

# Pipeline and Tanker Trouble

The Impact to British Columbia's Communities, Rivers, and Pacific Coastline from Tar Sands Oil Transport

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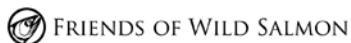
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### About the Natural Resources Defense Council

The Natural Resources Defense Council is an international nonprofit environmental organization with more than 1.3 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, Montana, and Beijing. For more information please visit [www.nrdc.org](http://www.nrdc.org).

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### About Living Oceans Society

Based in British Columbia, the Living Oceans Society is the largest organization in Canada focusing exclusively on marine conservation. It advocates for oceans that are managed for the common good, according to science-based policies that consider ecosystems in their entirety. For more information, please visit [www.livingoceans.org](http://www.livingoceans.org).

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# I. INTRODUCTION



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The pristine waters of the British Columbia coast.

The Canadian government is considering a proposal to build a pipeline under mountains and across rivers that could carry more than half a million barrels of raw tar sands crude oil (known as bitumen) daily across important salmon rivers, coastal rainforests, and sensitive marine waters. The Northern Gateway pipeline, proposed by energy company Enbridge, would stretch over 1,000 kilometres to connect the tar sands of Alberta with the Pacific coast of British Columbia. From that point, the extracted bitumen would be transported by tanker to refineries in Asia, California, or elsewhere.

Both the extraction and transportation of tar sands oil are a destructive business. The substance is extracted by either strip-mining or by a process that would heat the ground beneath Alberta's Boreal forests and wetlands. Tar sands oil is then refined in Alberta or piped over thousands of kilometres to refineries elsewhere.

The social, economic, and environmental costs of a tar sands pipeline and associated oil supertanker traffic would be enormous, including:

- Compromising the lifestyles of First Nations who depend on the region's lands and waters for their livelihoods, culture, and health.
- Threatening the economic well-being of the communities of British Columbia that depend on fisheries and forests.
- Potential devastation from a major oil spill from the pipeline or an oil supertanker, which could destroy economically important salmon habitat, as well as the habitat of Spirit Bears and grizzlies, and whales, orcas, and other marine life that depend on these rich coastal waters.
- Harm from an oil spill to the Great Bear Rainforest that the province and First Nations have worked hard to protect from unsustainable forestry practices and to shift to a conservation-based economy.

While the potentially devastating impacts of tar sands production are well documented, the increased risk and potential harm from transporting bitumen is less known.<sup>1,2</sup> This report outlines the potential dangers of bitumen transportation and the risks of spills to the environment and the economy in a region that depends on healthy fisheries, lands, and waters.

## II. TAR SANDS PIPELINES: GATEWAYS TO OIL SPILLS

The Enbridge Northern Gateway project would carry 525,000 barrels per day (bpd) of raw tar sands crude from Alberta to the B.C. coast in one pipeline and would carry, in a second pipeline, liquid condensate from ships for use in Alberta's tar sands.<sup>3</sup> The Northern Gateway project would span more than one thousand kilometres, from near Edmonton, Alberta, and cross a rugged and wild landscape to Kitimat, on British Columbia's northern coast. Enbridge has indicated that tar sands oil, which is raw bitumen blended with light volatile petroleum products to thin it enough to flow through a pipe, is the primary product for the pipeline moving west.<sup>4</sup>

The Enbridge Northern Gateway pipeline would travel across the mountainous border between Alberta and British Columbia, through agricultural regions, and then into the rugged west-central region of remote mountains, valleys, and wild rivers. The proposed Northern Gateway Pipeline would be largely buried one metre below ground along the 1,172 kilometre route, except for certain water crossings where it would run above ground. Enbridge has also proposed two 6.5 kilometre tunnels for the pipeline between the Clore River and Hoult Creek Valleys in northwestern British Columbia

where it passes through particularly mountainous terrain. The pipelines will cross more than 785 rivers and streams, including many which are critical fish-bearing habitat, and will cross through the headwaters of three of the continent's most important watersheds—the Mackenzie, the Fraser, and the Skeena. The pipeline would follow the Morice River up into the Coast Mountains, cross the headwaters of the Zymoetz River, and then follow the Kitimat River down to the coastal town of Kitimat. The geology of this area is complex, and destructive landslides are common. At Kitimat, a tank farm at the edge of the water would facilitate the transfer of oil to holding tanks and then into large oil supertankers. These supertankers would then traverse 185 kilometres of inner coastal waters, including the Douglas Channel, before reaching open ocean in the unpredictably dangerous Hecate Strait, Queen Charlotte Sound, and Dixon Entrance.<sup>5</sup> There is a reason that large oil supertankers have not used these waters in the past: the route poses many navigational challenges for large vessels, even under ideal conditions.

To transport oil from Kitimat to other North American or Asian markets, the oil will need to travel further by tanker. To date, large oil tankers have not used the inside coastal waters



© Neil Ever Osborne

Female moose and calf near Sutherland River Provincial Protected Area.

of central and northern British Columbia. Small tankers carrying up to 350,000 barrels of condensate (50,000 tonnes) do periodically travel these waters, as well as barges bringing diesel to float planes and supplies to local communities.<sup>6,7</sup>

However, to export tar sands oil, supertankers called “Very Large Crude Carriers” (VLCCs), with a capacity of 2.2 million barrels of oil (320,000 tonnes), would be required on a much more frequent basis.<sup>8</sup> There is already strong opposition to large oil tanker traffic in coastal waters among local citizens, First Nation communities, and organizations concerned about the potential impacts of an oil spill in the ecologically-sensitive marine habitats of the coast.<sup>9</sup> According to an April 2011 poll, four out of five British Columbians support a ban on crude oil tanker traffic in inner coastal waters.<sup>10</sup> And in 2010, the Coastal First Nations placed a ban on oil tanker traffic in these waters, in accordance with their traditional rights and laws.<sup>11</sup>

### Is the proposed Northern Gateway Pipeline even needed?

The case that this pipeline is needed is difficult to make based on the limited evidence presented by Enbridge.<sup>12</sup> Instead of relying on the market to demonstrate demand for the project, Enbridge is pushing ahead for regulatory approval:

- In an unprecedented move, Enbridge is seeking regulatory approval for a pipeline without any proven commercial support from shippers and investors.<sup>13</sup>
- Enbridge has failed to conduct a refinery-level demand analysis for the Northern Gateway pipeline, considered common practice in the industry.
- There is currently a glut of export pipeline capacity leaving western Canada. Current oil production in western Canada leaves 41 percent of existing export pipelines empty. Based on industry production estimates, no additional export pipelines are needed out of the tar sands for at least another 10 years.

In addition, Enbridge has not provided an adequate assessment of alternatives (as required under law), quantified the upstream environmental impacts from additional tar sands, or presented the full cost of the pipeline. As a result, it will be very difficult for Enbridge to make the case to government regulators that this pipeline is needed and in the interest of Canadians.

The Enbridge Northern Gateway pipeline project would expand what is currently a relatively small amount of tar sands and other crude oil crossing British Columbia. The Kinder Morgan Trans Mountain pipeline system carries about 300,000 bpd of oil from Edmonton to central and southern British Columbia, and to Washington State. Approximately 20 percent of the oil is shipped to other destinations in North America and, occasionally, to Asia.<sup>14</sup> Kinder Morgan also has proposed an expansion, increasing its piping capacity to Vancouver to 700,000 bpd of tar sands oil. The proposal is being billed simply as “expanded deliveries of crude oil and refined products to British Columbia, Washington State and offshore markets including California and Asia.” The plan also includes a northern expansion to Kitimat, British Columbia, for shipments to Asia, with a capacity of 400,000 bpd.<sup>15</sup> Although this proposed expansion has been under consideration since 2004, the more formal development process began over 2008 and 2009.<sup>16</sup> Kinder Morgan has not publicly stated how much of this new capacity would be allocated to tar sands oil; however, it is clear that the company would include tar sands oil as a major part of this proposed pipeline supply.<sup>17</sup> Although this project is still in development, if built, it would also put the region’s rivers and coastal waters at risk.



