WATER USE AND TAILINGS MANAGEMENT IN SURFACE MINED OIL SANDS

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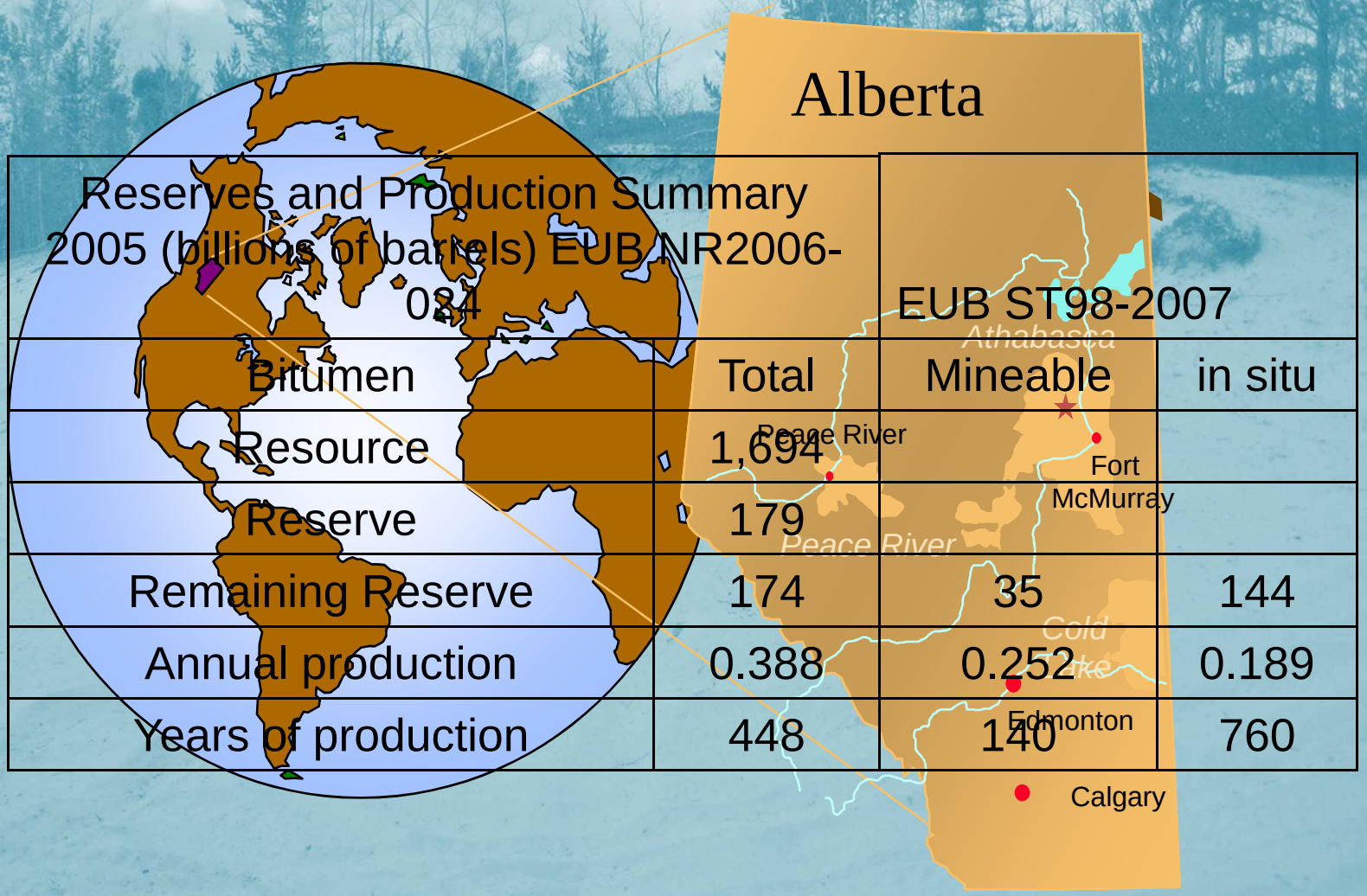

Reserves and Production Summary 2005 (billions of barrels) EUB/NR2006-084	EUB ST98-2007		
Bitumen	Total	Mineable	in situ
Resource	1,694		
Reserve	179		
Remaining Reserve	174	35	144
Annual production	0.388	0.252	0.189
Years of production	448	140	760

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Reserves and Production Summary 2009 (ERCB ST98-2010) in billions of barrels			
Bitumen	Total	Mineable	in situ
Resource	1,805	131	1,674
Reserve	176	38	138
Remaining Reserve	170	34	135
Annual Production	.544	.302	.246
Years of Production	312	113	553

Approximately a 20% production increase in 2 years; 27 fewer years to reclaim

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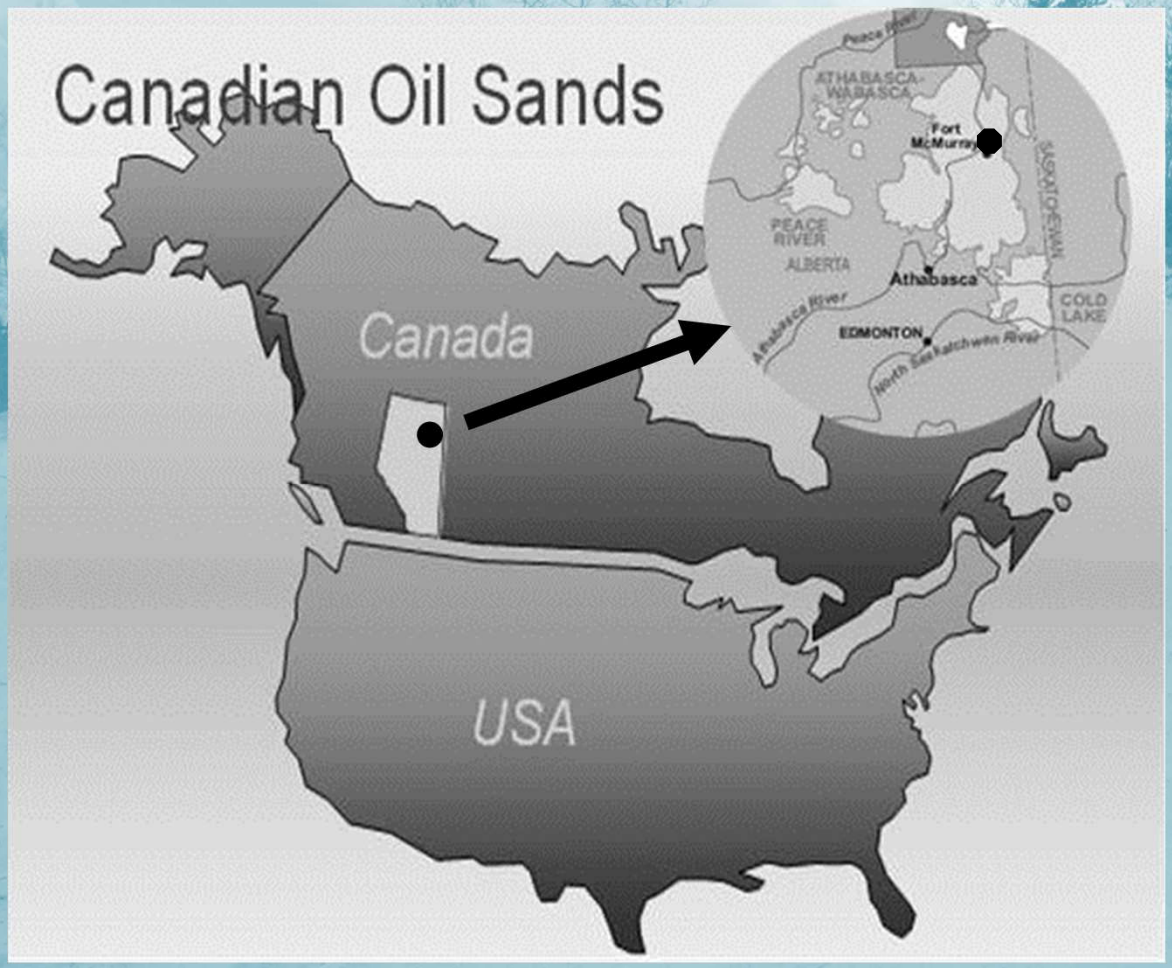

