
Total	2,526,165	100	2,490	100

PHMSA - OPS Regions



Regulatory Overview

- **Safety Regulations in 49 CFR Part 195**
  - Materials
  - Design
  - Construction
  - Operations & Maintenance (O&M)
    - Integrity Management (IM)
- **Response Plans for Oil Pipelines in 49 CFR Part 194**
  - Onshore oil spill response plan requirements

Liquid Pipeline Safety Regulations

- **49 Code of Federal Regulations (CFR) Part 195**
  - Subpart A – General
  - Subpart B - Annual, Accident, and Safety Related Condition Reporting
  - Subpart C – Design Requirements
  - Subpart D – Construction
  - Subpart E – Pressure Testing
  - Subpart F – Operations and Maintenance
    - Pipeline Integrity Management
  - Subpart G – Qualification of Pipeline Personnel
  - Subpart H – Corrosion Control

Part 195 - Overview

- **Subpart F – O&M – Integrity Management (IM)**
  - ***Defines High Consequence Areas (HCAs)***
  - Defines Unusually Sensitive Areas (USAs)
  - Establishes Pipeline Integrity Management Requirements to Protect HCAs
  - Provides Additional Guidance and Information – Appendix C

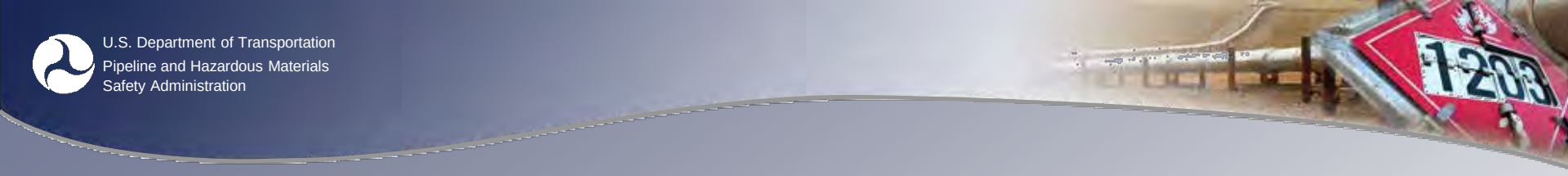
Part 194 – Overview

- **Subpart A – General**
  - **Purpose**
    - requirements for oil spill response plans to reduce the environmental impact
  - **Applicability**
    - applies to an operator of an onshore pipeline, that because of its location, could reasonably be expected to cause harm, or significant and substantial harm to the environment by discharging oil into the waters of the United States or adjoining shorelines

Part 194 – Overview

- **Subpart B – Response Plans**
  - **Operators required to submit response plans**
  - **Worst case discharge – operator submit**
    - Largest release volume based upon maximum release time, maximum shutdown time multiplied by flow rate, and largest line drainage volume after shutdown
  - **Response Plan**
    - Procedures and resources for responding to discharge
    - Training
    - Submission and approval

PHMSA – Safety Inspection Responsibilities



PHMSA – Safety Inspection Responsibilities

- Underlying Principles
- How is PHMSA set-up to monitor operator safety activities?
- Design and Material
- Construction
- Operations & Maintenance
- Risk Informed, Data Driven

PHMSA – Safety Inspection Underlying Principles

- It is the responsibility of pipeline operators to understand and manage the risks associated with their pipelines

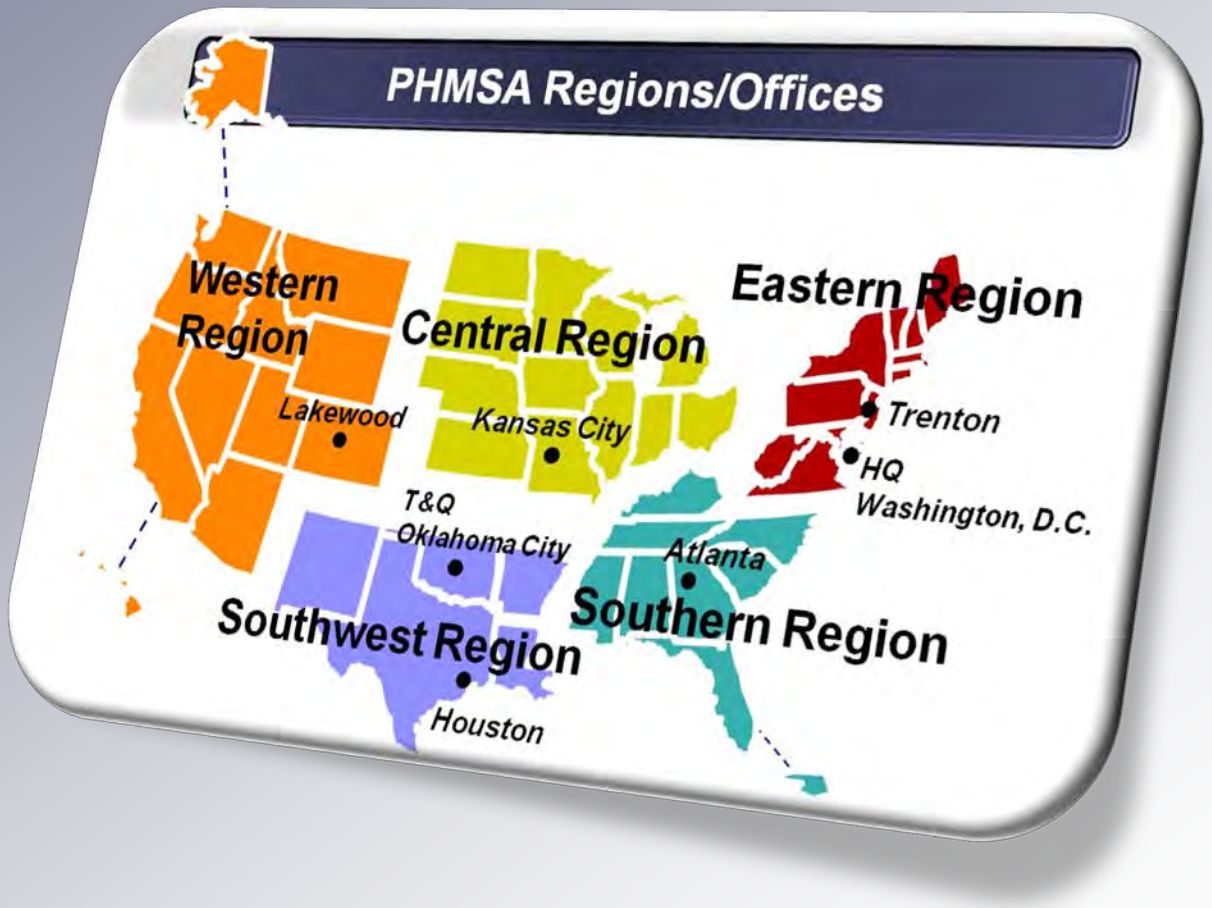
- PHMSA's primary role is to establish minimum safety standards (defined by required risk control practices) and to ensure that operators perform to these standards

- PHMSA also strives to impact operator performance beyond mere compliance with the regulations

PHMSA – Safety Inspection Responsibilities

- **How is PHMSA set-up to monitor Operator safety activities?**
  - Regional field offices
    - Eastern Region – Trenton, NJ
    - Southern Region – Atlanta, GA
    - Southwestern Region – Houston, TX
    - Central Region – Kansas City, MO
    - Western Region – Denver, CO
    - State Partners

PHMSA - OPS Regions



PHMSA – Safety Inspection Responsibilities

- **Design and Material**
  - Reviews drawings, specifications and procedures:
    - Compliance with Code
    - Compliance with Operator procedures
    - Know safety hazards included in design
  - Conducts inspection audits of:
    - Pipe mills
    - Coating mills
    - Fabrication yards

PHMSA – Safety Inspection Responsibilities

- **Construction**
  - Onsite field visits to review:
    - All phases of construction and pipeline start-up processes
    - Construction practices
      - Is operator and contractors following Codes, specifications, and procedures?

PHMSA – Safety Inspection Responsibilities

- **Construction**
  - Onsite field visits to review:
    - Witnesses
      - Material inspections for transportation damage
      - Weld procedure and welder qualification tests
      - NDT procedure tests
      - Ditching and blasting
      - Pipe girth welding and NDT
      - Coating of field joints and coating repairs
      - Pipe lowering –in to ditch and backfilling
      - Pressure testing and dewatering/cleaning of the pipeline
      - Pipeline start-up activities – filling, purging and pressurizing

PHMSA – Safety Inspection Responsibilities

- **Operations & Maintenance (O&M)**
  - Reviews O&M manuals, procedures, and specifications:
    - Compliance with Code
    - Compliance with Operator procedures
    - Know safety hazards included
  - Conducts inspection audits of:
    - Manuals, procedures, and specifications
    - Field facility and offices
    - Periodically conducted

PHMSA – Safety Inspection Responsibilities

- **Risk Informed, Data Driven Approach**
  - Inspection Plan Development
  - Inspection Execution
  - Follow up and analysis
- **Inspections through-out operating life cycle**
  - Design, Materials, Construction and O&M activities
- **PHMSA's Tools**
  - Enforcement Actions: Warning Letters, Compliance Orders, Civil Penalties
  - Notices: Advisory Bulletins, Interpretations, FAQ's

Origins and Scope of Diluted Bitumen (Dilbit) Study

Origins and Scope of Dilbit Study

- **Origin of Study**
- Pipeline Safety, Regulatory Certainty, and Jobs Creation Act of 2011 (P.L. 112-90),
  - SEC. 16. STUDY OF TRANSPORTATION OF DILUTED BITUMEN.
  - Not later than 18 months after the date of enactment of this Act, the Secretary of Transportation shall complete a comprehensive review of hazardous liquid pipeline facility regulations to determine whether the regulations are sufficient to regulate pipeline facilities used for the transportation of diluted bitumen. In conducting the review, the Secretary shall conduct an analysis of whether any increase in the risk of a release exists for pipeline facilities transporting diluted bitumen. The Secretary shall report the results of the review to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Transportation and Infrastructure and the Committee on Energy and Commerce of the House of Representatives.

Origins and Scope of Dilbit Study

- **Origin of Study**
  - Congress directed the Secretary of DOT via PHMSA to conduct a study on diluted bitumen (dilbit) and
  - determine any increase in the risk of release for pipeline facilities transporting dilbit.

Origins and Scope of Dilbit Study

- **Scope of Study**
  - **Task 1:** Analyze dilbit risk to pipelines
    - whether transportation of dilbit by pipeline has an increased risk of release compared with pipeline transportation of other liquid petroleum products.
    - Timing – 12-months from contract date
  - **Task 2:** Should the committee determine that an increased risk exists,
    - it will complete a comprehensive review of federal hazardous liquid pipeline facility regulations to determine whether they are sufficient to mitigate the increased risk.
    - Timing – 6-months after Task 1 is completed
  - **All Tasks Completed:** December, 2013

Agency Data Sources and Technical Reports

Agency Data Sources and Technical Reports

- **PHMSA - Research and Development Reports**
  - **US DOT/PHMSA/**
    - **Pipeline Safety/**
      - **Pipeline Technical Resources Tab**

        http://primis.phmsa.dot.gov/ptr.htm

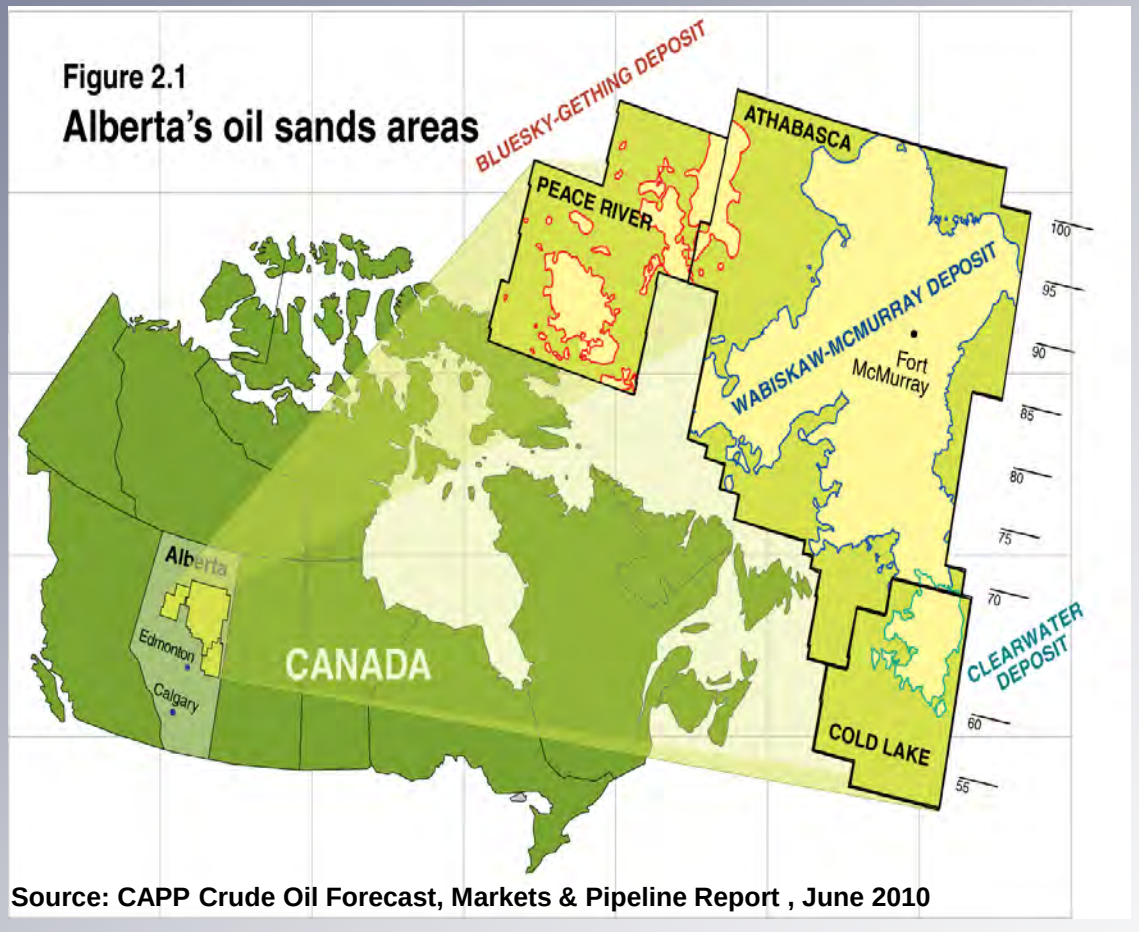
        Hazardous Liquid Integrity Management (HL IM)

