Toxic LIABILITY

HOW ALBERTANS COULD END UP PAYING FOR OIL SANDS MINE RECLAMATION

NATHAN LEMPHERS

SIMON DYER • JENNIFER GRANT

September 2010

Oil SANDS Fever SERIES

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25 years of Sustainable Energy Solutions

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Cover Photo: David Dodge, The Pembina Institute

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Acknowledgements

The Pembina Institute wishes to thank the William and Flora Hewlett Foundation for its generous support of this report. The Pembina Institute would like to acknowledge the following contributors who assisted in the production of this report:

- Cindy Chiasson, Environmental Law Centre; Andrew Logan, CERES; and four anonymous reviewers for providing insightful feedback and comments on the draft
- Alberta Environment and the Energy Resources Conservation Board for providing information and data
- Pembina Institute staff Dan Woynillowicz and Ed Whittingham, who provided valuable writing assistance, and Roberta Franchuk, Roland Lines and Adrienne Beattie for their editorial, production and outreach assistance

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How Albertans Could End Up Paying for Oil Sands Mine Reclamation

The pace and scale of oil sands mining continues to increase in Alberta despite a poor understanding of the environmental liabilities: costs associated with the environmental impacts throughout the life of a mine. In *Toxic Liability*, the Pembina Institute has compiled the first public estimate of these liabilities.

Over their 30 to 50 years of operation, oil sands mines have had significant environmental impacts, including emissions of greenhouse gases and other pollutants, surface water withdrawals, contamination and disruption of groundwater, toxic seepage from tailings lakes into groundwater, habitat fragmentation and impacts on wildlife.

To mitigate some of these impacts, oil sands mining companies are required to reclaim the land that has been disturbed during the mining process. Companies budget to pay for reclamation, which is supposed to occur as a company develops a mine. The cleanup bill for mines is potentially immense.

Alberta requires all oil sands mine operators to post a security deposit to fund reclamation in the event an operator is unable or unwilling to pay for reclamation. However, because of the lack of transparency about the true costs of reclamation, the public doesn't know whether or not the current security deposits are adequate.

Are Albertans Protected?

Costs could be 24 times higher

The total oil sands security in the Environmental Protection Security Fund was $820 million in 2009 for 68,574 hectares of disturbed land. That's only $12,000 per hectare. Based on the limited government and industry data available, the Pembina Institute conservatively estimates the cost of reclaiming this disturbed land will be $10 billion to $15 billion — approximately $220,000 to $320,000 per hectare.

Public will carry burden of failure

A reclamation security program is supposed to ensure that industry, not the public, is responsible for any unforeseen reclamation liabilities. If the program is underfunded, however, taxpayers might be on the hook for cleanup costs. Our report *Toxic Liability* suggests the underfunded security program could be exposing each Alberta taxpayer to a tax liability of $4,300 to $6,300.

The Costs of Cleanup

Current security policies inadequate

The government's reclamation security policy is supposed to ensure that sufficient money has been set aside to pay for the cleanup. Instead, the Pembina Institute has found that current policies

- lack transparency
- provide insufficient security
- use a narrow definition of environmental liabilities

"TRUST US"

Industry and government claim to want to talk about the facts, but surprisingly little information on reclamation costs is available to the public. How can Albertans and investors know there is enough money to reclaim oil sands mines?

- Alberta Environment is supposed to ensure reclamation security estimates are accurate, but information about how estimates are calculated is not publicly available.
- Companies are reluctant to provide public information on estimated or actual reclamation costs.
- Alberta Environment has no formal policy to use accounting safeguards to verify the data submitted by mines.

Improved transparency will be critical to regaining the trust of an increasingly critical public.

How much must be reclaimed?

Total disturbed area by oil sands mining (2009):

686 square kilometres

Total area of tailings lakes (2010):

170 square kilometres

Total volume of tailings (2010):

840 million cubic metres

What about our current security policies?

1. Policies lack transparency

Information about the liabilities of individual companies and about how estimates are calculated is not publicly available.

2. Policies provide insufficient security

How much will it cost?

Projected actual reclamation cost of current disturbance:

Land: $1.4 billion to $3.7 billion

Tailings: $8 billion to $10 billion

How much has been set aside?

Current financial security (2009): $820 million

What could taxpayers end up paying?

Potential shortfall (including 20% contingency):

$10 billion to $15 billion

Potential liability per Alberta taxpayer:

$4,300 to $6,300

3. Policies use a narrow definition of environmental liabilities

Many liabilities, such as initial land disturbance, post-reclamation maintenance and groundwater and plant-site contamination, don't show up on the balance sheet for mine development.

Insufficient Security

As of 2009 Alberta Environment had collected $820 million in reclamation security from oil sands mines for 68,574 hectares of disturbed land. Acknowledging the limited public information on reclamation costs, the Pembina Institute estimates the actual cost to reclaim that amount could actually be as high as $15 billion. After 40 years of mining the underestimation has amounted to $6,300 of potential liability per Alberta taxpayer.

Another important point is that security deposits are paid on individual mining projects and can only be used to draw for the reclamation of that mine — security deposits from other mines cannot be used.

Incomplete Balance Sheet

Environmental impacts create environmental liabilities throughout the life of the mine — liabilities with a real financial cost. Our analysis shows that many liabilities, such as initial land disturbance, post-reclamation maintenance, groundwater disruption and contamination, and plant-site contamination, are not showing up on the economic balance sheet for oil sands mine development.

Industry and the Government of Alberta are quick to point out the economic benefits of oil sands mining, but they are reluctant to discuss the financial and environmental liability that has accrued during the past 40 years. Responsible development of the oil sands needs to consider both the benefits and the costs.

Fair and Open

Industry must show it can clean up its own environmental damage

Unwelcome inheritance

Underestimating the costs for cleanup could create a large environmental and financial debt for our children and grandchildren. Many environmental problems current operators face began two generations ago. Which generation will be left paying for today's environmental impacts?

Albertans want polluters to pay cleanup costs

Passing on the financial risks associated with cleaning up an oil sands mine to taxpayers is clearly unacceptable to Albertans. A June 2010 public opinion poll found that 96% of Albertans agree companies operating in the oil sands should be held liable for **all** environmental damages caused by their operations.

Uncertain investments

Investors are becoming increasingly concerned about inadequate disclosure of liabilities. The recent sub-prime mortgage crisis, as well as the Enron and WorldCom scandals are all evidence of the dangers of not having thorough disclosure policies. For oil sands investors to make wise decisions and minimize uncertainties, financial reporting of assets and liabilities must be accurate and transparent.

Warnings repeatedly ignored

The inadequacy of Alberta Environment's mine reclamation security program has been known for many years. The province's government watchdog, the Alberta auditor general, has raised concerns four times in the last eleven years. The 1998–1999, 2000–2001, 2005–2006 and 2009 Alberta auditor general reports all expressed concerns about inconsistencies in the application of the oil sands mine reclamation security program, the failure of oil sands operators to properly estimate reclamation costs and the lack of government response to the auditor general's concerns.

Summary of Recommendations

Many opportunities exist for the Government of Alberta to improve oil sands mine liability management and to demonstrate environmental leadership and fiscal prudence.

Convene a public consultation on reclamation security deposits. Thorough public consultation was done during the development of Alberta's Environmental Protection and Enhancement Act and the recent Water for Life strategy. The Government of Alberta should conduct a similar review on the process of calculating, auditing, collecting and managing security deposits.

Provide online access to reclamation security calculations. Sharing the methodology behind the estimates will demonstrate transparency, improve trust among shareholders and stakeholders, and increase the credibility of Alberta Environment as the environmental regulator of the oil sands. This improved transparency can be accomplished without compromising proprietary information.

Require third-party verification of mine liability estimates. Third-party verification acts as a safeguard if mine liabilities are significantly underestimated. By requiring this additional measure, Alberta Environment can demonstrate a fiscally conservative approach to mine liability management.

Expansion of liability coverage. Just as all oil sands mines in Alberta must account for greenhouse gas emissions, these mines should also account for all reclamation liabilities. Expanding liability coverage will create a more accurate and reliable balance sheet for companies and investors.

Create a staged reclamation certification process. This provides standardized evidence that reclamation is proceeding, assisting industry to maintain their social licence and providing justification for returning a portion of the collected security. Transfer of liability to the Government of Alberta would still only occur with a final reclamation certificate, and companies would still have access to and control of land before final certification.

Enhance liability disclosure in company annual public financial reports. Investors need an accurate understanding of a mine's liabilities. Requiring mine operators to report the lifespans of all operational assets and providing clarity on feasible technologies will improve current practices.

1. Introduction

1.1 Canada's Oil Sands

The oil sands deposits underlie 140,200 square kilometres of primarily northeastern Alberta (see Figure 1). This area constitutes more than 20% of Alberta. It is located in the boreal forest, a vast circumpolar ecosystem that is the largest terrestrial carbon sink in the world[1] and one of the world's largest intact ecosystems. The boreal forest covers approximately 58% of Canada's landmass[2] and contains about 80% of the country's liquid fresh water.[3] The Athabasca River passes through the mineable oil sands region. It is part of the Mackenzie River watershed, which is North America's second-largest watershed (13th in the world).[4]

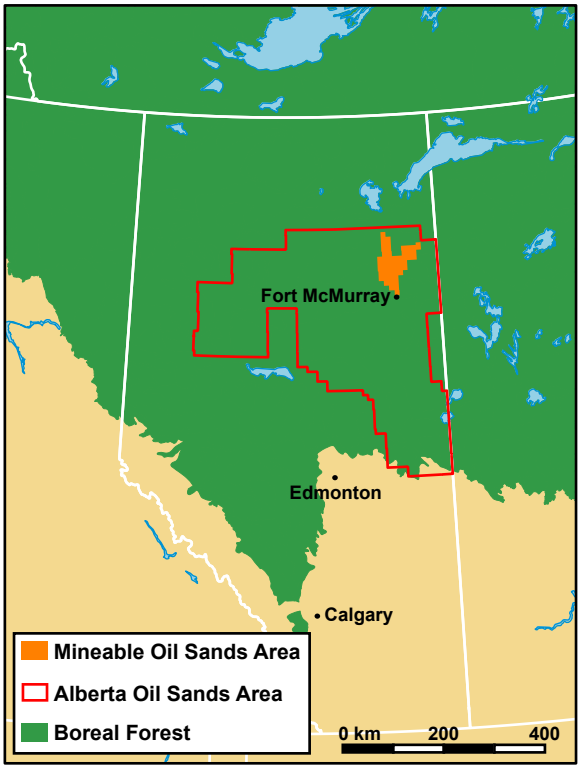

Figure 1. The oil sands underlie much of the boreal forest in northeastern Alberta

Map: Roland Lines, The Pembina Institute

Oil sands, also referred to as tar sands or bituminous sands, are composed of 10–12% bitumen in a matrix of sand, clays and water. Unlike conventional crude, in its unrefined state bitumen resembles tar or asphalt and requires processing before it can be transported through pipelines and used in conventional refineries.

Among petroleum reserves, Canada's oil sands presently rank second in the world, after Saudi Arabia, with 171 billion barrels recoverable with current technology.[5] In 2008, 45% of Canada's total oil production came from the oil sands,[6] and that proportion is increasing as oil sands production increases and conventional production declines. Of the total oil sands deposits, 18% is surface mineable with current technologies and 82% is suitable for in situ extraction.[7] In 2009, 55% of Alberta's oil sands production was from mining operations, averaging 825,223 barrels of raw bitumen per day.[8] As of July 2009,* the total oil sands mine footprint was over 68,574 hectares[9] of 475,000 hectares of current mineable deposits.[10] Over 99% of the surface mineable area mineral leases have been sold.[11]

Oil sands mines also produce considerable volumes of toxic mine tailings, which are stored in large artificial lakes The Government of Alberta estimates there are 840 million cubic metres of tailings inventory covering an area of 170 square kilometres.[12]

* Figures from 2008 were used in calculations to assess the total liability of oil sands mines (Section 4.3) because 2009 land disturbance numbers were unavailable for some oil sands mines. The 2008 figures used in the analysis include the following: 49,646 hectares of land disturbed by oil sands mines; 658,935 barrels of synthetic crude oil per day produced from oil sands mines; 13,000 hectares of tailing lakes; 617,825,868 tonnes of mature fine tailings inventory.

Production of both in-situ and mineable oil sands is expected to increase rapidly. Forecasts suggest oil sands crude oil production will grow from 1.5 million barrels per day in 2010 to 2.2 million barrels per day in 2015 and to 3.5 million barrels per day in 2025.[13] The 2025 projection assumes a "growth case" scenario that is based on the assumption that oil sands projects will be developed and brought into service at a pace similar to historical and current trends. Approved oil sands mines and existing proposals for expansions and new oil sands mines would amount to 3.4 million barrels per day.[14]

1.2 Oil Sands Environmental Liabilities

The pace and scale of oil sands mining continues to increase in Alberta despite a poor understanding of the environmental liabilities associated with oil sands mining and processing. "Environmental liabilities" are the costs associated with the environmental impacts throughout the life of the mine. They are not simply the costs of final reclamation at the mine site but also the costs of reclaiming the initial seismic lines, test pits and road works, the costs of damage to airsheds, groundwater contamination and disruption costs, the costs associated with greenhouse gas emissions and post-reclamation costs. These environmental liabilities are beyond the typical balance sheet of accountants: they cut across the environmental management of all aspects of oil sands mining. Critics of oil sands development have typically raised concerns over air emissions and greenhouse gases, surface water withdrawals, toxic seepage from tailings lakes into groundwater, habitat fragmentation and impacts on wildlife;[15] increasingly, these traditionally green issues are being framed as both environmental and financial concerns.

1.3 Oil Sands Mine Reclamation

Although it addresses only one facet of the suite of environmental liabilities created by oil sands mining, this report focuses on reclamation. Sound reclamation is an essential step in responsible oil sands development, and it potentially reduces liabilities. In theory, reclamation creates useful post-mining landscapes.