Aerial image of Upper Nascall River, central coast of British Columbia, Great Bear Rainforest, Canada.

© Ian McAllister/iLCP

### III. THE TROUBLE WITH TAR SANDS EXTRACTION

Enbridge has proposed the Northern Gateway pipeline project to transport diluted bitumen from the Alberta tar sands and liquid condensate back to the tar sands. Although there are also concerns with the transport of liquid condensate, this report focuses on diluted bitumen. Bitumen is a thick, tarry substance that can be upgraded into a synthetic crude oil or transported as diluted bitumen to refineries (modified to process heavy, highly corrosive crude) and then refined into fuels such as gasoline and diesel. Extraction of bitumen causes health and environmental problems on a global scale.

To extract the bitumen from the tar sands, the oil industry strip mines and fragments hundreds of thousands of hectares of Boreal forests and wetlands. Tar sands excavated through strip mining are processed with hot water to separate bitumen from the sand and clay. To drill for tar sands, most companies use an in-situ (in place) method called steam-assisted gravity drainage: steam is injected into the ground to free the bitumen from the sand, liquefying it so it can be pumped out. Because both of these processes require large amounts of energy, the upstream production of synthetic crude oil from tar sands releases approximately three times the greenhouse gas emissions per barrel than does the production of conventional crude oil the United States and Canada.<sup>18</sup> On a lifecycle (“wells-to-wheels”) basis, tar sands are, on average, 23 percent more greenhouse gas intensive

compared to conventional oil.<sup>19</sup>

In addition to its high carbon footprint, other issues surrounding tar sands oil production include that it:<sup>20</sup>

- Requires an average of 2.2 barrels of fresh water for each barrel of bitumen extracted for mining and 1.1 barrels for in situ drilling.
- Has already created over 170 square kilometres of toxic lakes of waste material.<sup>21</sup>
- Poses risks to the health of downstream indigenous communities.
- Could result in the loss of millions of migratory birds that nest in the forests and wetlands of the region.

In the past, most raw tar sands was processed (upgraded) to synthetic crude oil – similar to conventional crude – before being transported through the interprovincial pipeline network. In recent years, however, tar sands production is outpacing the capacity of upgraders in Alberta to convert bitumen to synthetic crude oil. Tar sands producers now send an increasing amount of the bitumen produced from the tar sands (as diluted or blended bitumen) through pipelines, rather than upgrading it to synthetic crude oil in Alberta, which exports jobs to foreign refiners. This new practice of shipping diluted or blended bitumen is expected to increase as production levels rise.



Suncor Millennium tar sands mine at the edge of the Boreal Forest.

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## IV. PIPELINE SAFETY CONCERNS

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### BITUMEN CAN WEAKEN PIPELINES

Diluted bitumen is not the same as conventional oil; it is more likely to cause corrosion in the pipelines through which it flows, as well as in the tankers that carry it through marine ecosystems. Compared with conventional crude, bitumen blends are more acidic, thicker, and more sulphuric. Diluted bitumen contains organic acid concentrations 15 to 20 times higher than conventional crudes, and contains 5 to 10 times more sulphur than conventional crudes.<sup>22</sup>

Because raw tar sands bitumen is a thick form of crude oil that is nearly solid at room temperature, producers “dilute” bitumen with light natural gas liquids or other light, or with volatile petroleum products that contain highly volatile petrochemicals (including benzene, toluene, and xylene).<sup>23,24</sup> This mixture, called diluted bitumen, is still very thick, but can be moved through pipelines at very high pressures.

In fact, the high viscosity (thickness) of diluted bitumen requires pipelines to operate at significantly higher pressures than conventional crude pipelines, depending on the diluted bitumen’s temperature.<sup>25</sup>

As thick diluted bitumen moves through pipelines, it creates significant friction, which heats the mixture to very high temperatures and promotes corrosion.<sup>26</sup> The high temperatures thin the diluted bitumen and increase its speed through the pipeline. As a result, the speed at which acids and other chemicals corrode the pipeline increases as the temperature increases. An accepted industry rule of thumb is that the rate of corrosion doubles with every 10 degrees Celsius increase in temperature.<sup>27</sup> The risks of corrosion are also augmented by the abrasive nature of diluted bitumen, which contains significantly higher quantities of sediments such as quartz and pyrite sand particles.<sup>28</sup> These sediments increase the amount of erosion within the pipeline, making diluted bitumen a sort of liquid sandpaper, as though the Northern Gateway project is sandblasting the inside of its pipe with more than eight million kilograms of hard sediment every year at high pressures.<sup>29</sup> These sediments can also settle in the pipeline, causing the type of localized internal corrosion that led to the 800,000 litre leak of British Petroleum’s pipeline on Alaska’s North Slope.<sup>30</sup> Meanwhile, high pressures increase the likelihood that a diluted bitumen pipeline weakened by corrosion will rupture.

The combination of chemical corrosion and physical

abrasion can dramatically increase the rate of pipeline deterioration. But despite these significant differences, Canada’s federal pipeline regulator, the National Energy Board (which is tasked with approving or rejecting pipeline projects), does not distinguish between conventional crude and diluted bitumen when setting minimum standards for oil pipelines. The safety and spill response standards used by Canada to regulate pipeline transport of bitumen are designed for conventional crude oil. Neither industry nor government regulators have investigated whether diluted bitumen can safely flow through pipelines. In summary, transporting diluted bitumen poses unique challenges and risks:

- Total acid concentrations for diluted bitumen are 15 to 20 times higher than the North American benchmark conventional crude.<sup>31</sup>
- The viscosity (thickness) of bitumen is 40 to 70 times higher than the North American benchmark conventional oil.<sup>32</sup>
- The sulphur content of diluted bitumen is 5 to 10 times higher than the North American benchmark conventional oil.<sup>33</sup>
- The high viscosity (thickness) of diluted bitumen generally requires pipelines to operate at significantly higher temperature and pressures than pipelines carrying conventional oil.<sup>34</sup>
- Although conventional oil pipelines contain virtually no abrasive materials, pipelines carrying tar sands contain significant quantities of quartz and silicates. Enbridge’s Northern Gateway pipeline is likely to transport nearly 24,000 kilograms of sediments composed of hard quartz, pyrite and aluminosilicates per day.<sup>35</sup>

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***“Diluted bitumen is not the same as conventional oil; it is more likely to cause corrosion in the pipelines through which it flows, as well as in the tankers that carry it through marine ecosystems.”***

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Table 1: Characteristics of Diluted Bitumen and Conventional Oil			
Characteristics	Conventional Crude <sup>36</sup>	Diluted Bitumen	Point of Reference
Viscosity	7 cST <sup>37</sup>	350 cST	Gasoline at the pump has a viscosity of 0.4–0.8 cST. <sup>38</sup>
Sulfur Content (%)	0.34% - 0.57% <sup>39</sup>	3.3%	Gasoline has a sulphur content of less than 0.0000008%.
Pipeline Temperature (in degrees Celsius)	Less than 37° C <sup>40</sup>	60° C	Conventional crude pipelines tend to run at ambient temperatures.
Pipeline Pressure	600 psi <sup>41</sup>	2,130 psi <sup>42</sup>	Industry defines a high pressure pipeline as one that operates at over 600 psi .
Abrasives (quartz and silicates)	Nil	Keystone XL pipeline maximum capacity would mean over 16.7 kilograms of quartz sand and aluminosilicates per minute.	Common sandblasters use between 0.7 and 21 kilograms of sand per minute.

cSt=centistokes, psi=pounds per square inch

## BITUMEN SPILLS ARE HAZARDOUS

A diluted bitumen spill poses certain hazards to the environment and public safety that are much more far-reaching than the dangers of a conventional oil spill. Any crude oil spill is potentially hazardous, but the presence of the natural gas liquid condensate used to dilute the bitumen increases the risk of any leaked material exploding. Diluted bitumen can also form an ignitable and explosive mixture at most temperatures, which can be ignited by heat, sparks, or flames from static electricity or lightning.<sup>43</sup>

A diluted bitumen spill could also threaten human health as it contains toxins such as benzene, polycyclic aromatic hydrocarbons, and n-hexane, which can affect the human central nervous system.<sup>44</sup> After an Enbridge pipeline spilled four million litres of diluted bitumen into the Kalamazoo River in Michigan, a government study found that nearly 60 percent of individuals living nearby experienced respiratory, gastrointestinal, and neurological symptoms consistent with acute exposure to benzene and other petroleum related chemicals.<sup>45</sup> In addition to short-term effects, exposure to benzene and polycyclic aromatic hydrocarbons has been known to cause long-term effects, such as cancer. Finally, diluted bitumen releases toxins that can accumulate in the environment and food chain (such as nickel, arsenic, and other heavy metals that do not biodegrade).<sup>46</sup> These chemicals can become persistent health hazards to wildlife and people.

