11 MILLION LITRES A DAY

THE TAR SANDS' LEAKING LEGACY

DECEMBER 2008

ENVIRONMENTAL | DEFENCE

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ACKNOWLEDGEMENTS

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Executive Summary

The Government of Alberta is telling the world that it is managing the vast toxic tailings ponds being created by tar sands mining so that toxic leakage from the ponds does not enter the groundwater.

This is untrue.

Virtually everyone close to the tar sands industry knows that all tar sands tailings ponds leak – even the new ones – and that while steps are taken to recapture the leakage, a significant portion of contaminated water still escapes into the environment.

For the first time, this report uses industry information to arrive at a conservative estimate of what the overall leakage from the tar sands tailings ponds is today, and also what it would likely be if proposed projects go ahead.

The results are staggering.

Already, the ponds are leaking over 11 million litres a day of contaminated water into the environment, which is equivalent to over 4 billion litres a year – enough to fill the Toronto Skydome two and a half times.

And, should proposed projects go ahead on schedule, by 2012 this annual leakage rate would increase five-fold to 72 million litres a day, or over 25 billion litres a year – enough to fill the Skydome over 16 times.

LEAKAGE LOST	2007	2012*
Litres Per Hour	465,800	3,006,900
Litres Per Day	11,179,200	72,165,600
Litres Per Month	335,376,000	2,164,968,000
Litres Per Year	4,024,512,000	25,979,616,000

* There have been significant delays in new projects, so timelines may change.

Adding up the annual leakage, the cumulative toxic leakage into the groundwater could reach almost a trillion litres by 2080, and that is without counting the new projects that will inevitably be proposed. This amount would fill Olympic swimming pools placed end to end from St. Johns, Newfoundland to Victoria, BC four times over.

Tar sands tailings water is widely acknowledged to be harmful to human health and the environment. Experiments with this water on fish have shown serious reproductive impacts. Studies on birds have found increased mortality rates, and experiments on plants have shown delayed germination and lower seedling weights. The tailings include naphthenic acids, which are acutely toxic and known to persist for many years, making tailings leakage a long-term contamination problem for the Athabasca watershed, the Mackenzie drainage it runs into, and the Boreal forest.

Tailings ponds leak because they are built on bare ground that conducts water, and their walls are made from the materials dug from the bitumen mining process, which also conduct water. Companies try to capture leaking water using ditches and intercept wells, but a portion escapes into the environment.

There are no public studies about the impacts of the overall toxic leakage today, nor are there public studies about the impacts of a five-fold expansion of this leakage that is projected over a short time span. Tar sands companies self-monitor groundwater contamination and give this information to the Alberta Government, but this is not made public. Monitoring of surface water in the tar sands region is done by an industry dominated body that independent experts have found lacking.

Both the Alberta and federal governments have jurisdiction over the discharge of harmful substances like tailings pond leakage. The Alberta Government is sanctioning the leakage through its permitting system. The federal government is failing to enforce its *Fisheries Act* by deferring to the province. Because Alberta refuses to act, tar sands tailings pond leakage will not end until the Canadian government enforces its own law.

Resumé

Le gouvernement de l'Alberta clame aux quatre horizons qu'il gère les énormes bassins de décantation toxiques qui sont le fruit de l'extraction des sables bitumineux, et que les fuites toxiques s'écoulant des bassins ne pénètrent pas dans l'eau souterraine.

C'est faux.

Pratiquement tous ceux qui vivent près de l'industrie d'extraction des sables bitumineux savent que tous les bassins de décantation ont des fuites – même les plus récents – et que, bien que des mesures soient prises pour récupérer l'eau qui s'échappe, une portion importante de l'eau contaminée réussit à se frayer un chemin dans l'environnement.

Pour la première fois, ce rapport présente, à l'aide des données de l'industrie elle-même, une estimation conservatrice de la quantité d'eau qui s'échappe actuellement des bassins de décantation et de la situation qui prévaudra vraisemblablement si les projets proposés voient le jour.

Les résultats sont bouleversants.

Déjà, plus de 11 millions de litres d'eau contaminée s'échappent chaque jour pour se perdre dans l'environnement, c'est-à-dire plus de 4 milliards de litres par an – de quoi emplir deux fois et demie le Skydome de Toronto…

Et, si les projets proposés vont de l'avant selon l'horaire prévu, d'ici 2012, ce taux de fuites annuelles quintuplerait, pour atteindre 72 millions de litres par jour, ou plus de 25 milliards de litres par an – de quoi emplir le Skydome plus de 16 fois.

FUITES	2007	2012*
Litres par heure	465,800	3,006,900
Litres par jour	11,179,200	72,165,600
Litres par mois	335,376,000	2,164,968,000
Litres par mois	4,024,512,000	25,979,616,000

* Les nouveaux projets connaissent des retards importants; il se peut que les dates diffèrent.