The reclamation process involves material placement, regrading, stabilizing, capping, placing cover soils, revegetation and maintenance. Reclamation hastens the re-establishment of functional and healthy ecosystems once mining operations have ceased, as is required by provincial legislation.[16] However, government regulations contain vague requirements to reclaim all lands disturbed by mines and processing plants land to "equivalent land capability." It is unlikely that regulations, as they are currently defined, would address much more challenging areas like peatlands (bogs and fens), end-pit lakes* (with and without tailings), dedicated storage areas for dry tailings, overburden dumps and processing plants.[17] A similar conclusion about

* End pit lakes are basins used to permanently store soft tailings or other process-related materials at a mine site. Their volumes range from 4.3 million to 750 million cubic metres of water. The tailings are capped with fresh water and, theoretically, the end pit lake is safe for aquatic life and recreational opportunities. While oil sands mines are conditionally approved with end pit lakes in their reclamation and closure plans, end pit lakes have never been tested at the commercial scale. For more information see Jennifer Grant, Simon Dyer and Dan Woynillowicz, *Fact or Fiction: Oil Sands Reclamation* (Calgary, AB: The Pembina Institute, 2008), www.oilsandswatch.org/pub/1639, and Fay Westcott and Lindsay Watson, "End Pit Lakes Technical Guidance Document" (prepared for CEMA, 2007), cemaonline.ca/component/docman/doc_download/1857-end-pit-lakes-subgroup-2007-annual-report.html.

ambiguous terminology was reached by the 2007 Oil Sands Multi-stakeholder Committee, which was comprised of representatives from government, industry, Aboriginal groups, environmental groups and local communities. The committee's final report included a consensus recommendation to the Government of Alberta to "define a reclamation standard that describes final certification requirement where site conditions are clearly self-sustaining, and where natural succession to a typical boreal ecosystem would occur."[18] Subsequently, in 2009, the Reclamation Working Group of the Cumulative Environmental Management Association (CEMA) released *A Framework for Reclamation Certification Criteria and Indicators for Mineable Oil Sands*.[19] While the CEMA report is an important step forward that provides valuable clarity for future work on reclamation standards, it also highlights the considerable effort needed before the multi-stakeholder committee's recommendation for clear reclamation standards will be addressed.

Government of Alberta and industry data suggest that the pace and scale of oil sands mining has been increasing much faster than on-the-ground reclamation (Figure 2).[20] This increase in disturbed land can have many explanations, including new mines coming on-stream, mine expansions, and land not being available for reclamation. The widening reclamation gap could also be the result of poor mine site planning that does not prioritize progressive reclamation or of a lack of financial and regulatory incentives to actively reclaim disturbed land. These issues are outside the scope of this report, but past Pembina Institute reports have focused exclusively on the Government of Alberta's reclamation policies and on industry performance against those policies.[21]

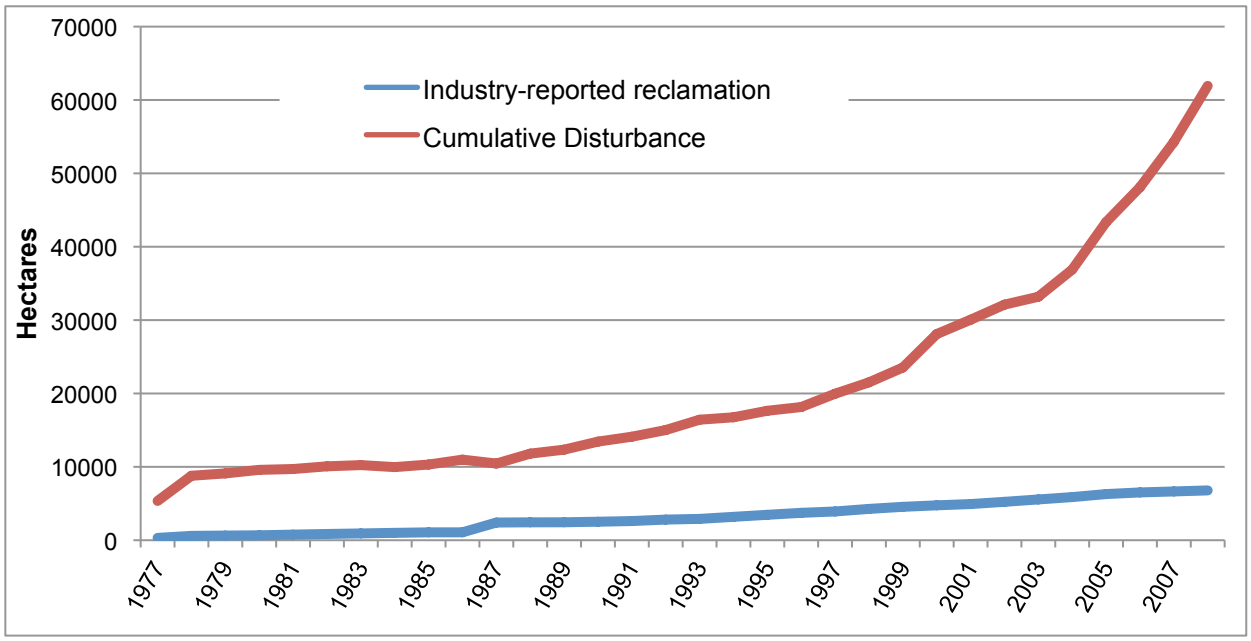

Figure 2. Industry-reported oil sands mine reclamation and cumulative land disturbance

Source: Data supplied by Alberta Environment

Note: The mineable oil sands industry definition of reclamation is unclear and, to our knowledge, unverified by Alberta Environment.

As the "reclamation deficit" has increased, industry has invested significant resources in communicating its reclamation efforts.[22] It has also enlarged its reclamation and research and development budgets. For example, Syncrude has increased annual reclamation spending from $20 million in 2003 to $140 million in 2010.[23,24] However, the industry's recent investments in

reclamation are overshadowed by the rapid increase in land disturbance from new mines and mine expansions. Indeed, mineable oil sands industry data reveals that the percentage of the total footprint of oil sands mines that has been reclaimed steadily decreased from a high of 23% in 1987 to 11% in 2008 (see Figure 3). It is important to note that from 1977 to 1987 the percentage of reclaimed land was increasing even as the two mines operating at that time were adding new mines and expanding their production levels. This increase suggests it is possible to improve the percentage of land being reclaimed while increasing production output.

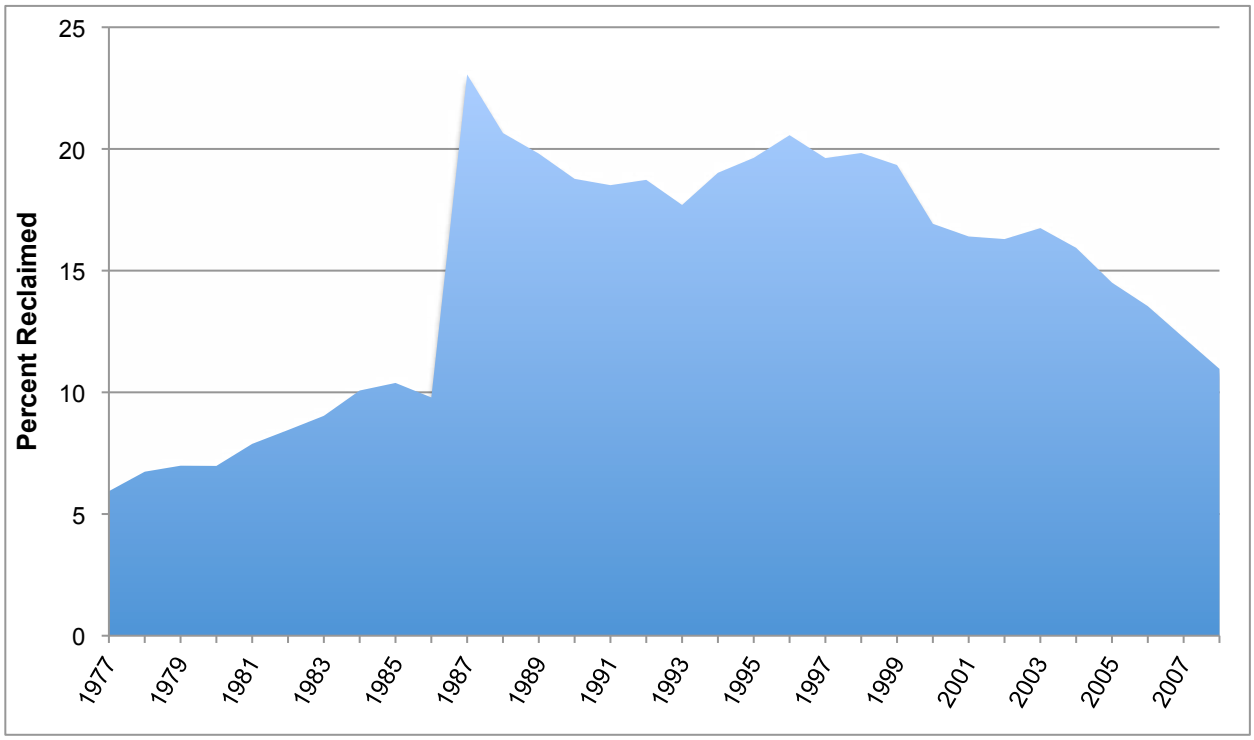

Figure 3. Percentage of the total footprint of disturbed land from all oil sands mines that is reclaimed, as reported by oil sands mine operators.

Source: Data supplied by Alberta Environment, 3 March 2010

Note: The mineable oil sands industry definition of reclamation is unclear and, to our knowledge, unverified by Alberta Environment.

1.4 Reclamation Securities and Risk

Beyond reclamation requirements, the Government of Alberta requires oil sands mine operators* to estimate reclamation costs and submit a security deposit.[25,26] This security deposit acts as a financial backstop or contingency plan to fund "the conservation and reclamation of specified land" if the mine operator is unwilling or unable to pay for the reclamation (e.g., in the case of an insolvency).[27,] The security deposit, held in Alberta Environment's Environmental Protection Security Fund (EPSF), is considered a surety, or guarantee, to prevent the public from bearing the reclamation costs.[28]

* Security deposits are only required by Alberta Environment for oil sands mining operations and not for in situ operations. The ERCB Licensee Liability Rating program and the Orphan Fund govern in situ operations' securities. (Alberta Energy Resources Conservation Board, personal communication, February 2010).

Security deposits are un-audited financial estimates by industry that are intended to correspond to the total cost of reclamation of the land disturbed to the end of the upcoming year. These confidential estimates are reviewed by Alberta Environment staff and not publicly available.[29] Considering that mining industry estimates for reclamation costs have a long history of underestimation,[30] it is uncertain, if not unlikely, that the security collected by Alberta Environment is sufficient to cover the costs of reclamation, let alone the broader environmental liabilities created by oil sands mining that are present but not addressed by current policies.

The risks associated with underestimated environmental liabilities are borne first by investors, then by the government treasury and taxpayers. Investors assume risk when they provide the capital needed for capital and operating costs, including liabilities. Investor risk ranges from reduced dividends to outright bankruptcy, if these liabilities are underestimated. The Government of Alberta bears the risk of paying for these liabilities if the mining companies are unable or unwilling to pay and if the security deposits prove insufficient to address these liabilities.

The Government of Canada may also assume a portion of the risk when environmental liabilities are not addressed by a company. There are numerous examples in Canada where a mine outside federally managed lands has become insolvent and both the provincial and federal governments have had to share the costs associated with reclamation. The Sydney Tar Ponds and the Canada-Ontario agreement on abandoned uranium mine and mill tailings are both examples where the federal and a provincial government have shared reclamation costs.[31] While not automatic, Canadian taxpayers could potentially be liable for the environmental impacts of oil sands mines as the Government of Canada recovers its costs through taxation and other priorities are adversely affected as a result.

What is the level of risk assumed by provincial and federal taxpayers if an oil sands mining company fails to actually pay for reclamation at the end of a mine's life? How can investors make informed financial decisions if significant liabilities remain undisclosed? If governments assume environmental liabilities, to what extent should future generations pay for these liabilities in the event of an insolvent oil sands mine? Unless liabilities are explicitly identified, with current mines projected to last 30 to 50 years or more, we are passing current liabilities to future generations.

Albertans believe mining companies should pay for clean-up costs

Passing on the financial risks associated with cleaning up an oil sands mine to taxpayers is clearly unacceptable to Albertans. A recent public poll found that 96% of Albertans agree that companies operating in the oil sands should be held liable for all environmental damages caused by their operations.[32]

1.5 Past Taxpayer-funded Reclamations

Costly environmental liabilities in Canada are not new. Canada has a long history of mines and industrial sites becoming insolvent, leaving taxpayers with expensive cleaning bills and local populations exposed to considerable pollution. In 2009, there were over 10,000 abandoned or un-reclaimed mines in Canada.[33] Below are three well-known examples of instances where taxpayers have borne the costs of reclamation.

1.5.1 Sydney's Tar Ponds, Nova Scotia

One hundred years of steel and coke production left more than a million tonnes of contaminated soil and sediment in Sydney on the eastern coast of Cape Breton Island, Nova Scotia.[34] This legacy prompted the Government of Canada to "undertake a 10-year, $3.5 billion program to clean up contaminated sites for which the Government is responsible,"[35] as announced in the 2004 Speech from the Throne. The Government of Canada also promised to "augment this with a $500 million program of similar duration to do its part in the remediation of certain other sites, notably the Sydney Tar Ponds." For comparison, the Sydney Tar Ponds cover an area of 31 hectares. Alberta's current oil sands mine footprint covers 68,574 hectares — over 2,200 times larger.

1.5.2 Faro Mine, Yukon Territory

Only 25 years worth of zinc and lead extraction has led to an estimated $450 million in environmental liabilities at the Faro Mine in the Yukon Territory.[36] Of the $450 million, the mining company that operated Faro Mine only declared $93.8 million in liabilities shortly before going bankrupt.[37] Nearby water sources, which have been contaminated with acid and heavy metals from the mine, require continuous treatment. There is also the potential for a tailings dam failure.[38] The estimated cost per hectare is $180,000, but the government had only collected $5,600 per hectare in security.* The difference is being paid for by Canadian taxpayers. Clean up is expected to take 40 years.

1.5.3 Giant Mine, Northwest Territories

The legacy of 50 years of gold mining just outside Yellowknife has created an estimated $400 million in environmental liabilities. Over 237,000 tonnes of arsenic trioxide dust was stored in underground chambers by Royal Oak Mines before it went bankrupt. Water coming in contact with these chambers has since been contaminated with arsenic and must be pumped to the surface, treated and released.[39] Of the $400 million in liabilities, the Government of Canada held a $400,000 performance bond.[40] The difference is now being paid for by Canadian taxpayers.

1.6 About This Report

The poor reclamation performance of oil sands mines, past taxpayer-funded mine reclamation and the clear desire of Albertans to not assume the financial risks of paying for the clean-up of an oil sands mine clearly demonstrate the need for a rigorous mine liability policy framework. The policy gaps in oil sands mine liability management need to be assessed, along with a quantification of the total environmental liabilities for oil sands mines in Alberta. To our knowledge, no study exists that has combined an initial quantification of the total liabilities of oil sands mines and a sober critique of current policies.

This report addresses a clear policy need by providing a rough estimate of the total liabilities of oil sands mines, critiquing the current mine liability policy and providing recommendations for a new mine liability policy framework. To carry out this analysis, the Pembina Institute

* Based on a 2,500-hectare mine site.

interviewed mine liability experts in government, mining companies, industry associations, academia and non-governmental organizations and gathered publicly available information from government and industry as well as academic sources.