## BITUMEN SPILLS ARE DIFFICULT TO CLEAN UP

In the event of a diluted bitumen spill, there are also significant challenges for cleanup efforts, particularly in rivers and wetland environments. In the case of conventional oil spills, mechanical devices such as booms, skimmers, and materials to absorb oil are directed at containing and recovering oil floating on the surface of water. Unlike conventional crude oils, however, the majority of diluted bitumen is composed of raw bitumen, which is heavier than water. After a release, some of the diluted bitumen will sink into the water column and wetland sediments as the light diluents evaporate.<sup>47</sup> If this happens, the cleanup of a diluted bitumen spill may require significantly more dredging than a conventional oil spill. Diluted bitumen exposed to sunlight tends to form a dense, sticky substance that is difficult to remove from rock and sediments. Removing this tarry mess from river sediment and shores requires more aggressive cleanup operations than are needed for conventional oil spills. All of the aforementioned factors increase both the economic and environmental costs of diluted bitumen spills. A case in point is the cleanup of the Kalamazoo River tar sands spill in 2010; originally expected to be completed within two months, it is now expected to continue through 2012, costing at least USD\$700 million.<sup>48</sup> The full social, economic, and environmental costs of this disaster remain to be determined.

## Lessons from Enbridge's Kalamazoo River tar sands spill

© Susan Connolly



The Kalamazoo River remains closed more than one year after the spill due to continued clean up efforts.

On July 25, 2010, an Enbridge pipeline carrying tar sands diluted bitumen ruptured, spilling more than three million litres of tar sands into the Kalamazoo River watershed in Michigan. Enbridge's pipeline operators did not shut down the pipeline for 12 hours after the rupture occurred. Responders reported being surprised by both the rapid spread of benzene and the large quantities of submerged oil, which together created significant new challenges.<sup>49</sup> Conventional spill response measures proved inadequate to deal with the large amount of tar sands crude that had sunk into the water column. More than a year after the spill occurred, approximately 60 kilometres of water and sediment, and 80 hectares of wetlands, were still contaminated with tar sand crude. The U.S. Environmental Protection Agency (EPA) has reported that it expects to find tar sands oil in the Kalamazoo River for years to come.<sup>50</sup>

The containment and cleanup of a diluted bitumen spill requires significant personnel, equipment, supplies, and other resources. For example, the three million litre Enbridge spill in Michigan required more than 2,000 personnel, over 45 kilometres of boom, 175 heavy spill response trucks, 43 boats, and 48 oil skimmers,<sup>51</sup> which were pre-positioned in nearby urban centers. The Michigan spill into the Kalamazoo River occurred in a populated area, in which residents could notify authorities of the spill and significant private spill response equipment was nearby. The Northern Gateway pipeline would cross significantly more remote areas; discovery and cleanup of a spill in these areas would be hampered by factors such as the remoteness, heavy winter snowpack, flooding, and potential avalanches and rockslides.



*“The Enbridge tar sands oil spill of July 2010 has hurt my hometown, my family, and our river ecosystems. Fifteen months have passed and questions, concerns, and tar*

*sand oil remain. I will continue to fight for my community and our river—I am not going away.”*

—Susan Connolly, resident of Marshall, Michigan

**Table 2: Significant Enbridge pipeline spills, 2009 through 2010<sup>52</sup>**

Pipeline	Date	Location	Cause	Affected Area	Amount
Enbridge Lakehead Pipeline System, Line 6A	September 2010	Romeoville, Illinois	Third party activity	Local vegetation	6,100 barrels of crude oil
Enbridge Lakehead Pipeline System, Line 6B	July 2010	Marshall, Michigan	Stress corrosion cracking	Kalamazoo River and Morrow Lake	19,500 barrels of tar sands oil
Enbridge Line 2B	January 2010	Neche, North Dakota (near Manitoba)	Cracking in long seam	Agricultural lands	3,000 barrels of synthetic crude oil
Enbridge Athabasca Cheecham Pipeline	January 2009	Cheecham, Alberta	Small diameter piping failure	Vertical spray contaminated nearby areas	5,749 barrels of oil

## THE INCIDENCE OF BITUMEN SPILLS IS INCREASING

While the use of pipelines to move large quantities of diluted bitumen is relatively recent, there are already many indications that diluted bitumen spills are more prevalent than conventional oil spills.

On April 11, 2011, Kinder Morgan's 300,000 bpd Trans Mountain pipeline, used to carry diluted bitumen from Edmonton, Alberta, to Burnaby, B.C., spilled near Chip Lake in Alberta.<sup>53</sup> Two and a half weeks later, the Rainbow pipeline, which carries a variety of crude blends including Peace River diluted bitumen, leaked 4.5 million litres in northern Alberta in the province's largest spill since 1980.<sup>54</sup>

In recent years, the vast majority of diluted bitumen not refined in Alberta is piped south to refineries in the United States. There are indications that the U.S. pipeline system may be experiencing a higher incidence of spills from growing diluted bitumen volumes from Canada. Midwestern state pipelines with the longest history of transporting heavy Canadian tar sands crude are in North Dakota, Minnesota, Wisconsin, and Michigan. Between 2007 and 2010, crude oil pipelines in these states spilled almost three times as much crude per mile than the U.S. national average.<sup>55</sup>

The 3,000 kilometre long Enbridge Lakehead System, which transports the majority of Canadian crude exported to the United States, was responsible for over half of all crude oil spilled in the United States in 2010, but accounted for less than five percent of the country's crude transmission mileage.<sup>56</sup> One such spill on July 25, 2010, from an Enbridge line in Michigan, resulted in a spill of four million litres of diluted bitumen, contaminating the Kalamazoo River.<sup>57</sup> Prior to the spill, inline inspections had revealed 329 corrosion anomalies on that line alone.<sup>58</sup>

Meanwhile, TransCanada's Keystone pipeline, one of the first pipelines in the United States dedicated to moving diluted bitumen from Canada to the United States, had 35 leaks in its first year of operation. Of these spills, 21 were in Canada<sup>59</sup> and 14 were in the United States.<sup>60</sup> The largest of these, in May of 2011, was nearly 80,000 litres, a large spill by most reporting categories.<sup>61</sup>

The U.S. Department of Transportation responded to these incidents by issuing TransCanada a Corrective Action Order, which temporarily shut down the first Keystone pipeline and placed it under investigation.<sup>62</sup> This made the first Keystone project the newest pipeline to be officially deemed an immediate threat to life, property, and the environment.<sup>63</sup> The Keystone pipeline is the newest hazardous liquid pipeline in the United States to receive such an enforcement action. While the pipeline is too new for corrosion related failures, the high number of accidents on a new, state-of-the-art pipeline raises the alarm that industry isn't building safe pipelines.