        Research & Development
- **Canadian Government Reports**
  - **National Energy Board and Provinces**
- **Public and Industry Studies and Reports**

Bituminous Sands and Dilbit Review

- Terms
- Production and Reserves
- Public Concerns
- Composition Review

Bituminous Sands Region - Alberta



Source: CAPP Crude Oil Forecast, Markets & Pipeline Report , June 2010

- **Located in Canada**
  - north & east of Edmonton
  - Dilbit Pipelines originates in Hardisty, Alberta
- **Bituminous sands found in 3 deposit areas**
  - Peace River Area
  - Athabasca Area
  - Cold Lake Area

Bituminous Sand Terms

- **Oil sands** – mixture of sand, water, clay and **bitumen**
- **Bitumen** – crude oil that is too heavy or thick to flow or be pumped without being diluted or heated
  - At 50°F (10°C) bitumen is as hard as a hockey puck
  - At room temperature, it is much like cold molasses
- **Bitumen Production**
  - 20% Mined - when near surface
  - 80% Drilled - extracted by steam injection
- **Diluent** – lighter viscosity petroleum product that is used to dilute bitumen for transportation in pipelines

Bituminous Sands - Samples

Bituminous Sand - sample

Source: Suncor Energy Inc.
A sample of oil sand.

Source: ACS Division of Fuel Chemistry – picture from Syncrude .

Bitumen – raw state

Source: Syncrude
Bitumen in its raw state

Bituminous Sand Terms

- **Dilbit** – bitumen that has been reduced in viscosity through addition of a diluent, i.e., natural gas condensates or naphtha
  - **Dilbit** has an API gravity in low 20°API range
  - **Example** of **Dilbit Blend** from Cold Lake Area
    - ≈ 21 to 23°API gravity and ≈3.6% sulfur content
    - Blending is ≈ 70:30 bitumen to condensate or naphtha ratio
- **Synbit** – bitumen that has been blended with upgraded heavy sour crude and light grade crude oil with a blending ratio of ≈50:50
- **Viscosity** – is a measure of a fluid's resistance to flow. It varies greatly with temperature. Light crudes have a viscosity of ≈5 - 100 centipoises. Alberta bitumen has an in-place viscosity of ≈>50,000 centipoises (cp) and will not flow to surface unless heated.
  - **Dilbit** – ≈ 325 cp; West Texas Intermediate – 5 cp

Bituminous Sand Terms

- **°API** – is a measure of how heavy or light a petroleum liquid is compared to water. The API scale relates actual specific gravity (SG) of crude oil through an expression of density called "degrees API" measured at 60°F. Actual specific gravity of crude oils range from ≈ 0.75 to 1.05. °API is expressed mathematically as:
  - °API = (141.5/SG) – 131.5
  - Gas Condensates – ≈ 42 to 55°API
  - Light Crude Oils – ≈ 31 to 42°API - varies
  - Medium Crude Oils – ≈ 22 to 31°API
  - Heavy Crude Oils – ≈ <22°API
  - Alberta Bitumen – ≈ 8°API prior to being mixed with diluent
  - Water (≈10°API); Gasoline (≈63°API); Fuel Oil #2(≈30-38°API)

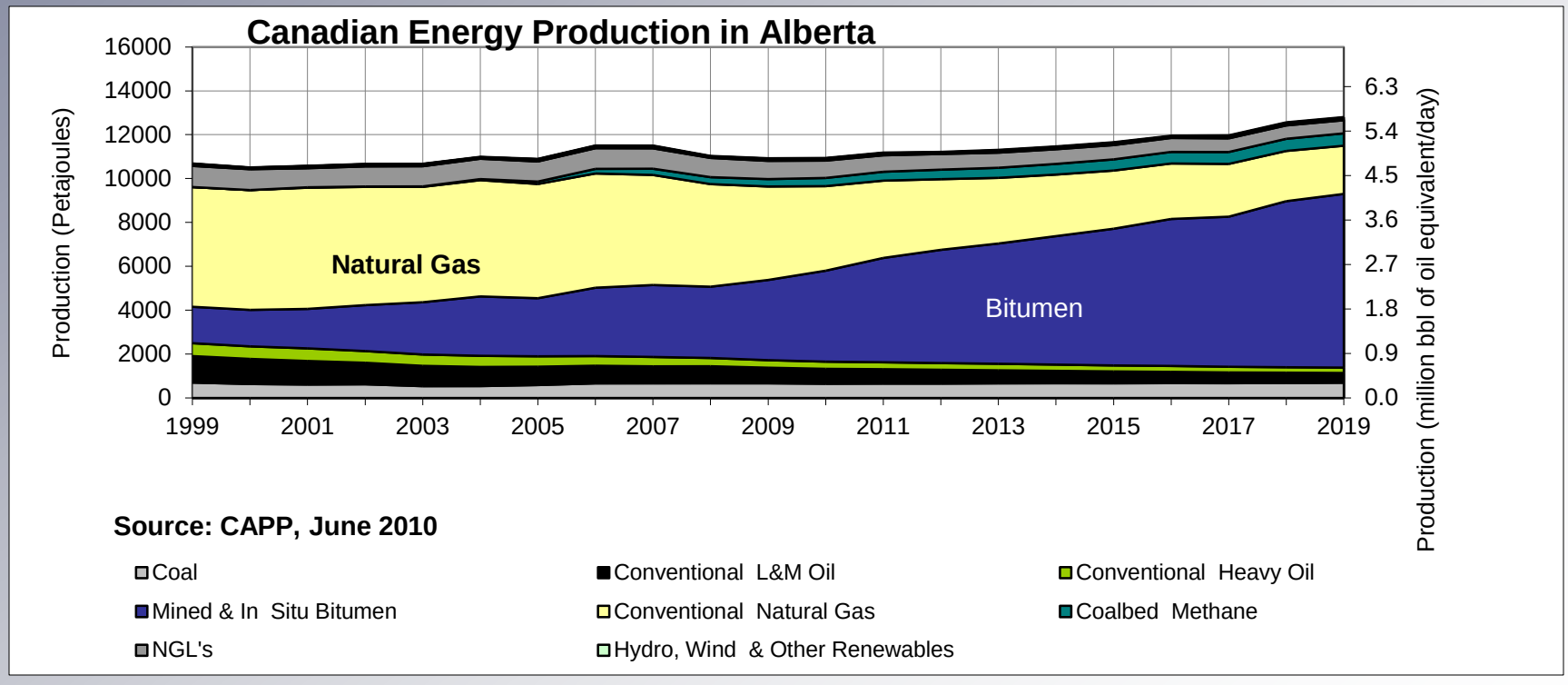
Bituminous Sands Region

- **Bituminous Sand Reserves – estimated**
  - 170 billion barrels recoverable - bitumen
  - 315 billion barrels potential - bitumen
- **Canadian Crude Oil Production and Future Estimate**

Canadian Oil Production – Barrels per Day Source: CAPP 2010			
Year	**1980**	**2010**	**2025 est.**
Crude Oil Incl. Bituminous sands	1.5 million	2.8 million	4.3 million
Bituminous Sands	0.1 million	1.4 million	3.5 million

Bituminous Sands Region – Energy in Alberta

- **Bitumen production - estimates**
  - ≈1.4 million barrels per day in 2010



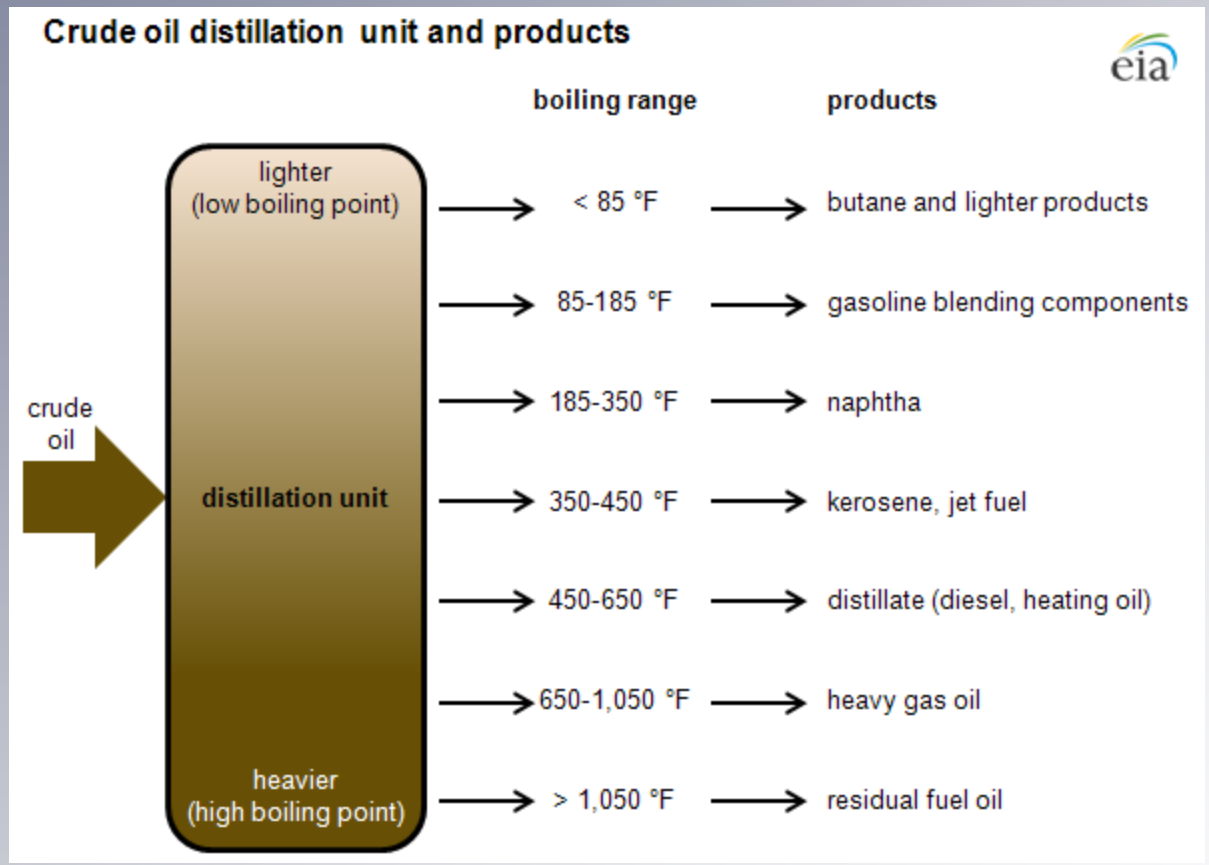
Bituminous Sands – Crude Oil

- **Public concerns known to PHMSA?**
  - Increased risk of leak or rupture
    - Pollute aquifers (Ogallala Aquifers) in Midwest States
  - Increased corrosiveness and abrasiveness
- **What has caused this concern?**
  - Higher gravity/viscosity crude oil
  - Possible heavy metals
  - Possible more sulfur and hydrogen sulfide
  - Possible higher Total Acidity Number (TAN)
  - Reporting does not differentiate between crude oil grades

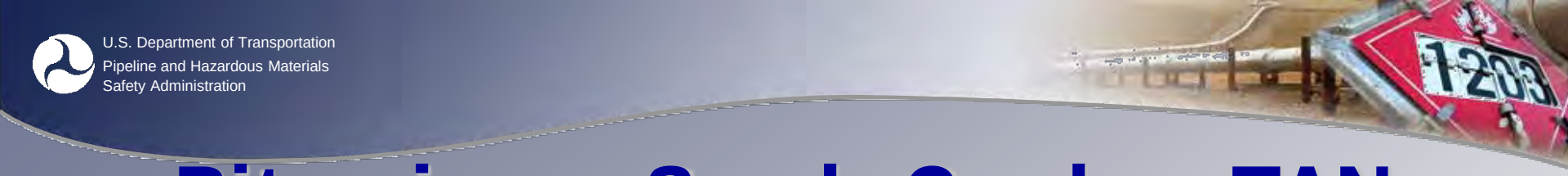
What is a Total Acidity Number (TAN)?