Despite the increasing public attention given to the environmental management of oil sands mining, this study was limited by the poor disclosure of actual environmental liabilities and the complete lack of transparency over Alberta Environment's proposed "Mine Financial Security Program." The Pembina Institute acknowledges the limits of this information and welcomes further research, improved information disclosure, as well as any suggestions on how to overcome gaps in data collection, analysis and synthesis.

This report, the first of its kind, exclusively examines Alberta's mine liability policy in the context of oil sands mining. It builds on the Pembina Institute's 2008 report on reclamation, *Fact or Fiction: Oil Sands Reclamation.*[41] In this report, we first critique the current mine security deposit policies in Alberta, outline their strengths and weaknesses, and offer a conclusion on their effectiveness. Second, we look at accounting disclosure policies of environmental liabilities, in particular the strengths and weaknesses of asset retirement obligations and their overall effectiveness as a disclosure tool. Third, we share the current liability estimates for oil sands mining provided by the Government of Alberta and by industry, followed by our own estimates. The report concludes with recommendations on how to improve the management of environmental liabilities from oil sands mining.

2. Current Security Deposit Policies

2.1 About Security Deposit Policies

Through provisions in the *Environmental Protection and Enhancement Act* (EPEA) and the EPEA's *Conservation and Reclamation Regulation*, the Government of Alberta requires all oil sands mine operators* to post a security deposit with it.[42,43] This security deposit acts as a financial backstop or contingency plan to fund "the conservation and reclamation of specified land" if the mine operator is unwilling or unable to pay for the reclamation (e.g., in the case of an insolvency).[44] The security deposit, held in Alberta Environment's Environmental Protection Security Fund (EPSF), is considered a surety, or guarantee, to prevent the public from bearing the reclamation costs.[45]

Security deposits are intended to correspond to the total cost of reclaiming all of the disturbed land as planned to the end of the upcoming year. Alberta Environment reviews a company's security estimate and either accepts the estimate or asks for changes or clarifications and then accepts the estimate.[46] These estimates are created on a mine-specific basis. The underlying rationale is not publicly available.[47]

The amount of the security deposit is based on the following:

- the estimated costs of conservation and reclamation submitted by the oil sands operator
- the nature, complexity and extent of the activity and the probable difficulty of conservation and reclamation, giving consideration to such factors as topography, soils, geology, hydrology and revegetation
- any other factors Alberta Environment considers relevant[48]

The estimated costs of conservation and reclamation are, in theory, based on the third-party expenses associated with recontouring, grading, subsoil and surface soil placement, revegetation, post-closure monitoring, remediation, establishing drainage patterns, such as creeks, ponds, lakes and wetlands, and an overall fee to manage the reclamation work.[49] The cost estimates submitted by oil sands mines to Alberta Environment are also intended to include the reclamation of tailings dams, the cost of moving tailings and the reclamation of end pit lakes that contain tailings.[50]

While the above list of general reclamation activities are provided to mine operators to assist in the assessment of reclamation liabilities, there are no clear requirements outlined in legislation or

* Security deposits are only required by Alberta Environment for oil sands mining operations and not for in situ operations. The ERCB Licensee Liability Rating program and the Orphan Fund govern in situ operations' securities. (Alberta Energy Resources Conservation Board, personal communication, February 2010.)

policy. Until 2009 there were no specific written guidelines for companies to follow.* While not outlined in any publicly available policy, Alberta Environment requires a 10% contingency and a 10% project management cost that is intended to cover the mine suspension, monitoring and maintenance costs.[51] In 2010, Alberta Environment required all oil sands mines to use a common template, from which companies then self-report reclamation information. This shift in data collection is intended to provide more clarity to companies on Alberta Environment's data needs and allow for more consistency in reclamation reporting.

According to the Alberta Energy Utilities Board Decision Report for Albian Sands, an "annual liability calculation update" is used by Alberta Environment to determine reclamation security requirements.[52] Again, this document is not publicly available.[53] According to Alberta Environment, it does not use an "annual liability calculation update" but rather an "annual reclamation security estimate."[54] This annual reclamation security estimate is considered confidential and is not publicly available.[55] Consequently, neither the details of what process was followed nor what activities and costs are included are publicly available.[56] As a result, the Pembina Institute is unable to comment on the sufficiency of security estimates provided to Alberta Environment. Currently, Alberta Environment does not require a third-party audit of industry-reported reclamation cost estimates or a sign-off by a financial officer of an oil sands mine operator.

Several internal checks and balances exist for Alberta Environment to assess the accuracy of a mine's reclamation security estimate. Alberta Environment reviews these estimates and can ask companies to provide more detail or to make a re-assessment. Alberta Environment conducts inspections of conservation and reclamation activities. Both Alberta Environment and Alberta Sustainable Resource Development have the power to issue enforcement orders if needed. Alberta Environment requires the annual submission of conservation and reclamation reports, which must indicate compliance and non-compliance with EPEA approval and track disturbance and reclamation efforts. Audits can also be issued by Alberta Environment on reclamation costs and adjustments can be made on reclamation costs where, for example, the cost of future conservation and reclamation changes, development activities increase or decrease or a portion of the land is reclaimed.[57]

When a company has initiated reclamation on its site, security adjustments are made based on the following generic formula:

Security required = Total cost to reclaim all disturbance that is not already reclaimed, at the end of the current year

Security for oil sands mines is typically submitted to Alberta Environment in the form of a letter of credit,[58] although regulation allows for several forms of security deposit including cash.[59] This letter of credit is issued by an operator's bank against the operator's existing line of credit and submitted to Alberta Environment's Regulatory Approvals Centre.[60] The amount in the letter of

* However, operators of oil sands mines that were approved under the Land Surface Conservation and Reclamation Act (the predecessor to EPEA) have their reclamation security calculated based on production. Suncor Lease 86/17 and Syncrude Mildred Lake were approved under the Land Surface Conservation and Reclamation Act. (Conservation and Reclamation Regulation, supra note ***, Section 18[3].)

credit is updated annually to reflect the updated reclamation security estimate.* Security estimates are reduced based on industry-reported reclamation, not on government certified reclamation.[61] In other words, no security is withheld to ensure certification criteria are met. In theory, if an operator fails to meet a project's reclamation obligations, then the government will use the security funds to reclaim the mine.[62] It is important to note the letter of credit does not represent an exchange of cash, rather a guarantee by the bank of available funds.[63]

A security deposit must be provided to Alberta Environment before an EPEA approval is issued to the oil sands mine. For an approval amendment or a change to the amount of security required, the security must be provided within 30 days of a request by the director of regulatory approvals.

In addition to the security deposit required under EPEA, the Energy Resources Conservation Board (ERCB) may collect a security deposit. According to the ERCB, "[d]epending on the specific circumstances before the Board, proponents may be required to post performance bonds, make security deposits, establish internal or external accounts in which funds from revenue are deposited on an ongoing basis for reclamation and decommissioning, and obtain both third-party and environmental damage insurance coverage. In some cases, the Board may also ask that security instruments be provided by an applicant's corporate parent or affiliate."[64] However, the ERCB does not enforce this policy and does not presently collect security from oil sands mine operators, because security is already collected by Alberta Environment.† The ERCB collects and manages securities for in situ oil sands production and conventional oil and gas through the ERCB Licensee Liability Rating program and the Orphan Fund.[65]

2.2 What If a Mine Cannot Pay?

Should an oil sands mine become insolvent and unable to pay for reclamation, Alberta Environment can issue an environmental protection order to the operator, requiring it to complete reclamation.[66] If the mine operator fails to comply with the environmental protection order, Alberta Environment can order that all or part of the security provided by mine operator be forfeited.[67] If the security deposit proves insufficient, the Government of Alberta has the ability to recover any additional costs from the mine operator that Alberta Environment incurs to complete the required reclamation.[68] Alberta Environment cannot draw from other mines' security deposits if it proves insufficient to cover reclamation costs.[69]

The environmental protection order can also allow the ERCB, working with Alberta Environment, to use the EPSF to cover costs associated with the mine suspension, monitoring and maintenance of the oil sands mine until a new mine owner can be sought.

If Alberta Environment cannot recover any additional funds from operator assets, the Government of Alberta can recover funds from any of the working interest partners in a joint venture. Typically, joint ventures help to spread the financial risks and liabilities of an operation

* Two mines (Syncrude Mildred Lake and Suncor Lease 86) still provide security at flat rates under older legislation, rather than at full cost under the Environmental Protection and Enhancement Act.

† The only exception is in the case of pilot or demonstration oil sands upgraders (daily production capacity of 5,000 cubic metres or less), where the ERCB relies on the Licensee Liability Program described in Directives 001, 006 and 011. (Personal communication, Alberta Energy Resources Conservation Board, Feb 2010.)

across multiple parties, minimizing the exposure of any one interest. However, EPEA works under the "joint and several liability" system,[70] where joint venture partners are each 100% responsible for the costs, rather than being responsible for their proportionate share.*

The following mines are operated as joint ventures: Syncrude's Aurora and Mildred Lake Mines, the Muskeg River Mine, the Jackpine Mine, the Fort Hills Mine and the Kearl Mine. It is highly unlikely that all of the working interest partners in each of these specific mines would be unable to pay for reclamation costs, should one of the working interest partners become insolvent, making recovery of any additional reclamation costs by the Government of Alberta more likely.

Both Suncor's Steepbank and Millennium Mines and Canadian Natural Resources Limited's Horizon Mine are, however, operated by a single working interest. In the event that these single-interest mines or that all working interests in a joint venture become insolvent, then all liabilities would be assumed by the Government of Alberta.

Many oil sands mines, including joint ventures, are owned by limited liability companies (LLC) or limited partnerships (LP). Of the 16 companies involved in oil sands mining, 12 are subsidiaries (LLC or LP) of parent companies. These types of companies are legally distinct and arms-length from parent companies and can be undercapitalized. As a result, if a subsidiary company becomes overexposed and lacks the capital to pay for reclamation costs, the parent corporations are potentially shielded from bearing the liability associated with the mine. However, depending on the particular circumstances, if the letter of credit proves insufficient, it could leave a solvent parent company and Alberta taxpayers having to pay for the reclamation of an oil sands mine.†

In 2009 the total oil sands mine security in the EPSF was $820.48 million,[71] on a current disturbance footprint of 68,574 hectares.[72] This represents $11,965 per hectare.‡ It is important to note that this figure is an approximation of security coverage because of the lack of publicly available data on mine security estimates. This figure adjusts for the year discrepancy between disturbance reporting in the annual conservation and reclamation reports and the EPSF estimates. The EPSF estimate does not include the plant site, unlike the disturbance footprint. The Syncrude Mildred Lake and Suncor Lease 86/17 mines, which were approved under the Land Surface Conservation and Reclamation Act, the predecessor to EPEA, have their reclamation security calculated based on production.[73] Figure 4 shows the total security collected in the EPSF for oil sands mines since 1984 and the amount of security collected per hectare of disturbed land. All prices are inflation adjusted using the consumer price index.[74]

* Alberta Environment's "joint and several liability" policy is different from the ERCB policy, which uses a company's proportionate share in a joint venture to assess liability.

† Under Section 129(2)(b) of EPEA, there is the possibility that previous owners may be liable for remediation costs of a contaminated site should the current mine operator become insolvent and the contamination occurred while the previous owners owned the mine. However, this provision has not been used by Alberta Environment since 1998. Currently Alberta Environment relies on the substance release provisions of Section 113 of EPEA rather than Section 129 of EPEA. Notwithstanding Section 129, there are still circumstances where previous owners may not be liable (Section 1(tt) of EPEA). (Personal communication, Environmental Law Centre, 28 July 2010.)

‡ Appendix B of this report shows the 2009 annual summary of account balances for oil sands mine operators.

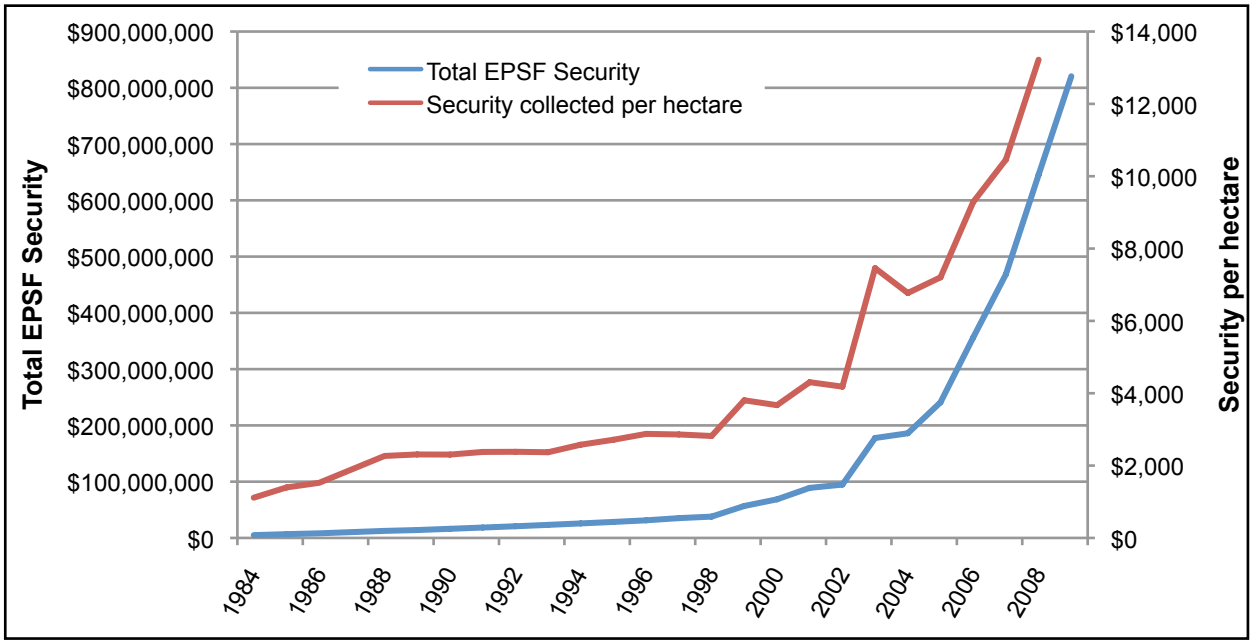

Figure 4. Total security collected for oil sands mines since 1984 in the Environmental Protection Security Fund and the amount of security collected per hectare of disturbed land

Source: Pembina Institute calculations based on data from annual EPSF reports and data supplied by Alberta Environment.

Note: Data from 1987 was unavailable.