The area occupied by the circle is approximately 400,000km^2, and the area of the oil sands resource (in white) is approximately 141,000km^2. Currently land disturbance due to oil sands development is about 600km^2, with tailings containment about 180km^2.

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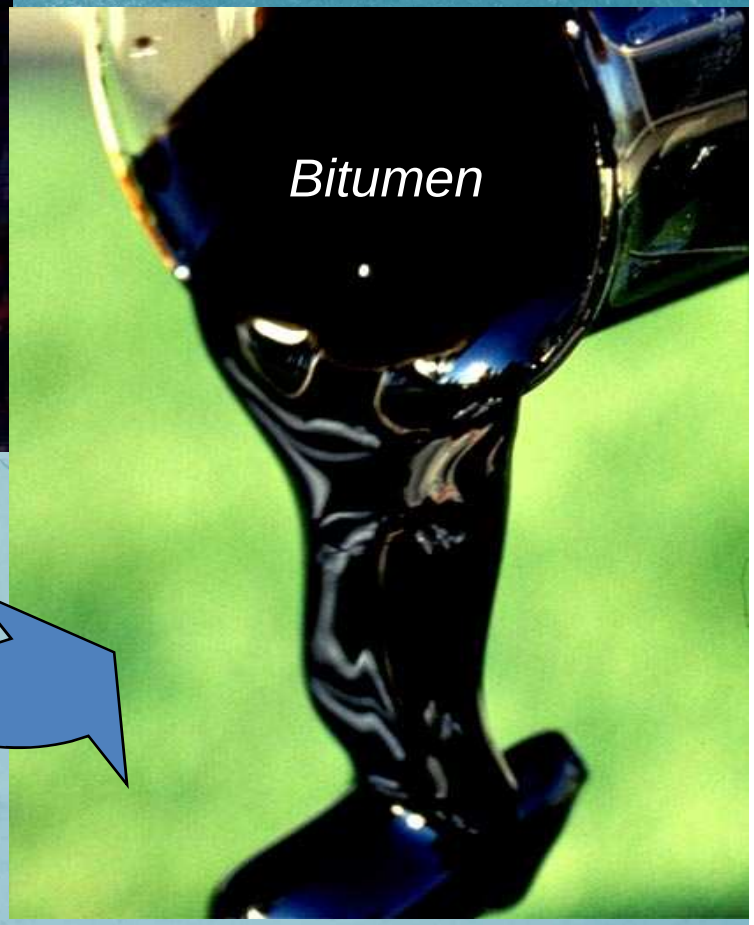

A lot of water is required to produce a barrel of bitumen!