- **Total Acid Number (TAN)**
  - Is an oil refinery naphthenic acid test
    - Measured by using ASTM D664
  - High TAN crude oils may contain corrosive properties
  - Acid will come out of crude oil during refining processes at high temperatures - over 450°F to 850°F
  - Corrosive to carbon steel at these temperatures
- **Liquid pipelines operate below 150°F**

A Typical Refining Distillation Column



Source: U.S. Energy Information Administration



Bituminous Sands Crude – TAN Comparison

Summary of Total Acid Number (TAN) Crude Oils of "Heavy" /Low °API Type				
Crude Type	**Location**	**Crude Oil Name**	**°API Gravity**	**TAN (mg KOH/g)**
Heavy	**Canada**	**Cold Lake - Dilbit**	**23**	**0.95**
	California	Midwest Sunset		4.70
	Mexico	Maya	22	0.28
	Kuwait	Ratawi	25	0.1 – 0.4
	North Sea	Captain or Clair	19 - 24	1.2 – 2.36
	Saudi Arabia	Arabian Heavy	27	0.10
	Venezuela	BCF or Hamaca	17 - 26	0.70 – 2.5

Bituminous Sands – Crude Oil

- **Composition Comparisons with Other Crude Oils**
  - **Higher gravity / viscosity crude oil**
    - Dilbit – 20 to 23 °API
    - Others – 17 to 27 °API
  - **Possible heavy metals**
    - Dilbit – 54 to 161 Vanadium and 21 to 65 Nickel
    - Others - 45 to 352 Vanadium and 13 to 21 Nickel
    - Dilbit/Others: similar for mercury, lead, & arsenic
  - **Sulfur and Hydrogen Sulfide (H_2S)**
    - Dilbit – Sulfur 1.6 to 3.6 and H_2S none
    - Others – Sulfur 0.8 to 3.6 and H_2S none to 60 ppm

Bituminous Sands – Crude Oil

- **Composition Comparisons with Other Crude Oils**
  - Total Acid Number (TAN)
    - Dilbit - ≈1; Other Crudes - ≈0.1 to 4.70
- **What are public concerns?**
  - Composition of Dilbit crude oil being different than other oils transported in U.S.
  - Loss of internal pipe wall thickness due to increased corrosiveness & abrasiveness.

Pipeline Overview

Pipelines that transport Dilbit and heavy crude oil in the U.S.?

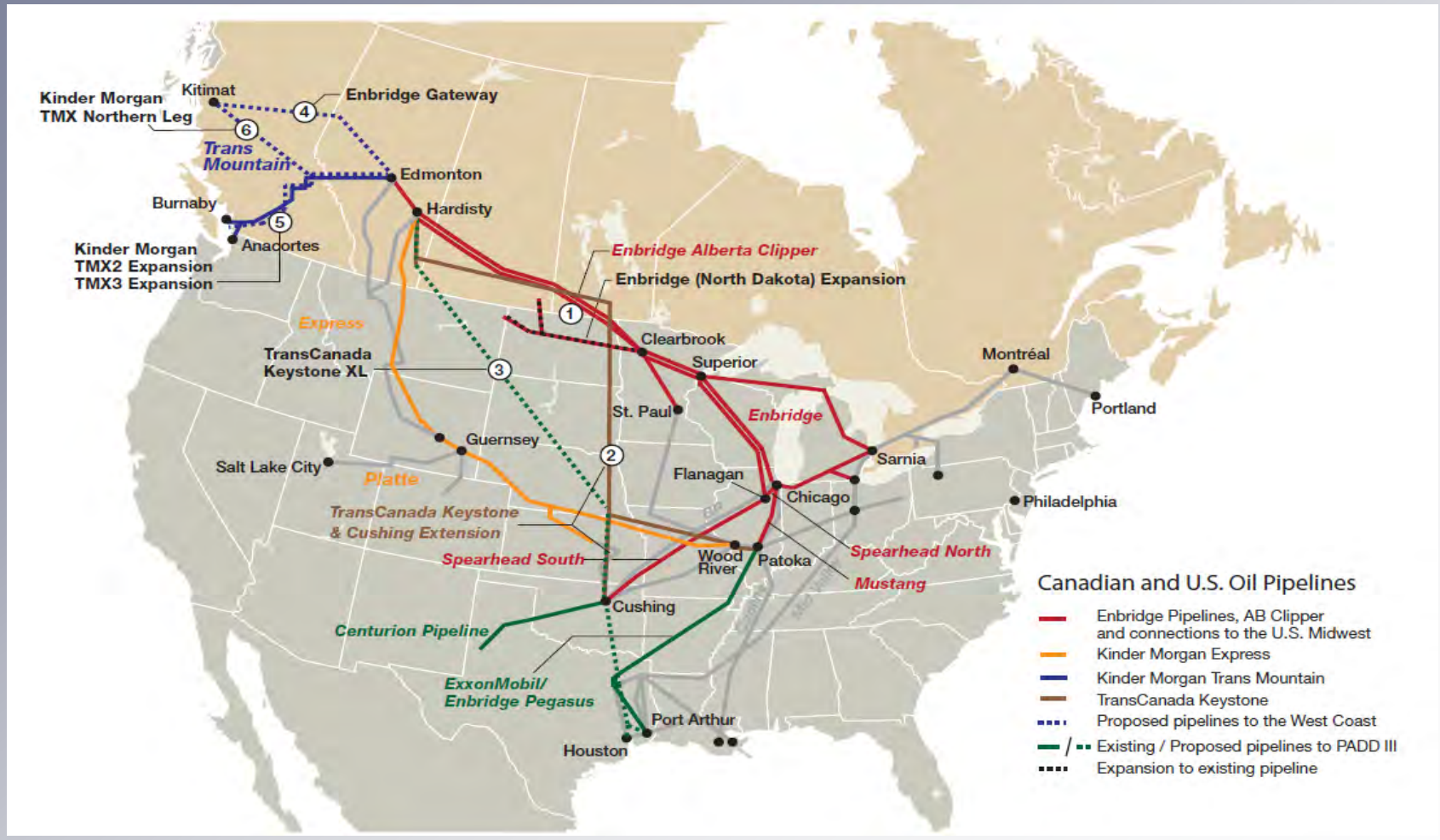
Bituminous Sands Region

- **What pipelines transport crude oil (including Dilbit or Synbit) from the Alberta oil sands?**

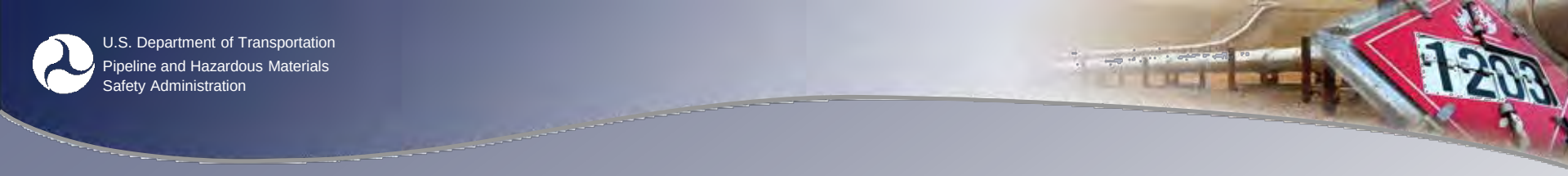
Pipeline	Crude Type	Annual Capacity (1000 Barrels/day)
Enbridge	Light	1,072
Enbridge	Heavy	796
KM Express	Light/Heavy (35/65)	280
KM Trans Mountain	Light/Heavy (80/20)	300
Alberta Clipper (new)	Heavy	450
Keystone (new)	Light/Heavy (25/75)	435
Proposed New PL		
Total Capacity		**3,333**

Source: CAPP Crude Oil Forecast, Markets & Pipeline Report , June 2010

Pipelines from Bituminous Sands Region



Source: CAPP Crude Oil Forecast, Markets & Pipeline Report , June 2010



Bituminous Sands Region Pipelines to U.S. Incident History

Pipeline	Incident	2000 - 2010	Total	Mileage
Enbridge Lakehead/Alberta Clipper	Corrosion – Internal Corrosion – External All other incidents	4 2 99	105	3615
Kinder Morgan PL	Corrosion – Internal Corrosion – External All other incidents	3 0 20	23	1461
Total Incidents - above			**128**	**5076**
Total Incidents per Year-1000 miles of pipelines		**128 Total Incidents**		**2.29/yr-1000 miles**
Total Corrosion Incidents per Year-1000 miles of pipeline		**9 Corrosion Incidents**		**0.16/yr-1000 miles**

Source: PHMSA incident data

Crude Oil Pipeline Failures U.S. and Alberta

U.S. Crude Oil Pipeline Incident History – 2002 - 2010		
Incident / Failure Cause	**Failures / Year**	**Failures per 1000 pipeline miles per year**
Corrosion - External	9.8	0.19
Corrosion - Internal	22.1	0.42
All Failures	89.3	1.70

Source: PHMSA incident data, incidents + 5 bbls. U.S. has 52,475 miles of crude oil pipelines 2009.

Alberta Crude Oil Pipeline Incident History – 2002 - 2010		
Incident / Failure Cause	**Failures / Year**	**Failures per 1000 pipeline miles per year**
Corrosion - External	2.3	0.21
Corrosion - Internal	3.6	0.32
All Failures	22.0	1.97

Source: Alberta Energy and Utility Board Report, includes spills less than 5 bbls. Alberta has 11,197 miles of crude oil pipelines in 2005.

Pipeline Tariffs - Comparison

Pipeline Tariffs - Comparison				
Pipeline	**Sunoco**	**Chicap**	**Mobil Pipeline**	**Proposed New PL**
Gravity	NR	NR	NR	NR
Basic Sediment & Water (BS&W) %	1%	1% (crude) 0.5% (diluent)	1%	0.5%
Max, Pour Point (°F)	40	35 (Oct to Mar) 55 (Apr to Sept)		
Max. Temperature (°F)	140		140	100
Max. Reid Vapor Pressure (psi)	13	13.5	13.0	15 (103 kPa)
Viscosity(sus)	110 to 399 with surcharge	100 and higher with surcharge		350

NR – not required by tariff

Percentages of Total Imported Crude Oil by API Gravity

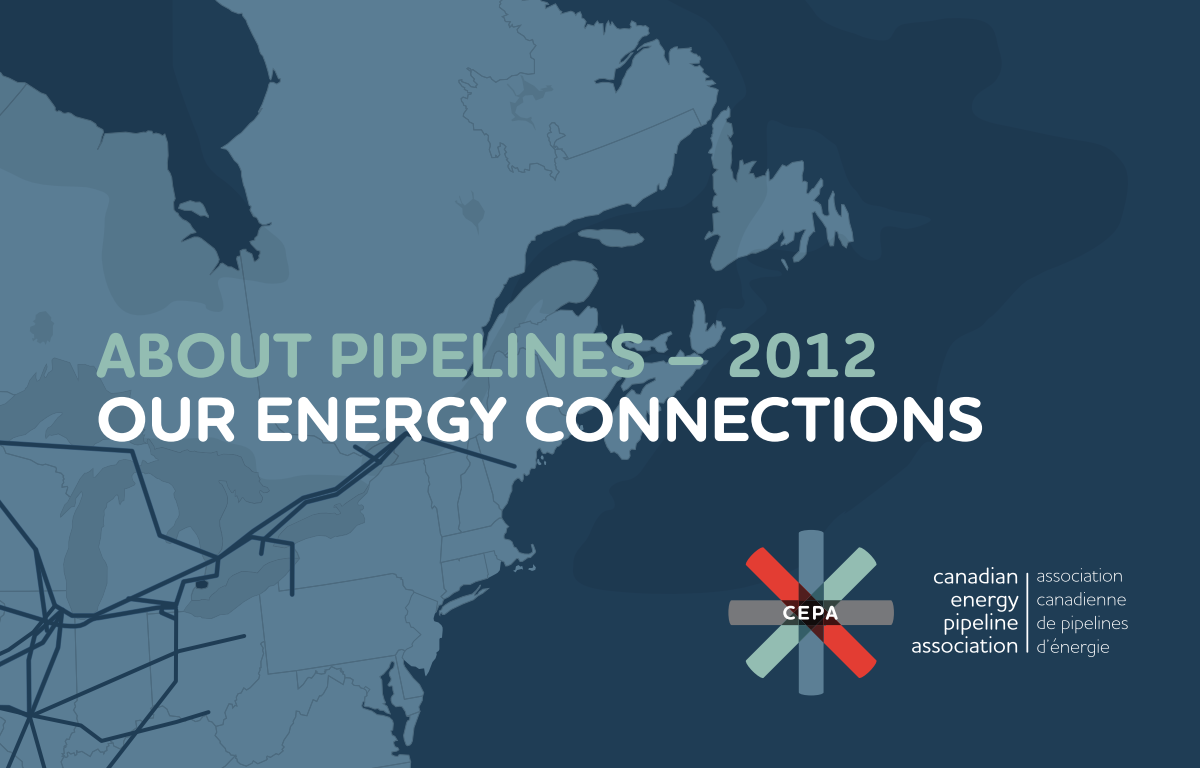
API Gravity (°API)	Year – 1995 Percent	Year – 2000 Percent	Year – 2005 Percent	Year – 2010 Percent
20° or less	4	6	12	16
20.1° to 25°	18	19	23	26
25.1° to 30°	17	13	10	5
30.1° to 35°	32	37	32	30
35.1° to 40°	24	20	17	14
40.1° to 45°	3	4	4	6
45.1° & more	2	1	2	3
Total	100	100	100	100

Source: DOE – Energy Information Administration (EIA), Petroleum & Other Liquids, released 02/01/2011.

