

# Losing Ground

## Why the problem of oilsands tailings waste keeps growing

Photo: Jennifer Grant, Pembina Institute

**In 2009, new rules were released by Alberta's energy regulator to help manage growing volumes of toxic tailings waste from oilsands mining. As of 2013, not a single company is complying with those rules.**

### Regulations not enforced

In June 2013, the Energy Resources Conservation Board (now the Alberta Energy Regulator) released long-overdue tailings compliance reports. Surprisingly, the summary report reveals that from 2011 to 2012, not a single mining operator was in compliance with the rules managing the reduction of liquid tailings lakes in the oilsands. And yet the regulator has said that it will not enforce penalties or fines on the operators — it was simply “overly optimistic” when it set those targets in 2009.

For more than 40 years, tailings management in Alberta was voluntary. In response to growing public concern, in 2009 the Energy Resources Conservation Board (ERCB) finally announced new rules to regulate tailings waste in northeastern Alberta. Those rules — Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes — require oilsands companies to capture and dry a minimum proportion of their new tailings waste, and to continue to reduce the rate of liquid tailings stored on the landscape each year. By 2013, operators are meant to capture and dry 50 per cent

of their fine tailings particles. Captured tailings are to be disposed of in a dedicated disposal area, the surface of which must become “trafficable” — solid enough to support motorized traffic and eventual reclamation — within five years of the tailings being deposited.



Directive 074 was touted as an ambitious plan that would show the world that Alberta was serious about its commitment to improve environmental performance in oilsands development.

Initially, Directive 074 appeared to provide the first binding requirement for operators to reduce the volume of toxic tailings on the landscape. However, recently it has taken a more permissive approach. Companies have successfully negotiated extensions and exceptions on the annual particle capture rates — so long as operators meet cumulative requirements, the ERCB would permit non-compliance with their established annual reduction targets.

As the data is beginning to show, this is a troublesome move: over the lifetime of the directive, the vast majority of companies have not successfully met even the weaker negotiated targets.<sup>1</sup> Moreover, the regulator is not enforcing fines or penalties for these failures. As a result, toxic tailings waste continues to grow in northeastern Alberta without penalty.

# Compliance is optional

In December 2010, the ERCB stated it has the power to “exempt from its own regulatory requirements” — meaning that operators could negotiate exemptions and exceptions to the Directive 074 rules, as long as operators meet cumulative requirements. All companies except Suncor have taken advantage of this, and have been allotted weaker performance targets as a result. As shown in the table below, however, all operators are failing to meet their tailings reduction targets.

▼ All four oilsands mine operators are underachieving relative to both their original Directive 074 target and their weaker negotiated target.

Project	Capture rate (% of fine particles captured in oilsands feed)		
	Rate established in Directive 074	Rate negotiated by company	Rate achieved* (2011–2012)
Suncor	30.0	30.0	8.5
Syncrude (Mildred Lake)		12.0	8.8
Shell (Muskeg River)		23.5	8.8
Shell (Jackpine)		15.0	0.0

\* “Rate achieved” denotes the amount of fine tailings each company has captured according to the Directive 074 standards, based on the ERCB’s assessment of the companies’ reported performance.

The ERCB has jurisdiction to enforce the requirements of Directive 074, and can even go as far as suspending a company’s operations as a means of enforcement. However, in its 2013 Tailings Management Assessment report, the ERCB concluded that it would not be appropriate to enforce compliance measures — despite zero per cent compliance with its rules — because operators have been working to achieve its targets (see sidebar). Whether or not any punitive measures will be taken in the future is a question now left to the Alberta Energy Regulator.



Photo: Jennifer Grant, Pembina Institute

## Industry’s efforts

Despite the lack of regulatory enforcement from government, oilsands operators have taken some steps to reduce their mining footprint. In 2010, the Oil Sands Tailings Consortium (part of the Canadian Oilsands Innovation Alliance as of March 2012), agreed to share tailings research and technology in an effort to advance tailings management in the mining industry. To date, the industry has invested hundreds of millions of dollars in new tailings technologies.

Despite these major investments, technologies have not advanced at the rate that industry and government had originally hoped it would. Companies have had limited success with leading technologies, such as Suncor’s Tailings Reduction Operation and Shell’s Atmospheric Fines Drying, and have been unable to meet the capture and trafficability requirements set out in Directive 074.

At the time Directive 074 was developed, the ERCB said it had consulted extensively with the oilsands industry and there was nothing in the directive that industry would be unable to comply with. The ERCB has since stated that industry needs more time to test and implement new technologies in order to comply with the directive.