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Oil Sand

Water

Water

Bitumen

Mineral

Sand

Fines

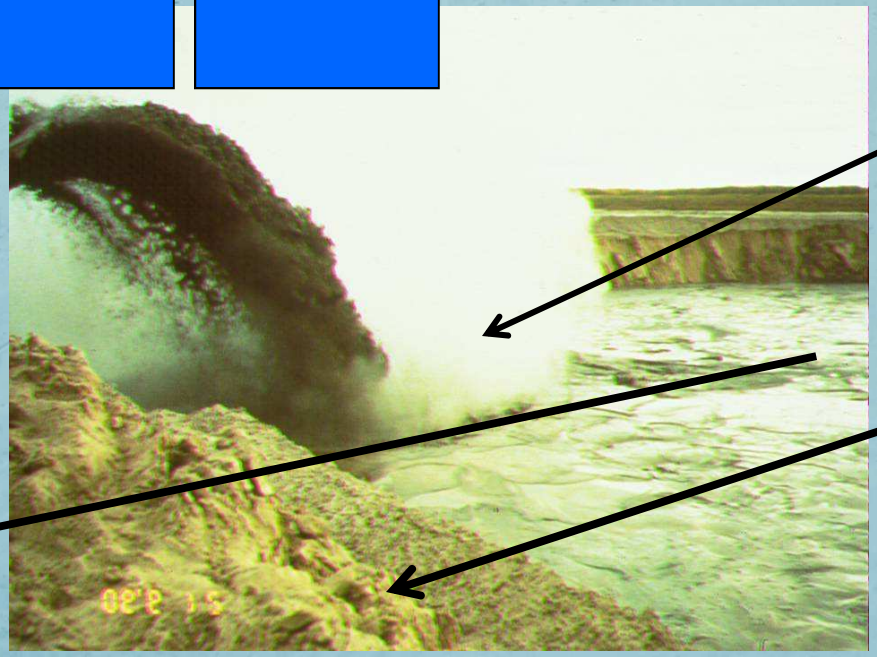
\+

Bitumen product

Leftover water and mineral

Fluid fine tails

Sand Tails



Recycled Water

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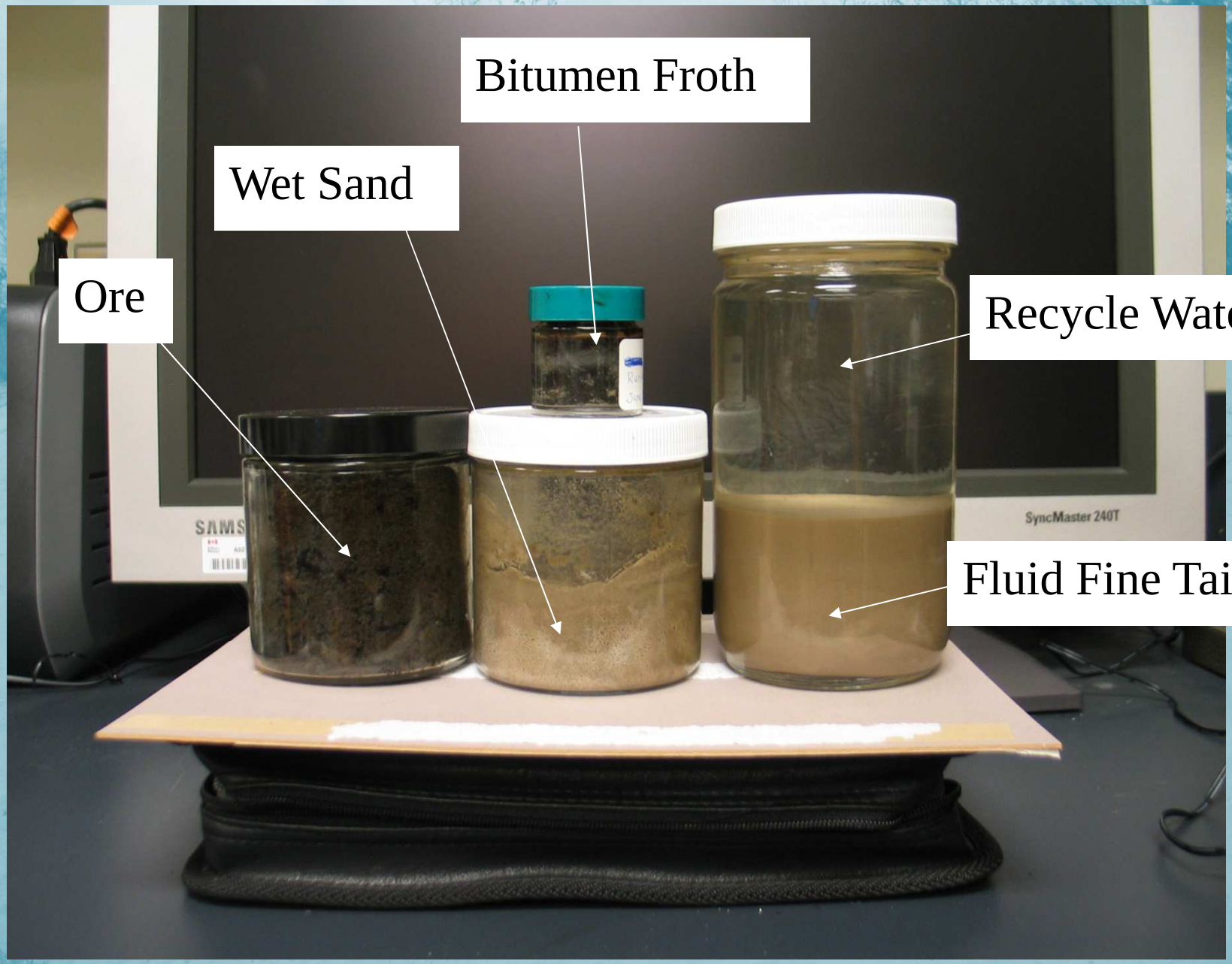

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The tailings containment structures are some of the largest man made features on the planet.

Dry stackable tailings technology is one way to reduce the volume of the accumulated fluid fine tailings. Dry stackable tailings implementation will allow for reclamation of the boreal forest, and reduce the water requirement from the Athabasca river.