Summary

- **TRB Committee** – will review technical factors of flowing Dilbit through liquid pipelines and corrosion effects
- **Dilbit Crude Oil Composition Appears**
  - Similar to other U.S. crude oils that are transported in pipelines
  - No additional corrosiveness or abrasiveness issues found
- **Pipeline – Proposed Pipeline Facts**
  - Design, Construction, and Operations & Maintenance
    - In accordance with 49 CFR Part 195
- **PHMSA Reporting –** does not differentiate between crude oil grades (Dilbit/Synbit/other Heavy Crude Oils)

Thank You



ABOUT PIPELINES – 2012
OUR ENERGY CONNECTIONS

CEPA

canadian energy pipeline association | association canadienne de pipelines d'énergie

THE FACTS ABOUT PIPELINES

This fact book is designed to provide easy access to information about the transmission pipeline industry in Canada. The facts are developed using CEPA member data or sourced from third parties. For more information about pipelines visit **aboutpipelines.com.**

An electronic version of this fact book is available at **aboutpipelines.com**, and printed copies can be obtained by contacting **aboutpipelines@cepa.com.**

The Canadian Energy Pipeline Association (CEPA) represents Canada's transmission pipeline companies who operate 110,000 kilometres of pipeline in Canada. CEPA's mission is to ensure a strong and viable transmission pipeline industry in Canada in a manner that emphasizes public safety and pipeline integrity, social and environmental stewardship, and cost competitiveness.

*CEPA's members transport **97 per cent** of Canada's daily natural gas and onshore crude oil production.*

TABLE OF CONTENTS

Unless otherwise indicated, all photos used in this fact book are courtesy of CEPA member companies.

CANADA'S PIPELINE NETWORK

94% *of the energy used for transportation in Canada comes from petroleum products.*

The Importance of Canada's Pipelines

Oil and gas products are an important part of our daily lives. We use them to heat our homes and fuel our cars. In fact, many consumer goods we use each day are made from petroleum products.

- More than half the homes in Canada are heated by furnaces that burn natural gas.
- Many pharmaceuticals, chemicals, oils, lubricants and plastics incorporate petroleum products.
- Production of many consumer goods including shoes, telephones and tennis racquets requires petroleum products.

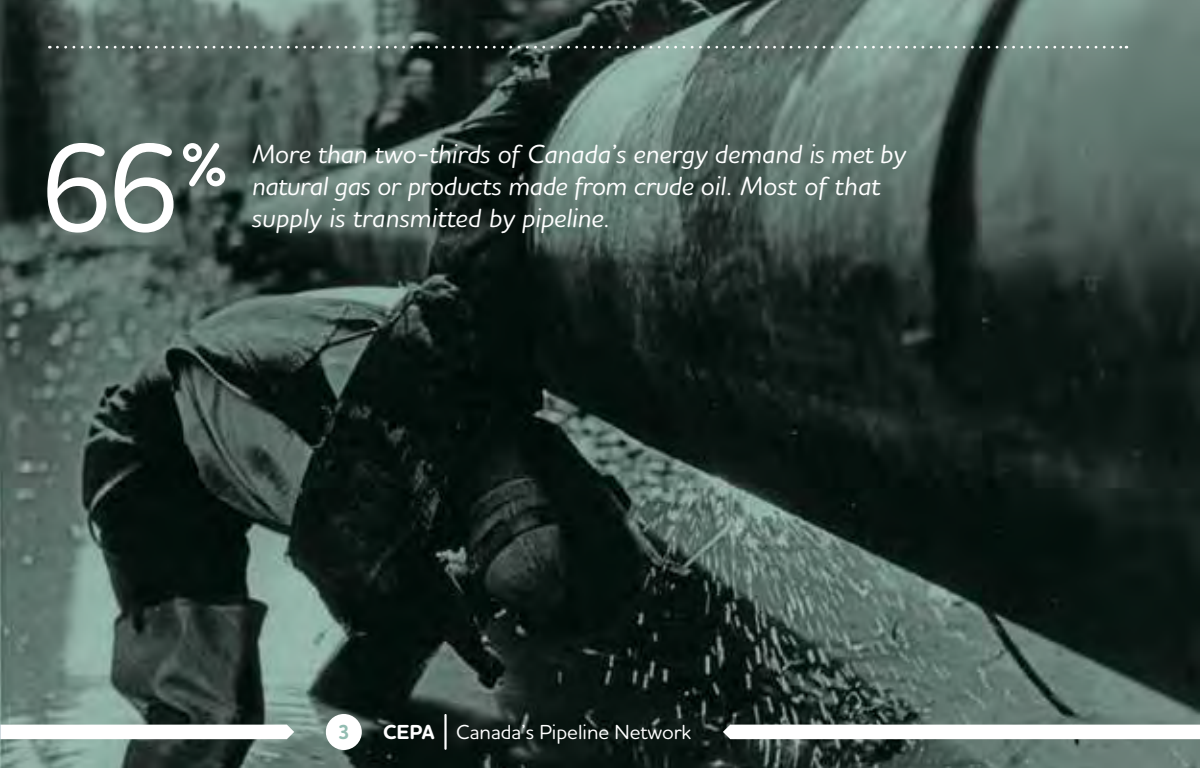
Our Energy Highways

Just like highways, railways and electricity transmission lines, pipelines criss-cross the country to service some of our most important needs.

Oil and natural gas resources are typically located in rural and remote areas, while consumers are located predominantly in urban areas across Canada. As a result, transportation of oil and natural gas to markets by pipeline is a vital component of our energy infrastructure.

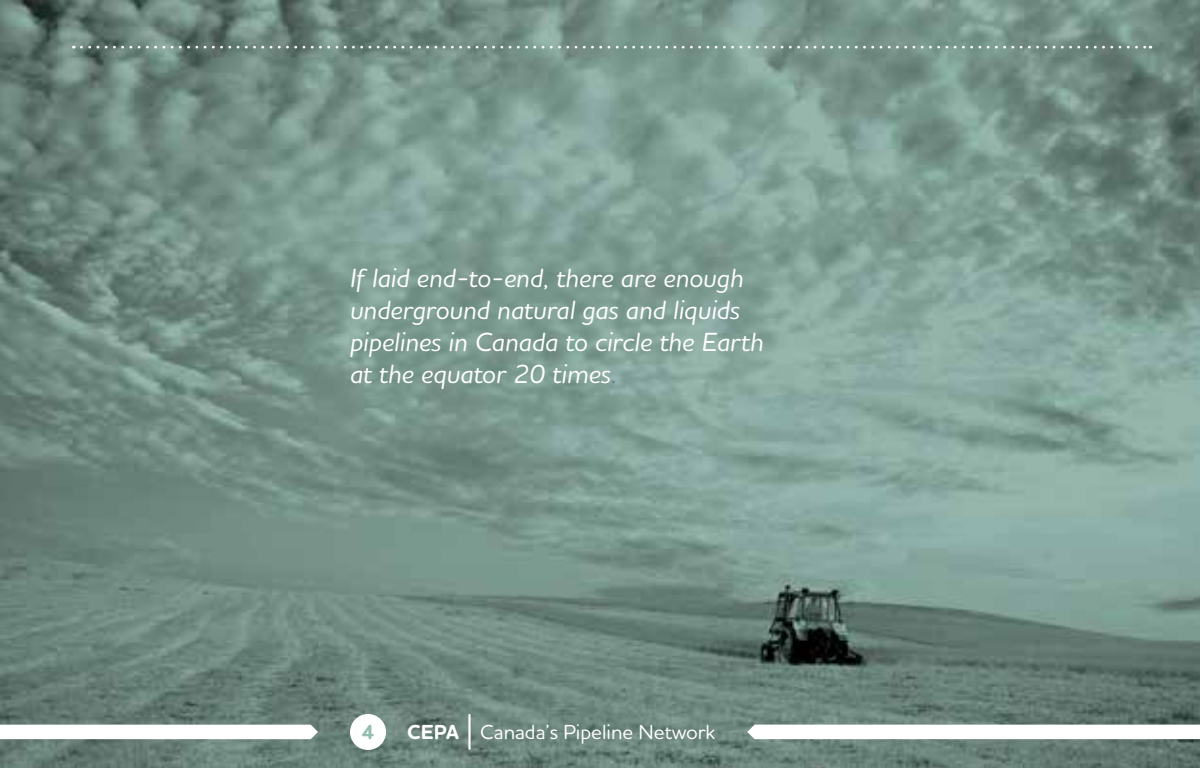
This vast network of pipelines, virtually all of which is buried underground, transports almost all of Canada's crude oil and natural gas from areas of production to consumer markets. In fact, Canadians safely live, work and travel over pipelines every day without even knowing it.

Members of CEPA are proud to operate Canada's pipeline network with the utmost regard for public safety and environmental stewardship.



66%

More than two-thirds of Canada's energy demand is met by natural gas or products made from crude oil. Most of that supply is transmitted by pipeline.



If laid end-to-end, there are enough underground natural gas and liquids pipelines in Canada to circle the Earth at the equator 20 times.

DID YOU KNOW?

Canada's transmission pipeline network is more than three times the length of Canada's national highway system.

Types of Pipelines

1. Gathering Pipelines – move crude oil and natural gas (and combinations of these products) from wellheads to oil batteries and natural gas processing facilities. More than **250,000 kilometres** of these lines are concentrated in the producing provinces of western Canada, primarily in Alberta.
2. Feeder Pipelines – transport crude oil and other products such as natural gas liquids from batteries, processing facilities and storage tanks to the transmission pipelines. There are more than **25,000 kilometres** of feeder pipelines in the producing areas of western Canada.
3. Transmission Pipelines – these are the major highways of the pipeline network, transporting crude oil and natural gas within a province and across provincial or international boundaries. There are **110,000 kilometres** of transmission pipelines in Canada, more than three times the length of Canada's national highway system.
4. Distribution Pipelines – local distribution companies or provincial cooperatives operate natural gas distribution lines that deliver natural gas to homes, businesses and various industries. There are approximately **450,000 kilometres** of these lines in Canada.

History of Canada's Pipeline Network

Canada has a proud history of pipeline construction and operation dating back to 1853 when a 25 kilometre cast-iron pipe moving natural gas to Trois Rivières, QC was completed.

In 1862, Canada would complete one of the world's first oil pipelines, from the Petrolia oilfield in Petrolia, ON to Sarnia, ON.

By 1947, only three oil pipelines moved products to market in Canada. One transported oil from Turner Valley, AB to Calgary.

A second pipeline moved imported crude from coastal Maine to Montreal, QC, while a third brought American mid-continent oil to Ontario.

With the discovery of an abundant supply of crude oil and natural gas in the west, Canada's oil and gas industry began expanding its vast pipeline network in the 1950s. This expansion contributed significantly to the development of domestic and international markets, while propelling the Canadian economy forward.

As Canada's energy infrastructure matured, the country witnessed broad-based economic growth, industrial diversification, and rising living standards.

KEY DATES

1912

Canadian Western Natural Gas builds a natural gas pipeline from Bow Island, AB to Calgary, AB (275 km).

© Glenbow Museum | Re-printed with permission | Tractor and wagon loads of pipe, Claresholm, Alberta.

1923

Northwestern Utilities Company Limited completes construction of a 124 kilometre natural gas pipeline and 129 kilometres of distribution pipelines from Viking, AB to Edmonton, AB.

1941

Portland-Montreal Pipe Line completes its 380 kilometre oil pipeline from South Portland, Maine, USA to Montreal, QC.

1944

The Canadian Oil Pipeline, otherwise known as Canol, completes a crude oil pipeline from Norman Wells, NT to Whitehorse, YK.

1950

Interprovincial Pipe Line Inc. (now Enbridge Pipelines Inc.) transports crude oil from Edmonton, AB to Superior, Wisconsin, USA.

1953

Trans Mountain Pipeline system (now Kinder Morgan Canada) transports crude oil from Edmonton, AB to Vancouver, BC.

Interprovincial Pipe Line Inc. extends to Sarnia, ON.

1954

The Pembina Pipeline system is constructed to transport crude oil from the Pembina field near Drayton Valley, AB to Edmonton, AB. The Pembina system serves one of the oldest oil producing areas in Alberta.

