

# **Report and Recommendations of the Task Force on Tree and Shrub Planting on Active Oil Sands Tailings Dams**

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February 2011



## Oil Sands Research and Information Network

OSRIN is a university-based, independent organization that compiles, interprets and analyses available knowledge about returning landscapes and water impacted by oil sands mining to a natural state and gets that knowledge into the hands of those who can use it to drive breakthrough improvements in reclamation regulations and practices. OSRIN is a project of the University of Alberta's School of Energy and the Environment (SEE). OSRIN was launched with a start-up grant of \$4.5 million from Alberta Environment and a \$250,000 grant from the Canada School of Energy and Environment Ltd.

OSRIN provides:

- **Governments** with the independent, objective, credible information and analysis required to put appropriate regulatory and policy frameworks in place
- **Media, opinion leaders and the general public** with the facts about oil sands development, its environmental and social impacts, and landscape/water reclamation activities – so that public dialogue and policy is informed by solid evidence
- **Industry** with ready access to an integrated view of research that will help them make and execute reclamation plans – a view that crosses disciplines and organizational boundaries

OSRIN recognizes that much research has been done in these areas by a variety of players over 40 years of oil sands development. OSRIN synthesizes this collective knowledge and presents it in a form that allows others to use it to solve pressing problems. Where we identify knowledge gaps, we seek research partners to help fill them.

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## **REPORT SUMMARY**

Dam safety concern over the planting of trees and woody shrubs is in conflict with progressive reclamation, which is also a desirable outcome for oil sands tailings dams. International dam safety practice commonly restricts trees and woody shrubs on the downstream slopes of dams to preclude damage to drains, aggravation of seepage and piping and to ensure the integrity of both visual and instrumentation monitoring which require access and clear sight lines.

To address this issue, Alberta Environment (AENV) requested the Oil Sands Research and Information Network (OSRIN) to convene a third-party Task Force to provide independent opinion and recommendations on the subject.

The Task Force met in December 2010 and has recommended that provision for trees and woody shrubs on the slopes of active oil sands tailings dam shall be considered part of the responsibility of the Engineer-of-Record and plans will be submitted to AENV, Dam Safety for approval. The Task Force appreciates that it will be customary for the Engineer-of-Record to consult with corporate reclamation specialists for input into the recommended tree and shrub planting zones and tree and shrub exclusion zones. Potential exclusion zones include local critical areas such as drains, liners, berms, drain outfalls, ditches, access ramps and adjacent to instrumentation, etc.

## **ACKNOWLEDGEMENTS**

The Oil Sands Research and Information Network (OSRIN), School of Energy and the Environment, University of Alberta provided funding for this project.

OSRIN wishes to thank the members of the Task Force – Barry Hurdall (BJH Engineering Ltd.), Dr. Norbert Morgenstern (University of Alberta), Dr. John Sobkowicz (Thurber Engineering), and Angela Kupper (AMEC Earth and Environmental) – for their assistance in preparing the recommendations. OSRIN also wishes to thank Santiago Paz and Tanya Richens (Alberta Environment), Bob Cameron and Wayne Mimura (Syncrude Canada Ltd.) and Norm Eenkooren (Suncor Energy Inc.) for the advice they provided to the Task Force.

## 1 INTRODUCTION

The essential issue for discussion is that dam safety concerns over the planting of trees and woody shrubs on active oil sands tailings dams is in conflict with progressive reclamation, which is also a desirable outcome for oil sands tailings dams. International dam safety practice commonly restricts trees and woody shrubs on the downstream slopes of dams to preclude damage to drains, aggravation of seepage and piping and to ensure the integrity of both visual and instrumentation monitoring which require access and clear sight lines.

To address this issue, Alberta Environment (AENV) requested the Oil Sands Research and Information Network (OSRIN) to convene a third-party Task Force to provide independent opinion and recommendations on the subject. It is expected that this would allow AENV to provide a balance to their decisions given the need to ensure dam safety and allow some form of progressive reclamation on active oil sands tailings dams.

