

Analysis of the Potential Costs of Accidents/Spills Related to Crude by Rail

Prepared

by

Ian Goodman
Brigid Rowan

on behalf of
Oil Change International

Before the
Pipeline and Hazardous Materials Safety Administration
in the Context of
Hazardous Materials: Rail Petitions and Recommendations to Improve
the Safety of Railroad Tank Car Transportation
Docket No. PHMSA-2012-0082 (HM-251)



the goodman group, ltd.

November 8, 2013

Table of Contents

- 1. Introduction 1**
- 2. Estimated Costs of the Crude by Rail Disaster at Lac-Mégantic 4**
 - 2.1. Description of Disaster 4**
 - 2.2. Costs and Sources of Cost Data..... 5**
 - 2.3. Relevance of Lac-Mégantic to Estimating the Costs of CBR Accidents/Spills 9**
- 3. Estimated Costs of Enbridge’s Line 6B Spill in Marshall, MI..... 11**
 - 3.1. Description of Disaster 11**
 - 3.2. Costs and Sources of Cost Data..... 13**
 - 3.3. Relevance to the Project 13**
- 4. Conclusion 16**

1. Introduction

This analysis was prepared by The Goodman Group, Ltd. (TGG), a consulting firm specializing in energy and regulatory economics,¹ on behalf of Oil Change International. Any findings, conclusions or opinions are those of TGG and the authors and do not necessarily reflect those of Oil Change International.

The costs of crude by rail (CBR) accidents/spills can be very large. This analysis demonstrates that a major crude by rail (CBR) unit train accident/spill could cost \$1 billion or more for a single event.

The following examples provide key support for our findings:

1. The explosion, fire and spill of Bakken crude from a train derailment in Lac-Mégantic, QC (2013): The Lac-Mégantic rail accident/spill will likely have costs in the order of \$500 million to \$1 billion. Costs/damages for a similar incident could have been substantially higher had it occurred in a more populated area. Lac-Mégantic is also relevant in that it shows how an accident involving highly flammable light crude (such as the Bakken crude) can have devastating consequences even in a small town in terms of loss of human life and widespread explosion and fire damage to surrounding property.
2. The spill of tar sands dilbit² from Enbridge's Line 6B in Marshall, MI (2010): This rupture had costs of about \$1 billion for Enbridge. The spill volumes at Marshall were within the range of the amount of spill possible (and, in fact, substantially less than the maximum spill) if a crude by rail unit train released much of its cargo. Costs/damages for similar incident could have also been substantially higher had it occurred in a more populated area. Marshall is also relevant in

¹ www.thegoodman.com This analysis was co-authored by Ian Goodman and Brigid Rowan.

² Diluted bitumen. Raw bitumen (a very heavy asphalt-like crude produced from the Alberta tar sands) is diluted for the purposes of rail and pipeline transport. Bitumen is transported in various forms, including a) SCO (raw bitumen upgraded to light synthetic crude oil), b) raw bitumen mixed with a petroleum-based diluent (such as naphtha or condensate) to make it less viscous, or c) raw bitumen (no diluent). SCO and dilbit (diluted bitumen to pipeline specifications, 25–30% diluent) can be transported in standard (non-coiled and non-insulated) tank cars and pipelines. Railbit (bitumen with 15–20% diluent) and raw bitumen can be transported in coiled and insulated tank cars (which are also sometimes used to transport dilbit). Keystone XL Draft Supplemental EIS, p. 1.4-49. Accessed October 30, 2013. <http://keystonepipeline-xl.state.gov/documents/organization/205654.pdf>

showing the high potential cost of dilbit spills into water (and rail lines are often highly proximate to water).³

The AAR petition for rulemaking states:⁴

AAR surveyed its members for information on derailments involving packing group I and II materials from '2004-2008. The derailments resulted in one fatality and eleven injuries, the release of approximately 925,000 gallons of these hazardous materials, and cleanup costs totaling approximately \$63 million.