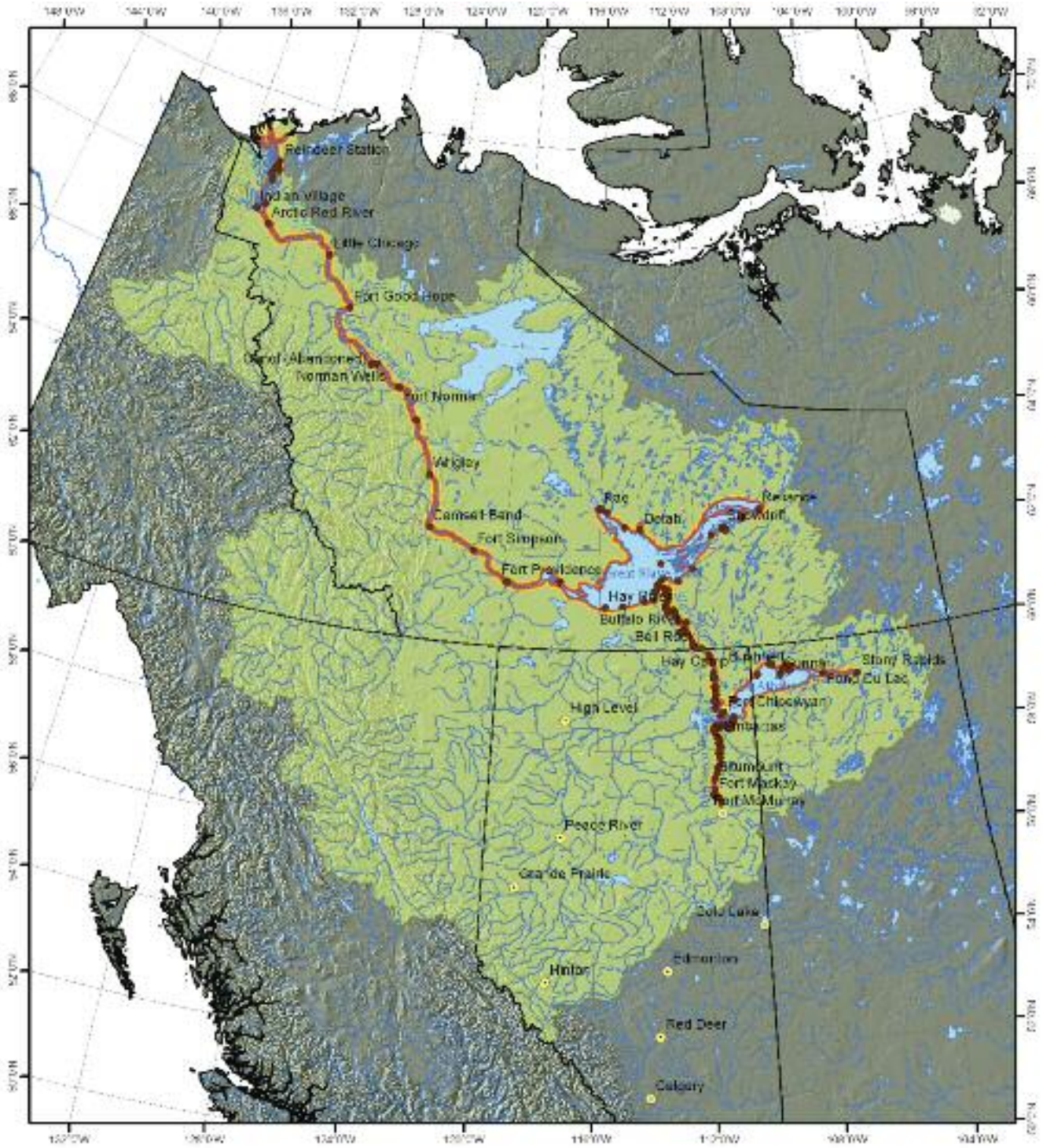
Si l'on additionne les fuites annuelles, la totalité de l'eau toxique qui se retrouve dans l'eau souterraine pourrait atteindre près d'un billion de litres d'ici 2080, et ce, sans même compter les nouveaux projets qui ne manqueront pas d'être mis de l'avant. Avec une telle quantité d'eau, on pourrait remplir des piscines olympiques, placées bout à bout, de St. Johns (Terre-Neuve) jusqu'à Victoria (C.-B) quatre fois.

Il est bien connu que l'eau des bassins de décantation des exploitations de sables bitumineux est néfaste pour la santé et pour l'environnement. Les expériences faites avec cette eau ont montré qu'elle avait des effets très graves sur la reproduction du poisson. Des études portant sur les oiseaux ont révélé des taux de mortalité accrus et les expériences sur les plantes ont montré un retard dans la germination et une taille inférieure de la plante. Les résidus contiennent des acides naphténiques, une matière toxique à effets aigus connue pour sa capacité de persister pendant de nombreuses années, ce qui fait de ces fuites un problème de contamination à long terme pour le bassin hydrographique Athabasca, le réseau hydrographique du Mackenzie dans lequel il se déverse, ainsi que la forêt boréale.

Les bassins de décantation fuient parce qu'ils ont été construits sur le sol dénudé, sur lequel l'eau peut s'écouler, et que les côtés des bassins sont faits de matériel obtenu lors de l'extraction du bitume qui, lui aussi, permet à l'eau de s'écouler. Les sociétés concernées tentent de récupérer les fuites en creusant des fossés et des puits pour les intercepter, mais une partie de ces eaux finit toujours par s'échapper.

Il n'existe actuellement aucune étude publique sur l'impact de toutes ces fuites toxiques, et il n'existe également aucune étude publique sur l'impact qui découlerait de la multiplication par cinq de ces fuites – ainsi que l'on projette de le faire – dans un court laps de temps. Les sociétés qui procèdent à l'extraction des sables bitumineux font elles-mêmes le suivi de la contamination de l'eau souterraine et transmettent ensuite cette information au gouvernement de l'Alberta, mais ces données ne sont pas rendues publiques. Le suivi de l'eau de surface dans la région des sables bitumineux est effectué par un organisme qui relève de l'industrie et que des experts indépendants n'ont pas trouvé à la hauteur de sa tâche.

L'écoulement de substances dangereuses, telles celles provenant des fuites des bassins de décantation, relève du gouvernement de l'Alberta et du gouvernement fédéral. Le gouvernement de l'Alberta approuve ces fuites par le biais de son système de licences. Le gouvernement fédéral évite de faire appliquer sa Loi sur les pêches en s'en remettant à la province. Et parce que l'Alberta refuse d'agir, les bassins de décantation continueront de fuir tant et aussi longtemps que le gouvernement du Canada ne fera pas appliquer sa propre loi.



Downstream Waterbodies from the Bituminous (tar/oil) Sands Area

10 km zone around downstream waterbodies

10 km

0 km

Populated places within 10 km of downstream waterbodies

Mackenzie River basin

Projection: 10 TM
Central Meridian: -115.0
Scale Factor: 0.9992
Origin: 0.0
Linear Unit: Meter
Easting: 500000
Datum: NAD 1983

Introduction

This study documents the existence of widespread and increasing leakage – often called "seepage" – of toxic chemicals from tar sands tailings ponds.