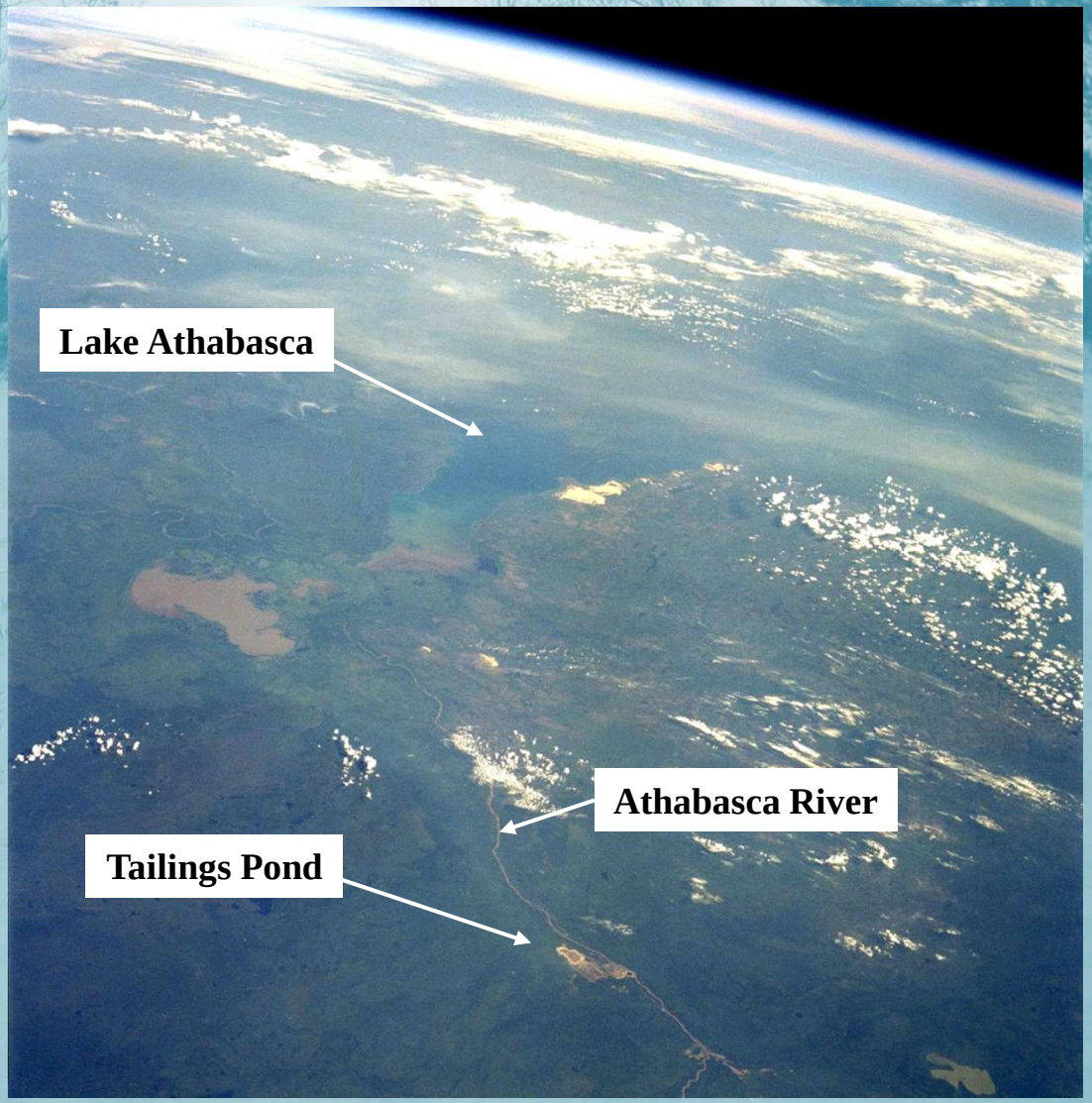

Photo courtesy of NASA, space shuttle program

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Aerial photo from approximately 1987 when the “best available technology” was water capping of the accumulated fluid fine tailings or sludge.

CT/NST technology promised to increase water re-use from 75% to over 80%, but now even this improvement on the “best available technology” proposes to have an end pit lake containing leftover fluid fine tailings or MFT.

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Suncor Pond 1 Reclamation

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Suncor Pond 1 September 2010 (Wapisiw Lookout)

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Environmental issues

Water availability (river ecosystem)

Lease storage volume limitations (land disturbance)

Economic issues

Water availability (collection and conservation of water)

Lease storage volume limitations (sterilization of resource)

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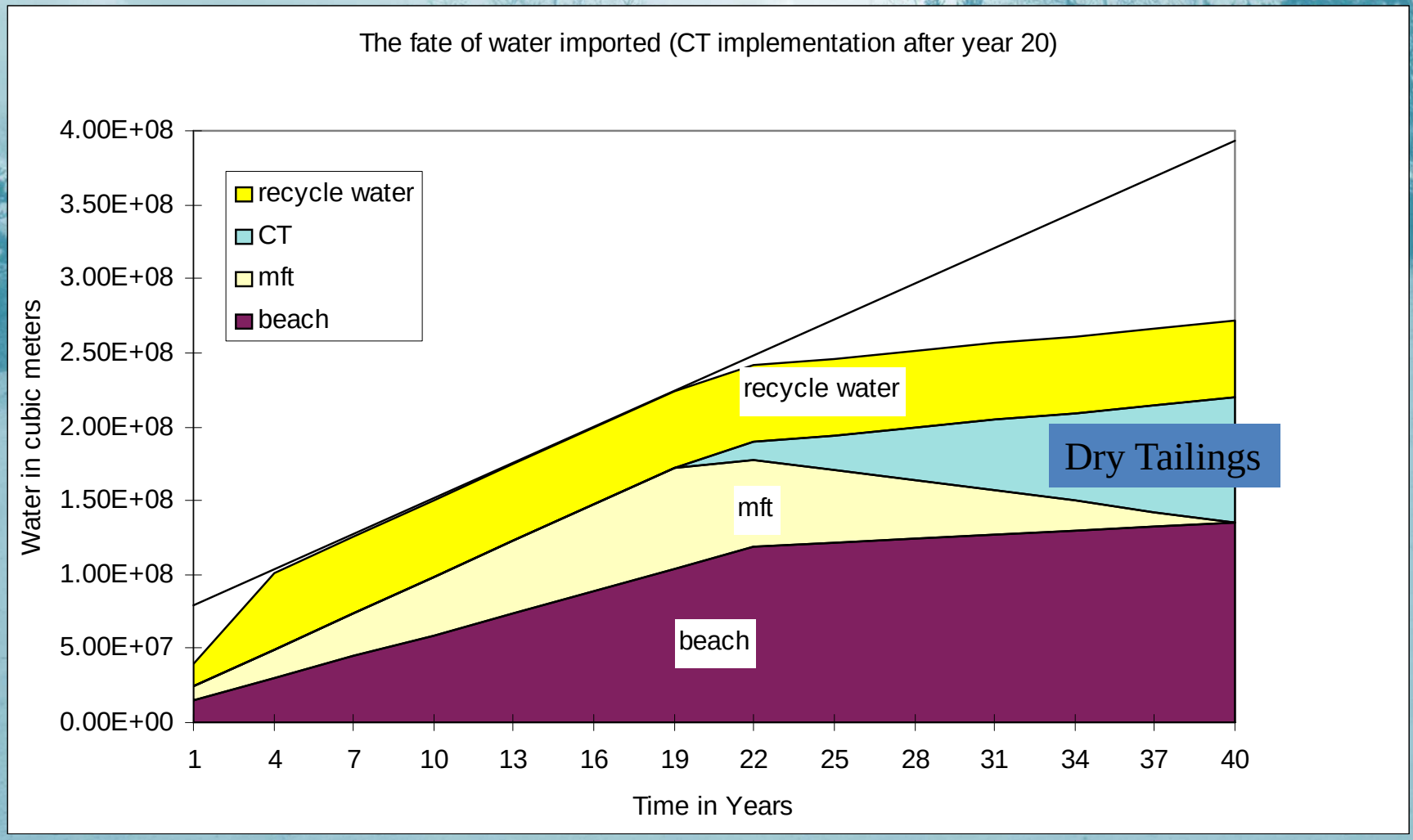

Storage volume limitations will drive new tailings technologies as much as water availability. Without the implementation of some other dry stackable tailings technology, long term storage volumes could become unsustainable.