▼ In allowing operators to renegotiate their particle capture rate, the government has pushed the reclamation of Alberta’s oilsands region further and further into the future.

# A growing problem

Tailings are stored in large settling basins, referred to as tailings lakes, which cover approximately 176 square kilometres of the landscape. Typically, tailings lakes account for between 30 to 50 per cent of a mine’s total footprint.<sup>2</sup>

The current volume held in these lakes is approximately 830 million cubic meters.<sup>3</sup> Regulators have already approved the production of 2.4 million barrels of bitumen per day through mining.<sup>4</sup> For each barrel produced, 1.5 barrels of tailings waste will be added to the landscape.<sup>5</sup> Accordingly, approved minable production would produce 1.4 billion barrels of tailings by 2022.

## Reclamation: no easy task

Government reports that less than 10 per cent of disturbed lands from oilsands mining are in the process of being reclaimed.<sup>6</sup> Approximately 715 square kilometres of land has been disturbed by oilsands mining activity, and 71 square kilometres of disturbed lands are in the process of being reclaimed. To date, only 0.2 per cent of the land disturbed by oilsands

Alberta’s premier, Alison Redford, recently told a Washington, D.C. audience that tailings would “disappear from Alberta’s landscape in the near future.”

But even if Directive 074 were enforced, this simply is not true. In fact, tailings volumes are projected to grow by over 40 per cent in the next two decades.

development is certified as reclaimed and therefore returned to Albertans. This small 104-hectare site was never mined, did not include tailings, and is therefore not representative of the looming reclamation challenges that lie ahead.

There remains considerable uncertainty as to how and if tailings lakes will be reclaimed in the long term. To date, there is no proven method for reclaiming peatlands, a valuable wetland type that characterizes the oilsands region.<sup>7</sup>

## Tailings by the numbers

176 km<sup>2</sup>

Area of Northern Alberta now covered by tailings lakes

1.5 times bigger

Surface area of tailings lakes compared to the City of Vancouver

0.2 %

Amount of the land disturbed by oilsands development that has been certified as reclaimed

25,000 m<sup>3</sup>

Volume of tailings waste produced per day at current mining production rates

2 times as much

Amount of water operators are licensed to divert from the Athabasca River per year compared to the amount of water used annually by the City of Calgary

2–4

Number of barrels of freshwater used per barrel of bitumen produced through mining

2060

Year when tailings growth is predicted to stabilize, barring significant advancements in technology

1.3 billion m<sup>3</sup>

Predicted volume of liquid tailings waste produced by 2060

11,000 m<sup>3</sup>

Estimated volume of contaminated water seeping from tailings lakes into adjacent surfaces and groundwater each day



# Why do tailings matter?

## 1 Contents are toxic and can harm people and ecosystems.

Tailings contain a host of toxins including bitumen, naphthenic acids, cyanide, phenols and metals such as arsenic, cadmium, chromium, copper, lead and zinc. Several of these toxic compounds are released during ore processing and become concentrated in tailings lakes over time. Tailings lakes seep approximately 11 million litres per day — risking contamination of surface water and groundwater systems.<sup>8</sup> The Athabasca River flows north through several oilsands mines, and seepage from tailings lakes and surface runoff from operations could pose risks to the water that people drink and fish from downstream.

## 2 Commercial-scale reclamation is not yet proven.

The reclamation of tailings lakes has yet to be demonstrated on a commercial scale. End pit lakes — a high-risk tailings reclamation strategy — allow companies to dump liquid tailings into old mine pits and cap them with freshwater from the Athabasca River at the end of mine life. Despite the lack of evidence that this is a safe and reliable reclamation strategy, at least 27 of these high-risk lakes are planned for the Athabasca Boreal region in the next 60 years.<sup>9</sup> Approximately half of these would contain toxic tailings deposits.

End pit lakes have been approved for several oilsands projects, but full-scale demonstration will not be proven for at least another two decades.<sup>10</sup>

## 3 Wildlife at risk.

Waterfowl, shorebirds and larger wildlife depend on freshwater ponds for drinking, foraging and other important life events. Because tailings lakes are fed with warm liquids, they remain open when natural lakes in the area freeze over. Because of this, wildlife mistake the lakes as open water ponds in winter months. Mine operators typically deploy air cannons in an attempt to keep birds and other wildlife

away from their tailings lakes, but these measures are not always successful. If birds do land on these lakes, their feathers may become covered with residual bitumen. They may then be unable to fly off the pond and may ultimately die. Additionally, there have been instances whereby wildlife are in direct contact with tailings lakes posing challenges to local communities who rely on moose, caribou and other species for food.<sup>11</sup>