1955

Westcoast Transmission Company Ltd. (now Spectra Energy Inc.) begins construction on a 24-inch pipeline from Taylor, BC to the USA.

1957

TransCanada PipeLines Ltd. begins construction on a natural gas pipeline across Canada.

Westcoast Transmission Company Ltd. begins transporting natural gas from northeastern British Columbia to the BC/US border.

TransCanada Pipelines Ltd.'s Alberta system, known as NOVA Gas Transmission Ltd. or NGTL, begins operations.

1974

Foothills Pipe Lines Ltd., a subsidiary of Westcoast Transmission Company Ltd, now TransCanada Pipe Lines Ltd., was created for the purpose of constructing and operating the Canadian portion of the Alaska Natural Gas Transportation System.

1976

Interprovincial Pipe Line Inc. extends to Montreal, QC.

1977

Alyeska Pipeline completes construction of its Trans Alaska Pipeline System, known as TAPS, which moves crude oil from Prudhoe Bay on Alaska's North Slope to Valdez, Alaska, USA.

1981

Foothills Pipe Lines Ltd. begins transporting natural gas from central Alberta to the US border.

1985

Interprovincial Pipe Line Inc. completes construction of its Norman Wells, NT to Zama, AB pipeline, which is the first buried pipeline through permafrost in Canada.

1997

Encana Corporation begins operation of its Express Pipeline, which transports crude oil from Hardisty, AB to markets in Montana, Utah, Wyoming and Colorado, USA.

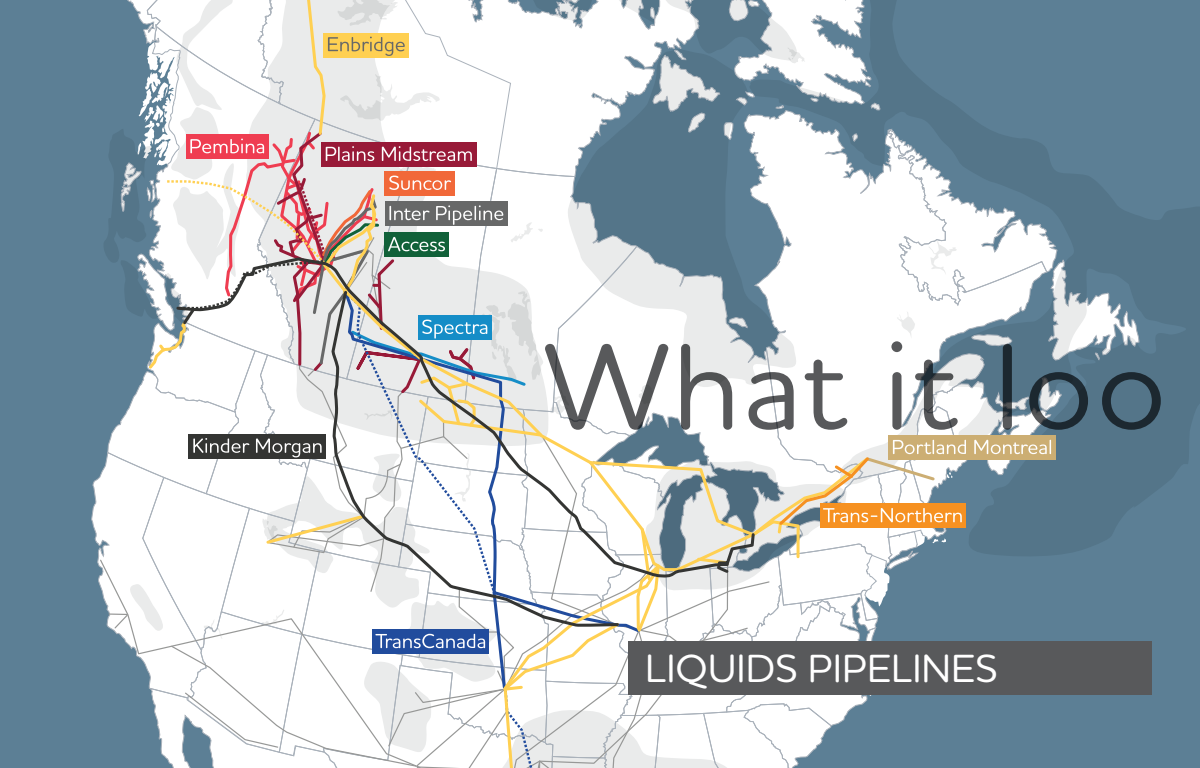
2000

Alliance Pipeline Ltd. starts transporting natural gas from northeastern British Columbia and northwestern Alberta to Illinois, USA.

2011

TransCanada PipeLines Ltd., begins transporting crude oil on its Keystone pipeline from Hardisty, AB to Cushing, Oklahoma, USA.

The Mackenzie Valley Pipeline Project, owned by a consortium, receives federal Cabinet approval to construct a 1,200 kilometre natural gas pipeline from the Mackenzie Delta, NT to Fort Simpson, NT and on to existing pipeline infrastructures in Alberta.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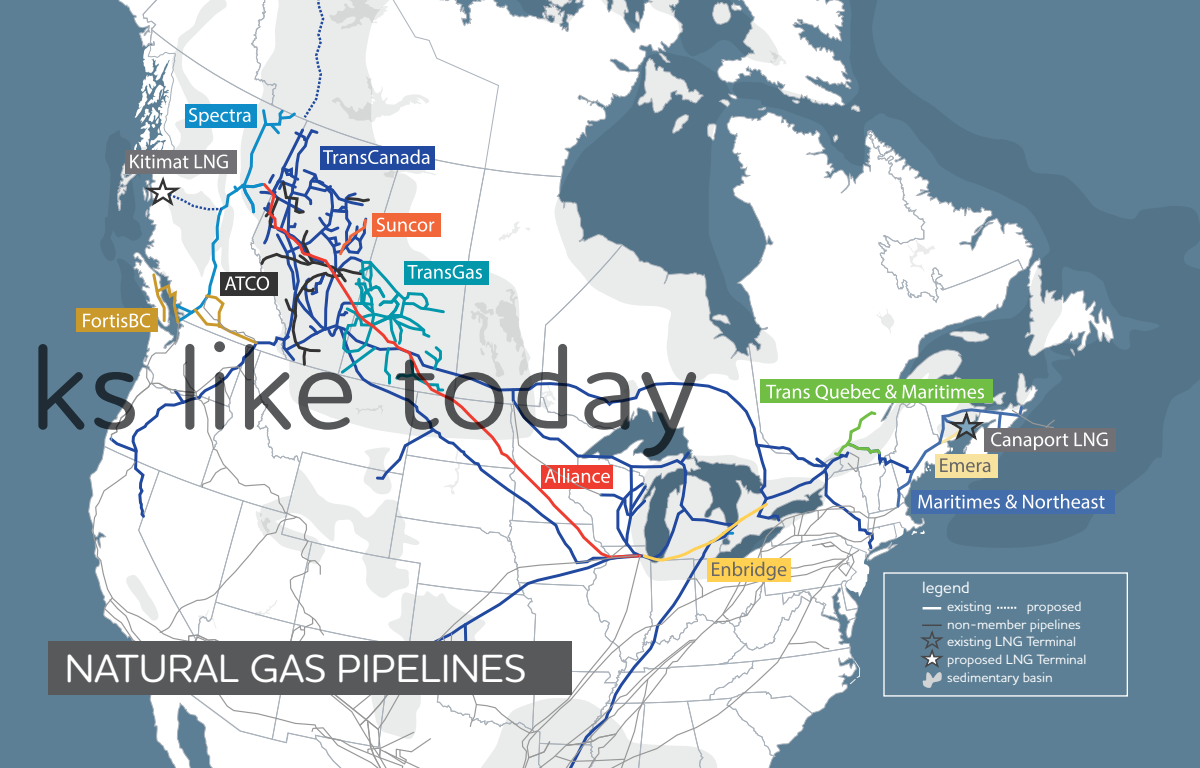
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existing LNG Terminal
proposed LNG Terminal
sedimentary basin

110,000 KM

DID YOU KNOW?

CEPA member companies operate110,000 kilometres of transmission pipelines in Canada.

Pipeline Length - Kilometres (2011)

	BC	AB	SK	MB	ON	QC	NB/NS	NT	Canada
Natural Gas	5,996	34,689	18,377	2,472	8,077	912	1,400	0	71,923
Liquids	2,595	21,374	7,151	2,464	2,064	354	0	751	36,753
Total	**8,591**	**56,063**	**25,528**	**4,936**	**10,141**	**1,266**	**1,400**	**751**	**108,676**

3,000,000 BARRELS PER DAY

DID YOU KNOW?

In 2011, CEPA members transported approximately 5.3 trillion cubic feet of natural gas and 1.2 billion barrels of crude oil and refined petroleum products.

CEPA members transport three million barrels of crude oil by pipeline every day. This is the equivalent of 200 olympic-sized swimming pools. If there were no pipelines, it would take a 75 kilometre-long train to transport the equivalent amount.

Estimate of 2011Transported Volumes

	Annual	Daily
Crude Oil	1,059 MB	2.9 MB/d
Refined Products	119 MB	0.326 MB/d
Natural Gas	5.3 TCF	14.6 BCF/d

PIPELINE DESIGN AND STANDARDS

To find out more about the CSA Oil and Gas Pipeline System Standard visit: http://shop.csa.ca

Designing and constructing a pipeline is a lengthy and complex process that considers a number of factors and requires a number of steps and commitments before product begins to flow. This includes extensive stakeholder engagement and a thorough review of the social and environmental factors.

Prior to construction, a detailed route analysis must be performed to adequately assess the specific topographical, environmental and social factors along the proposed right-of-way.

Canadian pipeline operators are subject to very specific regulatory and technical requirements ensuring that pipelines are built and operated with the utmost regard for public safety and environmental integrity.

The Canadian Standards Association

Pipeline design and construction decisions are guided by a set of comprehensive standards issued by the Canadian Standards Association (CSA). In addition to federal, provincial, territorial and, in some cases, municipal regulations, CSA standards set out specific design criteria, including the depth at which pipeline is laid in the ground, the thickness and coating of pipe walls and the integrity of the welding process connecting the pipe.

CSA standards cover the design, construction, operation and maintenance of oil and gas pipeline systems and underground storage of petroleum products and liquefied natural gas.

CSA pipeline standards are world renowned for their valuable guidance on issues of safety, performance, and pipeline integrity.

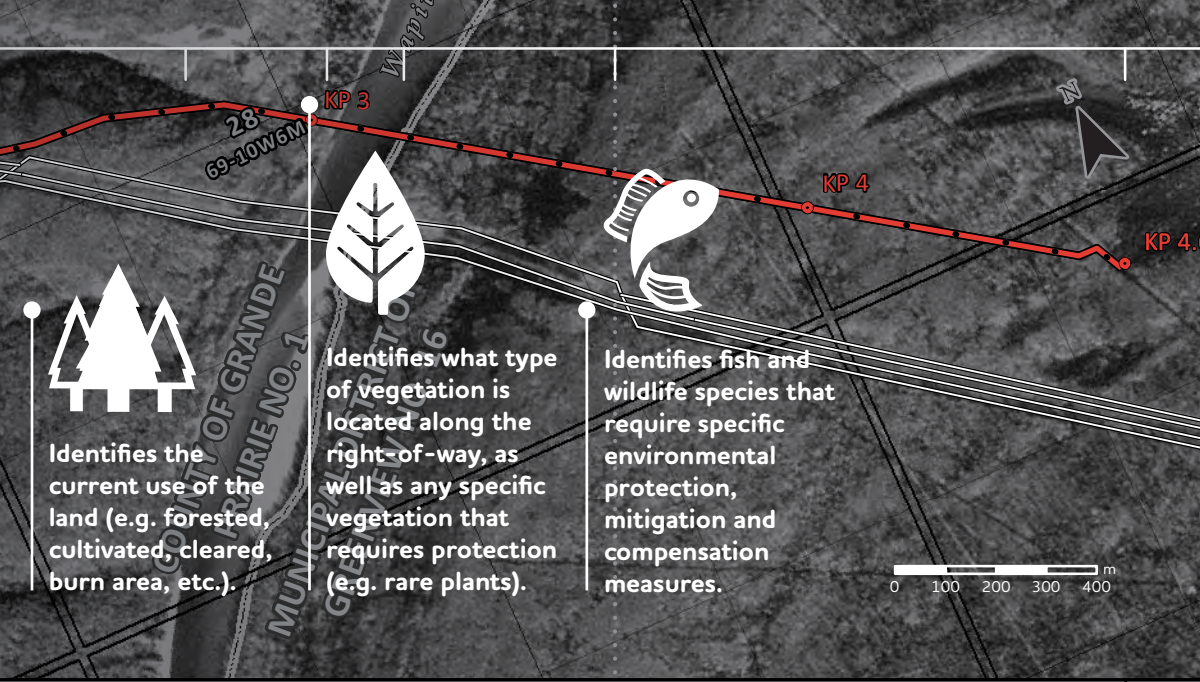
SAFETY AND THE ENVIRONMENT

Nothing is more important to CEPA members than the safe operations of their pipelines. *As an industry, pipeline operators understand that a good track record in safety and environmental performance is expected by Canadians. In 2011, CEPA members spent more than $600 million on monitoring and maintenance activities to ensure the safety of their pipelines.*

Environmental Assessment of Proposed Projects

When planning a pipeline, the industry makes every effort to manage the unique environmental and socio-cultural aspects of the proposed pipeline route. Pipeline proponents conduct a thorough assessment of the proposed right-of-way and its surrounding natural environment to identify the unique features that must be protected throughout the full lifecycle of the pipeline. This detailed review helps pipeline companies develop appropriate mitigation strategies to protect the local environment.