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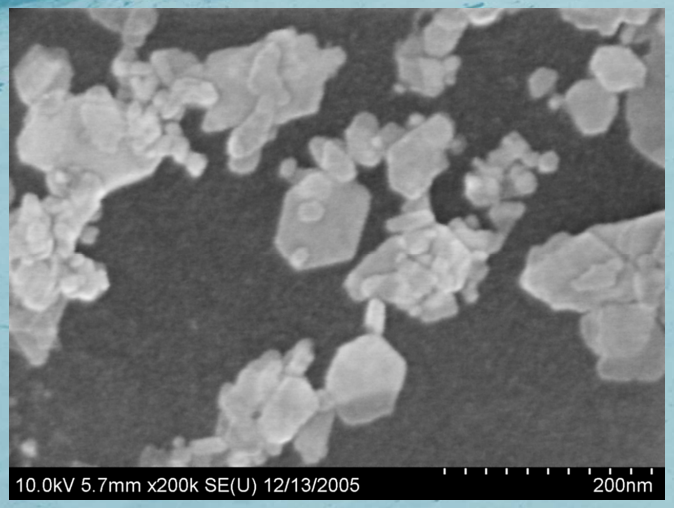

The ability to characterize nano-scale oil sands components is critical to our ability to manipulate their properties and mitigate the environmental impact of oil sands tailings development.

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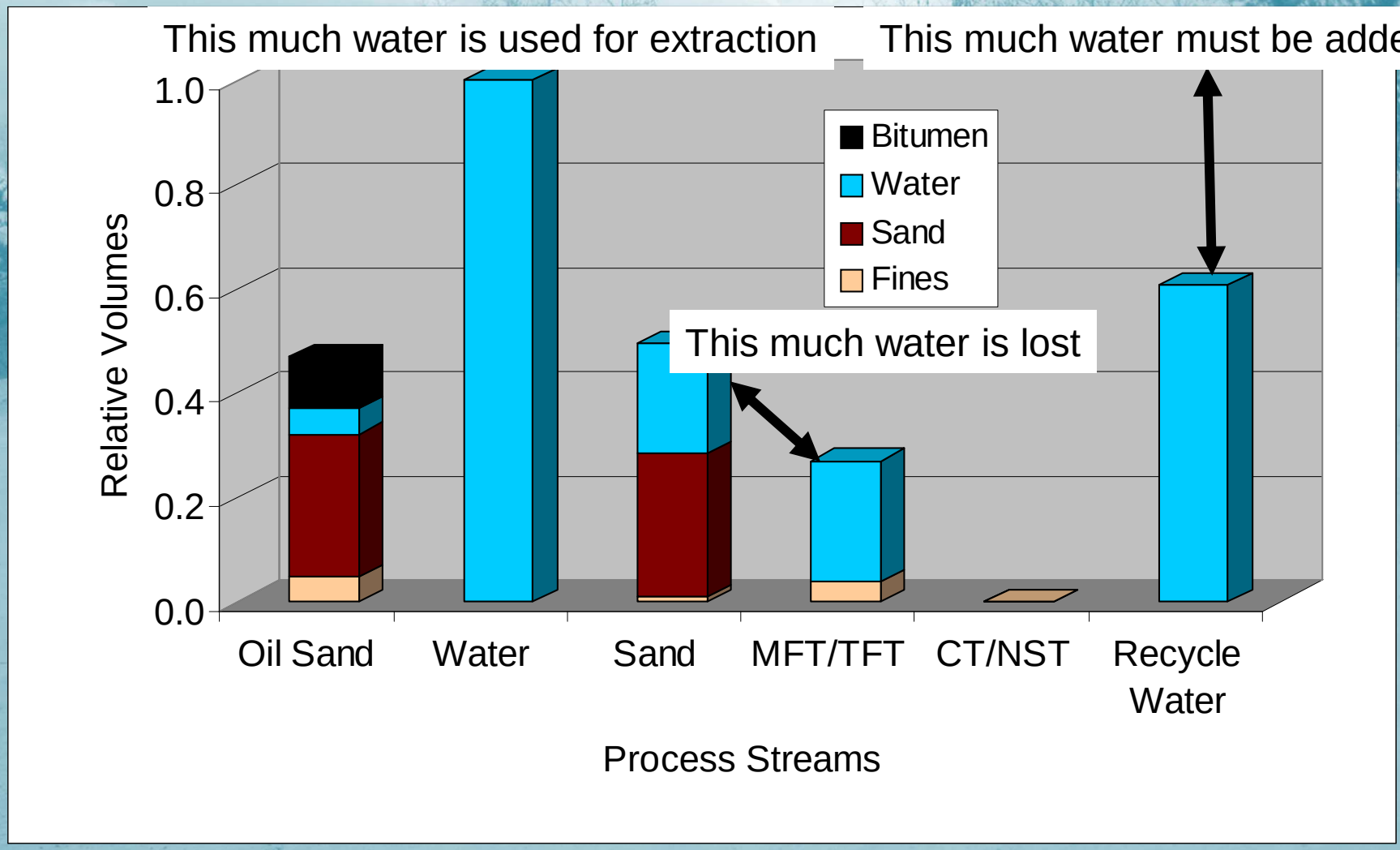

Water used for extraction: Approximately 12 barrels per barrel of bitumen
Water Recycled: Approximately 70%
Water lost to tailings: Approximately 4 barrels per barrel of bitumen

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(this is for a typical ore)

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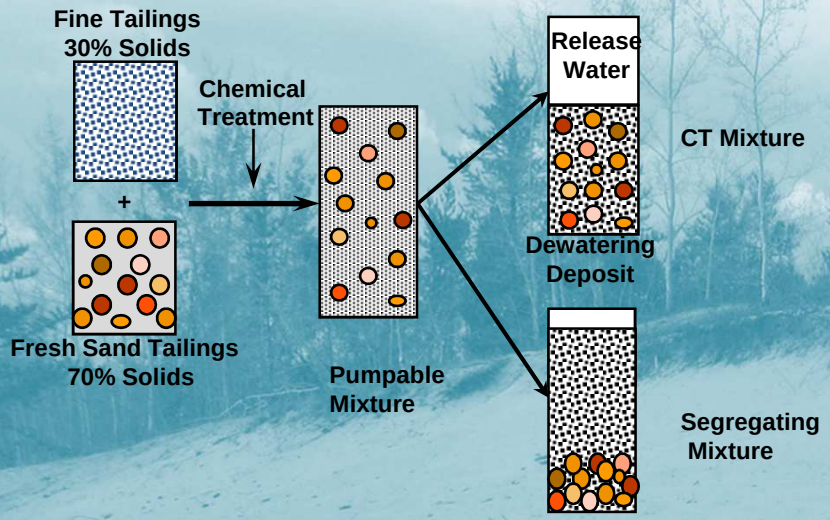

With the correct recipe, CT or NST is pumpable, but rapidly releases recycle water, leaving a trafficable surface for reclamation of the boreal forest. Without the correct recipe, the mixture will segregate, leaving a fluid material unsuitable for reclamation.