As part of its tar sands public relations campaign, the Government of Alberta is circulating a brochure on the tar sands with the claim that measures are taken in the tar sands "to prevent any seepage from entering groundwater systems or waterways."[1]

In the Alberta Legislature, the Alberta Premier and Environment Minister have dismissed evidence of tailings leakage by suggesting that this is only a problem with older tailings ponds, or that leaking water is captured.[2]

These statements contradict what virtually everyone close to the tar sands industry knows: that all tar sands tailings ponds leak, even the new ones, and that while steps are taken to capture this leakage, these steps are imperfect and there is a significant loss of contaminated water into the environment.

We therefore concluded that the truth about tailings ponds leakage would not penetrate until someone calculated *how much* they leak into the environment, so that the debate can progress to discussing the magnitude of the problem, rather than whether such a problem exists.

This study uses industry information to estimate what the overall leakage rate is for tar sands tailings ponds both now and into the future. This information is estimated on a project-specific basis by companies in their project applications, but it has never been publicly put together to come up with an overall leakage rate.

Requests to the Alberta Government regarding what the overall leakage rate is have so far gone unanswered. We welcome a public debate on the magnitude of the tailings ponds leakage problem in the tar sands. Such a debate is critical to the health of the Athabasca watershed, to the people who live there, and indeed to the entire Mackenzie Valley drainage into which the Athabasca empties – an area comprising a fifth the size of Canada and much of Canada's Boreal forest.

"…the principal environmental threats from tailings ponds are the migration of pollutants through the groundwater system and the risk of leaks to the surrounding soil and surface water…the scale of the problem is daunting…" **NATIONAL ENERGY BOARD** [3]

What are Tailings?

Many have seen pictures of the massive toxic tailings "ponds" – a misnomer considering they are now as big as lakes. A bright spotlight was shone on these toxic lakes in April, 2008 after five hundred ducks were killed after landing on one of them.

Tar sands companies want the dense bitumen that's mixed in with sand, silt, and clay. After digging up the mixture, they separate the materials from one another using hot water. Following the recovery of bitumen, there is a large quantity of unwanted water, sand, silt, and clay contaminated with leftover hydrocarbons and other toxic substances.

This waste stream is called "tailings" and is piped into giant pits that the companies build using the materials they dig out of the ground as part of mining. The tailings areas are constructed over the top of bare ground.

The theory is that the solids settle out from the liquids over time, allowing the water to be recycled and the solids to be buried during "reclamation." The reality, however, is that the settling process for the finest tailings has turned out to take much longer than expected – up to 150 years[4] – meaning that these tailings lakes will remain a toxic legacy long after industry has left.

THE PROBLEM IS MASSIVE

It is important to understand the scale of the tailings problem. The industry on average produces about 2,000 to 2,500 litres of tailings per barrel of bitumen, and given levels of production this results in the production of about 1.8 billion litres of tailings every day.[5]

Since mining began in 1968, one study estimates that there are five and a half trillion litres of tailings now on the landscape.[6] These huge toxic tailings lakes now cover an area over 130 square kilometers.[7]

With such massive numbers, there should be no surprise that there is a significant problem with leakage.

TAILINGS ARE TOXIC

Several studies have found tailings pond water to be acutely toxic. An experiment with goldfish in tailings waters found adverse impacts on endocrine functioning.[8] A study of tree swallows on wetlands that used tailings water found that the odds of dying on the sites using the most tailings water were ten times higher than those on the control site.[9] An experiment to assess the impacts of tailings water on plants found that it slows germination in several plant species, and led to reduced weight in seedlings.[10]

These are some of the contaminants of major concern in tailings water:

- **Naphthenic Acids:** Naphthenic acids can be found in tailings ponds at levels over a hundred times those found in nearby rivers.[11] In addition to being acutely toxic, the naphthenic acids associated with the tar sands ponds do not easily break down in the natural environment.[12] The combination of toxicity and slow breakdown rates means water contaminated with naphthenic acids poses a threat to the environment for decades.[13]

- **PAHs:** Polycyclic Aromatic Hydrocarbons (PAHs) are known to be carcinogenic and mutagenic. PAHs are relatively non-soluble, and are therefore known to settle in sediment and to degrade slowly. Exposure of aquatic organisms to PAHs is associated with liver tumours and Environment Canada has concluded that certain PAHs pose a threat to human life or health.[14]

- **Other Contaminants**[15]**:** Trace metals such as copper, zinc and iron can exist at concentrations that exceed the Canadian water quality guideline for freshwater aquatic life. Tailings have also been found to contain residual bitumen – for example, Suncor's tailings pond contained 9% residual bitumen and diluent.

TAILINGS PONDS ARE ALREADY LEAKING THE EQUIVALENT OF TWO-AND-A-HALF TORONTO SKYDOMES FULL OF CONTAMINATED WATER INTO THE ENVIRONMENT EVERY YEAR.

Tar Island Dyke – a special case

Tar Island Dyke was constructed in mid 1960's by Suncor and has been expanded several times. It is now 92 metres high and stands directly next to the Athabasca River. Tailings are no longer placed in the pond.

The current leakage rate of contaminated water from Tar Island Dyke into the river is estimated to be 67 litres a second or almost 6 million litres a day.[16]

The leakiest tar sands tailings pond gets most of the attention, but it is important to note that while Tar Island Dyke is probably the worst tailings pond for leakage – especially leaking directly into the Athabasca River – all tailings ponds leak, even the new ones.

How do Tailing Ponds leak?

ALL TAILING PONDS LEAK

Tailings ponds leak because they are built directly on ground that conducts water, and the ponds have walls that are built out of the material that tar sands companies take out of the ground, which also conducts water.