2.3 Benefits of Current Security Policies

2.3.1 Annual Estimate Updates

Every year oil sands mine operators update the amount of security collected by Alberta Environment based on their projected disturbance for the following year and the amount of liability reduced through their reclamation activities. Because the oil sands industry is more susceptible to world oil price volatilities than other conventional sources, owing to the high cost of extraction, the amount of production and disturbance from oil sands mines can tightly follow global oil prices. An annual update allows Alberta Environment to make frequent adjustments that correspond with a mine's disturbance footprint more accurately than if it were adjusted at longer intervals.

2.3.2 Increasing Security Collected

While the methodology used by industry and verified by Alberta Environment to calculate security estimates is not publicly available,[75] the data show a significant increase since 2002 in the amount collected from oil sands mines (see Figure 4). This trend reduces the amount of risk borne by the Government of Alberta should an oil sands mine become insolvent.

2.3.3 Discretionary Language

The highly discretionary language of current security policies gives Alberta Environment the opportunity to exercise significant change without needing substantial legislative or regulatory

reform. While discretionary language, such as the consideration in the security estimate of "any other factors Alberta Environment considers relevant,"[76] may seem ambiguous, it gives Alberta Environment sufficient flexibility to quickly respond to any potential liabilities they have failed to previously consider. Further, because calculation requirements are not described in regulation, it is possible to improve calculation consistency and rigour without onerous modifications of regulations. This flexibility can be seen in the recent increase in the amount of security collected per hectare of disturbed land (see Figure 4).

2.4 Challenges of Current Security Policies

2.4.1 Narrow Definition of Environmental Liability

Existing Alberta Environment reclamation security policies have a narrow definition of environmental liability. They do not consider the liabilities associated with land disturbances that happen before EPEA approval, the reclamation costs of the processing plants, airshed contamination, greenhouse gas emissions, the treatment of contaminated water in end pit lakes, soil contamination or post-reclamation care and custody.[77,78] The potential for groundwater contamination is considered on a case-by-case basis.*

The current definition of reclamation liability for oil sands mines does not consider the liabilities accrued over the life of the mine.[79] Environmental liability associated with oil sands mining is not simply the costs associated with reclamation but begins with the initial seismic lines, test pits and road works and extends through the operational life of the plant to post-reclamation monitoring and maintenance. It also includes the damage to airsheds, the contamination and disruption of groundwater and dangerous greenhouse gas emissions.

Alberta Environment only requires mine operators to estimate the liabilities associated with the total disturbed area as projected for the subsequent year. This approach does not take into account the full costs associated with the entire life of the mine or the mining company's ability to pay for total reclamation.

Both the Government of Alberta and the Government of Canada are directly aware of the shortcomings in current mine liability, including security deposits.[80] The Joint Review Panel for Imperial Oil's Kearl Lake oil sands mine recommended that "a [revised] liability management program should provide a financial mechanism for the funding of total project liabilities, including decommissioning of project facilities, reclamation/remediation of all disturbed lands, and any end-of-project-life monitoring that may be required for a project."[81] Despite this joint federal-provincial panel's recommendations in 2006 and 2007, mine liability management policy has not yet changed in Alberta.

The narrow definition of environmental liabilities used by Alberta Environment to estimate reclamation security significantly underestimates the actual liabilities Albertans could bear if an

* Currently only for Suncor's South Tailings Pond, where "an estimate of the costs associated with the seepage mitigation plan during the operation of the South Tailings Pond, and during the post-closure period, until napthenic acid concentrations in the Wood Creek Sand Channel reach levels protective of aquatic life in McLean Creek." (Section 5.1.4[c] of Suncor's 2007 EPEA for its oil sands mining operations.)

oil sands mine become insolvent. This limitation certainly restricts the amount required in security deposits by oil sands mines. In so doing, the province fails to account for significant sources of risk and consequently become implicitly responsible for those costs should an oil sands mine be unable to afford to address these risks. This situation poses an unacceptable amount of risk to Albertans, who may ultimately have to pay for these costs.

2.4.2 Absence of Transparency

2.4.2.1 Poor Access to Government Information

The current oil sands mine reclamation security program lacks transparency. Alberta Environment's annual report for the EPSF is available online,[82] but it only shows the amount of security posted by each mine approval holder (or its joint venture partners). It does not release any of the data used to calculate this amount; company submissions to Alberta Environment on their reclamation costs are considered proprietary and not shared with the public. Even the government calculation methodology for the EPSF that Alberta Environment uses to assess the accuracy of reclamation costs estimates remains confidential.[83] (Section 16 of the *Freedom of Information and Protection of Privacy Act* allows oil sands mine operators and the Alberta government to withhold the public release of information that is deemed proprietary.[84])

Public access to information on mine liability has been limited historically. Companies were required to submit digital conservation and reclamation reports only since 2009.[85] Before then, most oil sands mine operators submitted paper copies, which are more difficult to share than digital versions. Conservation and reclamation reports are not available online. Older paper versions of these reports can only be accessed in hardcopy at the Alberta Government Library in Edmonton,[86] or requested from a mine operator.

2.4.2.2 Lack of Industry Estimates

Information about reclamation costs is a closely guarded secret in Alberta. All of the oil sands mine companies, industry associations, private reclamation contractors and academics interviewed for this report were reticent to share any information about how much oil sands mine reclamation actually costs. The most often cited explanations for this reticence included the bidding process and site characteristics. The reclamation bidding process among reclamation contractors is highly competitive; to maintain competitive value, to prevent underbidding and to maximize potential revenue, reclamation costs are kept confidential. Others cited mine-specific factors that prevent the development of any industry averages. They said the differences among the mines, including the industrial processes used and hauling distances at each mine, prevent cost comparisons. While this explanation may hold between prairie and mountain coal mines, where topography and access to ore bodies are very different, the variation in reclamation costs among oil sands mines will not be nearly as significant, making basic cost comparisons possible. There is variation in hauling distances, material types and equipment used among oil sands mines, but this diversity should not eliminate the possibility of providing publicly available reclamation cost estimates. Creative solutions exist that can address this diversity without compromising proprietary information.

2.4.2.3 Lack of Accounting Safeguards

While most oil sands mines use third-party accounting firms to verify their asset retirement obligations, as required under federal law (see Section 3), existing provincial mine liability policy requires neither third-party validation of reclamation security estimates nor sign-off by the chief executive officer, the chief financial officer or a designated financial representative. Alberta Environment can request additional information to gain comfort with the estimate, but it has no formal policy that uses verifiable methods of ensuring the data submitted is accurate.*

2.4.2.4 Growing Public Concern

Compounding the limited transparency are the growing public concerns on the existing mine security policy in Alberta. Attention has been brought upon the need for more transparent inclusion of stakeholder concerns into the development of oil sands reclamation security policy. In 2007, the Oil Sands Multistakeholder Committee, which consisted of representatives from industry, environmental groups, academics, bureaucrats and aboriginal groups, reached consensus on the recommendation that the Government of Alberta "develop formal and transparent processes and policies for financial management of reclamation liabilities."[87] The Government of Alberta's own report, *Responsible Actions: A Plan for Alberta's Oil Sands*, carried forward the recommendation of "enhanc[ing] existing mining liability management programs to further protect Albertans from financial liabilities related to reclamation."[88] However, there has been no evidence of improved transparency. Indeed, discussions about changes to the mine reclamation security program have included only industry and government (see Section 2.4.4).

Independent of the multistakeholder committee, concerns were also raised by interveners in the regulatory review of proposed oil sands projects. The Mikisew Cree First Nation[89] and the Oil Sands Environmental Coalition (which includes the Pembina Institute, the Toxics Watch Society of Alberta and the Fort McMurray Environmental Association)[90] have raised objections over the lack of transparency of the current reclamation liability policy at numerous approval hearings.

2.4.3 Underestimated Liabilities

The following analysis suggests that Alberta Environment and oil sands mine operators have significantly underestimated the actual cost to address environmental liabilities. Even with the narrow understanding of mine liability in Alberta Environment's current legislation, the amount collected by Alberta Environment appears wholly insufficient to fully reclaim an oil sands mine to provincial standards should a mine company be unable to cover reclamation costs. If the broader life of the mine is considered, from exploration to post-reclamation monitoring, the liabilities are even greater.

The inadequacy of the Alberta Environment's mine financial security program has been known for many years. The provincial government's own watchdog, the Alberta Auditor General, has raised concerns four times over the past 11 years. The 1998–1999, 2000–2001, 2005–2006 and October 2009 Alberta Auditor General reports all expressed concerns about inconsistencies in

* Through Section 5 of EPEA approvals for oil sands mines, Alberta Environment specifically requests third-party costs of reclamation, but it gives not further guidance on what third-party means.

the application of the oil sands mine reclamation security program, the failure of oil sands operators to properly estimate reclamation costs and the lack of government response to the Auditor General's concerns.[91,92,93,94]

1998–1999 Annual Report of the Auditor General of Alberta, p. 158:
My review [of mine liability management policy] suggests that some types of projects are required to provide financial security, while others are not. For those that are required to provide security, differing methods were used to evaluate the need for and actual amount of financial security. In some cases, the security is based on the estimated cost of reclamation; in other cases it is based on an estimate of the value of permanent structural improvements. …The [Mine Financial Security Risk Assessment] Model was forwarded to the Department Executive in June 1998. The Financial Security Risk Assessment Model has not yet been implemented.

2000–2001 Annual Report of the Auditor General of Alberta, p. 90:
No final solution appears imminent. Progress against the intent of our 1998–1999 recommendation has been unsatisfactory.

2004–2005 Annual Report of the Auditor General of Alberta, p. 182:
For oilsands and coal mines, for which the Ministry is legislatively responsible to collect reclamation security, there are still many inconsistencies. Some sites posted security under prior legislation and that security has been continued under existing legislation, with the result that some sites have security based on production. Some sites use outdated information to determine their estimated full cost of reclamation. Some estimates do not include all required costs. As a result of these inconsistencies, the sufficiency of security for the completion of reclamation is not ensured.

With the passage of time, the Ministry continues to be exposed to the risk of obtaining inadequate security resulting in additional costs to the province.

October 2009 Report of the Auditor General of Alberta, p. 207:
We are repeating the recommendation [that Alberta Environment implement a sufficient mine financial security policy] for a third time because the Department could not confirm when a new program for obtaining financial security will be finalized and implemented.

2.4.4 Recent Mine Financial Security Policy Developments

The Government of Alberta has been developing a Mine Liability Management Program (MLMP) since 2004.[95,96] This program is intended to redesign the security process for oil sands mine liabilities. Despite the Government of Alberta's purported intention to make the MLMP consultation a transparent initiative,[97,98] the program is being developed by industry and government personnel without input from stakeholders or the public.[99] Since the MLMP is a draft policy, it is neither a public document nor available for scrutiny beyond the industry groups involved in the policy's development. The Pembina Institute has been told that the MLMP has been turned down by cabinet twice over the past four years for reasons not publicly disclosed.

In the past year, the MLMP has apparently been renamed the Mine Financial Security Program (MFSP). Like the MLMP, the MFSP also lacks transparency. Alberta's Auditor General has noted that Alberta Environment has been privately working with Alberta Energy, the Alberta Treasury Board, Alberta Finance and Enterprise, the ERCB, oil sands mines and industry associations in the development of the MFSP.[100] Syncrude subsequently registered its lobbying of Alberta Environment on the MFSP.[101] The Alberta Chamber of Resources has noted that its "Mine Reclamation Security Committee, led by Ray Hansen of Syncrude, and populated with

some of the most well-informed people in the world on the subject, have been working this issue tirelessly for a [sic] several years."[102] Despite their close involvement in the development of the MFSP, Syncrude,[103] Suncor,[104] Shell,[105] CAPP,[106] the Oil Sands Developers Group,[107] the Alberta Chamber of Resources[108] and numerous private sector consultants all turned down the Pembina Institute's request to comment on their contribution to the development of the MFSP.

Even within the Government of Alberta, there is secrecy over the MFSP. Alberta Environment and ERCB employees have said that the policy is confidential. The Pembina Institute's requests to Alberta Environment to provide feedback on the proposed MFSP before cabinet approves the policy were denied. According to one government official, because the MFSP does not deal with the environment and is considered a financial policy, environmental groups are not consulted.[109] The same official explained that industry is consulted because its finances are directly affected by the policy.[110]

Unfortunately, it is not only industry's finances that are at stake. Shareholders of oil sands mining companies will be the first to pay, as a company's forecast profits will be eaten up by the increasingly costly reclamation. While increasing a security estimate will also cut into company profits, these costs would be known and incorporated into revenue forecasts instead of ignored.

If a company cannot pay for the reclamation costs and becomes insolvent, Alberta Environment's EPSF draws from that particular company's deposit, not the total fund. However, the security deposits held in the fund will likely not cover the reclamation costs.* If the EPSF proves insufficient to cover the costs of reclamation then Alberta taxpayers will most likely have to foot the bill.

Reclamation security mechanisms for oil sands mines are an environmental issue and a financial issue to parties other than just oil sands companies, namely to Alberta's citizens. If oil sands mine operators or the province cannot afford or choose not to fully reclaim the mine site, then aboriginal rights holders, local communities and land users will have to bear the consequences of the problematic environmental legacy left behind from the mines. Scientific evidence is quickly accumulating on the problematic environmental legacy of the oil sands.[111] If reclamation is as challenging as some studies are suggesting, then reclamation and remediation costs will be much higher than budgeted.

* Per company range is $45-285 million. See Appendix B for a breakdown of EPSF security deposits by company.

3. Asset Retirement Obligations

Besides Alberta Environment mine financial security policies, which in theory ensure there is adequate reclamation funding in the event a mine becomes insolvent, there are also accounting and disclosure policies that can encourage companies to better plan for reclamation costs and give a more accurate picture of the long-term health of a company.

Environmental disclosure policies are created by various securities commissions and vary depending upon where a company is registered. They are only applicable to publicly traded companies. Companies listed on Canada stock exchanges must follow the disclosure standards set by the Canadian Securities Administrators that are followed by all securities commissions in Canada.* Companies listed in American stock exchanges must follow the policies set forth by the United States Securities and Exchange Commission. Of the 16 companies involved in active oil sands mines, five are publicly traded (see Table 1). Publicly traded parent companies are required under securities law to consolidate the assets and liabilities of their subsidiaries into the financial statements of the parent company.

In the securities laws of both United States and Canada, the fundamental rule is that all material information must be promptly disclosed. In both countries, existing law requires disclosure in the Management Discussion and Analysis sections of financial reports of risks and uncertainties known to management that would be reasonable likely to cause future financial results and conditions to differ materially from those currently reported. In addition, there are specific requirements for the disclosure of material environmental information, including the current and future financial impacts of environmental regulations and environmental risk factors that may have a material effect on the enterprise. Environmental liabilities, such as future costs of closure and reclamation of mining sites must be disclosed unless the firm can make a determination that such expenditures are not reasonable likely to be necessary, of if necessary, not financially material.