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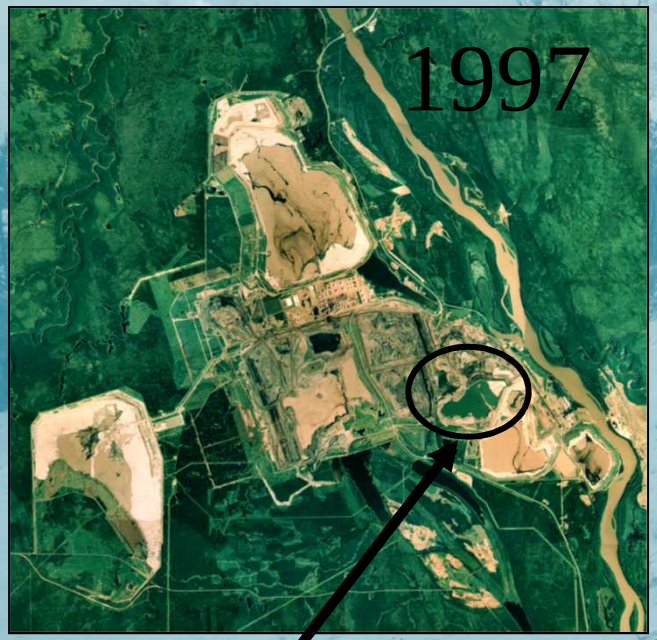
Commercial Scale CT at Suncor



2006

The circled area represents the commercial version of the swimming pool experiment in the previous slide, and the photographs show the trafficable surface created. Water released from this pond was returned to the extraction process, reducing storage volumes and reducing withdrawal from the Athabasca river.

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Carbon Dioxide CT

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Carbon Dioxide CT: Pilot Testing at Syncrude

CNRL is proposing to commercialize the CT/NST process using carbon dioxide as the chemical additive rather than gypsum.

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MFT DEWATERING

aka Thin Lift
aka TRO
aka AFD

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Thin lift dewatering, Syncrude 2010

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Thin lift dewatering

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Rim Ditching on a lab scale

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Rim Ditching on a big scale: 2009 Syncrude Test

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Rim Ditch September 2010

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Centrifuged fluid fine tailings

Increased water recycle
Reduced volume
No fluid storage requirement
Reclamation behind the mining operation

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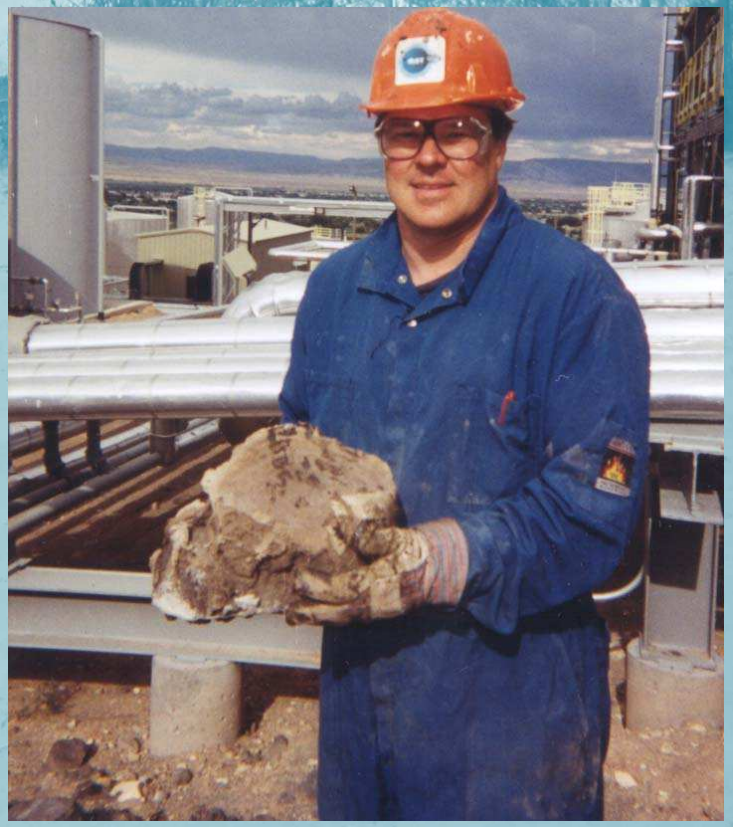
20 t/h pilot test of dry stackable fluid fine tailings



"Conclusions from the 20t/hour pilot study were that not only is it possible to create a stackable total tailings, but the project was economically viable at year 2000 oil prices.
Lessons learned during this study can be directly applicable to the Athabasca oil sands." 2006 CIPC, Calgary

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Centrifuged Tailings in Utah

Tailings stack being removed in preparation for another test run.