The Village of Barrington petition for rulemaking responds:⁵

Furthermore, while AAR claims that derailment costs totaled approximately \$64 million over the past five years, including equipment, lading, response and environmental remediation costs," [footnote 17 in original: March 9, 2011 Petition for Rulemaking letter to Dr. Magdy El-Sibae from Michael Rush of the Association of American Railroads at page 2, footnote 7.] Petitioners question the accuracy of industry's cost-benefit claims. In reviewing the derailment cost chart at Attachment B of AAR's petition, PHMSA should note that there is no apparent accounting for costs associated with civil litigation in the wake of derailments. However, in the Cherry Valley/Rockford derailment, CN paid over \$36 million in October of 2011 to settle a lawsuit brought by the family of only one victim. AAR's chart, however, reflects costs of only \$8 million for that incident. [footnote 18 in original: At the very least, Petitioners believe it would make sense for the PHMSA to ascertain the costs stemming from civil litigation for the entire list of derailments incidents that the AAR provided to your office on March 9, 2011. Even if it doesn't yet completely balance the cost-benefit equation in favor of public safety, Petitioners would guess that the plaintiffs' bar would look forward to securing ever higher awards for future victims of derailments based on the public record demonstrating that industry chose to do nothing meaningful in terms of investing in a retrofit program of tank cars that are known to be dangerous and that are increasingly serving as a rolling pipeline for the ethanol and crude oil industries.]

³ The discussion of the costs of the Lac-Mégantic disaster and the Marshall, MI pipeline rupture is partly based on excerpts from a TGG report filed as written expert testimony at Canada's National Energy Board:

"The Relative Economic Costs and Benefits of the Line 9B Reversal and Line 9 Capacity Expansion," August 8, 2013, pp. 38-41. Accessed October 23, 2013.

<https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objId=985663&objAction=Open>

⁴ See <http://www.regulations.gov/#!documentDetail;D=PHMSA-2012-0082-0005> p. 2. Accessed October 29, 2013.

⁵ See <http://www.regulations.gov/#!documentDetail;D=PHMSA-2012-0082-0006> p. 8. Accessed October 29, 2013.

In fact, even a single accident relating to a crude by rail unit train can have dramatically higher costs than the costs taken into account in the AAR's cost-benefit claims. As further explained in this briefing, this analysis will demonstrate that a major crude by rail unit train accident/spill, involving either dilbit or a very light crude such as Bakken, could cost \$1 billion or more for a single event.

We have limited our cost analysis to environmental and socio-economic impacts that directly affect economic activity and can be somewhat readily (albeit approximately) quantified using market economics. These costs escalate very quickly in more densely populated urban areas. Moreover, as we have witnessed firsthand in Quebec, in summer 2013, unconventional crudes (such as Bakken and dilbit) have hazardous characteristics (notably flammability), such that their unsafe transport can result in the loss of human life. We have not attempted to assign a cost to potential effects on human health and safety or to broader effects on ecosystems (notably residual effects).⁶

As noted above, two relevant examples to support our findings that a single unit-train accident/spill could result in very large costs are the following:

1. the explosion, fire and spill of Bakken crude from a train derailment in Lac-Mégantic, QC (2013).
2. the spill of tar sands dilbit from Enbridge's Line 6B in Marshall, MI (2010).

For each example, TGG will provide:

1. description of the disaster;
2. the cost and sources of the cost data;
3. the relevance of the example to estimating the potential costs of CBR accidents/spills.

⁶ Residual effects are those effects remaining after implementation of mitigation measures, such as emergency response and decontamination efforts.

2. Estimated Costs of the Crude by Rail Disaster at Lac-Mégantic

2.1. Description of Disaster

According to the Transportation Safety Board of Canada (TSB), “[o]n July 6 2013, a unit train carrying petroleum crude oil operated by Montreal, Maine & Atlantic Railway (MMA) derailed numerous cars in Lac-Mégantic, Quebec, and a fire and explosions ensued.”⁷

The train with five locomotives was pulling 72 DOT-111 tanker cars full of light crude oil from the Bakken shale play in North Dakota to the Irving Oil refinery in Saint John, New Brunswick. The train was operated by Montreal Maine & Atlantic Railway. The train broke away and derailed, unleashing an explosive ball of burning Bakken crude, which incinerated the downtown core of this small Quebec town.⁸

Quebec’s Department of Sustainable Development, Environment and Parks reports that this rail accident released 6.0 million litres⁹ of crude oil into the environment (affecting soil, water and air).¹⁰ Among its other findings (as of October 28, 2013):

A total of 7.7 million litres¹¹ of crude oil were on the runaway MMA train
from a total of 72 tankers, 63 spilled and 9 avoided spilling during the accident
43 million litres of oily water have been recovered from Lac-Mégantic’s city
centre (sewer system, lake, and grounds)
52,000 litres of oily water removed from the nearby Chaudière River

⁷ See TSB website, Railway investigation R13D0054. Accessed October 29, 2013.