These environmental disclosure rules are particularly applicable to hard rock mining companies because their operations typically have significant environmental impacts and require extensive reclamation when concluded. In the past, mining companies have understated environmental risks and liabilities, such as closure and reclamation costs, and have declared bankruptcy when mining has ceased, leaving costly environmental clean-up operations to the public sector.[112]

* In Canada, National Instrument 51-102 is one of the main disclosure standards used to report environmental liabilities. (Ontario Securities Commission, Chapter 5: Rules and Policies, 5.1.1 National Instrument 51-102 Continuous Disclosure Obligations, www.osc.gov.on.ca/documents/en/Securities-Category5/rule_20040402_51-102-cont-disc-ob.pdf, accessed August 10, 2010.)

Table 1. Private and public companies with operating oil sands mines

Private Oil Sands Mine Companies	
Chevron Canada, Ltd.	**Murphy Oil Company, Ltd.**
ExxonMobil Canada Properties	**Nexen Oil Sands Partnership**
Imperial Oil Resources Ventures, Ltd.	**Shell Canada Energy, Inc.**
Imperial Oil Resources, Ltd.	**Sinopec Oil Sands Partnership**
Marathon Oil Canada Corp.	**Suncor Energy Oil and Gas Partnership**
Mocal Energy, Ltd.	
Publicly-traded Oil Sands Mine Companies	
Canadian Natural Resources, Ltd. (TXX/NYSE: CNQ)	
Canadian Oil Sands, Ltd. (TSX: COS.UN)	
Suncor Energy, Inc. (TSX/NYSE: SU)	
Imperial Oil, Ltd. (TSX/NYSE: IMO)	
Teck Resources, Ltd. (TSX/NYSE: TCK)	

Note: Companies in boldface type are subsidiary companies.

One of the disclosure tools used in accounting is an asset retirement obligation (ARO). The purpose of an ARO is to inform investors and the public about how a company accounts for future risks from reclamation obligations and provides assurance that a company is accurately assessing these risks.[113] Ideally AROs incorporate all foreseeable long-term reclamation costs discounted to a present-day value. Underreporting or underestimating AROs can make an unprofitable operation look like it is actually making money because it excludes major liabilities that it will be required by regulation to eventually address. While AROs do not influence Alberta Environment mine financial security policy, they can influence how oil sands mines account for their environmental liabilities and help shape overall investment in a company.

Currently in Canada, publicly traded firms are required to disclose AROs under the Canadian Institute for Chartered Accountants (CICA) standard 3110.[114] The Canadian standard strictly defines AROs as the estimated cost of activities that a firm is legally required to complete to retire its assets. Legal obligation is an obligation that a party is required to settle due to an existing or enacted law, statute, ordinance, or written or oral contract or by legal construction of a contract.[115] Moreover, under CICA 3110, a company cannot report any additional costs should it choose to exceed legal obligations.[116] The disclosure requirements of an ARO will vary among jurisdictions based on the breadth and the specificity of regulations in effect.

In 2011 Canadian firms will be required to use International Financial Reporting Standards (IFRS) and report their ARO under IAS 37.[117] Under these new standards, the scope of an ARO is broadened to include not only the costs to legally fulfill any end of life obligations but also any constructive obligations. Constructive obligations are the costs associated with end-of life activities that go beyond the legal requirements and that have been negotiated with outside

stakeholders. In terms of reclamation, such activities could include recreational paths or nature interpretation signage that have been negotiated with a local community. While the narrower CICA standard was easier to calculate, the planned IFRS standard will have more definitional flexibility.

In the United States, where many oil sands mine operators are registered, accounting disclosure standards are also undergoing significant change. In the wake of the Enron and WorldCom corporate governance scandals, in 2002 Congress passed the Sarbanes-Oxley Act to prevent similar occurrences and to restore investor confidence. One year later, in 2003, publicly traded companies were required, under Financial Accounting Standards Board Statement Number 143, to disclose their annual retirement obligation in their annual reports and in their Securities and Exchange Commission (SEC) 10-K submissions.[118] The SEC plans to adopt the IFRS standards, including the new ARO reporting standards (IAS 37), no sooner than 2015.[119]

3.1.1 Benefits of Asset Retirement Obligations

There are several benefits of the ARO when compared to the current reclamation security policy with the Government of Alberta. Unlike reclamation security policy, the ARO does not represent money that is set aside; rather, it is a quantification of future risk. While certainly imperfect as a tool, it allows mine operators and investors to manage some of the risk associated with funding reclamation efforts. Overall, given current accounting best practices in the Canadian mining industry and given the upcoming adoption of stricter accounting standards in Canada, ARO reporting among oil sands mine operators will become a more important metric for the quality of the reclamation management practices.

3.1.1.1 Longer-term Perspective

While there are significant drawbacks to AROs as a method to assess the reclamation liabilities of oil sands mines, AROs do provide some benefits. They provide a longer-term perspective on the total reclamation costs for an oil sands mine. Under the current reclamation security policy in Alberta, companies are only required to identify the reclamation costs one year into the future; with AROs, companies must disclose the total undiscounted estimated cash flow required to settle reclamation requirements at the end of mine life. The resultant difference between the amount the province collects and the amount budgeted by companies are significantly different. For instance, Suncor, prior to its merger with Petro-Canada, had $271 million in Alberta Environment's EPSF in 2008, while its ARO estimate was $3.5 billion.[120,121] While the ARO estimate does not represent money that is set aside, it does provide an insight on how much a company understands all of its reclamation activities will cost. The methodology employed by the Government of Alberta fails to consider the long-term implications of reclamation liabilities. AROs, although flawed, present a more comprehensive account of these liabilities.

3.1.1.2 Financial Incentive to Minimize Environmental Liabilities

If AROs are calculated well, they can provide financial incentive for companies to improve their environmental management. By bringing external costs onto the balance sheet, upfront mitigation investments, such as early reclamation or putting money aside for reclamation, will demonstrably lower the liability a company carries, making the company more attractive to potential investors.

3.1.1.3 More Transparent Calculation Methodology

Under the new IAS 37, in 2011 public oil sands mining companies traded in Canada will have to report the methods used to determine their ARO and any actual or potential offsets to the liability.[122] The current Government of Alberta policy, on the other hand, does not reveal the methodology used to develop its security estimates. The added transparency in ARO accounting will help investors make more informed decisions about how a company manages environmental liabilities and will provide incentives for companies to invest in mitigation that reduces long-term liabilities.

Also, if any liabilities are excluded, an explanation must be given for their exclusion: "If a fair value of an ARO cannot be reasonably be estimated, that fact and the reasons should be disclosed."[123] This requirement reduces the likelihood that a company simply will not mention a potential liability, even if the technologies do not currently exist to mitigate a liability. Despite the fact that many reclamation costs are excluded in an ARO, their exclusion is noted. Due to the inclusion of constructive obligations in IAS 37, ARO figures will more accurately reflect what a company intends to spend on reclamation activities.

3.1.2 Limitations of Asset Retirement Obligations

3.1.2.1 Uncertainty over New ARO Standards

While AROs are another tool to minimize the risk associated with financing oil sands reclamation, there is still considerable uncertainty over the new IAS standards. In a 2008 report to Canadian mining industry accountants, the accounting consulting firm Deloitte included AROs in their top 10 list of accounting issues as Canada transitions to international accounting standards.[124] The adoption of IAS 37 will, at least in the short term, increase the uncertainty of the accounting landscape for firms in the extractive industry. According to the accounting firm Ernst and Young, under the new IFRS, mining companies' AROs create a "medium" conversion risk to both their financial statement and to their business practice.[125] In other words, there is not an insignificant cost of switching to the new IFRS ARO accounting standards, with respect to their financial statement and their actual business practices. This additional uncertainty will make it more difficult in the short term for both the reporting of AROs by companies and the interpretation of AROs by investors as these new standards are adopted.

3.1.2.2 Significant Underestimation of Reclamation Costs

AROs are also not comprehensive in their accounting of reclamation costs. Current disclosure standards do not require companies to reveal the technical base numbers that are used to calculate the ARO. This exclusion is problematic because the liabilities associated with operational assets are not required to be included in an ARO. In some cases, a mine operator can choose to exclude a tailings lake from an ARO, because it is viewed as an operational asset. As a result, this operator can exclude any associated reclamation costs for tailings lakes in the total ARO. Also, an ARO does not cover the cost of remediation, which, given the potential for groundwater pollution arising from tailing lake seepage, could be significant.[126]

AROs also exclude the liabilities associated with assets of an indefinite life. By classifying assets as having indeterminate life it is possible to significantly manipulate reclamation costs. For

example, historically, oil sands mines have excluded certain assets from their AROs on the basis of an indefinite mine closure date.[127]

> "Syncrude's upgrader facilities have indeterminate lives and therefore the fair values of the related asset retirement obligations cannot be reasonably determined. Also, the timing and amount of the reclamation expenditures, if any, related to Syncrude's sulphur blocks are not determinable at the present time. The asset retirement obligations pertaining to the upgrader facilities and the sulphur blocks will be recognized in the year in which the settlement amounts and dates can be reasonably estimated."[128]

Other oil sands mines reach similar conclusions in their annual reports.[129] The problem, in this case, is that "long-term" has a much different meaning in accounting terms than it does for local communities and ecosystems.

Also if a fair value for a reclamation cost cannot be determined, a company can choose to not include that asset in the ARO calculation. Due to the immense scale of uncertainties around reclamation of oil sands mines (reclamation costs of bogs and fens, sulphur blocks, upgraders, tailing lakes), it stands to reason that AROs only reflect a small, relatively inexpensive, and easily measured fraction of actual reclamation costs. With the regulatory certainty provided by the ERCB's Directive 074 to reduce liquid tailings, there may be less ambiguity for mine operators to exclude tailing lake liabilities in future ARO calculations. If a significant portion of reclamation costs are not measured, the costs and liability assumed by the company become very difficult to manage. This oversight leads to the implicit adoption of significant and potentially material financial impact on oil sands mines and obscures for investors the true costs and profitability — or lack thereof — of oil sands development.

3.1.2.3 Failure to Disaggregate AROs

Under Canadian and U.S. accounting practices, companies are not required to file disaggregate AROs per mine. As a result, unless there is a pure-play oil sands mine operator, an ARO will include a host of reclamation liabilities from other sites. For example, Imperial Oil owns 25% of Syncrude and has substantial upstream oil and gas holdings and downstream refineries and retail sites. As required in an ARO, Imperial Oil aggregates all of its reclamation liabilities into one figure from all of its operations. Consequently, investors will be unable to discern Imperial Oil's oil sands mine reclamation liabilities from the company's larger portfolio. This limits the utility of ARO in informing investment practices specific to the oil sands and the government's ability to manage mine liabilities; companies with significantly higher risk exposure in the oil sands may appear to have minimal exposure when aggregated with other operations. As energy companies increasingly diversify into unconventional production, such as oil sands and oil shale, or into deepwater offshore production, the different levels of risk associated with each production type is unable to be interpreted by risk-averse investors.

4. Estimates of Current Liabilities

Despite the lack of publicly available information on oil sands mine reclamation costs, the Pembina Institute has attempted to provide a brief synthesis on the estimates of reclamation costs based on Government of Alberta data, industry data and a Pembina Institute analysis. Estimates are based on reclamation costs for existing disturbance only and do not consider broader environmental liabilities, such as the costs of reclaiming the initial seismic lines, test pits and road works, damage to airsheds, contamination and disruption of groundwater, the costs associated with greenhouse gas emissions and post-reclamation costs.

4.1 Government of Alberta Estimates

In 2008 the total oil sands security in the EPSF was $645 million,[130] on a disturbance footprint of 49,647 hectares.[131] This represents only $13,221 per hectare.* It is important to note that this figure is an approximation of security coverage, given the lack of publicly available data on mine security estimates. This figure adjusts for the year discrepancy between disturbance reporting in the Annual Conservation and Reclamation Reports and the EPSF estimates. The EPSF estimate does not include the plant site, unlike the disturbance footprint. Syncrude and Suncor, which were approved under the Land Surface Conservation and Reclamation Act, the predecessor to EPEA, have some of their reclamation security calculated based on production.† This number, when compared to other publicly available figures on oil sands reclamation costs, appears inadequately low.

Alberta Environment has been far from consistent in its collection of mine security. Figure 5 illustrates that financial security collected per hectare of disturbed land has increased over time, even when adjusting for inflation.[132] In 1977, $1,112 was collected per hectare of disturbed land by Alberta Environment (in 2010 dollars). By 2008 this number had increased to $13,221 (in 2010 dollars). Our analysis indicates that while this upward trend of more security collected per hectare of disturbed land is positive (see Figure 6), the rationale for this increase is unclear.

There is hardly a level playing field among oil sands mines operators when it comes to collection of reclamation security. Table 2 demonstrates the inconsistent application among oil sands mines of Alberta Environment's reclamation costing methodology, based on 2008 figures. The amount collected per hectare of disturbed land ranges from $3,841 for CNRL's Horizon Mine to $35,536 for Imperial Oil's Kearl Mine. Both mines are at relatively similar stages in development; the Horizon mine just started producing oil in 2009 and Kearl is scheduled to begin producing in

* Appendix B indicates the 2009 annual summary of account balances for oil sands mine operators.