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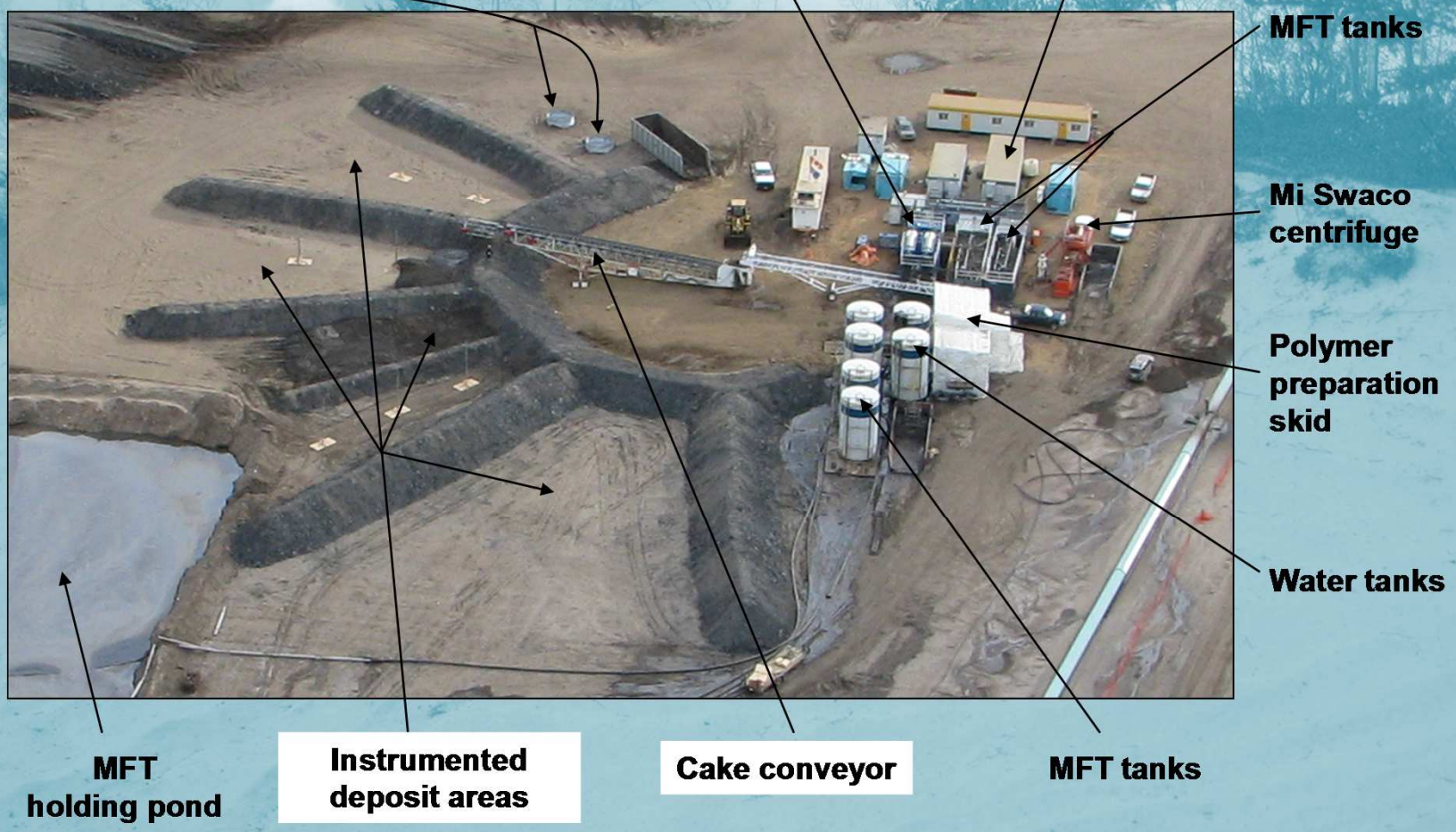

Aerial view of the 2008 Syncrude pilot demonstration of centrifuged fluid fine tailings

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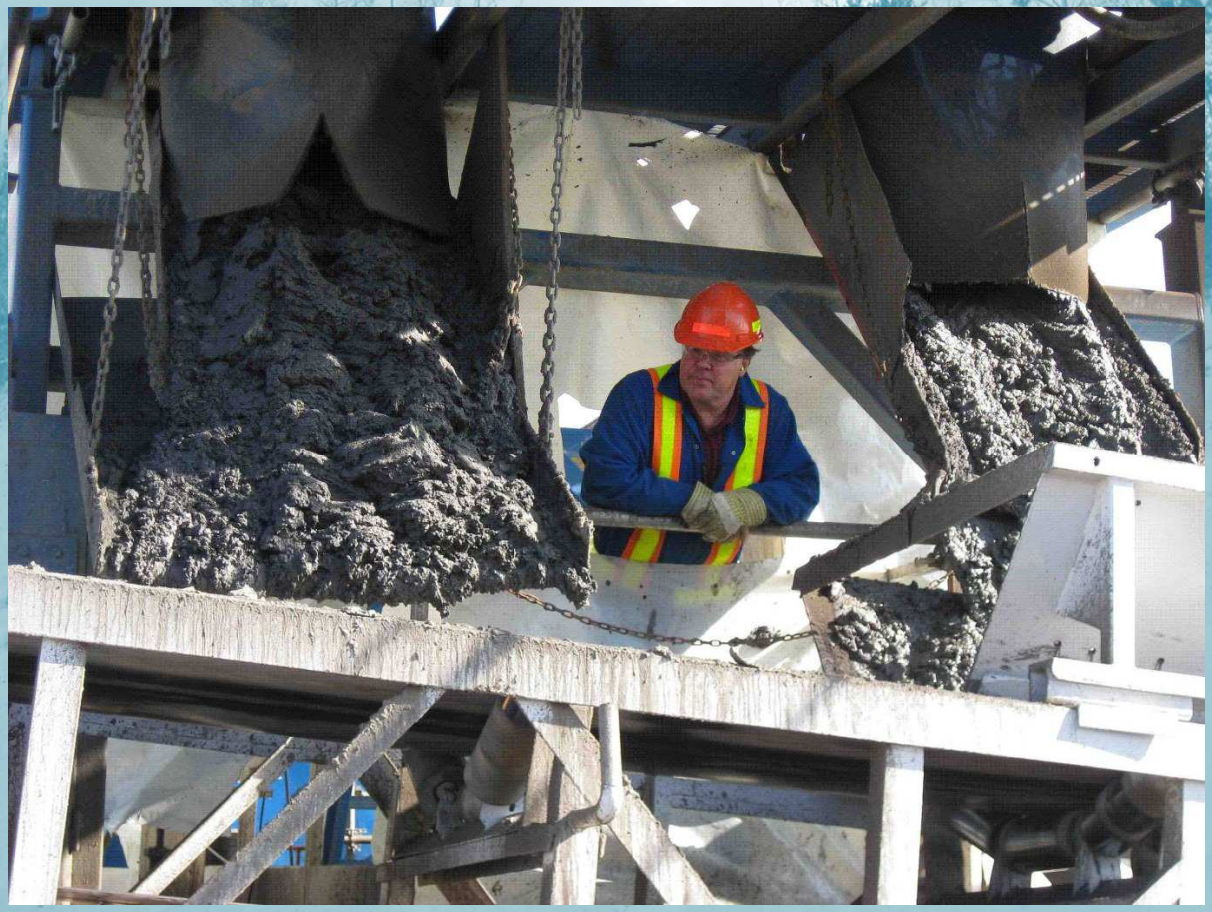

Centrifuged Fluid Fine Tailings Pilot at Syncrude: Dry Cake
Another dry stackable tailings technology

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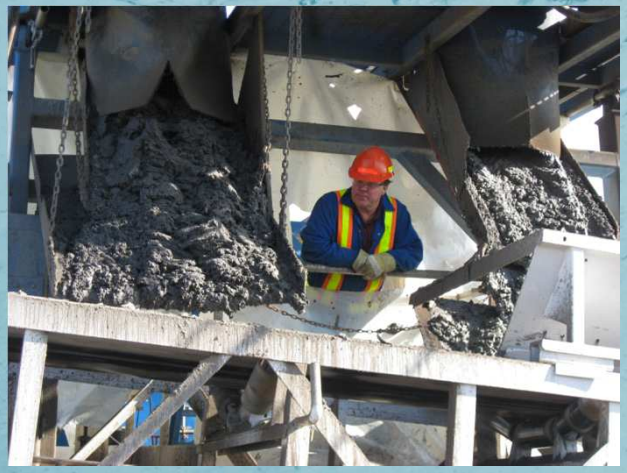