<http://www.bst-tsb.gc.ca/eng/enquetes-investigations/rail/2013/R13D0054/R13D0054.asp>

⁸ “Lac-Mégantic: What we know, what we don’t,” Montreal Gazette, July 22, 2013. Accessed August 2, 2013.

<http://www.montrealgazette.com/news/M%C3%A9gantic+What+know+what+know/8626661/story.html>

⁹ Equivalent to 1.6 million gallons.

¹⁰ See Quebec Department of Sustainable Development, Environment and Parks website, Train Accident in Lac-Mégantic (content in French: *Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP), Accident ferroviaire à Lac-Mégantic*), Accessed November 8, 2013

<http://www.mddefp.gouv.qc.ca/lac-megantic/index.htm>; and specifically Summary Table on quantities of oil estimated as of October 28, 2013 (*Tableau-Synthèse: Estimation au 28 octobre 2013 des quantités de pétrole brut léger impliquées dans l'accident à Lac-Mégantic*)

<http://www.mddefp.gouv.qc.ca/lac-megantic/20131028-tableau-synthese-petrole.pdf>

¹¹ Equivalent to 2.0 million gallons.

the oily water recovered has concentrations of oil ranging from 2% to 50%, and it is not possible to determine the exact amount of oil actually recovered.

“The catastrophe killed 47 residents and levelled more than 40 buildings.”¹²

According to a September 11, 2013 TSB news release, “TSB test results indicate that the level of hazard posed by the petroleum crude oil transported in the tank cars on the accident train was not accurately documented.” The crude was “offered for transport, packaged, and transported as a Class 3, PG III product, which represented it as a lower hazard, less volatile flammable liquid.”¹³

2.2. Costs and Sources of Cost Data

The TSB investigation into the accident is still ongoing.¹⁴ It is still too early to know the final costs for this disaster (including decontamination, town reconstruction, economic recovery, and compensation for victims’ families); but **TGG estimates these costs to be in the hundreds of millions (in the order of \$500 million to \$1 billion).**

Preliminary clean-up bills for damage to the town doubled in the weeks following the accident from \$4 million to almost \$8 million. The MM&A Railway stated at the end of July that it was unable to pay clean-up costs because it was not getting funds from its insurers. At the time, MM&A had outstanding bills for \$7.8 million. MM&A also publicly raised the concern that it could go bankrupt.¹⁵ In response, the Quebec government ordered World Fuel Services Corp. to assist with the clean-up. World Fuel “purchased the oil from producers in North Dakota’s Bakken region, then leased and loaded rail cars and arranged for their transport to an Irving Oil refinery in New Brunswick.”¹⁶ World Fuel is disputing the cleanup order.

¹² Blatchford, Andy, “Railway says it can’t pay for Lac-Mégantic disaster cleanup”

<http://www.theglobeandmail.com/news/national/mma-lays-off-nearly-one-third-of-quebec-workforce-union/article13496970/#dashboard/follows/>

¹³ “TSB calls on Canadian and U.S. regulators to ensure properties of dangerous goods are accurately determined and documented for safe transportation,” TSB News release, September 11, 2013. Accessed October 29, 2013.

<http://www.bst-tsb.gc.ca/eng/medias-media/communiqués/rail/2013/r13d0054-20130911.asp>

The news release further explains that this misclassification may partly explain why the crude ignited so quickly following the rupture.

¹⁴ See the TSB active investigation page for Lac-Mégantic:

<http://www.bst-tsb.gc.ca/eng/enquetes-investigations/rail/2013/R13D0054/R13D0054.asp>. According to a September 11, 2013 news

¹⁵ See footnote 12.

¹⁶ McNish, Jacquie and Justin Giovanetti, “Oil Company Disputes Lac-Mégantic Cleanup Order,” Globe and Mail. Accessed August 4.

(footnote continued on next page)

“In the end, says one expert in civil responsibility, taxpayers could be stuck with a bill in the hundreds of millions of dollars.

Quebec law professor Daniel Gardner says he highly doubts MM&A has enough coverage to absorb the massive, combined financial liabilities of damages like environmental cleanup, emergency-crew salaries and lawsuits.

In fact, he believes the Lac-Mégantic derailment could have more financial consequences than any other land disaster in North American history.