This means that contaminated water from the tailings ponds leaks through the base and the sides of the tailings ponds. Leakage through the base can also be more severe depending on the nature of the ground. Suncor's south tailings pond, for example, is built over glacial meltwater channels that provide faster pathways for leaking water.[17]

THE TAR ISLAND DYKE IS NOTORIOUS FOR LEAKING CONTAMINATED WATER DIRECTLY INTO THE ATHABASCA, BUT ALL TAILINGS PONDS LEAK.

STEPS TO SLOW AND RECOVER TAILINGS WATER ARE IMPERFECT

Tar sands companies do try to slow down leakage and to recapture contaminated water that does escape, but they do not get it all. These are some of the ways they do this:

- **Thickeners** – Companies are experimenting with various ways to make the fine tailings settle out faster and thereby reduce the overall amount of tailings available to leak.

- **Drainage Ditches –** Drainage ditches are dug around tailings ponds to collect leaking water, and it is pumped back into the ponds. But these ditches only catch leaking water at relatively shallow depths.[18]

- **Interception Wells –** Interception wells are dug beyond the drainage ditches to try to catch contaminated water before it leaves the company's lease boundary or enters rivers or lakes.

- **Barriers –** When leakage can be transported quickly in underground channels, barriers may be built such as the "grout curtain" installed at Syncrude's Aurora project.

How much leakage do these kinds of efforts catch? That is a hard question to answer since when company estimates do exist, they vary significantly, not just from company to company but also from year to year.

The information provided by CNRL (Horizon) and Shell (Muskeg River Mine) indicates they will capture all "shallow" leakage from their tailings ponds, but not the leakage to deep aquifers, which runs at about a third of the overall rate. PetroCan (Fort Hills) estimates that it will lose about 15 percent of its overall leakage.[19]

It should be noted that there are differences in terrain, meaning that there will be differences in how fast the tailings ponds leak depending on how fast any given piece of ground conducts water. One study suggests that industry is now encountering more shallow sand on new sites,[20] so leakage could speed up.

"SELF SEALING"

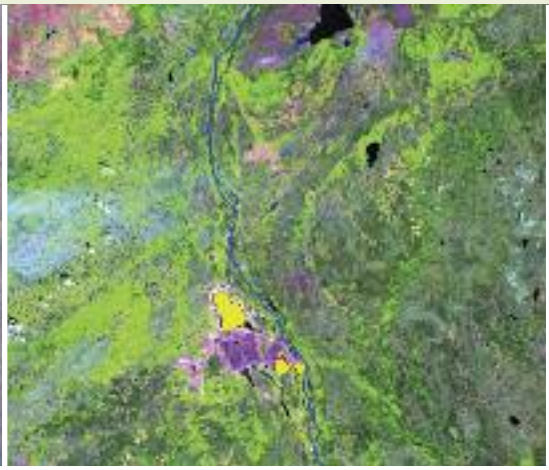
Industry claims that tailings ponds "self seal" over time. The University of Waterloo has found that leakage declines over time for two reasons. "First, clay and silt sized tailings accumulate at the bottom of the tailings impoundment and act to minimize seepage. Second, permeability is reduced as residual bitumen from the tailings stream forms bitumen mats in the beaches of coarser grained tailings along the edges of the tailings impoundment." [21]

Even though the concept of "self sealing" has not been adequately proven or measured, this study has given the benefit of the doubt to industry on this issue, assuming that this does indeed take place, and has reduced the estimated overall leakage rate accordingly. Industry does not claim, however, that tailings ponds entirely self-seal; they acknowledge there will always be some leakage.

The growth of tar sands mining and tailings ponds is exploding. Tailings ponds now cover 130 square kilometres. This is a sequence of satellite shots from 1974 to 2006, with the final one showing a projection of approved ponds not yet built. The ponds are in yellow.

Credit: Global Forest Watch Canada

1974



1992

THE LONG TERM – CAPPED TOXIC LAKES

Even when the tar sands industry realized it had a problem with the failure of finer tailings to settle out on a timeline to make reclamation possible, it barreled ahead with increased production of both bitumen and tailings, assuming that it could somehow figure things out.

The result is a proposed experiment with the lands and waters of Northern Alberta, putting toxic waste into something called "End Pit Lakes."

The basic idea is that towards the end of a useful bitumen mine, the company would decommission the tailings ponds and transfer the unsettled liquid tailings into the pits from which it has dug the bitumen in the first place. A layer of fresh water would be added over the top of the tailings, the landscape would be built so that water drains in and out of the End Pit Lakes, and then industry would walk away.

At least 25 End Pit Lakes are planned for the tar sands region within the next 60 years despite the fact that nobody really knows how they will perform.[22]

Each year tar sands tailings ponds are already leaking the equivalent of two and a half Toronto Skydomes full of toxic water into the environment, and this could quickly grow to 16 Skydomes.

2002 | 2006 | APPROVED PONDS

What is the overall leakage rate?

METHOD

There has not yet been a public attempt to come up with an estimate of how much tar sands tailings ponds are leaking overall, and what this rate could be if the many new mines go ahead using the same planned approach to tailings.

We therefore contracted Pembina Corporate Consulting to go through the industry proposals to put together this figure. Based on the companies' own data, Pembina produced several scenarios for leakage rates using different assumptions that can be found on the **Environmental Defence** website at **www.environmentaldefence.ca.**

This report has chosen a conservative scenario. This means the leakage problem could be much larger than this report estimates.