† This production-based liability estimate only applies to Suncor Lease 86/17 and Syncrude Mildred Lake. S. 18(3) Conservation and Reclamation Regulation, Alberta Regulation 115/1993

2012. Legacy producers Suncor and Syncrude also show significant difference in their security collected, likely because Syncrude's Mildred Lake Mine is still using a grandfathered flat-rate security estimate methodology.* Because Alberta Environment and the oil sands mine operators we contacted were unwilling to share their current calculation methodology for mine liability, it is difficult to determine why such significant disparity exists. Whatever the reason for the disparity, a particular mine's deposit held by the EPSF can only be used to draw for the reclamation of that mine. In other words, Alberta Environment cannot draw from other mines' security deposits if it proves insufficient to cover reclamation costs.[133]

Table 2. Company contributions to the Environmental Protection Security Fund

Mine	EPSF Contribution ($ CAD)	Net Disturbed Land (hectares)	EPSF/Net Disturbed ($/hectare)
Suncor (Steepbank & Millenium)	$271,319,713	16,730	$16,218
Syncrude (Aurora & Mildred Lake)	$165,623,662	17,267	$9,592
Muskeg River	$73,238,264	5,269	$13,900
Fort Hills	$14,243,667	2,596	$5,488
Horizon	$27,552,040	7,173	$3,841
Jackpine	$93,450,723	3,112	$30,029
Kearl	$98,400,000	2,769	$35,536

Source: Alberta Environment, 2008 Environmental Protection Security Fund Annual Report and 2008 Annual Conservation and Reclamation reports for various oil sand mine operators

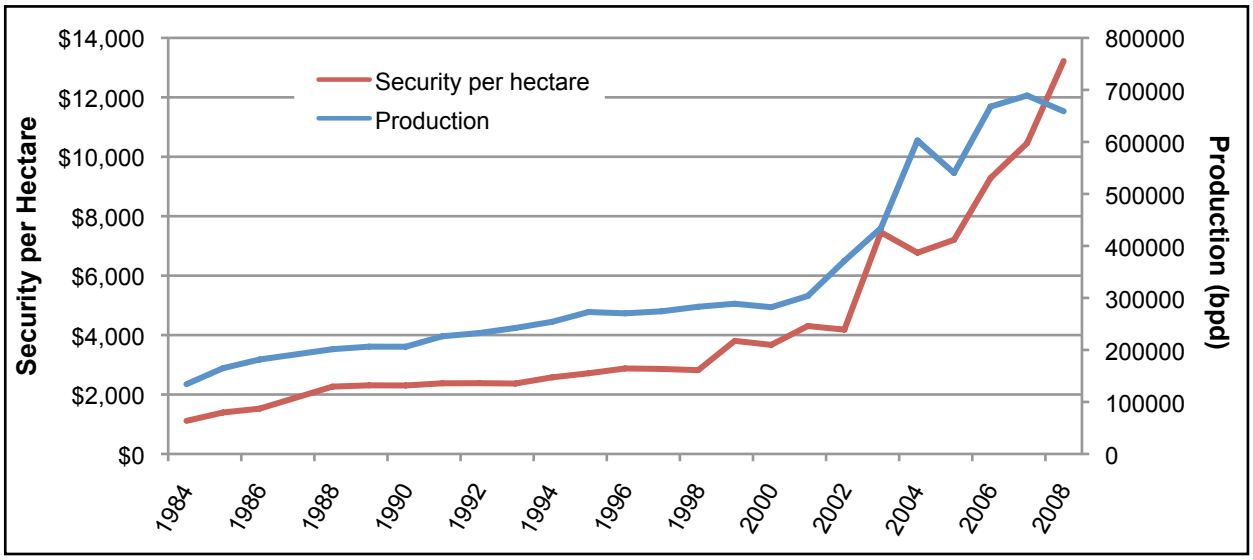

Figure 5. The amount of security deposits from oil sands mines held in the Environmental Protection Security Fund per hectare of disturbance (inflation-adjusted) compared to the production of synthetic crude oil per day produced from oil sands mines over time

Source: Annual Environmental Protection Security Fund reports and ERCB oil sand mine production data

Note: Data from 1987 was unavailable.

* Suncor's Lease 86/17 also has a grandfathered flat-rate estimate for reclamation, although it is no longer in production. (Alberta Environment, personal communication, January 2010.)

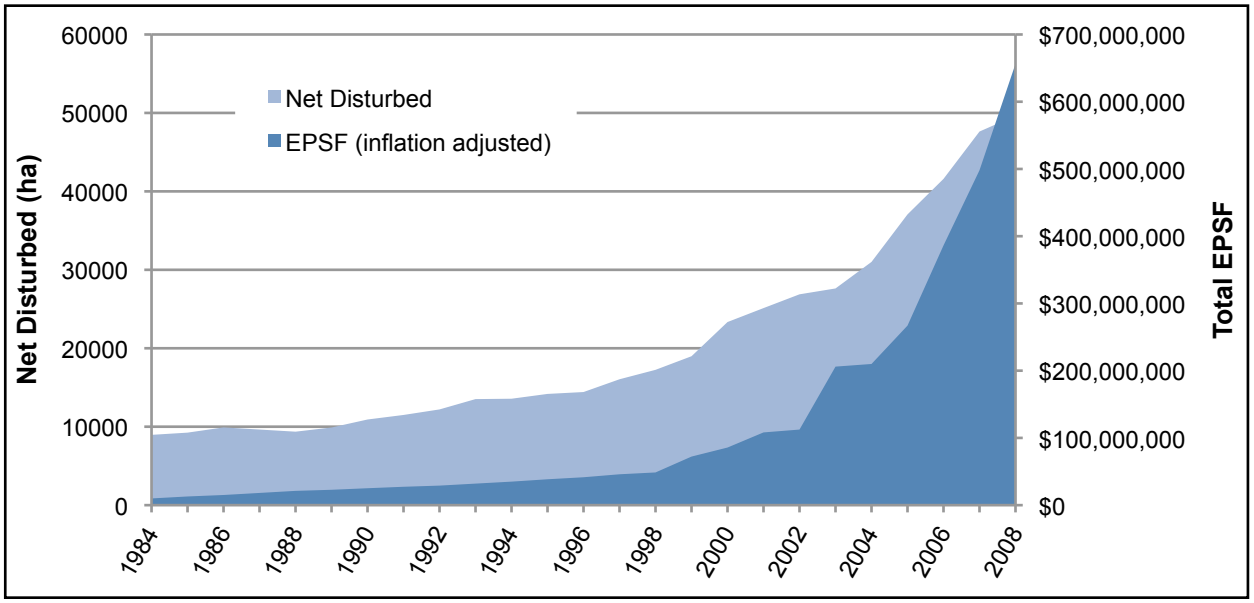

Figure 6. Total security deposits from oil sands mines in the Environmental Protection Security Fund (inflation-adjusted) and the net disturbed land from oil sands mines over time

Source: Alberta Environment data and Annual Environmental Protection Security Fund reports

Note: Data from 1987 was unavailable.

4.2 Industry Estimates

Oil sands mining industry representatives provided even less information than Alberta Environment on what mining companies actually spend on reclamation. Suncor, Shell and Syncrude were unwilling to provide any data on what they spend on reclamation, although Shell and Suncor were willing to discuss in general terms how they accounted for reclamation costs. The Oil Sands Developers Group, Canadian Association of Petroleum Producers, Alberta Chamber of Resources, and the Canadian Land Reclamation Association were unable to provide generalized industry standard costs for reclamation. Three academics from the University of Alberta, approached during the course of this study, who work on oil sands mine reclamation research, were unwilling or unable to provide cost estimates as well.

Despite the lack of publicly available data from industry on the costs associated with oil sands mine reclamation, we were able to obtain some financial information from a number of public sources. Some reclamation experts suggest that revegetation alone could cost $200,000 per hectare.[134] In 2006 Syncrude spent a total of $30.5 million on reclamation activities on 267 hectares — or about $114,000 per hectare.[135] This number is for a relatively straight-forward upland site without significant remediation issues. Low-lying bogs and fens, which once occupied approximately 40% of the oil sands mine-affected landscape, are much more costly to reclaim. Syncrude has spent $50 million experimenting with the reclamation of a 54-hectare fen, which corresponds to $926,000 per hectare.[136] While this price per hectare is not representative of the total cost to reclaim the land, it does indicate that an oil sands operator cannot, with current technology, find a lower priced, practicable alternative to reclaim a fen. Tailings lakes are also costly to reclaim. Suncor plans to spend billions of dollars in its West Side Lake Closure initiative over the next 10 years.[137] Some of the major issues around soil contamination from naphthenic acids and salt have yet to be addressed.

Often the technology to reclaim a landscape is not yet scalable to an entire landscape. Suncor plans to spend $450 million on commercial implementation of new tailings and reclamation technologies.[138] Though one Suncor reclamation researcher readily admits that, "large scale reclamation of this magnitude has not yet been optimized in terms of costs, it is difficult to assign a dollar value per hectare."[139]

One thing is certain: the amount oil sands mining companies are investing in reclamation is increasing. Syncrude increased its annual reclamation spending from $20 million in 2003 to $140 million in 2010.[140,141]

An industry representative cited that most oil sands mining companies spend $30,000 to $75,000 per hectare on reclamation; a respected mine reclamation engineer has also quoted $50,000 per hectare.[142] Given that Alberta Environment is expecting to reclaim an oil sands mine for an average of $13,000 per hectare, it is unclear how the provincial government can expect to pay two to four times less than industry's ever-inflating reclamation costs.

4.3 Pembina Institute Estimates

Given the extremely limited publicly-available information on liabilities for oil sands mines, the Pembina Institute has attempted to provide its own estimate for the potential reclamation liabilities of oil sands mining in Alberta. During the course of the analysis, Pembina researchers endeavoured to use the most accurate data possible. When there was lack of oil sands specific data, proxies from related industries were sought. Comparisons with reclamation costs for mountain and prairie coal mines in the Alberta were not possible due to the unique habitat and operations associated with oil sands mining. Pricing individual products and services involved in oil sands mine reclamation was also treated as confidential for the companies we consulted. Furthermore, many of the liabilities associated with oil sands mining are apparently unknown even to the mine operators, as indicated in their ARO filings in their annual reports.* Given this uncertainty, it would appear prudent to ensure that reclamation securities accounted for this contingency.

Similar to industry reclamation security estimates, the liabilities associated with pre-EPEA approval disturbance, processing and upgrader plant site remediation, sulphur and coke stockpiles, groundwater disruption and contamination from tailings ponds, post-operation maintenance and monitoring and post-reclamation certification were excluded from the total liability estimate. Furthermore, the estimate is not based on full-cost or lifecycle accounting, which means only disturbance to date is considered and not disturbance over the entire life of the mine. Therefore it is reasonable to assume that the figures presented are very conservative and comparable to the reclamation security estimates submitted by industry to Alberta Environment.

Our estimate, based on 2008 figures, includes the costs to reclaim the total amount of land disturbed by oil sands mining, the cost to reclaim all tailings inventory and an uncertainty or

* Unknown liabilities include, but are not limited to, the following: pre-EPEA approval disturbance, processing and upgrader plant site remediation, sulphur and coke stockpiles, post-operation monitoring and maintenance, and post-certification monitoring and remediation. (Canadian Oil Sands Trust 2009 Annual Report, page 32; Suncor 2009 Annual Report, page 92.)

contingency factor of 20%.* The costs of reclaiming disturbed land is based on the potentially underestimated industry average of $30,000 to $75,000 per hectare.[143] This figure does not include the costs to reclaim wetland habitat and tailing ponds, to remediate contaminated land, surface water or groundwater, or to address any cumulative effects caused by the mine and is therefore considered conservative.

Very limited information exists on the costs to remediate oil sands tailings lakes. The Government of Alberta estimates there are 840 million cubic metres of tailings inventory covering an area of 170 square kilometres.[144] Currently, Alberta Environment does not have any reclamation standards for tailings lakes, and no technology has been proven to remediate a tailings lake. Those technologies that do exist, such as consolidated tailings and thickeners remain expensive to implement. For our lower-bound estimate we used the cost to use consolidated tailings at $13.09 per tonne of tailings. For our upper-bound estimate we used the cost of a thickener technology without cyclones at $16.40 per tonne of tailings.[145] Bioremediation, while still experimental, is projected to cost $15 to $50 per tonne of tailings.[146] Based on Alberta Environment data on the current tailings inventory, the cost to remediate all tailings, excluding groundwater contamination, could range from $8 billion to $10 billion.

A contingency of 20% was then added to the sub-total of land and tailing reclamation costs. This amount of contingency is commonly used by the Government of Canada to calculate mine liability in Canada's North.[147] The total amount of the EPSF in 2008 was subtracted from the sub-total to avoid double-counting any reclamation security already in place

Based on the limited government and industry data and projecting it across the entire area disturbed by oil sands mines, we conservatively estimate that reclamation liabilities for oil sands mines, based on their 2008 disturbance footprint, is CAD $10–15 billion.† This figure is 16 to 24 times more than the security held by Alberta Environment for oil sands mines for that year. If this liability had to be paid for by the Government of Alberta, it would cost each Albertan between $4,300 and $6,300.[148] This works out to $3.18 to $4.70 per barrel in reclamation liabilities created by oil sands mining. To put this into comparison, the Canadian Oil Sands Trust puts 13.2 cents per barrel into a reclamation trust.[149] Because this analysis only contains reclamation costs, tailing remediation costs and a 20% contingency factor, it is considered roughly comparable to Alberta Environments reclamation security estimates.

Up to $15 billion in reclamation liabilities have accrued from over 40 years of oil sand mining, mostly from only two mines. Projected 2010 oil sands mine production is expected to be 912,000 barrels per day from five mines.[150] Considering that over 3.3 million barrels per day of oil sands mining projects are currently either operating or planned,[151] without significant improvements in reclamation technologies, it is highly likely that the financial liabilities of oil sands mining will continue to increase.

Projections for industry-wide liabilities in 2025 were also estimated. Using a 30-year relationship of historic annual synthetic crude production and the historic annual land disturbed from oil sands mines (see Figure 7), it is possible to extrapolate the amount of land that could be

* Due to the lack of consistently available data, 2008 was used as the base year for the calculation of the estimate.

† Calculations for these estimates are explained in Appendix A.

disturbed in 2025 based on synthetic crude production estimates from CAPP.[152] The amount of tailings in 2025, 1.1 billion cubic metres, are based on Alberta Environment estimates, assuming all oil sands mine operators with be Directive 074 compliant.[153] Because not all companies are currently compliant with Directive 074,[154] this estimate takes into account a degree of technological innovation over time.

Based on these assumptions, our analysis indicates that in 2025 oil sands mining liabilities will increase to CAD $17–33 billion.* If the current security collected by Alberta Environment per hectare of mining disturbance remains constant, the liability posed by oil sands mining will be 9 to 16 times higher than what is projected to be in the EPSF in 2025.