“The whole cost of this will be far closer to \$1 billion than to \$500 million,” said the Université Laval academic, adding he would be surprised if the railway had a total of \$500 million in coverage.

“What will probably happen? ...The company will go bankrupt, insurance coverage won’t be enough.”

Gardner expects governments will wind up covering the difference.¹⁷

On August 7, 2013, MM&A filed for bankruptcy in both Canada (Quebec) and the US (Maine).¹⁸

“It has become apparent that the obligations of both companies now exceed the value of their assets, including prospective insurance recoveries,” MM&A chairman Edward Burkhardt said in a statement Wednesday.

Filing for bankruptcy is “the best way to ensure fairness of treatment to all in these tragic circumstances,” he said.

The decision means the company will start a judge-supervised process to determine how much money will be paid to its various creditors. The process, which allows the company to tackle its unmanageable debt load and remain viable, can be lengthy and typically places secured creditors ahead of those seeking compensation through a lawsuit.

(footnote continued from previous page)

<http://www.theglobeandmail.com/news/national/oil-company-disputes-lac-megantic-cleanup-order/article13518237/>

¹⁷ See footnote 12.

¹⁸ Mackrael, Kim and Tu Thanh Ha, “MM&A files for creditor protection after Lac-Mégantic rail disaster” Globe and Mail. Accessed August 7.

<http://www.theglobeandmail.com/news/national/rail-company-involved-in-megantic-disaster-files-for-bankruptcy/article13644535/#dashboard/follows/>

MM&A's insurance provider, XL Group, has so far declined to cover the cleanup bills, leaving the province to step in and pay more than \$8-million to ensure the work continues.

The court documents indicate that XL has no plans to contribute to continuing environmental recovery costs because it has decided to prioritize claims from victims affected by the disaster. MM&A's insurance policy with XL covers the company for up to \$25-million, according to the court documents.

Because of the number of claims and the amounts being claimed, the insurer "cannot provide for payment of covered environmental cleanup costs to the detriment of the third-party claimants, especially where the amounts of the claims exceed the limit of the coverage," the documents state.

Based on the information provided above, the now bankrupt MM&A has liabilities in excess of assets, minimal insurance coverage (\$25 million); and the insurer has so far refused to pay environmental cleanup costs.

Ongoing squabbling has recently intensified between Quebec and the Canadian federal government over who should pay for the clean-up, economic recovery and town reconstruction. Quebec is insisting that the federal government pitch in more than the \$60M they have committed to. In the October 2013 Throne Speech, the federal government promised to help more with decontamination and reconstruction but have yet to commit to an exact amount.

The Quebec government has still not supplied the federal government with a cost estimate for the cleanup and reconstruction. Federal officials refuse to commit to a fixed amount without a final bill.¹⁹

While MM&A is bankrupt, some **\$25 million** in derailment insurance policy is earmarked by the US bankruptcy trustee for the victim's families. There is a possibility that additional compensation could be obtained for the families from a second insurance policy or from the sale of the company's assets, but these amounts are uncertain.²⁰

¹⁹ The Globe and Mail, "Throne Speech to promise help with Lac-Mégantic cleanup, but not a 'blank cheque,' insiders say," October 15, 2013.

<http://www.theglobeandmail.com/news/politics/throne-speech-to-promise-help-with-lac-megantic-cleanup-but-not-a-blank-cheque-insiders-say/article14883079/#dashboard/follows/>

²⁰ The Gazette, "Quebec rail victims could begin to see compensation in mid-2014: U.S. trustee," October 22, 2013.

<http://www.montrealgazette.com/business/Quebec+rail+victims+could+begin+compensation+mid2014/9066861/story.html>

Certainly, even individual victims of derailment have recently received compensation greater than \$25 million,²¹ therefore higher compensation, if available, would be justifiable.