This is the method of the scenario we selected:

1. Wherever it exists, Pembina used the specific company information on leakage rates.
2. Where companies did not provide this information, Pembina applied an average leakage rate calculated using the numbers from the companies that did. These averages were applied on the basis of leakage per barrel of bitumen proposed to be produced.
3. Benefit of the doubt was given that tailings ponds largely "self seal" over time, and it was assumed that all ponds largely self seal after 18 years, but that some leakage still occurs. Pembina estimated that sealed ponds leak 85% less than un-sealed ponds.[23]

4. Due to lack of information, it was assumed that existing ponds have largely "self sealed," even though this is probably untrue and therefore under-estimates the current leakage rate. Tar Island Dyke, though, is a special case, and Pembina applied the leakage numbers calculated by the University of Waterloo, but assumed that leakage from Tar Island Dyke would reduce to a long term 'normal' leakage rate after 5 years.
5. The numbers were added together on an annual basis, using start-up dates and production numbers provided by the companies, and therefore arriving at overall leakage rate by year.
6. The final overall leakage rate is what escapes from the ponds after recovery steps have been taken. In other words, this is the leakage that the companies don't catch.

LIMITATIONS

Although the leakage values presented in this report are both rationally developed and conservative, there are several limitations to the calculations used. These are:

- **Slowdown:** With the recent pull back in the price of oil and delays by tar sands companies, the timelines in this analysis may need adjusting, depending on how this reduction in development actually plays out. In any event, a slowdown would not have any affect on calculated current leakage rates.

- **Use of Averages:** Determining leakage rates is a complex task. This analysis does not attempt to develop numbers based on the unique geological characteristics of each site. Where information was unavailable, averages were applied that were calculated from the companies that did provide it.

- **The Very Long-Term:** Mine closure includes the construction of End Pit Lakes (see above) and the burying of tailings into the landscape. Both will continue to leak contaminated water into the environment. This analysis does not attempt to quantify the very long-term – i.e. more than several decades into the future – leakage rates for these sources.

RESULTS – MASSIVE LEAKAGE

Even with a conservative methodology, the estimated cumulative leakage numbers are huge.

In 2007, the tailings ponds were already losing over 11 million litres a day to the environment, or about four billion litres a year.

Four billion litres a year is the equivalent of filling the Toronto Skydome to the roof about two and a half times.[24]

LEAKAGE LOST	2007	2012*
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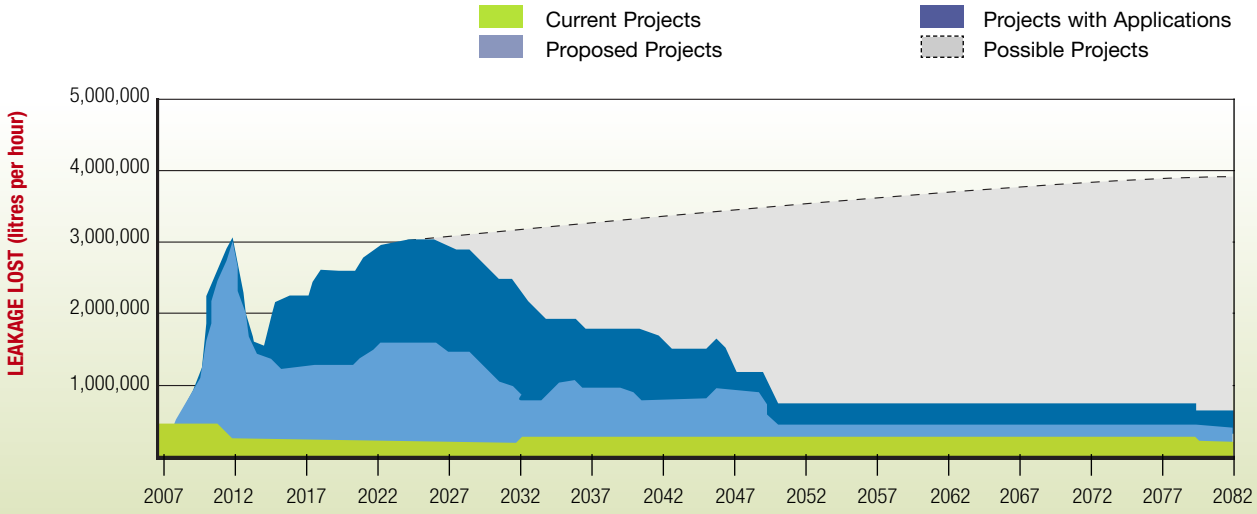
* There have been significant delays in new projects, so timelines may change.

Estimates of current and proposed projects – and there may indeed be more announced – show leakage rising rapidly. In 2012, overall leakage could grow five fold to about three million litres an hour, or over 25 billion litres a year – enough to fill the Skydome over 16 times.

Adding up the annual leakage, the cumulative toxic leakage into the groundwater could reach almost a trillion litres by 2080, and that is without counting the new projects that will inevitably be proposed. This amount would fill Olympic swimming pools placed end to end from St. Johns, Newfoundland to Victoria, BC four times over.[25]

AGGREGAGED RATE - LEAKAGE LOST TO ENVIRONMENT



This graph shows the estimated overall tailings ponds leakage rate for existing and proposed ponds starting up and "self sealing" at different times. New ponds will likely be proposed though, meaning that the overall rate would keep going up. The timelines in the graph will change due to recent project delays.

Source: Based in part on data from Pembina Corporate Consulting

Impacts

There has not been a public assessment of the existing cumulative contaminated leakage from the tar sands tailings ponds, nor has there been a public assessment of the likely impacts of the vastly increased future toxic leakage.

WHAT THE COMPANIES SAY

To date, the only public information comes from the tar sands companies themselves, who model the impacts of their specific leakage on the groundwater and associated surface waters as part of their project proposal processes. This raises several concerns, including:

- **Independence.** Tar sands companies are trying to get approvals and therefore have an incentive to reach conclusions that minimize concerns.
- **Incrementalism.** Each tar sands company models its own additional impact, but does not model the regional impact several years from now when cumulate leakage will be many times greater than today.
- **Reality.** Modeling of impacts is educated guesswork, and because companies use different models, this creates even greater uncertainty. In reality, groundwater flow is not yet well understood.