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October issue of Alberta Oil Magazine

A new standard in fluid fine tailings dewatering: Syncrude Centrifuge Pilot cell #3

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Centrifuge 2010

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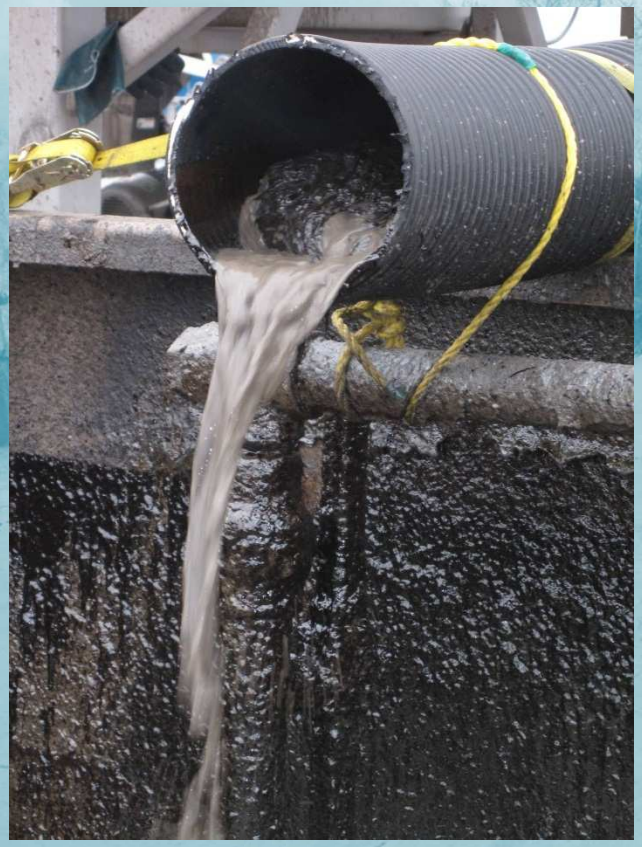

Bitumen in Tailings

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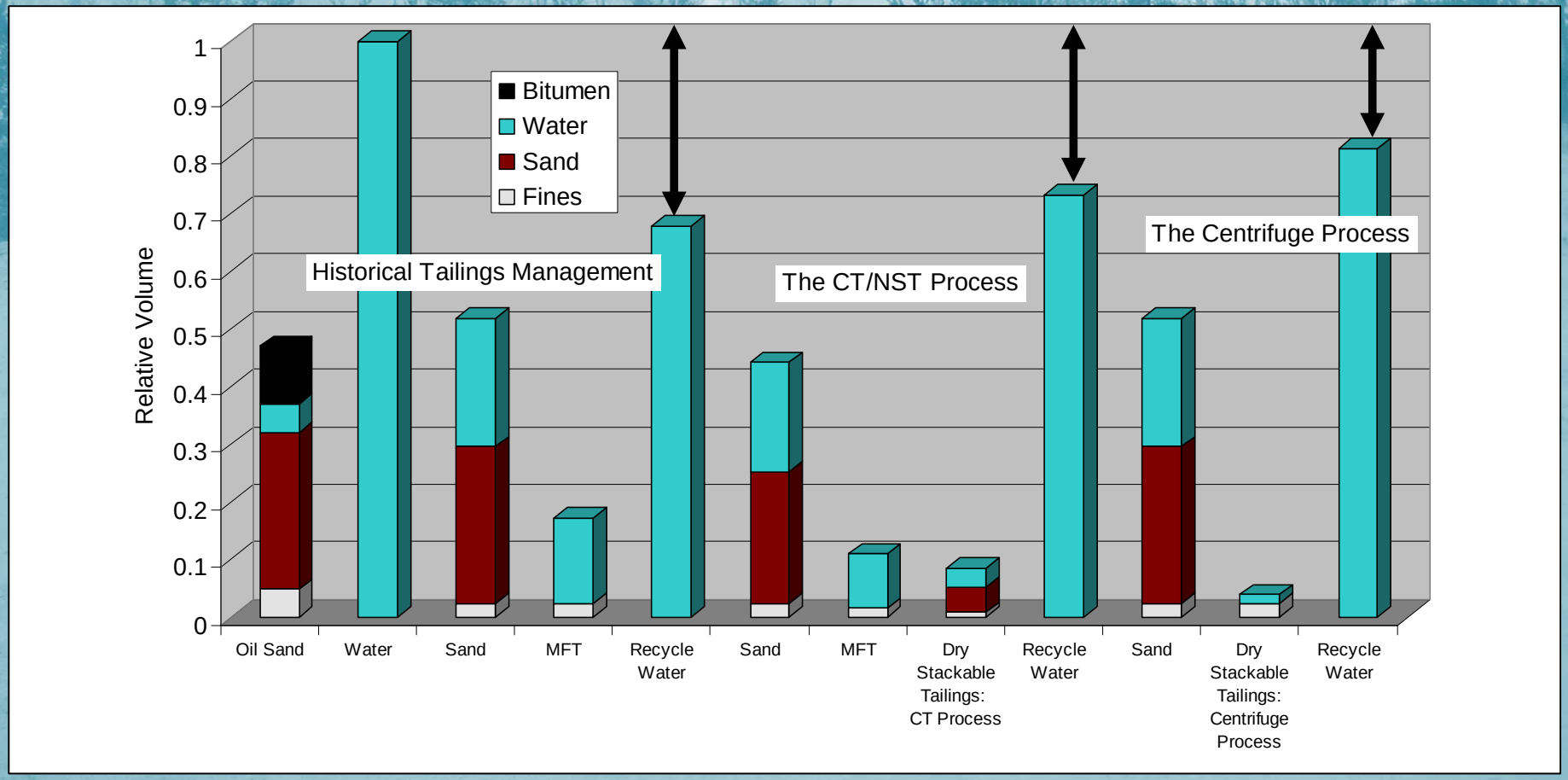

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SUMMARY

Several tailings management options are commercialized or have been demonstrated at close to commercial scale. Syncrude is leading the industry in understanding and scaling up all of these options.

Water conservation by the use of “dry stackable tailings” management options will have significant implications for the recycle water chemistry and we may have the opportunity to improve water quality from an environmental perspective.

The implementation of the ERCB Tailings Directive will be extremely challenging.

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