On the **decontamination costs alone** there are a series of estimates:

- In late July 2013, a Quebec-based Ecotoxicologist, Emilien Pelletier, estimates that the bill just for decontamination would be **\$500 million** and that doesn't include town reconstruction.²²
- In early August 2013, MM&A was reported to have estimated the decontamination costs at **\$200 million** in court documents.²³
- In an October 2013 article, the Quebec government recently estimated the **soil decontamination costs alone at \$150 million.**²⁴

Overall costs estimates vary from several hundred million dollars to \$1 billion:

- As indicated above, Quebec law professor, Daniel Gardner, estimated in August that the costs would far closer to **\$1 billion than \$500 million.**²⁵
- In September 2013, the Toronto Star reported that cleanup costs are pegged as high as **\$500 million by some estimates.**
- On October 15, 2013, the Globe and Mail (Canada's National paper), indicated that "[e]xperts and government officials expect that **the bill will easily reach \$200-million, and could even end up in the vicinity of \$1-billion.**"²⁶

In light of the above, it would appear that the minimum decontamination costs would be \$200 million and the minimum total costs (decontamination, town reconstruction and economic recovery, and compensation for victims' families) would be approximately

²¹ See footnote 5.

²² See <http://www.ledevoir.com/environnement/actualites-sur-l-environnement/383941/blanchet>

²³ See <http://www.theglobeandmail.com/news/national/quebec-could-still-be-on-hook-for-cleanup-bill/article13680378/#dashboard/follows/> and

http://www.thestar.com/news/canada/2013/08/09/lac_megantic_cleanup_to_stretch_into_next_year.html

²⁴ See http://www.thestar.com/news/canada/2013/10/03/lacmegantic_ottawa_to_pitch_in_more_money_for_cleanup_of_train_derailment.htm

²⁵ See footnote 12.

²⁶ See footnote 19.

\$500 million. The total bill could escalate to \$1 billion and beyond. The updated information is consistent with TGG's August 2013 estimate from the NEB expert report:

“It is far too early to know the final costs for this disaster but they are estimated to be in the hundreds of millions, and possibly exceed \$1 billion.”²⁷

2.3. Relevance of Lac-Mégantic to Estimating the Costs of CBR Accidents/Spills

The Lac-Mégantic tragedy is directly relevant to an estimation of the costs of a major CBR accident/spill for the following reasons:

1. It demonstrates the consequences of a CBR accident in a small town by a lake, thus proximate to people, water and economic activity.
2. The Lac-Mégantic tragedy demonstrates the effect of a rupture of 63 tank cars on a unit train with a total of 72 tankers, all carrying Bakken crude.
3. Bakken crude, which caused the explosion, is very light, and has hazardous characteristics (notably flammability).
4. Rail is now transporting over 600,000 barrels per day (and over 60% of the total) from Bakken production.²⁸
5. More generally, the rapid expansion of CBR results from the rapid expansion in production and transport of unconventional crudes (Bakken and other light crudes from shale/tight oil plays and dilbit and other heavy crudes from Canadian tar sands).²⁹

²⁷ See footnote 3, p. 39.

²⁸ See North Dakota Pipeline Authority website. Accessed October 30, 2013.

<http://northdakotapipelines.com/directors-cut/>.

Monthly Updates for April 2013-October 2013 (February 2013-August 2013 data), reporting transport by rail ranging from 600,000 to 700,000 barrel per day, comprising 61-75% of total Bakken production.

²⁹ To date, a sizable proportion of overall recent CBR activity relates to Bakken production. The Keystone XL Draft Supplemental EIS (KXL DSEIS) assumes that CBR could be rapidly expanded to transport expanded Canadian tar sands production of dilbit and other heavy crudes, so as to provide a viable alternative to expanded pipeline capacity. The KXL DSEIS analysis of tar sands CBR is flawed and potentially misleading because it assumes that CBR can be quickly and vastly scaled up, with no significant operating, logistical, economic or regulatory constraints. Nonetheless, some Western Canadian production is already being transported by rail into the US (including dilbit, railbit, and raw bitumen, from both tar sands and non-tar sands), and there is a potential for further expansion of CBR transport of unconventional Canadian crudes.

See footnote 28; Titterton, Paul, Tank Car Update: Presentation to SWARS, February 28, 2013.

Accessed October 30, 2013.

http://www.swrailshippers.com/swars_pdfs/2013_gatx_presentation.pdf;

Keystone XL Draft Supplemental EIS, pp. 1.4-33 – 1.4-60. Accessed October 30, 2013.

<http://keystonepipeline-xl.state.gov/documents/organization/205654.pdf>;

(footnote continued on next page)

6. In addition to the devastation of the Lac-Mégantic town center, there has been significant release of crude oil (6.0 million liters or 1.6 million gallons) into the environment (affecting soil, water and air).³⁰
7. There are very serious concerns about who will bear the financial responsibility for the disaster.