## 4 Emissions are harmful for human health and contribute to climate change.

Fugitive emissions of volatile organic compounds (VOCs) — carbon-containing gases suspected to have serious human health impacts — are not being adequately monitored in the oilsands.<sup>12</sup> In addition to VOCs, tailings lakes emit air pollutants, such as hydrogen sulfide and NOx.<sup>13</sup> These pollutants can travel long distances before depositing on land or water. Tailings lakes also emit carbon dioxide and methane, two powerful greenhouse gases.<sup>14</sup> New tailings technologies exist that would likely have environmental benefits, but the government must enforce Directive 074 and create a comprehensive tailings management framework to ensure their uptake.

## 5 Liability insurance is inadequate.

In 2011, the Government of Alberta unveiled a new Mine Financial Security Program which contained marked improvements on the previous system, including improved transparency and accountability of reclamation cost estimates. However, it also changed the basis of liability management from a system that holds oilsands developers responsible for 100 per cent of the current cleanup costs to one where undeveloped oilsands deposits can be offered as collateral. Only toward the end of the mine's life will the total amount of reclamation security actually be collected by the government. Over most of a mine's lifetime, there is little protection for taxpayers except for the asset — bitumen — that created the liability in the first place. As oilsands production continues to increase, so too will Albertans' risk exposure.

It's not too late

## Recommendations

The Alberta Energy Regulator plays a critical role in ensuring Alberta's resource development is efficient, safe and responsible. However, in letting operators continue with status quo tailings management practices, it fails to deliver on those commitments.

It's not too late for the Government of Alberta to follow through with its promise of enhancing the province's regulatory regime. With the recent transition from the ERCB to the AER, there is an opportunity to display new leadership from all parties on the issue of tailings management. The following three actions would ensure that the government and the regulator are on a path toward responsible oilsands mining:

### 1 Enforce Directive 074.

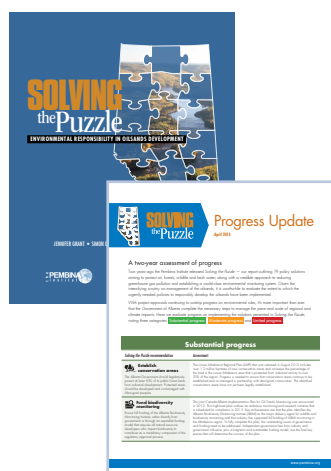
The regulator must take swift action — beginning first with enforcing its own rules and regulations — to ensure that tailings waste is minimized, mining sites are properly reclaimed and land is ultimately returned to Albertans. This directive is a step in the right direction. However, it must be enforced to ensure the rules are delivering on their intended goals.

### 2 Implement a comprehensive tailings management framework.

The government should account for reclamation and remediation of both legacy and future tailings within its pending tailings management framework. Within this policy, the government should make clear that end pit lakes are not an appropriate reclamation strategy. Additionally, the government should reverse previous approvals of end pit lakes.

### 3 Manage the pace and scale of oilsands development.

The government should limit the future production of liquid tailings. To ensure this, no new mines should be approved until proven technologies exist that eliminate the creation of wet tailings. Additionally, the government should commission a life cycle assessment on alternative tailings technologies currently available to industry. This assessment should study the trade-offs associated with different tailings technologies, examining dimensions such as greenhouse gas emissions, land use and water.



## More insights on responsible oilsands development

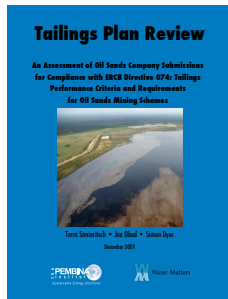
*Solving the Puzzle: Environmental responsibility in oilsands development* outlines 19 specific solutions available to help the Alberta government adequately address the environmental impacts of oilsands operations.

This Pembina Institute report recommends implementing specific policies to protect air, land and water, along with a credible approach to reducing greenhouse gas emissions and a world-class environmental monitoring system.

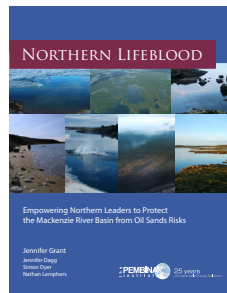
The full 2011 report, along with progress updates from 2013, is available at [www.pembina.org](http://www.pembina.org).

## Learn more about tailings

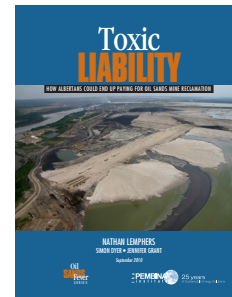
These reports are available at [www.pembina.org](http://www.pembina.org).