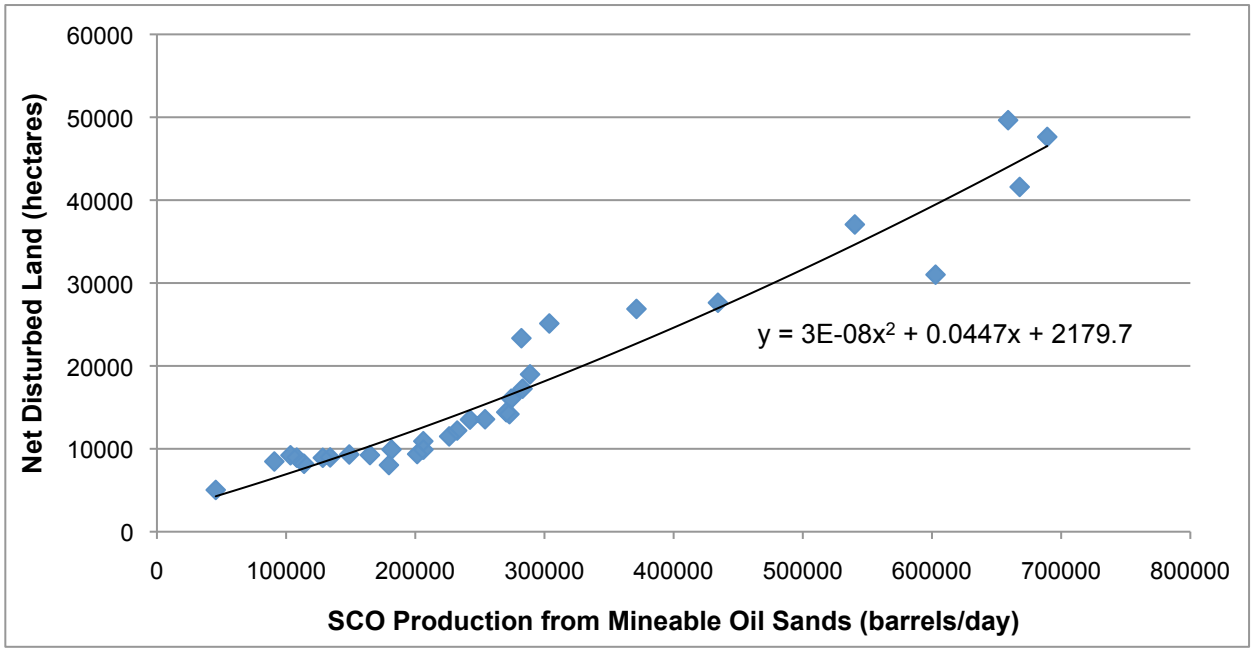

Figure 7. Relationship between net disturbed land and SCO production from mineable oil sands
Source: Data obtained from ERCB and Alberta Environment

* 2025 cost projections are not discounted or inflation-adjusted. Calculations for these estimates are explained in Appendix A.

5. Conclusion and Recommendations

The Pembina Institute conservatively estimates the current reclamation liability of oil sands mine reclamation could be as high as $15 billion based on their 2008 disturbance footprints.* This represents a $4.70 per barrel liability and a potential financial risk of $6,300 for every income taxpayer of Alberta. The actual environmental liabilities created by oil sands mine is much higher than $15 billion, because both reclamation security estimates accepted by Alberta Environment and the Pembina Institute figures do not consider broader environmental liabilities, such as the costs of reclaiming the initial seismic lines, test pits and road works, damage to airsheds, contamination and disruption of groundwater, the costs associated with greenhouse gas emissions and post-reclamation costs.

Decisive action needs to be taken by the Government of Alberta to limit the growing financial and environmental liabilities facing Albertans from risks associated with oil sands mining reclamation. This action would not only provide concrete evidence that Alberta is committed to responsible oil sands development but also demonstrate much-needed environmental leadership. Given the unprecedented scope and scale of reclamation challenges in the oil sands, it is essential that Alberta have a world-class financial security program to protect Albertans and the environment from the long term liabilities associated with reclamation of oil sands mines. Several easily-achievable opportunities exist for the Government of Alberta and the Government of Canada to address the significant challenge of improving the transparency and sufficiency oil sands mine liability management in Alberta.

5.1 Transparency

5.1.1 Widen Policy Consultation

Closed-door meetings between industry and government continue to impair the development of a transparent and sufficient mine liability policy in Alberta. Future mine liability policy reform will necessarily involve a wider, more democratic consultation. To increase the transparency, sufficiency and political acceptability of a new mine liability policy, it is critical to hear the perspective of not only industry but also environmental groups and communities affected by mining.

Convene a public consultation process on reclamation security deposits

During the development of Alberta's Environmental Protection and Enhancement Act and the recent Water for Life strategy, the Government of Alberta conducted a thorough public

* See Appendix A for the calculation methodology.

consultation process. A similar review is warranted on the process of calculating, auditing, collecting and managing security deposits.

Undertake an independent third-party review to identify the total environmental liabilities from oil sands mines

Initiated by the Government of Canada, this review will ensure clarity for Canadians and oil sands operators alike and will ensure that sufficient money is collected to protect Canadians from all potential liabilities. The liabilities assessed in this review will go beyond the reclamation liabilities, as defined by Alberta Environment, to include the liabilities associated with pre-EPEA approval disturbance, processing and upgrader plant site remediation, sulphur and coke stockpiles, groundwater disruption and contamination from tailings ponds, post-operation maintenance and monitoring and post-reclamation certification. This third party review should be completed by a team of independent scientists, accountants, engineers and Traditional Ecological Knowledge specialists. Having the review convened by the Government of Canada will enhance the legitimacy and sense of independence of any liability estimate compared to having the review conducted by the Government of Alberta.

5.1.2 Improve Information Availability

Raising the level of public awareness of the energy industry is a critical concern for government, industry and environmental groups. Part of ensuring there is balanced, publicly available information is accurately reporting the potential liabilities associated with oil sands mining.

Provide online access to reclamation security calculations

Currently, Alberta Environment and oil sands mine operators consider how they estimate their reclamation security to be confidential. All that is disclosed to the public is the total value of the letters of credit submitted. The methodology used to calculate a mine's reclamation security should be posted on a publicly-available website. Sharing the methodology behind their estimates will demonstrate transparency and improve trust among shareholders and stakeholders and increase the credibility of the Alberta Environment as the environmental regulator of the oil sands, while respecting proprietary information.

Provide online access to annual conservation and reclamation reports

Existing Alberta Environment policy only requires companies to submit paper copies of their annual conservation and reclamation reports. These reports are only available in the Government of Alberta library in Edmonton. By posting these reports online and by making these reports comparable increases the accountability of companies not only to Alberta Environment but also to the public.

Maintain an online reclamation progress indicator

Under current policy, there is very poor public record keeping of oil sands mine reclamation progress. For instance, according to the Government of Alberta, only 0.16% of the total land disturbed by oil sands mining is certified as reclaimed: Syncrude's 104-hectare Gateway Hill site. The details of this reclamation certificate can only be accessed through a *Freedom of Information and Protection of Privacy Act* request. Industry asserts that 11% of the total land disturbed land by oil sands mining is reclaimed. However, the detailed information that

corroborates industry's reclamation claim is considered proprietary and not publicly available. There is no possible method for Albertans or shareholders to determine if industry's reclamation numbers are accurate. By maintaining an online dashboard of reclamation progress that uses comparable indicators, both government and industry can demonstrate transparency and leadership in their efforts to reclaim oil sands mines.

Enhance liability disclosure in company annual public financial reports

Investors need an accurate understanding of a mine's liabilities. Securities commissions require publicly traded companies to disclose AROs and other environmental liabilities in a company's annual reports. Yet, significant improvements can be made to the utility of AROs as a metric of a company's management of environmental liabilities. In particular, the estimation of assets with uncertain retirement costs can be clarified, and ARO estimates can be disaggregated to show liabilities for each mine site. Operators should be required to assign a lifespan to those assets with a long lifespan. Uncertain technologies, such as tailings reclamation technologies are also exempt from ARO calculations. The ERCB can also give regulatory certainty for what technologies are feasible, compelling companies to report the liabilities of these technologies in their ARO. We recommend the Canadian Securities Administrators, which sets national disclosure requirements, provide more certainty on disclosure requirements on long-term reclamation liabilities, such as disaggregating an ARO along oil and gas production types, such as oil sands mining operations. With improved disclosure, investors can make more informed decisions.

5.1.3 Create Accounting Safeguards

Demonstrating the oil sands industry achieves international accounting standards is another method to regain public credibility and allay increasing shareholder concern over the growing liabilities of mining oil sands.

Require third-party verification of mine liability estimates

Third-party verification acts as a safeguard if mine liabilities are significantly underestimated. While all oil sands mines already use third-party accounting firms to verify their ARO, Alberta Environment does not require any third-party verification for the financial security that they collect. This puts considerable risk on Alberta Environment staff to ensure these estimates are accurate and places considerable risk on the Government of Alberta should there be significant under-estimation of liabilities. By requiring this additional measure, Alberta Environment can demonstrate a fiscally conservative approach to mine liability management.

Require sign-off on liability estimates by chief executive officer, chief financial officer or designated financial representative

Currently Alberta Environment does not require any sign off for liability estimates by any financial executives from oil sands mines. Requiring a sign-off may hold the executives legally liable for the accuracy of the assessments and will raise awareness of the magnitude of potential liabilities among senior staff and also demonstrate to shareholders and the public that addressing liabilities is a priority for the company.

5.2 Sufficiency of Liability Estimates

Despite the host of methods that exist in Canada to estimate financial assurance (reclamation cost worksheets, flat-rate fees per hectare, asset to liability ratios) when a mining company has been unable to pay for reclamation costs, the financial assurance as required by legislation has often been insufficient.[155] In these cases, the actual funding to avoid major shortfalls in cleanup costs had to be provided by government using public funds with little expectation of cost recovery.[156] More often than not, it has been the application of financial security requirements that has proven to be a weak link in existing legislation.[157] This underlines the need for robust regulatory backstops and financial incentives to prevent host governments from assuming these costs.

Insufficient financial surety is not simply a problem of developing countries. There certainly have been instances in Canada and other developed countries, when mines have closed due to economic difficulties, that the surety collected by government has proven insufficient to address mine liabilities.[158]

Our conservative analysis indicates that based on a 2008 disturbance footprint, reclamation liabilities of oil sands mines may be in the order of $10–15 billion, while Alberta Environment has only collected reclamation security totaling $645 million for 2008. This suggests there are considerable unaccounted liabilities that have the potential to affect the bottom line of shareholders, the Government of Alberta and, ultimately, Albertans.

We recommend to the Government of Alberta that the sufficiency of mine liability estimates could be improved by creating an oil sands mine liability program, expanding liability coverage, incorporating a full-cost approach, including a post-operation monitoring and maintenance deposit, standardizing mine liability estimates, create a staged reclamation certification process, prevent the use of an asset to liability ratio, and create an independent third party review to identify the total liabilities from oil sands mines.

Oil sands mine liability program

This report has shown that although Alberta Environment collects financial security from oil sands mines, it does not sufficiently manage the liabilities, failing to account for a significant amount of liabilities and failing to reduce the risk borne by Albertans. Alberta Environment could create a program to not simply collect but also reduce the broader liabilities of oil sands mining. In so doing, they could reduce the risk faced by shareholders and Alberta taxpayers.

Expansion of liability coverage

Currently, the security collected by Alberta Environment is significantly underestimating the actual financial liabilities of oil sands mines. Bitumen extraction/processing facilities and related infrastructure are not included. Moreover, liabilities associated with aspects of operations with an indeterminate life, high uncertainty and any effects resulting from improper operation of a facility should also be included. Just as all oil sands mines in Alberta must account for greenhouse gas emissions, these mines should also account for all reclamation liabilities. By including additional infrastructure and enlarging operational oversight encompassed in the reclamation security estimate, the accounting methodology becomes more representative of the area needing reclamation and creates a more accurate and reliable balance sheet for investors and the government. As a result, the uncertainty facing mine operators, shareholders and the Government of Alberta is reduced.

Full-cost accounting approach

Industry should be responsible for liabilities associated with each phase of a project. This includes liabilities related to pre-EPEA approval disturbance, suspension, abandonment, remediation, surface reclamation and post-operation monitoring and maintenance prior to land certification. The sufficiency of liability management should not be based on simply the next year's predicted disturbance, but on the full cost of the project from start to finish. This change will require oil sands mines to forecast their liability much farther into the future, reducing uncertainty and potentially the effort put into annually adjusting their liability estimate.

Require reclamation insurance policies with government sign-off

In this way, the reclamation insurance held by oil sands mines becomes an insurance policy for the Government of Alberta and Alberta taxpayers. It would be held in addition to current reclamation security collected by Alberta Environment. Just as young and healthy people have health and life insurance, solvent and financially responsible mines should also have this insurance policy. It is a matter of due diligence on the part of the mine. When applied evenly to all mines in Alberta, requiring reclamation is not an unreasonable hindrance.

Standardize oil sands mine industry liability estimates

Currently, each mine operator employs a different methodology to calculate their reclamation liabilities. These methodologies are not required to be independently audited. For example, the accounting methodology for Suncor's 86/17 lease and Syncrude's Mildred Lake facility is based on production levels as opposed to disturbed area. Standardized security calculations should be used that are based on accounting and engineering standards that are independently audited. No grandfathering of older calculation methodologies or regulations should be permitted. This will ensure that all oil sands companies are treated fairly and consistently by the Government of Alberta.

Create a staged reclamation certification process

Achieving final reclamation certification is difficult and expensive. For instance, according to the Government of Alberta, only 0.16% of the total land disturbed by oil sands mining is certified as reclaimed: Syncrude's 104-hectare Gateway Hill site. Meanwhile, industry asserts that 11% of the total land disturbed land by oil sands mining is reclaimed, without any government-certified information to support this claim. Certifying and reporting on interim reclamation milestones, such as creating solid, or trafficable, surfaces on tailing disposal sites, completing earthmoving or successful planting of vegetation, would help provide accountability to industry and government. A staged reclamation certificate also provides standardized evidence that reclamation is proceeding, assisting industry to maintain their social license and providing justification for returning a portion of the collected security. Transfer of liability to the Government of Alberta would still only occur with a final reclamation certificate and companies would still have access and control of land before final certification.

Prevent the use of an asset to liability ratio

Asset to liability ratios are an increasingly common way to manage risk around oil and gas development. In Alberta the ERCB uses an asset to liability ratio to manage liabilities for in-situ oil sands development. It is built around the principle that all surface disturbances are liabilities

(costs of suspension, abandonment, remediation and surface reclamation) and future production or throughput from operations is an asset. It compares the inherent value of an in-situ mineral lease (based on its economics) to associated suspension, abandonment, remediation and surface reclamation liabilities (arising from site development) to ensure the mine has sufficient assets to cover those liabilities. This approach is problematic because the very asset that created the liabilities in the first place is being used to pay for existing liabilities. In other words to pay for existing liabilities, the new owner of the insolvent mine — the Government of Alberta — would have to further develop the mine and create additional liabilities to afford the reclamation needed from the previous owner. Further, there could be scenarios in which the asset is no longer operational. For example, an industrial accident at a mine could render it inoperable, thereby requiring new capital investment by the Government of Alberta to mine the remaining asset to pay for the reclamation. Another possibility is that the mine could have been abandoned because the project economics no longer work (i.e., costs exceeds revenue at market prices). Having the government assume control of the mine and extract oil sands in this situation to pay for reclamation costs is ill-advised.