Despite these concerns, the project approval process has never rejected a tar sands mine or associated leaking tailings ponds. Some of the evidence presented on leakage during these processes, though, is instructive:

- The Suncor Millenium tailings pond proposal highlighted the existence of underground channels that conduct contaminated water, in this case towards McLean Creek. Suncor outlined how it would have to operate mitigation measures for 60 years after the closure of the pond to prevent contamination from reaching the creek.[26] The Alberta Energy and Utilities Board approved the application despite concluding that the information about groundwater was imperfect, that unknown pathways for the transport of leakage into McLean Creek could exist, and that regional groundwater modeling needed to be done.
- The Shell Jackpine proposal again showed leakage reaching surface water – this time Jackpine Creek.[27] Regarding changes in groundwater quality, Shell indicated "These changes will be long term and irreversible."[28] The joint federal-Alberta panel then went on to call for an initiative to assess the regional impacts on groundwater,[29] but approved the mine and leaking tailings pond anyway.
- The Shell Albian Sands proposal saw Shell disagreeing with Environment Canada's requests to update predictions as new data became available, to include public

reporting, and to include external scientific peer review. Shell also disagreed with recommendations to collect further baseline water and sediment samples from the Muskeg River watershed prior to project initiation.[30]

- The CNRL Horizon proposal predicted that it would exceed several parameters of the provincial water quality guidelines for the protection of aquatic life and/or human health guidelines.[31]
- The Imperial Kearl proposal acknowledged that understanding of groundwater flows was incomplete.[32] Imperial indicated leakage could reach 1,000 litres a second and that measures were needed to prevent this from reaching the Firebag River and its tributaries.[33] The tailings pond was proposed to lie atop permeable deposits.[34]

Overall, the proposals processes show decisions about tailings leakage being made based upon incomplete information, with the regulators repeatedly asking for more analysis but always giving approvals without it.

THE MONITORING MESS

Alberta Environment requires companies to self-monitor tailings pond leakage in groundwater. Companies drill monitoring wells around their leases and send this information to government. Pembina's attempts to access this information have so far been unsuccessful, adding concerns about transparency and accountability to the concern about the conflict of interest inherent in self-monitoring.

Since the basic approach to tailings pond leakage is to hope that it does not show up in surface waters, a key question is how surface water quality is monitored. Both the federal and Alberta governments have delegated much of their responsibility for surface water quality monitoring in the tar sands to the increasingly mischaracterized "multi-stakeholder" body called the Regional Aquatic Management Program (RAMP).

Despite calling RAMP a "multi-stakeholder" body, it is funded and dominated by the tar sands companies, and First Nations and environmental organizations have now distanced themselves from the organization due to concerns over impartiality and competence.[35]

An independent expert review of RAMP in 2004 found "significant concerns" with scientific leadership, effective design, and a failure to incorporate a regional approach.[36] Alberta journalist Andrew Nikiforuk followed up in 2008 to find the outside reviewers lamented the failure to fix the problems, with one noting that industry monitoring efforts such as RAMP often design things to find industrial activity acceptable.[37]

RAMP has so far concluded that surface water quality has not been significantly impacted by tar sands activity.

"These changes will be long term and irreversible."

— **SHELL** ON IMPACTS TO GROUNDWATER QUALITY

What's At Stake

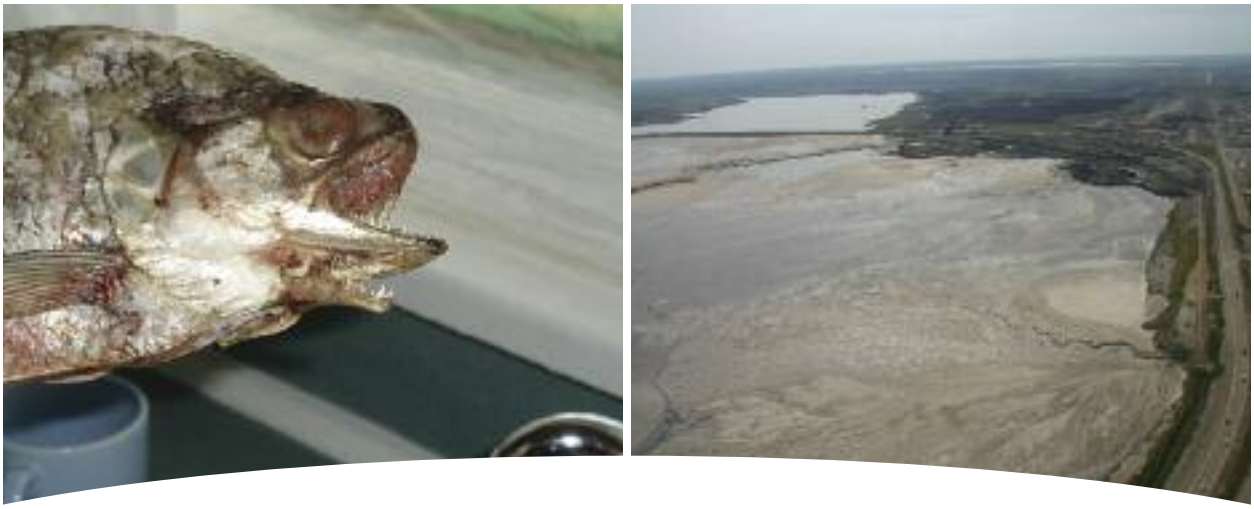
The people of Fort Chipewyan are living in fear of what tar sands pollution may be doing to their water, the fish and wildlife they depend on, and their health. The predominantly First Nations community sits on Lake Athabasca, about 200 km downstream of the tar sands mines.

Family doctor John O'Connor has become a hero in the community after speaking out about the high incidence of very rare cancers and being persecuted by government authorities as a result.

Dr. O'Connor found that at least three residents and likely two more have died of cholangiocarcinoma, a deadly cancer of the bile duct that occurs in one case for 100,000 people. Fort Chipewyan's population is about 1,000 people.

Alberta Health and Wellness and Health Canada brought misconduct charges against Dr. O'Connor in 2006 with the College of Physicians and Surgeons of Alberta. He has so far been cleared of most of the charges, with one pending.