Although the Lac-Mégantic accident/spill was devastating and will likely have costs in the order of \$500 million to \$1 billion, it is nowhere near a worst-case scenario for a CBR accident.

Costs/damages for a similar incident could have been substantially higher had it occurred in a more populated area. Lac-Mégantic demonstrates how an accident involving highly flammable light crude (such as the Bakken crude) can have devastating consequences even in a small town in terms of loss of human life and widespread explosion and fire damage to surrounding property. In an urban area, the effects of such an accident could be catastrophic and costs could easily escalate to the multi-billion dollar range.³¹

(footnote continued from previous page)

Goodman, Ian and Brigid Rowan, Report evaluating the adequacy of the Keystone XL (KXL) Draft Supplemental Environmental Impact Statement (DSEIS) Market Analysis, April 22, 2013, pp. 33-50, Adobe pp. 267-284

<http://switchboard.nrdc.org/blogs/aswift/Comments%20of%20Sierra%20Club%2C%20et.%20al.%2C%20on%20the%20Keystone%20XL%20DSEIS.4.22.13.pdf>

³⁰ There have been concerns that the spill affected water quality and drinking water in Lac-Mégantic and nearby towns. Authorities continue to monitor water quality.

“Government Examining Lac-Mégantic Health Risks,” The Record, July 31, 2013. Accessed August 2, 2013.

<http://www.sherbrookerecord.com/content/gov%E2%80%99t-examining-lac-megantic-health-risks>; see also CBC Inforgraphic: The amount of oil in Lac-Mégantic derailment, July 24, 2013. Accessed October 30, 2013.

<http://www.cbc.ca/montreal/features/lac-megantic-oil-amount-graphic/>

³¹ In the context of the PHMSA rulemaking and elsewhere, some may submit that the Lac-Mégantic accident is an exceptional and possibly worst-case scenario that is unlikely to be repeated. And this particular accident certainly has some attributes that may be atypical or even unique. That said, this accident also occurred in a relatively small town. A similar explosion and fire in a more dense urban area could have had even worse consequences and higher costs. In an urban area, the particular factors in Lac-Mégantic (unattended train rolling down steep grades to crash at high speeds) may be far less likely to occur. On the other hand, in an urban area, there are other risk factors, such as increased danger of collisions with other trains (or other vehicles), as well as proximity to large populations and other infrastructure.

It may also be pointed out that the Lac-Mégantic accident occurred in Canada and that the estimated costs are in Canadian dollars. But in fact, the Lac-Mégantic accident is very relevant for the US. First, US and Canadian dollars now have similar value, so the cost estimates for Lac-Mégantic accident would be similar if presented in US dollars. Second, the accident occurred very close to the US border, on a train that had originated in the US (North Dakota), traveled through numerous US states and cities, and would have again passed through the US (Maine) on its intended routing between Quebec and New Brunswick.

3. Estimated Costs of Enbridge's Line 6B Spill in Marshall, MI

3.1. Description of Disaster

According to the NTSB, following its investigation of the Enbridge Line 6B Spill (emphasis added):³²

On Sunday, July 25, 2010, at about 5:58 p.m., a 30 inch-diameter pipeline (Line 6B) owned and operated by Enbridge Incorporated ruptured and spilled crude oil into an ecologically sensitive area near the Kalamazoo River in Marshall, Mich., for 17 hours until a local utility worker discovered the oil and contacted Enbridge to report the rupture.

The NTSB found that the material failure of the pipeline was the result of multiple small corrosion-fatigue cracks that over time grew in size and linked together, creating a gaping breach in the pipe measuring over 80 inches long.

"This investigation identified a complete breakdown of safety at Enbridge. Their employees performed like Keystone Kops and failed to recognize their pipeline had ruptured and continued to pump crude into the environment," said NTSB Chairman Deborah A.P. Hersman. "Despite multiple alarms and a loss of pressure in the pipeline, for more than 17 hours and through three shifts they failed to follow their own shutdown procedures."

[...]

Over 840,000 gallons of crude oil - enough to fill 120 tanker trucks - spilled into hundreds of acres of Michigan wetlands, fouling a creek and a river. A Michigan Department of Community Health study concluded that over 300 individuals suffered adverse health effects related to benzene exposure, a toxic component of crude oil.