Appendix A: Reclamation Security Calculations

Given the extremely limited publicly-available information on liabilities for oil sands mines, the Pembina Institute has attempted to provide its own estimate for the potential reclamation liabilities of oil sands mining in Alberta. During the course of the analysis, Pembina researchers endeavoured to use the most accurate data possible. When there was lack of oil sands specific data, proxies from related industries were sought. Comparisons with reclamation costs for mountain and prairie coal mines in the Alberta were not possible due to the unique habitat and operations associated with oil sands mining. Pricing individual products and services involved in oil sands mine reclamation was also treated as confidential for the companies we consulted. Furthermore, many of the liabilities associated with oil sands mining are apparently unknown even to the mine operators, as indicated in their ARO filings in their annual reports.* Given this uncertainty is would appear prudent to ensure reclamation securities accounted for this contingency.

Similar to industry reclamation security estimates, the liabilities associated with pre-EPEA approval disturbance, processing and upgrader plant site remediation, sulphur and coke stockpiles, groundwater disruption and contamination from tailings ponds, post-operation maintenance and monitoring and post-reclamation certification were excluded from the total liability estimate. Furthermore, the estimate is not based on full-cost or lifecycle accounting, meaning only disturbance to date is considered and not over the entire life of the mine. Therefore it is reasonable to assume that the figures presented are very conservative and comparable to the reclamation security estimates submitted by industry to Alberta Environment.

Due to the lack of consistently available data, 2008 was used as the base year for the calculation of the estimate. The amount of net land disturbed from oil sands mines from 1978 to 2008 was obtained by request from Alberta Environment. The total oil sand mine production from 1978 to 2008 was obtained by request from the ERCB. The total liability for oil sands mines as listed from the EPSF in 2008 was obtained from Alberta Environment upon request. Using the net land disturbed from oil sands mines and dividing it by the total liability held for oil sands mine it was possible to determine a secure liability rate per hectare ($13,000). This rate was then applied to the projected net land disturbed in 2025 (140,661 hectares) to determine the estimated 2025 EPSF security for oil sands mines at $1,828,659.

The costs of reclaiming disturbed land are based on the potentially underestimated industry average of $30,000 to $75,000 per hectare.[159] This figure does not include the costs to reclaim wetland habitat and tailing ponds, to remediate contaminated land, surface water or groundwater,

* Unknown liabilities include, but are not limited to, the following: pre-EPEA approval disturbance, processing and upgrader plant site remediation, sulphur and coke stockpiles, post-operation monitoring and maintenance, and post-certification monitoring and remediation. (Canadian Oil Sands Trust 2009 Annual Report, page 32; Suncor 2009 Annual Report, page 92.)

or to address any cumulative effects caused by the mine and is therefore considered conservative.

Very limited information exists on the costs to remediate oil sands tailings lakes. The Government of Alberta estimates there are 840 million cubic metres of tailings inventory covering an area of 170 square kilometres.[160] The inventory (720,000,000 cubic metres), weight (617,825,868 tonnes) and area (13,000 hectares) of tailings lakes in 2008 was determined from ERCB data.[161] The ore processed to date was calculated using a ratio from Syncrude.[162]

Currently, Alberta Environment does not have any reclamation standards for tailings lakes, and no technology has been proven to remediate a tailings lake. Those technologies that do exist, such as consolidated tailings and thickeners remain expensive to implement. Tailing technology costs for a tailings thickening process with and without cyclones and a consolidated tailings were determined from a 2010 Alberta Energy Research Institute report that outlined the costs per cubic metre of ore processed.[163] For our lower bound estimate we used the cost to use consolidated tailings at $13.09 per tonne of tailings and for our upper bound estimate we used a thickener technology without cyclones at $16.40 per tonne of tailings.[164] Based on Alberta Environment data on the current tailings inventory, the cost to remediate all tailings, excluding groundwater contamination, could range from $8 billion to $10 billion. These costs did not include any earthmoving or revegetation costs. Therefore the $30,000 to $75,000 per hectare cost to reclaim land was also applied to the area covered by tailings lakes.

The cost per ton to remediate tailings was also estimated for three other technologies: bioremediation, the Bitmin process or the Gradek process. The Pembina Institute did not take into account any of these technologies in our calculations because of their experimental nature. Bioremediation costs using technology from Fiton Technology is projected to cost $15–50 to reclaim a tonne of tailings.[165] The Bitmin process is estimated to cost $2 to $2.5 per tonne to reclaim.[166] The Gradek process is estimated to cost $2.6 to $4 per tonne to reclaim.[167] All of these costs do not include the earthmoving and revegetation costs.

The cost to reclaim the total disturbed area and to reclaim tailings lakes using the high and low price selected technologies was subtotaled. To this sum a contingency factor of 20% was added to the upper and lower bound estimates. While not totally accepted by the policy community, given the uncertain and conservative estimates this analysis, a contingency factor of 20% was used. This figure is commonly used by the Government of Canada to calculate mine liability in Canada's North.[168]

After the contingency was added, the total amount of the EPSF in 2008 was subtracted to avoid double containing any reclamation security already in place. The result was an estimate of the total unaccounted reclamation liability of oil sands mines in Alberta: $10–15 billion, 16 to 24 times greater than Alberta's EPSF fund, $3.18 to $4.70 of liability per barrel of oil produced and representing a potential liability of $4,277 to $6,312 for every Alberta taxpayer. Per barrel mine liability was calculated from data supplied by the ERCB for total barrels of synthetic crude oil produced from oil sands mines from 1967 to 2008.* The number of Alberta taxpayers was obtained from the Canada Revenue Agency.†

* This amounts to 3,379,165,317 barrels of synthetic crude oil.

† This amounts to 2,473,657 taxpayers in Alberta as of July 1, 2010. This figure includes those who filed taxes with no stated income or with more credits than taxes.

Up to $15 billion in reclamation liabilities have accrued from over 40 years of oil sand mining, mostly from only two mines. Projected 2010 oil sands mine production is expected to be 912,000 barrels per day from five mines.[169] Considering that over 3.3 million barrels per day of oil sands mining projects are currently either operating or planned,[170] without significant improvements in reclamation technologies, it is highly likely that the financial liabilities of oil sands mining will continue to increase.

Projections for industry-wide liabilities in 2025 were also estimated. Using the CAPP Growth scenario for total oil sands mine production in 2025,[171] the amount of disturbed land in 2025 can be calculated. This is done using a 30 year relationship of synthetic crude bitumen production to land disturbed from 1978 to 2008 and extrapolated to 2025 using a regression analysis (R^2=0.93) (Figure 8). The amount of tailings in 2025, 1.1 billion cubic metres, are based on Alberta Environment estimates, assuming all oil sands mine operators will be Directive 074 compliant.[172] Because not all companies are currently compliant with Directive 074,[173] this estimate takes into account a degree of technological innovation over time. Using the projected 2025 tailing inventory, the amount or ore processed was calculated and, in turn, the costs for thickener and consolidated tailings technology.

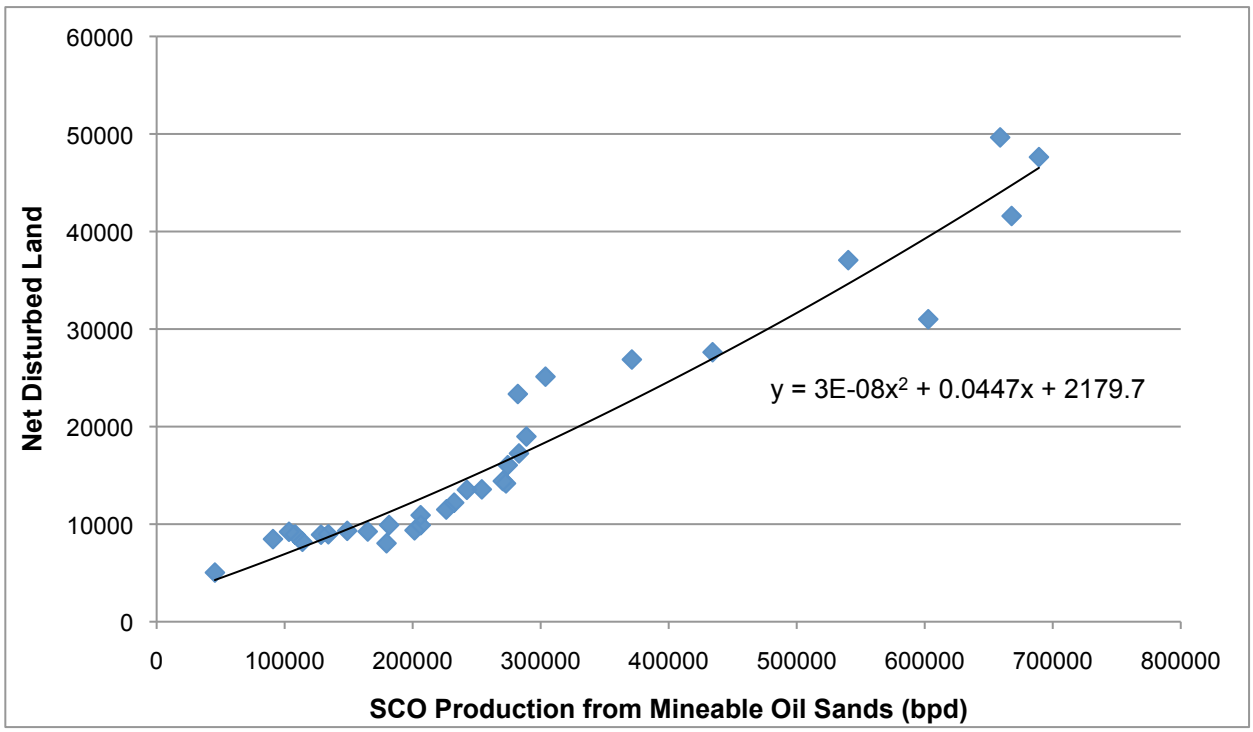

Figure 8. Relationship of synthetic crude bitumen production to net land disturbance (1978-2008)
Source: Data obtained from ERCB and Alberta Environment

Based on these assumptions, our analysis indicates that in 2025 oil sands mining liabilities will increase to CAD $17–33 billion.* If the current security collected by Alberta Environment per hectare of mining disturbance remains constant, the liability posed by oil sands mining will be 9 to 16 higher than what is projected to be in the EPSF in 2025.

* 2025 cost projections are not discounted or inflation-adjusted.

	2008	2025
Land Disturbed (ha)	49646.6	140661.23
Total Oil Sands Mine Production (bbl of SCO)	658935.2617	1529000
EPSF Total Liability	$645,428,069	$1,828,659,084
Reclamation cost (low @ $30k/ha)	$1,489,398,000	$4,219,836,900
Reclamation (high @ $75k/ha)	$3,723,495,000	$14,066,123,000
Area of Tailings ponds (ha)	13,000	19,861
Mature Fine Tailings Inventory (tonnes)	617,825,868	943,900,632
Mature Fine Tailings Inventory (m^3) (1 m^3 of tailings = 0.85 tonnes)	720,000,000	1,100,000,000
Ore Processed to date (m^3) (1 m^3 of ore = 0.266 m^3 of tailings)	2,706,766,918	4,135,338,347
Thickener (w/o cyclones) ($3.71 /$m^3$ of ore processed or $16.40/tonne of tailings)	$10,042,105,267	$15,342,105,269
Thickener (w/cyclones) ($3.66 /$m^3$ of ore processed or $16.18/tonne of tailings)	$9,906,766,921	$15,135,338,352
Consolidated Tailings (treating external MFT @ $13.09/tonne of ore processed)	$8,012,030,078	$12,240,601,509
Bioremediation Costs (low @ $15/tonne of tailings)	$9,267,388,020	$14,158,509,475
Bioremediation Costs (high @ $50/tonne of tailings)	$30,891,293,400	$47,195,031,583
Bitmin Process (low @ $2/tonne of tailings)	$1,235,651,736	$1,887,801,263
Bitmin Process (high @$2.5/tonne of tailings)	$1,544,564,670	$2,359,751,579
Gradek (organic polymers) (low @ $2.6/tonne of tailings)	$1,606,347,257	$2,454,141,642
Gradek (organic polymers) (high @ $4/tonne of tailings)	$2,471,303,472	$3,775,602,527
Subtotal Low (CT)	$9,501,428,078	$16,460,438,409
Subtotal High (Thickener w/o cyclones)	$13,765,600,267	$29,408,228,269
Contingency Factor of 20% (low)	$1,900,285,615.66	$3,292,087,681.70
Contingency Factor of 20% (high)	$2,753,120,053.41	$5,881,645,653.82
Less the EPSF Total Liability	$645,428,069	$1,828,659,084
Pembina Total Liability (Low - using CT)	$10,756,285,624.70	$17,923,867,005.84
Pembina Total Liability (High - using Thickener w/o cyclones)	$15,873,292,251.21	$33,461,214,838.56
Times more than EPSF (Low)	16.66535147	9.001370758
Times more than EPSF (High)	24.59343342	16.08185392
Per Albertan (Low)	$4,277.44	$7,127.76
Per Albertan (High)	$6,312.31	$13,306.48
Per Barrel Liability (Low)	$3.18	n/a
Per Barrel Liability (High)	$4.70	n/a

Appendix B: 2009 Oil Sands Securities

Adapted from Alberta Environment's 2009 *Environmental Protection Security Fund Annual Report*

Company Name		Value of Security
Suncor Energy Mines (Steepbank and Millenium)	**Total**	**$285,016,245.00**
Syncrude Mines (Aurora and Mildred Lake)	ConocoPhillips Canada Resource Corporation	$16,557,502.00
	Imperial Oil Ltd.	$45,840,261.00
	Canadian Oil Sands, Ltd.	$67,366,847.00
	Mocal Energy Ltd.	$9,168,052.00
	Murphy Oil Company Ltd.	$9,168,052.00
	Nexen Oil Sands Partnership	$13,257,003.00
	Petro-Canada	$22,003,325.00
	Total	**$183,361,042.00**
Kearl Mine	ExxonMobil Canada Propoerties	$28,600,000.00
	Imperial Oil Resources Ventures Ltd	$69,800,000.00
	Total	**$98,400,000.00**
Muskeg River Mine	Chevron Canada, Ltd.	$17,132,111.00
	Marathon Oil Canada Corporation	$17,132,111.00
	Shell Canada Energy Ltd.	$51,396,334.00
	Total	**$85,660,556.00**
Jackpine Oilsands Mine	Marathon Oil Canada Corporation	$10,840,470.00
	Shell Canada Energy Ltd.	$32,521,413.00
	Chevron Canada, Ltd.	$10,840,470.00
	Total	**$54,202,353.00**
Fort Hills Mine	Petro-Canada	$41,229,449.40
	Teck Cominco Ltd.	$13,743,149.80
	UTS Energy Corporation	$13,743,149.80
	Total	**$68,715,749.00**
CNRL Horizon Mine	**Total**	**$45,128,193.00**
Total Security for Oil Sands Mines		**$820,484,138.00**

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