In a December 2nd, 2010 letter to Chris Powter, Executive Director, OSRIN, Shannon Flint, Director, Northern Region, AENV set out the details of the formation of a Task Force to be initiated under OSRIN to address the issues raised from previous discussions within AENV ([Appendix 1](#)). This followed AENV's written direction to the oil sands mine operators in September 2010 to cease planting trees and woody shrubs on active oil sands tailings dams until further notice (see sample letter in [Appendix 2](#)).

The Task Force was asked to provide recommendations to AENV through OSRIN. A draft report was requested by January 31st, 2011 with the final report after appropriate internal and external review by March 31st, 2011.

In a December 3rd letter to the Oil Sands Developers Group, Rick Brown, ADM, Environmental Operations, AENV, informed the oil sands operators of this initiative and laid out the timetable for recommendations in a similar fashion to those mentioned above ([Appendix 3](#)).

Following some initial discussions, a Task Force was assembled consisting of:

- Barry Hurndall, P. Eng., Managing Director, BJH Engineering Ltd., Chairman
- Nordie Morgenstern, P. Eng., Professor Emeritus, University of Alberta, Consultant
- Angela Kupper, P. Eng., Vice President, Geotechnical, AMEC Earth and Environmental
- John Sobkowicz, P. Eng., Principal, Thurber Consultants

A Workshop was held on December 21st, 2010 at the AMEC Edmonton office. All of the Task Force members were in attendance with the exception of John Sobkowicz who joined by telephone conference call.

Also present at the Workshop, for the purpose of providing advice, information on current industry and regulatory practice, and historical perspective to the independent Task Force, were:

- Chris Powter, Executive Director, OSRIN, Project Manager

- Santiago Paz, P. Eng, AENV, Dam Safety
- Tanya Richens, P. Ag, AENV, Northern Region
- Bob Cameron, P. Eng, Syncrude
- Norm Eenkooren, P. Eng, Suncor
- Wayne Mimura, P. Eng, Syncrude (by telephone conference call).

## **2 TECHNICAL BACKGROUND**

The Task Force provides the following background statements to help set the context for the assessment of this issue.

1. International dam safety practice commonly restricts trees and woody shrubs on the downstream slopes of dams to preclude deep rooting from aggravating seepage issues, potential piping, interference with buried infrastructure and to facilitate both visual and instrumentation monitoring both of which require access and clear sight lines. Also, caution is required in areas where larger trees are subject to being blown over in wind storms thus aggravating erosion issues. Typically, erosion protection of dam slopes in temperate climates is usually restricted to well-maintained grasses or grass/legume mixes.
2. This practice has not been applied in a strict manner in the dam safety regulation of active oil sands tailings dams to date in recognition of the robustness of these structures. In fact, trees and woody shrubs have been planted or have naturally become established on some active oil sands tailings dams, and have been in place for many years.
3. Monitoring of active oil sands tailings dams has been on-going for decades, including in areas with tree and woody shrub growth.
4. The Canadian Dam Association, Dam Safety Guidelines and Bulletins (2007) and revisions to the guidelines and bulletins, which are currently underway, do not address this issue in a meaningful way.
5. The recent direction from AENV, and oil sands industry discussions, has highlighted the conflict between dam safety regulation concerns and the general desire to support progressive reclamation, including the planting of trees and woody shrubs. This is especially relevant given the life of an oil sands tailings dam in relation to the time required to complete reclamation of the site and the fact that slopes of tailings dams are often the first areas of land potentially available for reclamation on an oil sands mine site.
6. The objective of this Task Force is to evaluate whether an improved balance between these values can be achieved.