## What causes pipeline accidents?

Pipeline operators have no reason to want accidents on their pipelines; however, when forced to choose between expensive safety measures and saving money, company decision makers often face strong pressures to make the wrong choice. A federal investigation of the U.S. San Bruno natural gas pipeline explosion, which killed eight people, found that the disaster was the result of a pipeline company exploiting weaknesses in a lax system of oversight. The investigation found that poor quality control, poor integrity management, and overly optimistic risk assessments led to this tragic and preventable disaster.<sup>64</sup> As the federal investigator said, "For government to do its job – safeguard the public – it cannot trust alone, it must verify through effective oversight... when the approach to safety is lax, the consequences can be deadly."<sup>65</sup>

## LEAK DETECTION TECHNOLOGY WILL NOT PREVENT SPILLS

The standard leak detection systems have significant limitations, even though they are designed to help pipeline operators identify spills once they occur. The capability of leak detection systems to detect releases is often misunderstood by regulators, pipeline operators, and the public. The science of computer monitoring and identifying the wide range of possible releases from pipelines is complex and extremely challenging, and the ease of accurately identifying releases is often overstated, both for smaller leaks and larger ruptures.

An Enbridge Norman Wells pipeline spill in the Northwest Territories discovered in May 2010 demonstrates the weaknesses of conventional leak detection technology. Over a quarter-million litres of oil spilled from a pinhole-sized leak;<sup>66</sup> the spill was eventually discovered by nearby residents. While it is unclear how long the pipeline had been leaking, it is clear that all of Enbridge's leak detection systems had failed, which often happens with small drops in pressure. These types of pinhole leaks can add up over time, making "eyes on the ground" one of the few reliable systems and one that is difficult to rely on in wilderness areas and in poor weather conditions. Spills on Northern Gateway, which would carry more than 13 times as much crude as the Norman Wells pipeline, would be even more difficult to detect. The Enbridge pipeline in the state of Michigan spilled four million litres between July 25 and July 26 into the Kalamazoo River. Pipeline operators could not stop this leak for 12 hours—a particularly concerning failure given the significant size of the leak.<sup>67</sup>

Detecting leaks in diluted bitumen pipelines presents even greater challenges than in conventional oil pipelines. The operating parameters in bitumen pipelines vary much more than that of conventional crude oil systems, generating more “noise.” As diluted bitumen flows through a pipeline, pressure changes within can result in the formation of gas bubbles that can impede the flow of oil and send faulty signals to the detection system. Because of this phenomenon—known as column separation—real leaks may go unnoticed if operators assume that leaks are just gas bubbles.<sup>68</sup> In fact, because the typical response to column separation is to pump more oil through the pipeline, misdiagnoses can result in an even bigger leak. For example, the initial investigation of the Enbridge diluted bitumen pipeline in Michigan found that pipeline operators who received monitoring data interpreted it to be a column separation rather than a leak. The problem was compounded by the fact that the pipeline’s leak detection system was only able to identify leaks that were greater than 4.5 million litres per day, or 15 percent of the pipeline’s overall capacity of 190,000 bpd.<sup>69</sup>

proposition that diluted bitumen is not more corrosive than conventional crude. Unfortunately, spill data do not presently allow a comparison of spill rates between Canadian pipelines carrying conventional crude and those carrying diluted bitumen.

Weaknesses in current leak detection requirements are particularly troubling. Canadian pipeline leak detection regulations permit potentially significant leaks to remain undetected on high capacity pipelines. Safety standards require hydrocarbon pipelines to take periodic line balance measurements.<sup>73</sup> However, the minimum requirements for such systems allow the loss of two percent of the pipeline’s capacity per week (one percent per month).<sup>74</sup> For a 525,000 bpd pipeline like Northern Gateway, meeting Canada’s federal standards would still allow a spill of over 11 million litres a week (45 million litres a month) to remain undetected.

## CANADIAN SAFETY REGULATIONS ARE NOT ADEQUATE

Canadian pipeline regulations have not kept up with industry’s increasing practice of shipping raw diluted bitumen on pipelines. Neither federal regulators at Canada’s National Energy Board (NEB) nor provincial regulators at Alberta’s Energy Conservation Resources Board (ERCB) have studied the potential dangers of diluted bitumen and pipelines, or assessed its behaviour when spilled.<sup>70</sup> This lack of due diligence limits their capacity to anticipate or address unique dangers that diluted bitumen poses to pipelines.

This problem is compounded by the fact that the NEB and ERCB do not differentiate between diluted bitumen and conventional crude oil spills, thereby preventing the agencies from identifying unique hazards associated with diluted bitumen pipelines.<sup>71</sup> While both have cited a lack of historical data to support the idea that diluted bitumen is more corrosive than conventional crude, deficiencies in the data prevent an accurate evaluation of the problem.<sup>72</sup> Similarly, there is a lack of documentation to support the

## V. LANDS AND WATERS UNDER THREAT



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Pink Salmon migrate up river to spawn in British Columbia's Great Bear Rainforest.

### SALMON-BEARING STREAMS: CENTRAL TO THE PROVINCIAL ECONOMY

A diluted bitumen spill from the Northern Gateway pipeline could have a significant impact on salmon, a central component of the province's ecology, culture, economy, and social fabric. Wild B.C. salmon represents one of Earth's most productive biological communities, sustaining diverse terrestrial and aquatic life throughout the region while reflecting the overall health of the ecosystems they support. Wild salmon also support valuable recreational tourism, sport fishing, commercial fishing, and value-added processing.

The commercial salmon fishery in British Columbia harvests around 28 million salmon with an annual value of approximately CAD (Canadian dollars) \$250 million.<sup>75</sup> Collectively, recreational fishers generate approximately CAD\$550 million in direct expenditure, and nature tourism contributes hundreds of millions of dollars to the B.C. economy each year.<sup>76,77</sup> The wild salmon economy of the Skeena River alone has been valued at CAD\$110 million annually.<sup>78</sup>

Five species of salmon, as well as steelhead, thrive in the watersheds affected by the proposed Enbridge pipeline. The pipeline would cross approximately 785 rivers and streams in British Columbia. While salmon and steelhead can be impacted by the construction and operation of the Northern Gateway pipeline, there are particular concerns with a potential oil spill from the pipeline.<sup>79</sup> Construction impacts occur primarily at stream crossings and are characterized by short-lived, acute physical and water quality impacts.<sup>80,81</sup> These impacts include the direct destruction of sensitive gravel beds and the generation of silt, which disrupts salmon embryos and spawning.<sup>82</sup>

However, in terms of the region's salmon populations, pipeline failure is the most critical threat from the proposed Enbridge pipeline. Considerable scientific evidence points to chronic and acute toxicity of petroleum compounds on fish, including salmonids. Condensate and diluted bitumen are highly toxic to all species of salmon, particularly in early life stages. Exposure to these contaminants in a spill would be severely detrimental to salmon populations.<sup>83</sup> Depending on the spill volume and location relative to stream crossings, there could be serious and lasting adverse impacts on salmon habitat.

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*The commercial salmon fishery in British Columbia harvests around 28 million salmon with a total value of approximately CAD\$250 million. Collectively, recreational fishers generate approximately CAD\$550 million in direct expenditure, and nature tourism activities contribute hundreds of millions of dollars to the B.C. economy.*

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In addition to the direct impacts from construction, these salmon stocks are already under stress, meaning that pipeline construction and potential oil spills add to the dangers already facing these ecosystems. With the onset of global warming, the rising temperatures of salmon-bearing streams and rivers have harmed salmon stocks—which, in combination with the impacts from overfishing, mining, forestry, agriculture, and other developments, has put these stocks in further danger.