Line 6B had been scheduled for a routine shutdown at the time of the rupture to accommodate changing delivery schedules. Following the shutdown, operators in the Enbridge control room in Edmonton, Alberta, received multiple alarms indicating a problem with low pressure in the pipeline, which were dismissed as

³² NTSB Press Release, "Pipeline Rupture and Oil Spill Accident Caused by Organizational Failures and Weak Regulations," July 10, 2012. Accessed August 3, 2012.
<http://www.nts.gov/news/2012/120710.html>

being caused by factors other than a rupture. "Inadequate training of control center personnel" was cited as contributing to the accident.

The investigation found that Enbridge failed to accurately assess the structural integrity of the pipeline, including correctly analyzing cracks that required repair. The NTSB characterized Enbridge's control room operations, leak detection, and environmental response as deficient, and described the event as an "organizational accident."

Following the first alarm, Enbridge controllers restarted Line 6B twice, pumping an additional 683,000 gallons of crude oil, or 81 percent of the total amount spilled, through the ruptured pipeline. The NTSB determined that if Enbridge's own procedures had been followed during the initial phases of the accident, the magnitude of the spill would have been significantly reduced. Further, the NTSB attributed systemic flaws in operational decision-making to a "culture of deviance," which concluded that personnel had developed an operating culture in which not adhering to approved procedures and protocols was normalized.

The NTSB also cited the Pipeline and Hazardous Materials Safety Administration's weak regulations regarding pipeline assessment and repair criteria as well as a cursory review of Enbridge's oil spill response plan as contributing to the magnitude of the accident.

The investigation revealed that the cracks in Line 6B that ultimately ruptured were detected by Enbridge in 2005 but were not repaired. A further examination of records revealed that Enbridge's crack assessment process was inadequate, increasing the risk of a rupture.

"This accident is a wake-up call to the industry, the regulator, and the public. Enbridge knew for years that this section of the pipeline was vulnerable yet they didn't act on that information," said Chairman Hersman. "Likewise, for the regulator to delegate too much authority to the regulated to assess their own system risks and correct them is tantamount to the fox guarding the hen house. Regulators need regulations and practices with teeth, and the resources to enable them to take corrective action before a spill. Not just after."

As a result of the investigation, the NTSB reiterated one recommendation to PHMSA and issued 19 new safety recommendations to the Department of the Transportation, PHMSA, Enbridge Incorporated, the American Petroleum Institute, the International Association of Fire Chiefs, and the National Emergency Number Association.

3.2. Costs and Sources of Cost Data

As of March 31, 2013, Enbridge indicated in its First Quarter Interim Report to Shareholders that the total clean-up for the spill is now estimated to cost approximately \$1 billion. Enbridge's civil penalty for the spill was only \$3.7 million.³³ Enbridge also points out that there is a possibility that the clean-up bill will continue to increase as the clean-up is still ongoing.

No lives were lost, but as the NTSB citation above indicates: "over 300 individuals suffered adverse health effects related to benzene exposure, a toxic component of crude oil." Furthermore, "[o]ver 840,000 gallons of crude oil - enough to fill 120 tanker trucks - spilled into hundreds of acres of Michigan wetlands, fouling a creek and a river."

3.3. Relevance to the Project

The Marshall, MI pipeline disaster is also highly relevant to an estimation of the costs of a major CBR accident/spill for the following reasons:

1. It demonstrates the costs of a dilbit spill in an environmentally sensitive area (with wetlands and proximity to waterways and human population) in a non-urban area.³⁴ Marshall, MI is not dissimilar to the many areas through which trains are also routed (along waterways in order to minimize elevation and through population centers throughout the US).
2. The spill volumes at Marshall were within the range of the amount of spill possible (and, in fact, substantially less than the maximum spill) if a crude by rail unit train released much of its cargo. 840,000 gallons (or 3.3 million liters) were spilled at Marshall, the equivalent of the full cargo release of 27 tank cars (carrying 31,000 gallons) or 34 tank cars (carrying 25,000 gallons).³⁵ With

³³ Enbridge First Quarter Interim Report to Shareholders for the Three Months Ended March 31, 2013, Section 11 Contingencies, Adobe p. 67. Accessed August 3, 2013.

See <http://www.enbridge.com/InvestorRelations/FinancialInformation/InvestorDocumentsandFilings.aspx> and then click on FIRST QUARTER REPORT under 2013.

³⁴ The population of Marshall is approximately 7,000.