### **3 TECHNICAL ASSESSMENT**

The Task Force's technical assessment of the issues is as follows:

1. This Task Force is of the view that the protocols, regulation and dam safety values presently in place are paramount to the overall safety of these structures and cannot be sacrificed.
2. This Task Force is also of the view that progressive reclamation values are high for both industry and government, and should also be accommodated by allowing the planting of trees and woody shrubs on active oil sands tailings dams to the degree that is practical and consistent with 1. above.
3. This Task Force accepts this departure from conventional dam safety practices for the following reasons:
  - a. Tailings dams in the oil sands industry tend to be larger, often with relatively flat slopes, when compared to the more typical water resources structures, and tend to be more robust in design,
  - b. Boreal forest species used in oil sands reclamation are relatively shallow rooted and can be accommodated without aggravating dam safety issues in some areas of the dams,
  - c. Selective planting can be undertaken in a manner to ensure no negative impact (e.g., root intrusion) in local critical areas such as drains, liners, berms, drain outfalls, ditches, access ramps and instrumentation, etc.,
  - d. The values of both dam safety and progressive reclamation can be accommodated in a practical, regulated and transparent manner within the current dam safety management system.

### **4 PROPOSED WAY FORWARD**

The Task Force recommends the following:

1. Provision for trees and woody shrubs on the slope of active oil sands tailings dam shall be considered part of the responsibility of the Engineer-of-Record and plans will be submitted to AENV, Dam Safety for approval. The Task Force appreciates that it will be customary for the Engineer-of-Record to consult with corporate reclamation specialists for input into the recommended tree and shrub planting zones and tree and shrub exclusion zones, as well as recommended tree and shrub species.
2. Following approval by AENV, Dam Safety the protocol controlling tree and shrub planting would be incorporated into the site Operations Maintenance & Surveillance (OMS) manual for implementation. In addition, the process for managing volunteer trees and shrubs which establish themselves in the exclusion zones should be included in the OMS manual.

3. The Task Force recognizes that there may be occasions when dam safety concerns arise which require access and activities within an existing treed area, and under these circumstances it expects that dam safety concerns would override any other issues and that activities would proceed in these areas expediently to address these concerns. It notes that, under these circumstances, conflicts might occur with federal legislation such as the *Migratory Birds Convention Act* (Government of Canada 1994) and the *Migratory Birds Regulations* (Government of Canada 2010), which requires resolution outside of the scope and report of this Task Force.
4. The Engineer-of-Record, through annual inspection reporting, both corporately and to the regulators, may alter permissible planting both by accepting historical and/or invasive trees and shrubs in exclusion zones or by modifying the extent of exclusion zones as appropriate.

## 5 REFERENCES

Canadian Dam Association, 2007. *Dam Safety Guidelines (2007)*. Canadian Dam Association, Moose Jaw, Saskatchewan. 82 pp.  
[http://www.cda.ca/cda\\_new\\_en/publications/dam%20safety/dam%20safety.html](http://www.cda.ca/cda_new_en/publications/dam%20safety/dam%20safety.html) – summary and ordering information [Last accessed January 6, 2010].

Government of Canada, 1994. *Migratory Birds Convention Act 1994*. S.C. 1994, c. 22. Government of Canada, Department of Justice, Ottawa, Ontario. 54 pp.  
<http://laws.justice.gc.ca/PDF/Statute/M/M-7.01.pdf> [Last accessed January 6, 2010].

Government of Canada, 2010. *Migratory Birds Regulations*. C.R.C. c. 1035. Government of Canada, Department of Justice, Ottawa, Ontario. 78 pp. [http://laws-lois.justice.gc.ca/PDF/Regulation/C/C.R.C.,\\_c.\\_1035.pdf](http://laws-lois.justice.gc.ca/PDF/Regulation/C/C.R.C.,_c._1035.pdf) [Last accessed January 10, 2010].

### 5.1 Additional Reading

Canadian Dam Association – [http://www.cda.ca/cda\\_new\\_en/main%20index.html](http://www.cda.ca/cda_new_en/main%20index.html) [Last accessed January 6, 2010].

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The Mining Association of Canada, 2003. *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities*. The Mining Association of Canada, Ottawa, Ontario.