*Tailings Plan Review: An Assessment of Oil Sands Company Submissions for Compliance with ERCB Directive 074 (2009)*



*Northern Lifeblood: Empowering Northern leaders to protect the Mackenzie River Basin from oilsands risks (2010)*



*Toxic Liability: How Albertans could end up paying for oilsands mine reclamation (2010)*

## Endnotes

- <sup>1</sup> From 2010-2011, Syncrude Mildred Lake did achieve its renegotiated target (9.2 per cent) with a capture rate of 17.7 per cent. In this timeframe, all other operators failed to achieve their targets. From 2011-2012, no operators met the requirements of Directive 074.
- <sup>2</sup> WWF-Canada, *Tailings, A Lasting Oil Sands Legacy* (2010). [http://awsassets.wwf.ca/downloads/wwf\\_tailings\\_report\\_october\\_2010\\_final.pdf](http://awsassets.wwf.ca/downloads/wwf_tailings_report_october_2010_final.pdf)
- <sup>3</sup> Alberta Environment and Sustainable Resource Development, “Oil Sands Information Portal.” <http://www.osip.alberta.ca>
- <sup>4</sup> Oilsands Review, “Statistics: Oilsands Production.” <http://www.oilsandsreview.com/statistics/production.asp>
- <sup>5</sup> R.J. Mikula, “Advances in oil sands tailings handling: building the base for reclamation,” In *Restoration and Reclamation of Boreal Ecosystems: Attaining Sustainable Development*, D.H. Vitt and J.H. Bhatti, editors (Cambridge University Press, 2012).
- <sup>6</sup> Alberta Energy, “Oil Sands Facts and Statistics.” <http://www.energy.alberta.ca/OilSands/791.asp>
- <sup>7</sup> S. M. Rowland, C. E. Prescott, S. J. Grayston, S. A. Quideau and G. E. Bradfield, “Recreating a Functioning Forest Soil in Reclaimed Oil Sands in Northern Alberta: An Approach for Measuring Success in Ecological Restoration,” *Journal of Environmental Quality* 48 (2009). <https://www.agronomy.org/publications/jeq/abstracts/38/4/1580> ; Simon Dyer, Jennifer Grant, Marc Huot and Nathan Lemphers, *Beneath the Surface: A review of key facts in the oilsands debate* (Pembina Institute, 2013), 42. <http://www.pembina.org/pub/2404>
- <sup>8</sup> Alberta Energy and Utilities Board, *Application by Shell Canada Limited for an Oil Sands Mine, Bitumen Extraction Plant, Cogeneration Plant, and Water Pipeline in the Fort McMurray Area*, Decision No. 2004-009, Applications No. 1271285, 1271307, and 1271383 (February 5, 2004), 43.
- <sup>9</sup> James Hrynyshyn and Gord McKenna, *End Pit Lakes Guidance Document 2012*, prepared for the Cumulative Environmental Management Association, 2012, 4-9.
- <sup>10</sup> Canadian Environmental Assessment Agency and Alberta Energy Regulator, *Application by Shell Canada Energy for Amendment of Approval No. 9756 for Jackpine Mine Expansion Project*, Decision No. 2013 ABAER 011, Application No. 1554388 (July 9, 2013), 75-76.
- <sup>11</sup> CBC News, “Hunters worry wildlife entering tailings,” November 29, 2010. <http://www.cbc.ca/news/canada/edmonton/story/2010/11/29/edmonton-hunting-tailings-cnrl.html>
- <sup>12</sup> Environment Canada, *Integrated Monitoring Plan for the Oil Sands: Air Quality Component* (2011), 16-17. [http://www.ec.gc.ca/pollution/EACB8951-1ED0-4CBB-A6C9-84EE3467B211/Air%20Monitoring%20Plan\\_low\\_e.pdf](http://www.ec.gc.ca/pollution/EACB8951-1ED0-4CBB-A6C9-84EE3467B211/Air%20Monitoring%20Plan_low_e.pdf)
- <sup>13</sup> Environment Canada, “National Pollutant Release Inventory 2011,” spreadsheet, February 19, 2013. <http://www.ec.gc.ca/inrp-npri/default.asp?lang=en&n=0EC58C98->
- <sup>14</sup> Siddique, T., Gupta, R., Fedorak, P. M., MacKinnon, M. D., & Foght, J. M. (2008). A first approximation kinetic model to predict methane generation from an oil sands tailings settling basin. *Chemosphere*, 1573–1580.