Identifies what types of soil are encountered along the pipeline route which helps determine specific construction techniques.



BEAVER LODGE PLAIN DISTRICT - WAPITI RIVER PLAINS SECTION - SOUTHERN ALBERTA PHYSIOGRAPHIC REGION

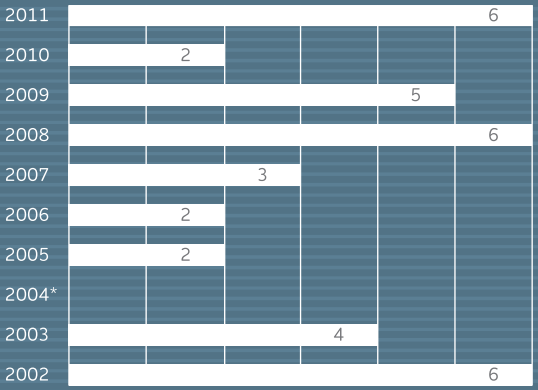
Monitoring and Maintenance

The excellent safety record of CEPA members is due in large part to the management systems and pipeline integrity programs now in place that have evolved and improved over the past 60 years. Pipeline operators monitor their lines 24-hours-a-day, seven-days-a-week from remote control centres across the country. These control centres use devices, such as Supervisory Control and Data Acquisition (SCADA) systems, to collect information from sensors installed along the pipeline route.

This information is then transmitted back to the control centre. In the control room, technicians trained in pipeline operations and emergency response evaluate the information and determine what action is required to keep the pipeline running smoothly and safely. Pipeline operators also conduct regular visual surveys of the pipeline and deploy in-line inspection tools. Visual surveys are completed using aerial and ground patrols. In-line inspection tools can inspect pipelines from the inside to identify changes such as dents or wall thinning that could threaten the integrity of a pipeline.

Pipeline Integrity Performance

Number of significant pipeline incidents by year



CEPA modelled its 'significant incident' criteria after the established United States Department of Transportation's definition. CEPA defines an incident as significant if one of the following occurs:

- A serious injury or fatality
- A liquid release greater than 8,000 litres (50 US barrels)
- An unintentional ignition or fire
- An incident that impedes the operation of a pipeline

*No significant incidents were reported in 2004

99.9%

of liquid products transported safely by pipelines between 2002 and 2011.

CEPA Member Pipeline Integrity Performance

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Pipeline Length (000s kms)	79.2	80.0	78.6	78.2	85.8	93.1	100.2	100.6	102.2	108.7
Number of Failure Incidents (per 1,000 km)	0.088	0.075	0.102	0.064	0.210	0.172	0.130	0.219	0.156	0.175
Number of Significant Failure Incidents (per 1,000 km)	0.076	0.050	0	0.026	0.023	0.032	0.030	0.050	0.019	0.055
Liquid Released (000s litres)	64	25	2	0	8	2,402	58	605	235.0	4,923
Gas Released (10^6 m^3)	8.31	5.77	6.20	0.90	0	0	4.07	7.76	0.02	2.82

Pipelines remain the safest form of transportation

According to the Transportation Safety Board of Canada, pipelines have far fewer recorded accidents than other modes of transportation.

Frequency of Accidents by Transportation Mode (2011)

Transportation Mode	Number of Accidents
Marine	322
Rail	1,023
Pipelines	5

Emergency Response

Despite the industry's best efforts, no pipeline is completely risk-free. Unfortunately, incidents do occur and, when they do, pipeline operators are equipped and trained to manage the emergency situation. With an emergency response plan (ERP) in place, the chance of a long-term impact on the community or the environment is greatly reduced.

An ERP outlines the necessary steps and decisions required to manage an emergency situation. It contains specific steps the pipeline operator must take in order to control the incident. These plans include manuals on how to proceed with the deployment of emergency personnel, evacuation plans, and guidance on how to best manage information, communication and resource coordination.

THE REGULATORY LANDSCAPE

Canada has a world-renowned regulatory system in place to oversee the construction and operation of pipelines. If a pipeline is contained within a province, the pipeline would fall under the jurisdiction of a provincial regulator. For example, in Alberta, these pipelines are regulated by the Energy Resources Conservation Board. In British Columbia, such pipelines are regulated by the British Columbia Oil and Gas Commission.

If a pipeline crosses provincial or international boundaries, the pipeline is regulated by the National Energy Board (NEB). The majority of pipelines operated by CEPA's member companies are regulated under the NEB. The NEB is an independent federal agency established in 1959 by the Parliament of Canada. The purpose of the NEB is to regulate international and interprovincial aspects of the oil, gas and electric utility industries. The NEB regulates pipelines, energy development and trade in the best interest of Canadians.

In Canada, the regulatory process is thorough and complex. Before a pipeline can be built, the pipeline operator must file an application with a regulator for approval. An application contains important information detailing consultation, environment, safety, commercial, and engineering elements related to the proposed project. Pipeline operators also consult with various provincial and federal agencies, depending on the pipeline route, to obtain specific permits relating to the pipeline application. In determining whether a pipeline project should proceed, the NEB reviews among other things, its economic, technical and financial feasibility, and the environmental and socio-economic impact of the project. To ensure that engineering, safety and environmental requirements are met, the NEB audits and inspects the construction and operation of the pipeline.

If a project is approved, the regulator may attach conditions to the approval to ensure that the pipeline is operated safely and the surrounding environment is protected. These conditions are monitored and enforced throughout the life of the project.

Monitoring Compliance

Regulators are extremely vigilant in monitoring a pipeline company's level of compliance with all established requirements, from the project application stage through to the construction, operation and potential abandonment of a pipeline. They verify that what was committed to during the application stage, and set out as the terms and conditions of approval, is being honoured throughout the life of the project.

Regulators have a number of tools at their disposal to monitor compliance, including:

- Project audits
- On-site inspections
- Compliance meetings
- Emergency response exercise evaluations
- Incident investigations

What happens when the rules are broken?

R.S.C., 1985, c. N-7

In cases of non-compliance, regulators can employ several different enforcement tactics to bring regulated companies into compliance and deter repeat offences. Tools include non-compliance notices, financial penalties, and potential prosecution by the Office of the Attorney General of Canada.

CANADA

Stakeholder Engagement

Ongoing dialogue with stakeholders is an integral part of the pipeline industry. One of the most important steps in the pipeline application process involves communicating effectively with various stakeholders. CEPA member companies engage in cooperative and collaborative dialogue during the application process and continue this approach throughout the project lifecycle.

Maintaining communication throughout the life of a project keeps stakeholders informed and the pipeline operators aware of community issues and concerns. Outreach tools to share information include town hall meetings, websites, and collateral materials.

Common stakeholders include:

- Regulators
- Landowners
- Environmental Nongovernmental Organizations (ENGO)
- Media
- Aboriginal, Local, Provincial, Territorial and Federal Government representatives

FUELLING STRONG ECONOMIC AND COMMUNITY GROWTH

The ability to transport large quantities of crude oil and natural gas over long distances has been a contributor to Canada's economic prosperity. In 2011, Canada's crude oil and natural gas exports were valued at approximately $82 billion, the majority of which were transported by pipeline.

CEPA member companies provide employment opportunities for Canadians. Transmission pipelines generate hundreds of millions of dollars in property tax revenue that is reinvested in the community and help fund important services. Local procurement, such as goods and services, and community investments by CEPA members provide an economic boost and improved quality of life to the local and regional municipalities in which they operate.

CEPA member companies directly employ 8,000 full-time equivalent positions in Canada.

Full-Time Equivalent Employees (2011)

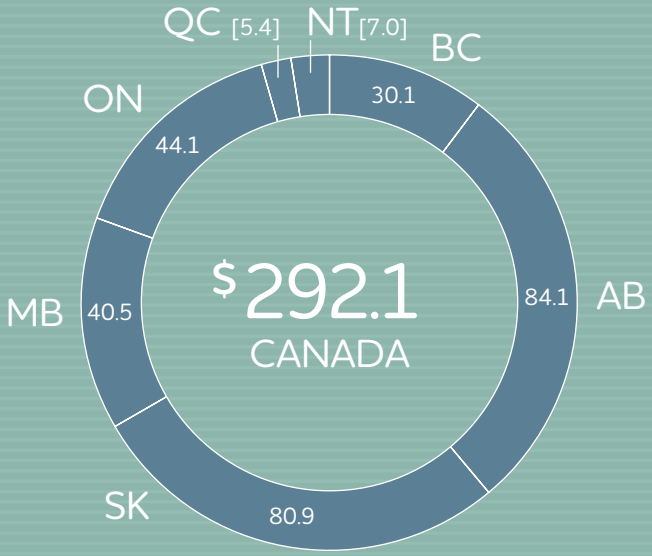
	BC	AB	SK	MB	ON	QC	NB	YT	NT	Canada
Head Office	115	4,950	146	0	36	3	0	0	0	5,250
Regional Office	330	1,543	368	104	335	51	2	2	17	2,752
Total	**445**	**6,492**	**514**	**104**	**371**	**54**	**2**	**2**	**17**	**8,002**

CEPA member companies collectively paid more than $500 million in property taxes in Canada in 2011.

Property and Corporate Taxes Paid in 2011, excluding Federal corporate taxes (in millions $)

	BC	AB	SK	MB	ON	QC	NT	Canada
Property Tax	156.4	194.5	58.1	33.9	85.9	5.6	1.8	536.7
Corporate Tax	38.4	108.2	32.2	16	27.8	3.4	26.6	252.7
Total Taxes	**194.8**	**302.7**	**90.3**	**49.9**	**113.8**	**9.0**	**28.4**	**789.4**

Local Procurement (in millions $) - 2011



In 2011, CEPA member companies invested more than $290 million in local and regional businesses procuring various services, supplies and equipment from the surrounding business communities.

CEPA members funded more than $17 million in community investment initiatives in 2011, supporting education, science, arts and more, including investments in Canada's aboriginal communities.

Total Community Investment in 2011 (in millions $)

	BC	AB	SK	MB	ON	QC	YT	Canada
Head Office	0.5	7.3	0.5	0	0	0	0	8.3
Regional Office	0.7	2.4	0.5	0.3	2.1	0.2	0.1	5.9
Aboriginal	0.3	1.7	0.4	0.2	0.2	0.3	0	2.9
Total	**1.5**	**11.4**	**1.4**	**0.5**	**2.3**	**0.2**	**0.1**	**17.1**

DID YOU KNOW?

CEPA member companies continue to make significant investments in pipeline infrastructure. In 2011, capital expenditures totalled $2.3 billion.

THE FUTURE OF CANADA'S PIPELINES

Canada's pipeline industry has contributed to our country's economic prosperity and overall quality of life. Over the next five years, CEPA members propose to invest more than $22 billion in pipeline projects. This would include expanding existing networks and new pipeline infrastructure to access Asian markets.

Looking ahead, CEPA will continue to play a key role in providing factual, science-based information to Canadians about the pipeline industry.

For more information, please visit us at www.aboutpipelines.com or join the conversation on Twitter (@aboutpipelines) or Facebook (http://facebook.com/aboutpipelines). CEPA would also like to hear your feedback on this fact book. Please send an email to aboutpipelines@cepa.com.

GLOSSARY OF TERMS

Barrel (Bbl) *– a unit of measurement of oil equal to approximately 159 litres*

BCF *– billion cubic feet*

BCF/d *– billion cubic feet per day*

BOE *– barrels of oil equivalent*

Cubic Foot *– unit of measurement of natural gas*

Liquids *– crude oil, natural gas liquids (NGLs) and refined petroleum products such as gasoline or diesel*

MB *– thousand barrels*

MB/d *– thousand barrels per day*

Right-of-Way *– a pipeline right-of-way (ROW) is the strip of land in which a pipeline is located*

TCF *– trillion cubic feet*

Contact Us

Canadian Energy
Pipeline Association
Suite 200, 505 - 3rd Street SW
Calgary, Alberta T2P 3E6

Tel: 403.221.8777
Fax: 403.221.8760

aboutpipelines@cepa.com
aboutpipelines.com

October 2012

Diluted Bitumen; What it is, pipeline transportation and impact on pipelines

Presentation to TRB Panel Investigating Diluted Bitumen's Impact on Oil Pipelines

July 23, 2012

Peter Lidiak, API Pipeline Director

Association of Oil Pipe Lines

API & AOPL

- API is a national trade association representing over 500 member companies involved in all aspects of the oil and natural gas industry, including pipeline transportation of crude oil.
- Association of Oil Pipe Lines (AOPL) is a national trade association representing operators of liquids pipelines.