Credit: Ron Plain



(left) DEFORMED FISH HAVE BEEN SHOWING UP DOWNRIVER FROM THE TAR SANDS. THIS TWO-JAWED FISH WAS CAUGHT IN FORT CHIPEWYAN IN THE SUMMER OF 2008. (right) UNLESS THINGS CHANGE, TOXIC TAILINGS PONDS LEAKAGE COULD INCREASE FIVE-FOLD WITHIN A DECADE.

Regulatory Responsibility

The failure of the relevant regulatory agencies to adequately deal with tailings ponds fits into the overall failure to protect the environment in the tar sands. Because environment is a shared jurisdiction in Canada, this failure belongs to both the Alberta and the federal governments.

EXPOSING THE ALBERTA GOVERNMENT'S "ZERO DISCHARGE" CLAIM

The Alberta Government monitors tailings ponds in two ways. First. the *Energy Resources Conservation Act* sets up the Energy Resources Conservation Board (ERCB) to approve tar sands projects under certain conditions. In June 2008, the ERCB proposed new directives on tailings management, none of which changed anything regarding tailings ponds leaking contaminated water. The ERCB is also responsible for ruling on environmental assessments for tar sands projects.

Second, the *Environmental Protection and Enhancement Act* (EPEA) prohibits the release of harmful substances into the environment, except where allowed by permit.[38] Alberta Environment therefore writes leakage into tar sands permits.

Some believe that because the EPEA prohibits the release of harmful substances that there is a "zero discharge" policy in the tar sands with regards to contaminated water. In fact, the billions of litres of contaminated water leaking from the tailings ponds are sanctioned by the Government of Alberta.

Because the Alberta government is in denial about the environmental impacts of the tar sands, it is unlikely to use its regulatory authority to end leakage from tar sands tailings ponds. Alberta Premier Stelmach called environmental concerns a "myth"[39] and instead ordered a $25 million public relations campaign to improve Alberta's image.[40] As seen above, part of that campaign includes materials saying that toxic leakage is prevented from entering groundwater.

THE FEDERAL GOVERNMENT'S FAILURE TO ENFORCE

The Canadian government has two laws pertaining to the discharge of contaminated tailings pond water into the environment.

First, the *Canadian Environmental Protection Act* (CEPA) is called by the Canadian government "the cornerstone legislation for preventing pollution in order to protect Canada's environment and the health of Canadians." Among the shortcomings of CEPA, however, is a reliance on the discretion of the government to officially name a substance as toxic and then to develop a regulatory response for it. CEPA therefore allows the federal government to regulate toxic tar sands ponds leakage, but does not compel it.

The Canadian *Fisheries Act,* however, has stronger provisions. Section 36(3) says:

> **…no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish *or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water* (emphasis added)**

Similar to the Alberta EPEA, the *Fisheries Act* allows the regulator to vary the prohibition through permitting or regulation-making activities, but in the case of toxic leakage from tar sands tailings ponds, neither is taking place.

Emphasis is added to the second part of 36(3) above because it is clear the *Fisheries Act* anticipates contaminants entering indirectly into waters frequented by fish. Environment Canada, which overseas enforcement of 36(3), says this about groundwater:

> **Any addition of undesirable substances to groundwater caused by human activities is considered to be contamination. It has often been assumed that contaminants left on or under the ground will stay there. This has been shown to be wishful thinking. Groundwater often spreads the effects of dumps and spills far beyond the site of the original contamination. Groundwater contamination is extremely difficult, and sometimes impossible, to clean up.** [41]

Environment Canada also acknowledges an ominous aspect of the tar sands tailings leakage problem – the impacts of today's groundwater contamination may take years to come to light:

> **Groundwater moves so slowly that problems take a long time to appear. Because of this, and because it is so expensive to clean up a contaminated aquifer (if it can be done at all), it is preferable by far to prevent contamination from happening in the first place.** [42]

Credit: Garth Lenz

TAR SANDS MINES FILL THE TAILINGS PONDS 24/7.

This is part of the reason some have characterized the tar sands as a "slow motion oil spill." It may take years to feel the full impacts of the pollution now taking place.

While there is a Canada-Alberta agreement on coordinating activities on deleterious substances,[43] the existence of a permit that sanctions tar sands tailings ponds leakage under the Alberta EPEA does not relieve the federal government of its responsibilities under s.36(3) of the *Fisheries Act*.

Factors that underline the duty of the federal government to step in on the tailings leakage issue include:

- Expressions of concern from federal officials in tar sands hearings about the weakness of information, modeling, standards, and monitoring with relation to water quality issues; [44]
- The trans-boundary nature of this problem given the proximity of downstream jurisdictions of Saskatchewan and the Northwest Territories;
- The double standard of having specific federal regulation of metals mining and tailings ponds, but not tar sands mining and tailings ponds; and
- The fiduciary duty the federal government has to First Nations, who have heightened concerns regarding water quality and health issues in the tar sands.

Left up to the Government of Alberta, the tailings leakage problem will only magnify. It is time for the Government of Canada to step in and enforce the *Fisheries Act*.

"It has often been assumed that contaminants left on or under the ground will stay there. This has been shown to be wishful thinking."

— ENVIRONMENT CANADA

ENDNOTES

1 "Alberta's Oil Sands. Opportunity. Balance," Government of Alberta, 2008, p. 6.

2 See Alberta Hansard, May 27, May 28, and June 4, 2008.

3 "Canada's Oil Sands: Opportunities and Challenges to 2015," National Energy Board, 2004.

4 "Fact or Fiction: Oil Sand Reclamation," Jennifer Grant et al, Pembina Institute, May 2008, p. 13.

5 "Fact or Fiction," p. 14 and p. 30.

6 Richard Nelson, "Cumulative Fine Tailings Inventory and Pace of Development," Alberta Energy Research Institute presentation at CONRAD 2006 Water Usage Workshop, March 28–29, 2006; cited in "Fact or Fiction," p. 14.