## **THE LANDSCAPE IS TOO UNSTABLE FOR PIPELINE SAFETY**

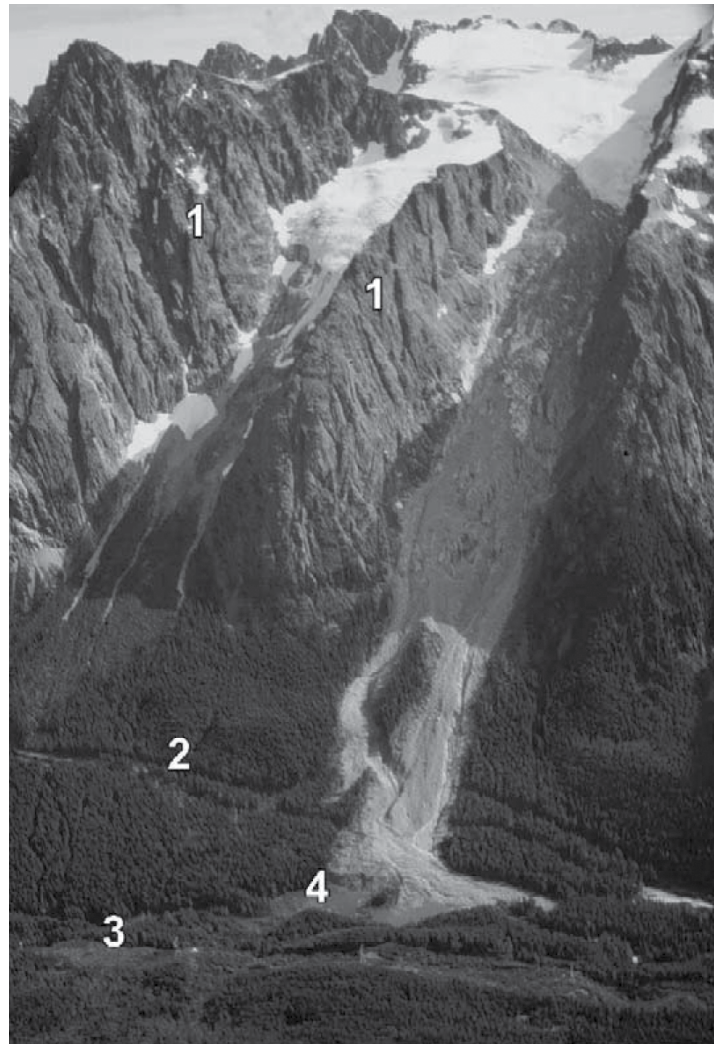
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*A 2011 report from the Bulkley Valley Research Centre concluded that “the unstable mountainous terrain across west central B.C. is not a safe location for pipelines. Eventually a landslide will sever a pipeline. An alternative safer route through B.C. needs investigation.”<sup>84</sup>*

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Landslides are also likely along portions of the proposed Northern Gateway pipeline route, creating higher risks for pipeline spills. Unstable, steep slopes and avalanche run-outs are common along the route’s western area and have contributed to landslides that have ruptured other pipelines in the region and regularly impact roads. Over the last 33 years, there have been six catastrophic landslides affecting natural gas pipelines in west central British Columbia.<sup>85</sup> Pipelines cannot be built to withstand serious landslides; therefore, pipeline routes must be selected to avoid landslide prone areas, as landslides usually result in pipeline ruptures.

In 2002, the Zymoetz landslide disrupted natural gas service to Kitimat, Terrace, and Prince Rupert, and caused CAD\$27.5 million dollars in indirect costs to the local



Howson rock avalanche. Note cliffs (1), pipeline (2), powerline (3), and new lake (4).

© Geertsema et al. (2006)

economy.<sup>86,87</sup> A 2003 landslide severed 350 metres of a natural gas pipeline, disrupting service to Prince Rupert for 10 days.<sup>88,89</sup>

Unfortunately, Enbridge’s landslide assessment only examines terrain up to 500 metres from the pipeline route.<sup>90</sup> Landslides can start much farther away, and travel considerable distances; for instance, the 2002 Zymoetz landslide travelled more than four kilometres when it ruptured a natural gas pipeline.<sup>91</sup>

A key crossing in the Fraser watershed, the Stuart River, also has significant geotechnical difficulties, including the existence of deep-seated sliding in the areas near the proposed crossing.<sup>92</sup> Despite these known hazards and having changed the original crossing site, Enbridge’s consultant, due to lack of access to private property, seems to have only conducted limited visual assessments, and only of the lower slopes.<sup>93</sup> The proposed pipeline route also follows known unstable parts of the Morice River valley, an area that has historically experienced landslides, some of which have recently been reactivated by natural and human

disturbances.<sup>94</sup> Other areas throughout the Nechako Plateau, the Hazelton Mountains, and the Kitimat Ranges also pose significant challenges for pipeline development.<sup>95</sup>

While routing adjustments can somewhat reduce the risks from landslides for the Northern Gateway pipeline, these risks cannot be eliminated given the terrain that the pipeline crosses. A 2011 report from the Bulkley Valley Research Centre concluded that “the unstable mountainous terrain across west central B.C. is not a safe location for pipelines. Eventually, a landslide will sever a pipeline. An alternative safer route through B.C. needs investigation.”<sup>96</sup> This study described the landscape, terrain, hill, slope, and fluvial processes within the area of the proposed Northern Gateway pipeline corridor. East of the mountains, along the Morice River, the pipeline traverses glaciolacustrine sediments with large dormant and active landslides. The volcanic bedrock of the Coast Mountains in this area is inherently unstable, as is evident in the many prehistoric and historic landslides. Avoiding such unstable slopes is generally the preferred engineering development option, yet Enbridge proposes pipeline construction through the area, including tunnelling through two mountains. West of the mountains, sensitive glaciomarine sediments occupy the floor of the Kitimat valley. The presence of large prehistoric and recent flow slides suggests a high probability that future landslides will occur in this area; the potential exists for landslides to occur during pipeline construction and in the future.

A recent report documents that six large rock slides have occurred in west central British Columbia since 1978, five of them since 2002; three of the six rock slides severed natural gas pipelines.<sup>97</sup> Damage to pipelines and roads commonly occurs in run-out zones many kilometres from the initial landslide; the potential for damage to pipelines, therefore, extends well outside the construction corridor.

The report also notes that the climate of northern British Columbia appears to have become warmer and wetter since the beginning of instrumental observations. Evidence suggests that landslide rates have increased as well. Climate change scenarios suggest a warmer and wetter climate; therefore, the rate of landslides and likelihood of impact to a pipeline will increase.

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*Some scientists and engineers suggest climate change will increase hazardous conditions over time with more landslides in west central British Columbia due to predicted warmer and wetter weather conditions.<sup>98</sup> To date, Enbridge has failed to consider how climate change will affect the design and operation of the Northern Gateway pipeline.*

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## **MULTIPLE DISASTERS CAN UNDERMINE PIPELINE SAFETY**

Enbridge has failed to consider the possible risk of pipeline spills due to multiple incidents happening at the same time.<sup>99</sup> The tragedy of Japan’s Fukushima Daichi Reactor meltdown in 2010 vividly points up the added risks when two incidents, an earthquake and tsunami, occur simultaneously. The site design and emergency planning of the reactor did not account for the concomitant occurrence of two natural



© Cristina Mittermeier, ILCP

The Great Bear Rainforest is the home of giant red cedar trees.



© Thomas P. Peschak/ILCP

The waters of the Great Bear Rainforest abound with wildlife such as the Steller sea lion.

disasters, resulting in the uncontrolled release of radioactive material into the environment.

Multiple natural disasters could also affect the Northern Gateway pipeline. For example in May 2011, during the Plains Midstream Pipeline leak in Alberta, a large forest fire prevented the timely cleanup of one of the largest pipeline spills in Alberta's history.<sup>100</sup> A fall frontal rain storm that triggered a rock avalanche could rupture the pipeline. Poor weather conditions combined with associated floods and erosion could prevent ground or air access for emergency response crews. Avalanches, rockslides, explosions, or leaks from the natural gas pipeline all can have cumulative impacts that worsen the ability to respond. Worst-case scenarios do happen and Enbridge has an obligation to consider all potential major risks associated with the project, especially given the sensitive areas of the proposed pipeline route, the potential of linked multiple disasters, and the catastrophic consequences of a major pipeline release.