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US Army Corps of Engineers, 2009. *Key Facts about Trees and Levees*.  
<http://www.usace.army.mil/CEPA/NewsReleases/Pages/0906TreesLevees.aspx> [Last accessed January 6, 2010].

US Mine Safety and Health Administration, 2010. Review of existing metal and non-metal mine standards for dams. <http://govpulse.us/entries/2010/08/13/2010-19960/metal-and-nonmetal-dams> [Last accessed February 2, 2011].

## **6 GLOSSARY**

### **Active Oil Sands Tailings Dam**

Any oil sands tailings dam which is actively being operated to store and manage tailings and associated fluids which is being regulated by Alberta Environment as a dam under Alberta's *Water Act*.

### **Engineer-of-Record**

A professional engineer appointed by the oil sands operator who is responsible for the overall design, performance and safety of the tailings dam.

#### **6.1 Acronyms**

AENV	Alberta Environment
OMS	Operations Maintenance & Surveillance
OSRIN	Oil Sands Research and Information Network
SEE	School of Energy and the Environment

## APPENDIX 1: Letter from AENV to OSRIN

Government of Alberta ■  
Environment

Environmental Management  
Northern Region  
111 Twin Atria Building  
4999 - 98 Avenue  
Edmonton, Alberta T6B 2X3  
Canada  
Telephone 780-427-7617  
Fax 780-427-7824  
www.environment.alberta.ca

December 2, 2010

Mr. Chris Powter  
Executive Director  
Oil Sands Research & Information Network (OSRIN)  
3-23 Business Building  
University of Alberta  
Edmonton, AB T6G 2R6

Dear Chris:

**Re: Review and Recommendations for Tree and Shrub Planting on Active  
Tailings Pond Dykes at Oil Sands Mines**

Thank you for meeting with Mike Boyd, Pat Marriott, Dave Ardell, and Tanya Richens of Alberta Environment on November 12, 2010. As per the discussion, we are happy to work with you through the Oil Sands Research and Information Network (OSRIN) to initiate a third-party assessment of planting trees and shrubs on active oil sands mine tailings pond dykes. We understand that OSRIN will contract BJH Engineering to coordinate the work of the Task Force which will include Dr. Norbert Morgenstern from the University of Alberta, among others.

The Canadian Dam Association (CDA) is currently developing recommendations related to tailings dams, however their focus is not specific to our needs related to progressive reclamation.

Historically, trees and shrubs have been planted on active tailings ponds dykes in the mineable oil sands region. In September 2010, Alberta Environment directed the oil sands mine operators to cease planning for planting of any trees or shrubs on active tailings ponds dykes until further notified. There was considerable thought put into the decision, and in support of direction from our Dam Safety Branch, a precautionary approach was taken until further analysis could be undertaken.

This decision however, could have a significant impact on plans for progressive reclamation. The sides of active tailings pond dykes offer some of the largest opportunities for progressive reclamation, specifically at the younger facilities.

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Alberta ■

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As a part of the third party assessment we understand that you will arrange for experts in dam safety to assess the impacts of trees and woody-stemmed shrubs on the stability of oil sands mine tailings pond dykes, and as well, the impact of this type of vegetation on visual inspections of these structures, and make a recommendation to Alberta Environment on the issue.

In order to meet the timelines required by the oil sands mine operators who are updating their reclamation and closure plans by December 31, 2011, Alberta Environment is proposing the following process and schedule:

- o OSRIN to initiate the Task Force of dam safety consultants as soon as possible
- o OSRIN to host a one day workshop for the Task Force to discuss with operators and government reps the issues associated with planting trees and shrubs on active tailings pond dykes, from both the dam safety and reclamation perspectives in: early January, 2011
- o Task Force to draft the report and recommendations and OSRIN to send the draft document to AENV for initial review by: January 31, 2011
- o Feedback from AENV to OSRIN by: February 9, 2011
- o OSRIN to submit the final report and recommendations to both AENV and the operators by: February 15, 2011
- o AENV to collect any outstanding feedback from the operators by: February 25, 2010
- o AENV to consider and adopt the recommendations through a guideline document by: March 31, 2010 (sooner if possible)

We expect full cooperation by the oil sands mine operators in this initiative, in that any information required by the review team will be provided by either Alberta Environment, or preferably, directly by the companies.