What is Diluted Bitumen?

- Oil Sands – a mixture of sand, clay, water and heavy petroleum oils (NOT “tar”)
- Bitumen – a heavy oil that is extracted from the oil sands of Western Canada by surface mining and separation of the oil from the ore or in-situ extraction
- Diluted Bitumen (dilbit) – Bitumen that has been separated from sands and other major contaminants (clay, water, metals and salts) and diluted using light petroleum liquids, generally natural gas condensates or naphtha.

ONCE PROCESSED DILBIT IS SIMPLY OIL

Association of Oil Pipe Lines

History of Dilbit Transportation

- Crude derived from the oil sands has been transported by pipeline since 1968 or for 44 years
- Diluted bitumen has been transported for more than 25 years
- Tariff specifications overseen by FERC limit impurities in crude introduced into pipeline transportation, including total water and solids (≤0.5 vol. %)
- PHMSA incident data from 2002 to mid-2012 show there were no releases of oil caused by internal corrosion from pipelines carrying dilbit
- No known examples before 2002

AOPL
Association of Oil Pipe Lines

Despite claims to the contrary . . .

There is no credible evidence that dilbit is more corrosive or erosive to pipelines than other crudes in use in North America

Association of Oil Pipe Lines

How do we know dilbit is not more corrosive than other crudes?

- Crude is not considered to be corrosive under pipeline transportation conditions, however, under low flow conditions, water and sediment can settle out and promote corrosion.
- Already discussed results of PHMSA data – no internal corrosion-related releases involving dilbit
- The Battelle Memorial Institute searched existing literature on the corrosivity of dilbit relative to other crudes and created an index to compare crude properties
  - The index is based on differences in sediment, sulfur and salt content.

Association of Oil Pipe Lines

Battelle Results

Battelle compared seven Western Canadian dilbits to conventional heavy crudes from Canada, Mexico and Columbia

- Six dilbits had lower index scores than Western Canadian Blend, a conventional crude used as the control or norm for the index
- All seven had lower scores than Mexican Mayan and Columbian Rubiales crudes that have both been transported by pipeline in the US for more than 40 years

Association of Oil Pipe Lines

Batelle Results (continued)

- Literature on this topic concludes that “the characteristics of dilbit are not unique and are comparable to conventional crude oils.” -Alberta Innovates
- The relative measure of similarity developed in this project did not indicate that one oil is significantly more corrosive than any other oil, and that the dilbit oils likely have corrosivities close to the heavy sour conventional crudes.
- In addition to this relative outcome, the experience of operators transporting dilbit does not indicate it behaves differently from typical crudes.

Association of Oil Pipe Lines

Others Agree

"Corrosivity of diluted bitumen is largely similar to crude oil, which is considered to be low. In addition, the threat of corrosion from diluted bitumen can be managed by conventional engineering practice in the same way as crude oil." --Oliver Moghissi, Immediate Past President of NACE International

"Analysis of pipeline failure statistics in Alberta has not identified any significant differences in failure frequency between pipelines handling conventional crude versus pipelines carrying crude bitumen, crude oil or synthetic crude oil." --Alberta ERCB

Other operating parameters

- Operating Pressure
  - Maximum Operating Pressure is based on the strength of the pipe and is verified through pressure testing and continued assessment
  - Pipelines carrying diluted bitumen are designed to handle whatever pressures are needed to move it with a significant safety factor – usually no more than 72% SMYS
- Temperature
  - Operators of pipelines carrying Canadian crude to the US report temperatures ranging from 40 to 75 ˚F

Practical Considerations

Pipelines are high value capital assets that are intended for operation over many years – operators have no incentive to accept materials for transportation through them that will significantly damage them.

Pipeline operators make money by transporting commodities others own – they require that materials transported meet specs that will not compromise the integrity of their pipe or the quality of the products they deliver.

Association of Oil Pipe Lines

Conclusions about Dilbit

- Similar characteristics as other crude oils
- Not more corrosive than other crude oils
- Does not contain sufficient sediment to pose a threat of erosion
- Transported at temperatures that are below any threshold of concern
- Pipelines carrying it are designed to operate at the pressures needed to move it

Association of Oil Pipe Lines

AMERICAN PETROLEUM INSTITUTE

October 18, 2012

Fact Sheet: Oil from Canada

The United States imports 8.9 million barrels of crude oil a day to help meet its energy needs. Canada is the largest supplier to the U.S., providing more than 2.2 million barrels a day – about 1/4 – of our imports. Canada has the third largest oil reserves in the world, with 174 billion barrels of oil within its borders, almost all of which is located in geologic formations that are a mixture of sand, water, clay and heavy, thick oil called bitumen. These natural formations are called oil sands. Canada sends more than 99 percent of its oil exports to the United States, the bulk of which goes to Midwestern refineries for refining and processing. Oil from Canada is mainly transmitted to these refineries and other locations in the United States through oil pipelines.

What the crude oil from Canadian oil sands means to the U.S.

Job Creation and Economic Growth

Studies by the Canadian Energy Research Institute (CERI) found that U.S. jobs supported by Canadian oil sands development could grow from about 57,000 jobs today to 600,000 jobs by 2035 given sufficient pipeline capacity.

At least 2,400 American companies from 49 states are involved in the development of oil sands either in Canada or at American refinery or pipeline expansions. A variety of US companies manufacture equipment and products that are then used in Canada for oil production – everything from engines made in Indiana to tires made in South Carolina.

In addition, U.S. dollars sent to Canada to purchase energy resources can end up back in the U.S. through the purchase of finished products and other American goods. In fact, increased development of Canadian oil sands could add over $560 billion to U.S. GDP between now and 2035.

Energy Security

The U.S. and Canada already enjoy the largest trading partnership in the world. Sourcing more of our energy from a friendly, trusted and nearby neighbor may help reduce U.S. reliance on energy resources from elsewhere. Moreover, expanding our cross-boarder infrastructure would give Americans access to a stable source of supply during time of supply disprution. While the U.S. is expanding the use of its own domestic energy resources, imported oil will continue to play a key role in meeting energy demand and oil from Canada can help meet those supply and demand challenges.

Environmental Protection

The Canada government has stringent environmental controls in place to protect the surrounding environment as oil is extracted. An additional consideration is that if Canadian oil is not transported to and refined in the U.S., it could be exported to other countries, many of which do not have the environmental laws and regulations that are in place here in the U.S. China has been actively seeking energy resources from around the globe including Canada.

U.S. government policies should encourage the expanded use of Canadian oil

A recent poll conducted by Harris Interactive that API released found that 75 percent of American voters support building the Keystone XL pipeline, with only 19 opposed. Additionally, a Washington Post poll showed that 82 percent of voters believe that the Keystone pipeline would create a significant number of jobs. Federal or state regulations that delay or stop oil from Canada would run counter to this overwhelming support and would weaken America's energy security. Other countries are looking out for their energy futures. The U.S. needs to as well.

Pipeline Transportation of Diluted Bitumen from the Canadian Oil Sands

- Diluted bitumen is one of the types of crude oil derived from the Canadian oil sands in Alberta, Canada. It is a combination of bitumen, the heavy oil that is extracted from the oil sands, and a diluent, which is usually natural gas condensate, naphtha or mix of other light hydrocarbons. The diluted mixture improves the quality of bitumen and allows the crude oil (referred to as "dil-bit" in the industry) to meet pipeline product quality specifications posted with federal regulators so the crude oil flows through transmission pipelines.
- Diluted bitumen has characteristics that are similar to other heavy crudes that are currently being transported safely in pipelines. As shown in the chart below it is comparable to heavy crudes from Venezuela, Mexico and California:

Table 1 Trace Element Concentrations in Various Heavy Crude Oil Types

Location	Crude Name	API Gravity	Sulfur % wt	Vanadium (ppm)	Nickel (ppm)	Mercury (ppm)	Lead (ppm)
Canada	Bow River Heavy*	26.7	2.1	54	21	---	---
	Western Canadian Select†	20.6	3.4	134	56	---	---
	Cold Lake Blend**	22.6	3.6	169	65	---	---
	Wainwright-Kinsella **	23.1	1.6	80	40	---	---
California	California API 15	13.2	5.5	266	111	---	3
	California API 11	10.3	3.3	245	106	bdl	3
	Hondo	19.6	4.3	196	75	bdl	bdl
	Point Arguello Heavy	18.2	3.4	---	---	---	---
	Santa Clara	22.1	2.9	193	77	bdl	bdl
Iran	Soroosh	18.1	3.3	101	35	---	---
Mexico	Maya	21.3	3.0	257	44	bdl	bdl
Nigeria	Focardos Blend	29.7	0.3	---	---	---	---
Venezula	Tia Juana Heavy	12.1	2.7	---	---	---	---
	Lago Treco	22.6	2.6	---	---	---	---
	Boscan	10.1	5.5	1320	117	bdl	bdl
	Bacaquero	16.8	2.4	---	---	---	---
	BCF 24	23.5	2.0	---	---	---	---

bdl = below detection limits; --- = no data reported

* = Conventional crude

** = Dil-bit

† = Made up of conventional and Dil-Bit streams as it is a special blend of various crude types

References:
Crude Monitor. 2011. Crudemonitor.ca. Website accessed 24 Jan 2011. Website: http://www.crudemonitor.ca/home.php.
Environment Canada. 2011. Oil Properties Database. Website accessed 24 Jan 2011. Website: http://www.etc-cte.ec.gc.ca/databases/oilproperties/.

- Despite recent claims to the contrary, diluted bitumen is not a new commodity in U.S. and Canadian pipelines. It has been transported in existing pipelines for more than a decade.

- Transportation of diluted bitumen does not pose an increased risk to pipeline infrastructure or the environment. In fact, no instances of crude oil releases caused by internal corrosion from pipelines carrying Canadian crude are evident in the U.S. Department of Transportation's pipeline accident data from 2002 through early 2011[1]. The facts are clear that crude oil from the oil sands is no more corrosive to transmission pipelines than other crudes.
- Corrosion experts support these facts and do not believe that diluted bitumen poses a unique threat to pipelines. In a recent statement, Oliver Moghissi, President of NACE International, said:

  "Corrosivity of diluted bitumen is largely similar to crude oil, which is considered to be low. In addition, the threat of corrosion from diluted bitumen can be managed by conventional engineering practice in the same way as crude oil."

- Some misinformation has stemmed from confusion over piping segments used in the production of bitumen in the production field before the bitumen is upgraded or diluted. By the time diluted bitumen reaches the interprovincial, international and interstate pipeline network, the crude oil must meet quality specifications that are posted with the National Energy Board in Canada and the Federal Energy Regulatory Commission in the U.S. Pipeline operators in fact take samples of incoming batches at receipt and during transit to monitor product adherence to quality specifications required of its shippers. Pipeline operators are responsible to deliver agreed-upon batch quality to the destination refinery.
- Transmission pipelines that carry crude oil produced from the Canadian oil sands operate at temperatures ranging from 41-75 °F, contrary to the false claims by some opposed to oil sands development. Let's stick to the facts. It is true that some piping used in the production area for the oil sands operates at higher temperatures before the oil is diluted or upgraded, but that production or gathering piping is specifically designed for such use. Transmission pipelines transporting oil out of Alberta to the United States and beyond cross thousands of miles at a moderate and safe temperature that does not pose risk to the pipeline, coating or lands under which the pipeline crosses.
- In response to claims that Alberta's crude pipelines are experiencing more releases as a result of transporting diluted bitumen when compared to U.S. pipelines, the Energy Resources Conservation Board (ERCB), stated,

  "Analysis of pipeline failure statistics in Alberta has not identified any significant differences in failure frequency between pipelines handling conventional crude versus pipelines carrying crude bitumen, crude oil or synthetic crude oil."

[1] Data collected by the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration on form PHMSA F 7000-1, Accident Report Form – Hazardous Liquids Pipeline Systems.

The ERCB also noted that comparing releases in Alberta's data, where there is no reporting threshold, to PHMSA's U.S. data with a 5 barrel threshold is inappropriate.

- The only conclusion that can be reached based on fact is that diluted bitumen is essentially the same as any other type of crude and is not more of a risk to pipelines, people or the environment than other crudes already being transported via pipeline.
- The U.S. refining sector has invested in upgrades of refineries throughout the country to adapt to changes in world oil supply, including the increasing percentage of the world's oil that is heavy crude. Refineries in the midcontinent are positioned to use this increasing supply of reliable energy from our trading partner to the North. Refineries in the U.S. Gulf Region that have long received heavy crude from other countries are already well positioned to handle supplies from Canada. The supplies of lighter crude from North Dakota and surrounding states and provinces (collectively referred to as the Williston Basin) are a welcome supply of lighter crude, but will only partially satisfy the crude oil required in the U.S.
- Pipelines are one of the safest and most efficient ways to transport liquid energy commodities and we must not allow false claims about the characteristics of the crude being transported to delay or block permits for pipelines.