## COASTAL OIL SPILLS PRESENT SPECIAL CHALLENGES

If approved, the pipeline will descend to the coast at Kitimat, where the diluted bitumen will then be loaded onto oil tankers from a new marine terminal. A diluted bitumen spill could reach the marine environment from numerous points along the transportation chain—such as a pipeline leak into a watercourse, a holding tank at the marine terminal, or an oil tanker itself.

Diluted bitumen would create challenges if spilled into marine ecosystems, similar to a spill into a freshwater environment; typically, only 10 to 15 percent of the oil from a marine spill can be recovered.<sup>101</sup> The coast poses additional challenges to oil spill response due to limitations in the current response regime and the coast's accessibility.

British Columbia's remote North Coast poses significant challenges to oil spill response in terms of access; most areas can only be reached by boat or floatplane. Communities are few and far between, and often are not connected to major highways or roads. In the event of a spill, cleanup crews would need to be dispatched and housed for extended



periods of time, yet the ability to transport and accommodate crews would likely prove to be a limiting factor for an effective response. This would be particularly true during poor weather and dangerous sea states, which are frequent in this region and make marine vessels and/or aircraft inoperable.

Canada's current response regime is unprepared to deal with a major marine oil spill. A 2010 analysis by the Canadian Commissioner of Environment and Sustainable Development found that the emergency management plans of the Canadian Coast Guard and Environment Canada, the lead government agencies responsible for responding to a spill, do not provide adequate national preparedness.<sup>102</sup> Furthermore, the response plans of the B.C. and Canadian governments, both of whom have jurisdiction in coastal waters, are incompatible and do not enable these groups to work together effectively.<sup>103</sup>

### Organizations certified to respond to a spill are ill-prepared to:

- Recover and salvage a vessel, should a tanker be damaged or sink
- Rescue and rehabilitate oil-coated wildlife
- Manage a large oil spill workforce
- Store and facilitate final disposal of recovered oil
- Use non-mechanical response methods such as burning or dispersant – all of which may be crucial components of effective response<sup>104</sup>

In addition, response organizations are only required to have the capacity to respond to a 73,300 barrel (10,000 tonne) oil spill. The Enbridge Northern Gateway pipeline project will be serviced by Very Large Crude Carriers (VLCCs), which can carry up to 2.2 million barrels (320,000 tonnes) of oil.<sup>105</sup>



© Rob Williams

A young humpback whale breaching off the coast of British Columbia.

## SPECIAL PLACES AT RISK



1

### FRASER RIVER

#### Cumulative Environmental Impacts

The Fraser River is the largest wild salmon producer in British Columbia. The pipeline route crosses two major salmon tributaries in the Upper Fraser—the Stuart and the Salmon Rivers. In 2009, Justice Cohen was appointed under the Inquiries Act to investigate the two decade decline of sockeye salmon in the Fraser River. One of the considerations of the Inquiry is the cumulative impacts of human activities on freshwater habitats, such as logging, hydroelectricity, urbanization, agriculture, and mining.<sup>106</sup> While the inquiry is still underway, it is clear that a major pipeline project through the Upper Fraser can only add stressors to these ecosystems.

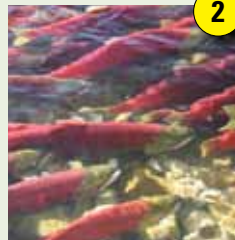


2

### STUART RIVER

#### Sockeye and Sturgeon

The Stuart River sockeye run is one of the Fraser watershed's largest. However, Stuart sockeye have been in steep decline due to migration difficulties and warm water temperatures along the migration corridor. Alcan's Kemano hydroelectric reservoir affects water temperature on the Nechako, but a water release program has been implemented to ensure that temperatures remain suitable for adult passage.<sup>107</sup> The Stuart also provides habitat for the endangered Nechako River white sturgeon, which is designated as endangered under the Federal Species at Risk Act.<sup>108</sup> The Stuart River pipeline crossing has significant geotechnical difficulties, including the existence of deep-seated sliding in the area.<sup>109</sup>



3

### FRASER LAKE

#### Trumpeter Swans

Fraser Lake is a globally significant wintering site for Trumpeter Swans. Typically more than a thousand swans can be seen on this lake in November.<sup>110</sup>





**4 SKEENA RIVER**  
**Wild Salmon**

The Skeena River is second only to the Fraser in wild salmon production and is free-flowing and largely free of industrial impacts. Skeena tributaries support an aboriginal food fishery, saltwater commercial and sport fisheries, and a freshwater steelhead and salmon sports fishery.<sup>111</sup> The proposed pipeline would put three major tributaries of the Skeena at risk: the Sutherland River, entering the east end of Babine Lake, the Morice River and the Zymoetz River.



**8 KITIMAT RIVER**  
**Recreational Fishing**

The Kitimat River provides some of the province's finest recreational fishing for salmon and steelhead. It is characterized by ease of access and the large number of fish, which are augmented with hatchery releases. The Kitimat valley floor is an uplifted fiord with highly unstable glaciomarine sediments that have experienced large prehistoric and recent debris flows including powerful landslides that can damage or rupture pipelines.<sup>120</sup>



**5 SUTHERLAND RIVER**  
**Babine Lake Rainbow Trout**

Babine Lake is the largest natural lake in British Columbia. It supports the largest sockeye population in Canada, partially as the result of artificial spawning channels.<sup>112</sup> The lake also supports a unique population of large "trophy rainbows" that spawn and rear in the Sutherland River. Sockeye and kokanee salmon also spawn in the Sutherland.<sup>113</sup> The pipeline route crosses the Sutherland watershed just upstream from the core fish spawning and rearing habitats and a provincial park put in place to protect this valuable fish habitat. A sizeable rock slide-debris flow occurred in the Sutherland watershed in 2005.<sup>114</sup>



**9 SKEENA RIVER ESTUARY**  
**Salmon and Waterbirds**

The proposed northern tanker route passes the Skeena River estuary, important habitat for salmon and water and shore birds such as the Common Goldeneye, the Harlequin Duck, the Surf Scoter, and many migratory and threatened birds.<sup>121</sup> The Skeena estuary supports some of the richest fish habitats in North America where salmon and steelhead, from hundreds of upstream tributaries, move through the lower river and estuary to the Pacific Ocean.<sup>122</sup> The possibility of oil spills put Skeena salmon at risk twice in their lifecycles: in their natal streams and as they pass through the estuary on their way to sea.



**6 MORICE RIVER**  
**Chinook and Steelhead**

The Morice is one of the most important salmon producing tributaries of the Skeena, producing four salmon species as well as steelhead. The Morice is one of the province's most significant streams for chinook. It is an internationally renowned summer-run steelhead fishing destination.<sup>115</sup> The pipeline would run parallel to the Morice for 36 kilometres, and then another 26 kilometres up Gosnell Creek, a major tributary. The mainstem Morice adjacent to the pipeline route is a braided complex of side channels and log jams comprising the most important spawning and rearing habitat in the watershed for salmon and steelhead.<sup>116</sup> The pipeline route along the Morice and Gosnell passes through unstable glacial deposits with large dormant and active landslides.<sup>117</sup>



**10 GREAT BEAR RAINFOREST AND THE SPIRIT BEAR**

The Great Bear Rainforest is a sanctuary for thousand year old western red cedar trees and home to black bears, grizzlies, wolves and countless other species. But even as long-term protections are being put in place, the Northern Gateway pipeline and associated tanker traffic poses a new threat. The pipeline will facilitate over 400 oil tanker transits back and forth through the heart of the Great Bear Rainforest and the core habitat of the Spirit bear. The globally rare Spirit Bear has become a worthy ambassador of the mystery and magnificence of this rainforest for a good reason. If an oil spill occurs, they will be among the first terrestrial mammals to be threatened.