OSRIN's role in the initiation of this project is much appreciated.

Yours truly,



Shannon Flint  
Director, Northern Region

cc: Terry Abel, Energy Resources Conservation Board  
Neil Barker/Terry Zitnak, Sustainable Resource Development  
Dave Ardell/Pat Marriott, Alberta Environment

## APPENDIX 2: Sample Letter from AENV to Industry

Government of Alberta ■  
Environment

Environmental Management  
Northern Region  
111 Twin Atria Building  
4999 - 98 Avenue  
Edmonton, Alberta T6B 2X3  
Canada  
Telephone 780-427-7617  
Fax 780-427-7824  
www.environment.alberta.ca

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September 13, 2010

Dear Mr. . . . :

**Re: Tree and Shrub Planting on Active Tailings Pond Dykes  
*Environmental Protection and Enhancement Act (EPEA) Approval***

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On August 10, 2009 all oil sand mine operators met with Alberta Environment (AENV) and Alberta Sustainable Resource Development (ASRD) to discuss the expectations for the annual conservation and reclamation reports and the upcoming reclamation and closure plan submissions. At this meeting staff from AENV's Dam Safety Section informed the operators of their concerns regarding planting of trees and shrubs on active tailings pond dykes, and the operators were verbally notified to cease planting trees and shrubs on active tailings pond dykes until further notice.

This letter serves as formal notification that AENV's current position is that reclamation plans should not include the planting of trees or shrubs on active tailings pond dykes, until otherwise notified in writing. A tailings pond dyke is considered active as long as the dam structure itself meets the definition of a dam under the Water Act.

This decision does not preclude the placement of reclamation material on active tailings pond dykes, as it is important for erosion control and stability. Seeding of native grasses is acceptable. The decision also does not preclude the planting of trees and shrubs on the plateau (top surface), or beaches, of the tailings ponds. Trees and shrubs previously planted on active tailings pond dykes do not need to be removed.

Discussions regarding end land use expectations for the tailings pond dykes post-closure are still required by the regulators. Well established grass communities could make successful planting of trees, shrubs and other native species challenging. However it should be acknowledged that beneficial soil development processes will continue throughout this period.

Alberta ■

It is recognized that this change in approach at the oil sands mines will impact opportunities for progressive reclamation, especially at the newer facilities, where tailings pond dykes typically represent some of the first areas reclaimed. Appropriate and effective communication of this change in approach to regional stakeholders will be required by both regulators and operators.

At this time we request that the reclamation and closure plans due in December of 2011 include an additional section of information that identifies how this change will affect progressive reclamation on active tailings pond dykes in comparison to previously approved reclamation plans, specifically: what the delay in progressive reclamation is (i.e. planting to a tree and/or shrub cover or using upland surface soil), and the area of land affected.

Should you have any further questions, please contact Tanya Richens at (780) 415-9630.

Yours truly,



Patrick Marriott, P. Eng.  
Acting Regional Approvals Manager  
Northern Region  
(Designated Director under the Act)

cc: David Ardell, AENV Water Management Operations  
Karyn Wog, AENV Dam Safety Section  
Shannon Flint, AENV Northern Region  
Tanya Richens, AENV Northern Region  
Elizabeth Grilo, ASRD Fort McMurray  
Steven Stryde, ASRD Fort McMurray  
Neil Barker, ASRD Edmonton  
Terry Abel, ERCB Fort McMurray

## APPENDIX 3: Letter from AENV to the Oil Sands Developers Group

**Government of Alberta** ■  
Environment

Environmental Management  
10<sup>th</sup> Floor, South Petroleum Plaza  
9915-108 Street  
Edmonton, Alberta T5K 2G8  
Canada  
Telephone: 780-427-1335  
[www.alberta.ca](http://www.alberta.ca)

AR 42729

December 3, 2010

Mr. Don Thompson  
617 – 8600 Franklin Avenue  
Fort McMurray, AB  
T9H 4G8

Dear Mr. Thompson:

As a representative of the Oil Sands Developers Group, I'd personally like to inform you of an initiative we are supporting through the Oil Sands Research and Information Network.