October 14, 2011

Facts About Pipeline Safety and Canadian Crude

Pipeline Safety Oversight in the United States

- Liquid petroleum pipelines carry crude oil and refined petroleum products (gasoline, diesel, jet fuel, heating oil, etc.) across state and even country borders (interstate & international) as well as within states (intrastate).
- Pipelines are widely acknowledged to be the safest and most efficient way to move energy products overland for long distances; crude oil and natural gas from production areas to processing plants and refineries, and consumer-ready products to markets.
- All pipeline safety is regulated by the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA).
- What pipeline operators may charge for transportation is regulated by the Federal Energy Regulatory Commission (FERC). FERC has siting authority for electric transmission lines and interstate natural gas pipelines but not for oil pipelines.
- States may choose to regulate the rates and safety of intrastate pipelines (most usually natural gas utility pipelines), but are preempted by federal laws from regulating interstate pipeline safety.
- Liquid petroleum pipelines have been subject to PHMSA safety regulations since 1970. PHMSA's regulations include comprehensive requirements addressing pipeline design, construction, operation, inspection, maintenance, repair and emergency response.

Pipeline Safety – A Decade of Improvement

- From 1999-2009, the number of spills from onshore liquid petroleum pipelines was reduced by about 60% while volumes spilled were reduced by more than 40%[1].
- Releases from crude oil pipelines have declined even more over that period, by nearly 70%.
- All major causes of liquid petroleum pipeline accidents were reduced over that period:
    - Corrosion – ↓73%
    - Third Party Excavation Damage – ↓66%
    - Equipment Failures – ↓50%
    - Pipe Material, Seams and Welds – ↓30%
    - Operator Error -- ↓40%
- Pipeline releases related to threats than can worsen over time declined by 36% from 2002 to 2009.[2] The decline was even greater for pre-1950s vintage pipe at 83%. This demonstrates that these age-related threats can and are being managed effectively by pipeline operators.
- Industry continues to learn and improve from shared incident information and best practices.

Transporting Canadian Crude in Pipelines

- Canadian crudes, including those extracted from the oil sands of Western Canada, have been shipped via pipeline for decades. Once oil sands crudes have been upgraded for transportation they are just "crude oil". Their characteristics are similar to crudes from California, Mexico and Venezuela.
- Canadian crudes pose no more of a threat to U.S. pipelines than any other crude. In examining accident reports from PHMSA since 2002[3], no pipelines carrying Canadian crude have experienced releases resulting from internal corrosion.
- Corrosion experts support these facts and do not believe that Canadian crudes pose a unique threat to pipelines.

January 4, 2012

[1] Pipeline safety statistics are based on reports from pipeline operators to the Pipeline Performance Tracking System, an industry pipeline release data base. PPTS participants operate 85% of DOT regulated liquid pipelines.
[2] From data collected by DOT/PHMSA on form PHMSA F 7000-1 (30-day accident report form).
[3] Ibid.

June 22, 2012

NRDC Recycles [Claims, Baseless Accusations and Pipeline Conspiracy Theories]!

With the Keystone XL provision stalled in the federal transportation bill conference, and an environmental assessment on the newly-proposed Keystone route through Nebraska pending, the Natural Resources Defense Council (NRDC) has set its sights on a brand new – and completely manufactured –controversy. They've found a willing audience among other fossil fuel opposition groups in New England, who joined together on Tuesday to release a ~~"n~~new" report entitled ~~"G~~oing in Reverse: The Tar Sands Threat to Central Canada and New England."

By repurposing some old claims on pipeline safety they made back in February 2011 and loosely tying them to a pipeline that happens to connect Portland and Montreal, NRDC pieced together a report based on a national agenda, absent of the facts facing New England communities. The 24-page report hangs on an assumption that Enbridge, the owner of the Line 9 pipeline connecting terminals in Sarnia and Montreal, will extend its reach into the Portland-Montreal pipeline to export oil from the U.S. East Coast.

The not-so-secret missing piece here is that there is no such pipeline project or plans to connect Line 9 to a reversed Portland-Montreal line. Enbridge has clearly and repeatedly explained that NRDC's claims are simply fabricated, and supporting documents have been filed with the National Energy Board of Canada (and can be found publically on their website).

OSFC took a closer look at individual claims made throughout this report and found that we'll need to highlight some new information and repeat some other facts in order to set the record straight. If you learn nothing else from this rebuttal, at least understand that there is a big difference between reiterating facts and reprinting uninformed claims. NRDC may want to internalize that lesson before targeting yet another pipeline community.

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p. 3: ~~"~~Reversing existing pipelines is not necessary and should not be put into operation."

FACT: Saying that all pipeline reversals are not necessary defies logic – line reversals help to optimize existing resources to respond to changing market demands. But in the case of the Portland-Montreal line (and to the detriment of NRDC's argument), Enbridge agreed – it has no plans with the owners and operators of the Portland-Montreal line to reverse the flow of oil. That's why Enbridge has publically expressed as recently as its May 2012 earnings call (see slide 18) how, despite considering and abandoning a proposal several years ago, there are no plans to reverse the line now. Regardless of these statements and documents filed with the National Energy Board of Canada, NRDC still decided to write a 24-page report theorizing a ~~"w~~what if" situation. If you can accept the fact that their entire report is premised on a theory we could stop right here. But there is too much to work with not to continue.

p. 3: ~~"T~~he Canadian and U.S. federal governments should complete more thorough reviews of plans to transport tar sands oil through central Canada and New England, evaluating the need for new safety regulations for tar sands pipelines."

FACT: Pipeline reviews in both Canada and the U.S. are thorough and complete. In fact, according to the Association of Oil Pipe Lines (AOPL), oil pipeline releases that occur over time were down 36 percent

between 2002 and 2009. In oil pipelines installed prior to the 1950s, which includes the 62-year-old Portland-Montreal line, releases are down by 83 percent. From the AOPL: —These statistics demonstrate that operators are managing the full array of threats and are dedicated to improving the performance of older assets."

p. 6: "[B]etween 2007 and 2010, pipelines in North Dakota, Minnesota, Wisconsin, and Michigan—all pipelines carrying tar sands oil—spilled almost three times more crude oil per mile of pipeline when compared to the U.S. national average."

FACT: Except for gathering and collection lines that take oil sands to be processed, there is no such thing as an "oil sands pipeline". Oil pipelines are designed to carry crude oil (and not tar or sand). And crude oil produced from Canada's oil sands region, once processed, has similar characteristics to other types of crude transported throughout the United States. Let's repeat that – oil sands crude, once processed, takes on similar characteristics as other types of crude. It travels down the same pipeline systems as oil from other parts of North America and the rest of the world.

We dug a little deeper on this assertion and checked the report's endnotes, which reveal that NRDC doesn't source where it gets its spill data. The statistics they use do not differentiate between conventional and oil sands crude oil … because pipelines aren't differentiated that way. Pipelines are designed and operated based on various grades (heavy to light) of petroleum travelling through them and according to specifications designated by the Federal Energy Regulatory Commission. Crude derived from the oil sands must first be upgraded or diluted to specifications before it enters a pipeline and in so doing, takes on a gravity similar to other heavy, conventional crude oils.

p. 6: "Tar sands diluted bitumen normally has organic acid concentrations up to 20 times higher than conventional crude oil, and contains up to 10 times more sulfur."

FACT: According to a 2011 study by Canadian energy research and technical services group Alberta Innovates, there are conventional crude oils on the market that display higher concentrations of both acid and sulfur than conventional Alberta heavy crudes, including crudes derived from the oil sands. NRDC suggests that these levels make a crude oil more corrosive and thus more dangerous to pipe. However, Alberta Innovates found that under pipeline transportation temperatures for oil sands crude, or any other crude for that matter, these compounds "are too stable to be corrosive and some may even decrease corrosion rates."

p. 6: "Tar sands diluted bitumen flowing through pipelines creates friction, which raises the material's temperature and amplifies its corrosive qualities. An accepted industry standard is that corrosion rates double with every 10-degree Celsius increase in temperature."

FACT: The most likely cause of internal pipe corrosion comes from the formation of sludge or leftover particle deposits. Bacteria found in these deposits are most active between 10 deg. C and 40 deg. C. According to the Alberta Innovates study, "higher temperatures up to 70 deg.C may reduce the corrosion rate underneath sludge deposits," and not amplify corrosive qualities. In examining accident reports from PHMSA from 2002 to early 2011, no pipelines carrying Canadian crude have experienced releases resulting from internal corrosion.

p. 6: "Tar sands diluted bitumen has suspended in its mixture abrasive materials like quartz and pyrite sand particles."

FACT: When Alberta Innovates conducted the research to inform its corrosivity study, it compared particle levels of heavy to light sour crudes, light sweet crude, and oil sands-derived diluted bitumen (dilbit) and diluted synthetic bitumen (dilsynbit). Researchers discovered that sediment levels of dilbit crudes were "comparable or lower than the conventional crudes." The dilsynbit registered higher levels of sediment than most other crude, however, they were still "well below the limit set by regulatory agencies and the industry."

p. 6: Tar sands diluted bitumen is 40 to 70 times more viscous than North American conventional crude oil. This high viscosity requires tar sands pipelines to operate at higher pressures than conventional pipelines.

FACT: Alberta Innovates found that dilbit crudes have similar degrees of viscosities to conventional heavy crudes. Diluent can be adjusted to control viscosity in order to keep operating temperatures within normal temperatures set by pipeline operators and approved by federal regulatory agencies in both Canada and the U.S.

p. 7: "[O]lder pipelines were not designed to carry a heavy crude like diluted bitumen."

FACT: Claims like this one do a disservice to thousands of engineers who study the integrity of pipelines as they age, just as any industrial engineer inspects bridges, tunnels and railways to ensure they are keeping up with inspections, maintenance and technology. *According to the* AOPL*, "*Pipelines are built to have long lives …Pipeline operators are required under federal statute to develop an Integrity Management Plan (IMP) for pipelines that could affect high consequence areas (HCAs) such as population centers, commercially navigable waters and environmentally sensitive areas." The Department of Transportation, which oversees pipeline safety, agrees: "Pipelines, in short, are practical and safe." But most of this is lost on NRDC – they don't approve of any pipelines. Not aging pipelines with demonstrated track records, or state-of-the-art pipelines like the Keystone XL, as they pointed out in their report from last month.

p. 9: "Enbridge is likely seeking to transport tar sands oil to the East Coast because tar sands crude is increasingly oversupplied locally and producers now receive $30 less per barrel than the average global price for crude oil. …The oil industry wants access to other markets like the Gulf coast and markets abroad, to increase their per-barrel tar sands profits."

FACT: If we haven't said it enough before, NRDC is opposed to a proposal that doesn't exist – there are no plans by either Enbridge or Portland Pipeline to reverse the Portland-Montreal line. The decision to transport resources to any location is based on demand, which, according to elementary economics, is one factor that affects the price of a barrel of oil. The oil industry is seeking to satisfy demand – something the U.S. has plenty of. According to projections from the Energy Information Administration, petroleum products will make up more than 30 percent of our energy consumption into 2035.

p. 12: "The landscape left behind after tar sands oil extraction is one of extreme industrial devastation."

FACT: Alberta law requires full reclamation of every mining site – a law put into place to ensure that "extreme industrial devastation" would not even be possible. All companies developing the oil sands must establish a reclamation plan that spans the life of the project. Thus far, over 67 square kilometers have been reclaimed.

p. 12: "From its extraction in Alberta to its final use in a car, tar sands oil is, on average, 14 to 20 percent more carbon intensive than other imported crudes to the United States."

FACT: First of all, NRDC lists as its reference for this stat a MarketWatch article that doesn't even mention the 14 to 20 percent figure. Putting general research standards aside, we stand by the results of an IHS CERA report that concludes, "The average oil sands import to the United States has well-to-wheels life-cycle GHG emissions about 6 percent higher than the average crude refined in the United States." And according to the Government of Alberta, GHG emissions per barrel of oil produced was reduced by an average of 29 percent between 1990 and 2009.

*Read more about the well-to-wheels debate in one of our previous issue alerts.

p. 13: "It is estimated that switching from refining lighter crude oils to heavier tar sands crude oils could double or even triple refinery emissions of greenhouse gasses."

FACT: Refining of crude oil from the oil sands results in similar emissions to other conventional heavy oils refined in the U.S. According to an IHS CERA report on well-to-wheels greenhouse gas (GHG) emissions among different crude oils, GHG emissions for Californian, Middle Eastern and Venezuelan heavy crude oils, all considered to be conventional by U.S. standards, are comparable to that of the oil sands. And refining isn't the largest source of emissions in the life cycle of a fuel anyway. As reported by IHS CERA, 70 to 80 percent of GHG emissions for all sources of crude, including oil sands, occur during combustion.

p. 15: "According to a 2010 report by the Michigan Department of Community Health, in the weeks after the spill, health officials identified 145 patients who reported illness or symptoms associated with the leak."

FACT: The Michigan Department's 2010 report was a survey of verbally reported illnesses in the area surrounding the Marshall, Mich. spill site. The Department took this study one step further in 2011 and concluded that "[c]ontact with chemicals in the submerged oil will not cause long-term health effects or cause a larger-than-normal risk of cancer." And then in a report dated May 23, 2012, which had been reviewed by the U.S. EPA and had been subject to a public comment period, the Department concluded yet again that contact with the oil "will not result in long-lasting health effects" or a "higher than normal risk of cancer."