7 Backgrounder to press release, "ERCB releases draft directive on oil sands tailings management and enforcement criteria," June 26, 2008, Energy Resources Conservation Board and Government of Alberta.

8 "Reproductive and stress hormone levels in goldfish (Carassius auratus) exposed to oil sands process-affected water," by A. Lister et al, *Aquatic Toxicology,* January 2008.

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12 See: "Napthenic Acids in Athabasca Oil Sands Tailings Waters Are Less Biodegradable than Commercial Naphthenic Acids," Angela C. Scott et al, *Environ. Sci. Technol.* 2005, 39, 8388-8394.

13 Imperial Oil Resource Ventures Limited: Kearl Oil Sands Project - Mine Development Application and Supplemental Information," Imperial Oil Ltd., 2005, Volume 6.

14 See: http://www.ec.gc.ca/toxics/wood-bois/over/pah_e.htm

15 "Fact or Fiction," p. 36.

16 "Attenuation of Contaminants in Groundwater Impacted by Surface Mining of Oil Sands, Alberta, Canada," Jim Barker et al, November, 2007, slide 12.

17 "Design of Tailings Dams on Large Pleistocene Channel Deposits: A Case Study – Suncor's South Tailings Pond," by Brett Stephens et al, date unknown.

18 "Integrated Solid Phase, Aqueous Phase and Numerical Investigation of Plume Geochemistry at an Oil Sand Mining Facility" by Alexander Avraham Louis Oiffer, Master Degree Earth Sciences – Thesis: 257, Earth Sciences, University of Waterloo, Section 1.0 Introduction, p. 122.

19 See the sheets for these companies provided in the accompanying scenarios from Pembina. Available at www.environmentaldefence.ca

20 "Attenuation of Contaminants in Groundwater Impacted by Surface Mining of Oil Sands, Alberta, Canada," by Jim Barker et al, November 2007, slide 20.

21 "Integrated Solid Phase, Aqueous Phase and Numerical Investigation of Plume Geochemistry at an Oil Sand Mining Facility" by Alexander Avraham Louis Oiffer, Master Degree Earth Sciences – Thesis: 257, Earth Sciences, University of Waterloo, Section 1.0 Introduction, p. 4.

22 "Fact or Fiction," p. 31.

[23] Shell projected reduced leakage rates for ponds at their propsed Muskeg River Mine expansion, Jackpine Phase 1 and Jackpine Expansion. The average reduction in leakage rates for tailings ponds at these mine sites is 84% compared with leakage rates during the first 18 years of operation.

[24] This is based on the estimated volume of the Skydome at 1.6 billion litres. See: www.rogerscentre.com/about/facts/index.html

[25] This assumes filling a 50m long Olympic swimming pool requires 2.5 million litres, which divided into a trillion is 400,000 pools worth, laid end to end is 20,000 km worth. St. Johns to Victoria as the crow flies is about 5,000 km.

[26] Decision 2004-113, Suncor Energy Inc., Application for an External Tailings Pond, for the Millennium Mine, Fort McMurray Area, December 30, 2004, p. 17.

[27] Joint Panel EUB Decision 2004-009, Shell Canada Limited, Applications for an Oil Sands Mine, Bitumen Extraction Plant, Cogeneration Plant, and Water Pipeline in the Fort McMurray Area, February 5, 2004, p. 43.

[28] Ibid, p. 44.

[29] Ibid, p. 49.

[30] Joint Panel Report, EUB Decision 2006-128, Albian Sands Energy Inc., Application to Expand the Oil Sands, Mining and Processing Plant Facilities at the Muskeg River Mine, December 17, 2006. p. 43

[31] Joint Panel Report, EUB Decision 2004-005, Canadian Natural Resources Limited, Application for an Oil Sands Mine, Bitumen Extraction Plant, and Bitumen Upgrading Plant in the Fort McMurray Area, January 27, 2004. p. 47.

[32] Joint Panel Report, EUB Decision 2007-013, Imperial Oil Resources Ventures Limited, Application for an Oil Sands Mine and Bitumen Processing Facility (Kearl Oil Sands Project) in the Fort McMurray Area February 27, 2007, p. 37.

[33] Ibid, p. 37.

[34] Ibid, p. 37.

[35] Both the Athabasca Chipewyan First Nation and the Chipewyan Prairie First Nation wrote to RAMP expressing their concern in 2008, and the Pembina Institute has asked RAMP to remove its name from the RAMP website.

[36] "Oil Sands Regional Aquatic Monitoring Program (RAMP), Scientific Peer Review of the Five Year Report (1997-2001), Submitted to: RAMP Steering Committee, February 13, 2004, G. Burton Ayles et al., p.iv.

[37] "Tar Sands: Dirty Oil and the Future of a Continent," by Andrew Nikiforuk, Greystone Books, Vancouver, 2008, p. 72-3.

[38] *Alberta Environmental Protection and Enhancement Act*, Part 5, Division 1, 109.

[39] "Stelmach fights 'dirty' image of oilsands in Washington," Jason Markusoff, Canwest News Service, Wednesday, January 16, 2008.

[40] "Alberta the underdog in oilsands PR battle: Stelmach," Jason Markusoff, edmontonjournal.com, Wednesday, April 30, 2008.

[41] See: http://www.ec.gc.ca/water/en/info/pubs/FS/e_FSa5.htm

[42] See: http://www.ec.gc.ca/water/en/info/pubs/FS/e_FSa5.htm

[43] See: http://www.mb.ec.gc.ca/pollution/e00s62.en.html

[44] See for example: "Submission of the Department of the Environment (Environment Canada), Alberta Energy and Utilities Board, Canadian Environmental Assessment Agency Joint Panel Hearings, Imperial Energy Inc, Kearl Oil Sands Project, EUB Applications 1408771 and 1414891, 2 October 2006, pp. 82-86.