³⁵ Maximum capacity per tank car typically varies between 25,000 and 31,800 gallons of crude, based on factors including maximum weight limits, tank car design, and type of crude. Capacity will generally be lower for heavy crudes (such as the dilbit spilled at Marshall), which weigh more per gallon than light crudes (such as the Bakken crude spilled at Lac-Mégantic). Likewise, capacity will be lower for tank cars which have higher tare (unloaded) weights (such as those with heater coils and insulation, which are also sometimes used to transport dilbit).

transport by unit trains on the rise, and unit trains carrying up to 100+ tank cars, it would be possible for a unit train to spill significantly higher volumes than the 840,000 gallons (or 3.3 million liters) released at Marshall. The 6.0 million liters released at Lac-Mégantic (almost twice the amount released at Marshall) provide support for this finding.

3. In light of recent findings regarding the Line 6B spill, the EPA has recently expressed concerns regarding the additional impacts of tar sands crude spills (versus conventional oil), with a particular concern about spills on waterways.³⁶

Regarding the need for improved safety regulation for CBR, there are a number of regulatory lessons from the Marshall, MI rupture that should be considered:

1. The NTSB investigation also clearly indicates that in the case of Enbridge, and with respect to the regulation of pipeline operators, “trust us” isn’t good enough. Chair Hersman has insightfully pointed out that “for the regulator to delegate too much authority to the regulated to assess their own system risks and correct them is tantamount to the fox guarding the hen house.”³⁷ Chair Hersman’s words are even more relevant for the regulation of transport of hazardous materials by rail, which is in many ways both weaker and more fragmented than the regulation of liquid pipelines.³⁸
2. The NTSB investigation pointed out that the Marshall rupture was “a wake-up call” to industry, the regulator, and the public.” Enbridge knew for years that the

³⁶ Comments of EPA on the Department of State’s Keystone XL Draft Supplement Environmental Impact Statement (DSEIS). Accessed October 30, 2013.

<http://epa.gov/compliance/nepa/keystone-xl-project-epa-comment-letter-20130056.pdf>

³⁷ See footnote 32.

³⁸ As described in various other documents in the current proceeding, there is a long history of problems in regard to transport of hazardous materials (notably flammable liquids) by rail, with only a very slow and partial response to tighten standards to insure public safety. See Village of Barrington, Illinois and The Regional Answer to Canadian National (TRAC) - Petition for Rulemaking (P-1587); National Transportation Safety Board - Accident Report - Derailment of CN Freight Train U70691-18 With Subsequent Hazardous Materials Release and Fire Cherry Valley, Illinois June 19, 2009; and National Transportation Safety Board - Safety Recommendation - R-12-5 through -8, R-07-4 (Reiteration)

In the case of liquid pipelines, the pipeline owner/operator is typically responsible for construction and operation of all facilities within its transport system that are handling hazardous materials (notably flammable liquids), including pipes, valves, and pumping stations. By contrast, in the case of rail, the railroads provide motive power and crews to move hazardous materials (notably flammable liquids) in tank cars which are typically owned, loaded, and unloaded by shippers and other entities besides the railroads.

pipeline was vulnerable; much as the rail industry knows that another CBR spill is only a matter of time.

Although the Line 6B rupture caused widespread devastation to the Kalamazoo and surrounding wetlands and, at \$1 billion in clean-up costs, holds the record for the single most expensive onshore spill in US history,³⁹ it is nowhere near the worst-case scenario for a CBR disaster. Similar to the Lac-Mégantic tragedy involving a CBR release of Bakken, the costs/damages for a CBR dilbit spill could be substantially higher in a more populated area, and costs could easily escalate to the multi-billion dollar range. The clean-up of dilbit, especially in waterways is particularly problematic and expensive. Moreover, the condensate can be highly flammable when spilled and this flammability could have catastrophic consequences in a more densely populated area.

³⁹ See footnote 32.

4. Conclusion

As the examples of the Lac-Mégantic CBR tragedy and the Marshall, MI pipeline rupture have demonstrated, a major CBR unit train accidents/spill could cost \$1 billion or more for a single event.

Unit trains now transport unconventional crude, including both dilbit and Bakken, through densely populated urban areas, and this form of transport is rapidly growing. An accident/spill in an urban area could damage and disrupt major infrastructure, result in serious and widespread water and soil contamination, and possibly cause loss of life. The costs of a major unit train derailment in an urban centre could easily escalate into the multi-billion dollar range.