**7 ZYMOETZ (COPPER) RIVER**  
**Steelhead**

High fisheries values are prevalent throughout the Zymoetz, locally known as the Copper River, used by all species of wild salmon. It is considered one of the top 10 steelhead angling rivers in British Columbia.<sup>118</sup> The pipeline route dissects the floodplain of the Clore River, a major tributary, immediately upstream from a visibly fractured and unstable canyon area. Two high elevation tunnels through mountains are proposed for this area. No development of any sort has occurred to date upstream of the Clore Canyon, so it is unclear how this terrain will respond to pipeline development.<sup>119</sup>



**11 DOUGLAS CHANNEL AND WHALES**

At ground zero for the proposed oil supertanker traffic are the quiet waters of the Douglas Channel and Camano sound. These waters represent critical habitat for fin and humpback whales in addition to Pacific white-sided dolphins, Dall's and Harbour porpoise. However, because of frequent hurricane-force wind events, strong currents, exposed reefs, and confined channels, this part of the north Pacific is considered one of the most challenging waterways for vessels to navigate. These acoustically-sensitive marine mammals will be severely impacted by the loud noise of these tankers. Their ability to forage, communicate, and survive will be compromised if tankers are introduced to these quiet waters.

## VI. DANGERS OF OIL TANKER TRAFFIC

### TANKER TRAFFIC CAN LEAD TO SPILLS

*“The unfortunate fact remains that, given the high marine traffic and topography of our coastline, it simply is not possible to completely prevent spills from happening in the first place. Narrow passages, underwater obstacles and a rocky ocean floor are only a few of the distinctive natural traits of our coastal waters.”*

—Barry Penner, Former British Columbia Minister of Environment<sup>123</sup>

Diluted bitumen can also spill from the tankers that take oil from the Port of Kitimat, the terminus of the Northern Gateway pipeline; historically, oil spills are an inevitable result of tanker traffic. It is not a question of if but when a spill will happen. The Northern Gateway project would bring an average of 220 oil tankers to British Columbia’s North Coast every year.<sup>124</sup> The largest of these tankers (VLCCs), can carry over two million barrels of oil—nearly eight times more than was spilled by the Exxon Valdez in Alaska.

The risk of a marine vessel incident increases with more traffic congestion from tankers and other marine vessels.<sup>125</sup> Enbridge’s proposed Northern Gateway pipelines alone would cause an 84 percent increase in tanker traffic to the port.<sup>126</sup> Additional proposed expansion projects for the port would further increase traffic levels; more tanker traffic means a likely increase in the risk of marine incidents like collisions or groundings, threatening coastal resources from oil or other hazardous cargo spills.

The risk of an oil tanker spill is elevated along the B.C. coast because the unique topography and poor weather conditions make navigation difficult. The coastline is punctuated by narrow inlets and fjords, dotted with thousands of rocky outcroppings and islands, lined with underwater ledges and shoals, and rife with unmarked hazards. This coast is often battered by winter storms with gale to storm force winds, 10-metre waves, and freezing sea spray. Precipitation and fog often reduces visibility to less than three kilometres.<sup>127</sup> The Hecate Strait—a main body of water for the proposed tanker route—is considered the fourth most dangerous body of water in the world because of quickly changing winds and sea states.<sup>128</sup> Marine vessel incidents along the coast are not uncommon. Between 1999 and 2009, there were 1,275 marine vessel incidents along Canada’s Pacific coast, including collisions, explosions, groundings, and sinkings.<sup>129</sup> The narrow passages of the coast allow little room for error;

the large oil tankers that would service the Northern Gateway Marine Terminal can take over two kilometres to come to a complete stop.<sup>130</sup>

### Queen of the North Tragedy



© Transportation Safety Board of Canada

The supertankers coming to transport oil from the Enbridge Northern Gateway pipeline would navigate the same challenging waterways where the Queen of the North passenger ferry sank in 2006. After running aground on Gil Island—a major obstacle on Enbridge’s proposed route—the Queen of the North drifted offshore and sank to her final resting place more than 400 metres below the surface. Two lives were tragically lost in the accident, and chronic oil discharges from the sunken vessel are an ongoing environmental concern. First Nations who rely on the area for food fisheries were heavily impacted by the spill and are still unable to harvest at many traditional sites.

*“In my opinion, even in an ideal world with a well built, perfectly operated and maintained tanker, corrosion can still be the number one enemy and turn a good ship into a ‘rust bucket.’ This is not a purely theoretical assumption but a statement based on experience and factual evidence direct from tanker operators.”*

—Dragos Rauta, Technical Director, Intertanko<sup>131</sup>



*“We are ground zero in Kitamaat Village where the pipeline ends and the tankers begin. If you care about the land, if you still harvest like we do, you can’t help but take a strong position against this pipeline. Our community knows that we need to make a stand against this pipeline or we may lose everything. This pipeline is where we draw the line. Big oil pipelines mean that life as you know it is over: we would not survive an oil spill.”*

—Gerald Amos, Member Haisla First Nation,  
Director of the Headwaters Initiative and  
President of Nanakila Institute Society,  
September 2011

## TANKER CORROSION INCREASES THREAT OF OIL SPILLS

Corrosion is a fact of life for oil tankers; cargo tanks are constantly exposed to crude oil, oil products, and acidic gases, all of which promote a corrosive environment. Indeed, structural failure due to corrosion has been the cause of some of the most prominent spills in oil tanker history.<sup>132</sup>

There are many factors that promote corrosion in the cargo tanks of oil tankers, including warm, humid conditions in the tanks, the presence of carbonic acid due to the condensation of boiler exhaust gases, the presence of microbial bacteria (which degrade the quality of steel), and hydrogen cracking induced by the presence of existing iron oxide (rust).<sup>133</sup>

In addition, sulphur in crude oil cargoes makes water in the cargo tanks acidic. During passage, some of the acidic water will settle in a layer just above the bottom of the tank. This low pH (high acidity) solution can initiate corrosion and penetrate the steel quickly. In general, corrosion increases with availability of soluble sulphur in the crude oil.<sup>134</sup>

Since bitumen contains sulphur and naphthenic acids (measured in total acid number, TAN) at higher levels than conventional crude, it is also more corrosive. The carriage of bitumen in oil tankers will, therefore, enhance the level of corrosion normally expected with conventional oil, thus increasing the chance of a spill.

## LIMITATIONS OF PROTECTIVE TANKER COATINGS

Cargo tanks in oil tankers can be partially protected from corrosion with the use of a coating system. All oil tankers with building contracts dated on or after January 1, 2013<sup>135</sup> must have protective coatings applied to the inner walls of their cargo tanks during construction.<sup>136</sup> Unfortunately, this requirement for new vessels will not affect ships already in service. It is unknown whether tankers servicing the Northern Gateway project will have protective coatings, since Enbridge has provided few details regarding the fleet. Regardless, the protective coating regulations still allow for minor spot rusting, and increased corrosion from bitumen is likely.

Research shows that crude oils containing high levels of naphthenic acids (such as tar sands bitumen) can weaken and blister many of the epoxy coatings used in the cargo tanks of oil tankers.<sup>137,138</sup> Bitumen has 15 to 20 times higher total acid levels than conventional crude, and its carriage may lead to the weakening of protective coatings. In turn, this could enable corrosion to occur more readily, reducing the structural integrity of the tanker and increasing the risk of a spill.

Because of bitumen’s high acid and sulphur content, it is expected to be more detrimental on the cargo tanks of oil tankers than conventional oil regardless of protective coatings. However, while research exists on the effect of high TAN oils on protective epoxy coatings<sup>139</sup>, there are no specific data for diluted bitumen. Further research is needed to adequately quantify the risks posed by shipping this product.