As you'll recall from our recent meeting, there were concerns raised by the Oil Sands Developers Group regarding a September 13, 2010 letter from Regional Approvals Manager, Mr. Pat Marriott to all oil sands mine operators indicating that tree and shrub planting on active tailings pond dykes should not be planned, until otherwise notified in writing.

Alberta Environment staff have been working with company reclamation experts since early 2009, defining reclamation and closure plan expectations and updating annual reporting requirements. On August 10, 2009 a representative from our Dam Safety Section informed the operators verbally to cease planting trees and shrubs on active tailings pond dykes until further notice. This direction has been discussed at numerous Cumulative Environmental Management Association Reclamation Working Group meetings, and it has been a general understanding with the reclamation experts for over a year. The September 13, 2010 letter from Mr. Marriott was meant to formalize this position until otherwise notified. There was considerable thought put into the decision, and in support of direction from our Dam Safety Branch, a precautionary approach was taken until further analysis could be undertaken.

We are happy to announce an initiative that we are supporting through the Oil Sands Research and Information Network (University of Alberta) to initiate a third-party assessment of planting trees and shrubs on active oil sands mine tailings pond dykes. The Oil Sands Research and Information Network has agreed to fund and lead the project, through which experts in dam safety will assess the impacts of trees and woody-stemmed shrubs on the stability of oil sands mine tailings pond dykes, and as well, the impact of this type of vegetation on visual inspections of these structures. With consideration of feedback obtained from operators and government through a workshop in January, the experts will make a recommendation to Alberta Environment on the issue so that a guideline can be developed specific to the needs of the mineable oil sands region.

In order to meet the timelines required by the oil sands mine operators who are updating their reclamation and closure plans by December 31, 2011, the following process and schedule has been proposed:

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- o Oil Sands Research and Innovation Network to initiate the Task Force of dam safety consultants as soon as possible
- o Oil Sands Research and Innovation Network to host a one day workshop for the Task Force to discuss with operators and government reps the issues associated with planting trees and shrubs on active tailings pond dykes, from both the dam safety and reclamation perspectives in: early January, 2011
- o Task Force to draft the report and recommendations and Oil Sands Research and Innovation Network to send the draft document to Alberta Environment for initial review by: January 31, 2011
- o Feedback from Alberta Environment to Oil Sands Research and Innovation Network by: February 9, 2011
- o Oil Sands Research and Innovation Network to submit the final report and recommendations to both Alberta Environment and the operators by: February 15, 2011
- o Alberta Environment to collect any outstanding feedback from the operators by: February 25, 2010
- o Alberta Environment to consider and adopt the recommendations through a guideline document by: March 31, 2010 (sooner if possible)

Based on recent thoughts shared by you and Mr. Chris Fordham during our meeting with the Deputy Minister of Environment on November 8, 2010, I anticipate you would appreciate the full participation by all oil sands mine operators in this initiative. I concur and suspect the Oil Sands Research and Information Network will require considerable information to facilitate a detailed review of the issue. I also encourage the participation in the workshop by appropriate experts including but not restricted to geotechnical engineers and reclamation experts.

Sincerely,



Rick Brown  
Assistant Deputy Minister  
Environmental Operations

cc: Chris Fordham, Suncor  
Shannon Flint, Alberta Environment  
Terry Abel, Energy Resources Conservation Board  
Neil Barker, Sustainable Resource Development  
Terry Zitnak, Sustainable Resource Development