### The Opposition to the Pipeline and Tanker Traffic Is Strong

The Northern Gateway pipeline faces considerable hurdles given the opposition from First Nations and the substantial public support for a permanent ban on crude oil tankers on the B.C. North Coast. The tankers would take crude oil from the pipeline and then transport it overseas. More than the 130 First Nations groups in Western Canada have publicly stated their opposition to tankers and tar sands pipelines.<sup>140</sup> Of these Nations, 70 have declared outright bans on the transport of tar sands crude through their traditional territories, whether by tanker or pipeline. All federal opposition parties in Canada—including Liberals, New Democrats, and Bloc Québécois—have signalled their support for a permanent tanker ban. Four out of five British Columbians support a ban, as do more than 40 businesses and nearly 50 citizen organizations representing tens of thousands of Canadians, including the Union of British Columbia Municipalities, Wilderness Tourism Association, United Fishermen and Allied Workers’ Union, and Kitimat Terrace and District Labour Council.

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## VII. FIRST NATIONS' CONCERNS

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*“First Nations have used our ancestral laws to ban Enbridge’s pipelines and tankers from our lands, taking up more than half of the proposed pipeline and tanker route from the Rockies, clear across to the Pacific ocean. Our Nations are the wall this pipeline will not break through. Our lands and waters are not for sale, not at any price. We want no part of Enbridge’s project and their offers are worthless to us when compared to the importance of keeping our lands, rivers and the coast free of crude oil spills. What Enbridge is offering is the destruction of our lands to build their project, and the risk of oil spills for decades to come which could hurt everyone’s kids and grandkids.”*

—Chief Larry Nooski, Nadleh Whut’en First Nation, member Nation of the Yinka Dene Alliance, 2011

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Wetland near Davie Lake, Fraser-Fort George, British Columbia.

© Neil Ever Osborne

First Nations depend on the lands and waters of the region, through which the pipeline and large oil tankers would pass, for their culture, their community health, and their livelihoods. Throughout the majority of the pipeline and tanker route, First Nations do not have signed treaties, so the land and water is subject to unextinguished Aboriginal rights and title. These unique rights are protected under the Canadian Constitution. Moreover, the recent adoption by the Canadian government of the U.N. Declaration on the Rights of Indigenous Peoples calls for the *free, prior and informed consent* of Indigenous Peoples on whose lands development is proposed. Many First Nations affected by the proposed Northern Gateway pipeline have called for a process that upholds the principles of free, prior and informed consent, which the Joint Review Panel process does not. The Enbridge pipeline proposal has been the target of strong opposition from local First Nations.

In March 2010, the Coastal First Nations, an alliance of First Nations on the North and Central Coast of British Columbia and Haida Gwaii, declared their opposition to tanker traffic stating:

“...in upholding our ancestral laws, rights and responsibilities, we declare that oil tankers carrying crude oil from the Alberta Tar Sands will not be allowed to transit our lands and waters.”<sup>141</sup>

In October of the same year, 61 First Nations in the Fraser River watershed signed the Save the Fraser Declaration prohibiting the transport of tar sands oil through their territories or the migration routes of the Fraser River salmon.<sup>142</sup> Both declarations are based on ancestral law and must be respected by the Canadian government.

There are now over 130 First Nations who are opposed to the proposed Northern Gateway pipeline – from Haida Gwaii to the Northwest Territories.<sup>143</sup> The existing laws and jurisdiction of Indigenous peoples in British Columbia have never been extinguished, and must be respected by governments and companies alike. The continued existence of Indigenous laws has been recognized by Canada’s courts and by International law.<sup>144</sup> These bans on tankers and pipelines, based in Indigenous law, should be similarly adopted in federal law by Canada’s Parliament.

First Nations have documented their numerous concerns over the potential pipeline and tanker spills, both within the federal regulatory process and outside of it.<sup>145</sup>

While not exhaustive, some of the key concerns include:



*“We just came off a salmon season where we canned and smoked for the winter. Soon the whole family is going out to harvest clams, cockles and crabs. It is as simple as that with us. It is who I am. Every year my calendar is run by the sea and the land. You can’t take away that essence of me. The money from a pipeline is there for a short time. The land is there forever.”*

—Nancy Nyce, Haisla Nation, Nana ki’la Guardians, 2011

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impacts to the Skeena and Fraser Rivers’ salmon and habitat, impacts to the endangered Nechako White Sturgeon, and impacts to shellfish and other seafood from the mainland coast to Haida Gwaii. Detailed studies on impacts to Aboriginal rights and title, and environmental, social, and cultural impacts are currently being produced by the majority of affected First Nations, and will likely be presented within the Joint Review Panel process, as well as outside of it by some First Nations.

## VIII. PROTECTING COMMUNITIES AND WATERS

Canada and British Columbia must take several steps in order to prevent a future diluted bitumen spill from devastating First Nation and non-First Nation ways of life and the rivers, lands, and coastal waters of British Columbia. These steps are essential for protecting salmon fisheries, wildlife habitat, critical water resources, and ecosystems unlike anywhere else on Earth.

### POLICY RECOMMENDATIONS

- **Federally legislate a permanent large oil tanker ban in accordance with the Coastal First Nations tanker ban and the Save the Fraser Declaration.** While additional measures must be taken to make tankers and pipelines as safe as possible, the value of some areas is too high to risk any accidents. The Great Bear Rainforest, the world's largest intact temperate rainforest, and the sensitive coastal waters and ecosystems surrounding it, should be permanently preserved and protected from the threat of oil spills. First Nations rights and laws over the resources of their traditional territories should be respected and their decisions on tanker traffic and pipelines through their territories should be mirrored by federal legislation.
- **The Government of British Columbia should reject northern coast oil tanker proposals as a matter of policy.** While the federal government has ultimate regulatory responsibility for interprovincial pipelines and marine transportation, the provincial government has an important role to play in protecting communities and jobs in coastal industries, and protecting the environment. The government of British Columbia can and should show leadership to stop crude oil tanker developments from proceeding, as desired by 80 percent of British Columbians.
- **Reject the proposed Northern Gateway pipeline project.** The Joint Review Panel assessing the proposed project and the Cabinet Ministers with final decision-making authority over its fate should reject the proposed Northern Gateway pipeline given the grave safety risks it would impose on a culturally, economically, and ecologically valuable region.
- **Restrict further diluted bitumen pipeline development until adequate safety regulations are in place.** Applications for diluted bitumen pipeline projects should be tabled until the National Energy Board evaluates the additional risks posed by diluted bitumen pipelines and ensures that adequate safety regulations are in place to address them.

### TECHNICAL RECOMMENDATIONS

- **Evaluate the need for new Canadian pipeline safety regulations.** The current safety standards designed for conventional oil transportation in Canada may not provide adequate protection for communities and ecosystems in the vicinity of a diluted bitumen pipeline. The National Energy Board should analyze and address the potential risks associated with the transport of diluted bitumen and enact new regulations as necessary to address these risks.
- **Commission an independent study on the impact of diluted bitumen on oil tankers.** The effect of diluted bitumen on the cargo tanks of oil tankers is largely unknown. Transport Canada should commission comprehensive, independent analysis of the risks posed by transporting diluted bitumen by tanker to ensure that existing tanker traffic in southern British Columbia is designed to the highest possible safety standards.
- **Ensure the oil pipeline industry takes adequate precautions for pipelines currently transporting diluted bitumen.** Until appropriate regulations are in place, oil pipeline companies currently shipping diluted bitumen must use technology that effectively addresses the additional corrosion caused by diluted bitumen, to ensure that the smallest leaks can be detected in the shortest time possible and that companies have sufficient spill response assets in place to contain a diluted bitumen spill.
- **Strengthen risk assessment from landslides and snow avalanches.** No pipeline can withstand a significant landslide. Enbridge and the Canadian government should assess landslide and snow avalanche risks by widening the study corridor to include the steeper terrain where landslides and avalanches are more likely to originate. The use of airborne imaging technology would greatly increase the detection and recognition of landslide features.<sup>146</sup> Pipeline regulations should be adopted that require new pipelines to avoid landslide prone routes.



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