Financial assurance for mine reclamation: An examination of Alberta's oil sands regulations

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Alberta's oil sands deposits

Map: Alberta Energy and Resources Conservation Board

- Oil sands are a mixture of
  - Sand
  - Fine materials (silts, clays, etc. <44 μm)
  - Bitumen
  - Water

- Alberta is host to 3 bitumen basins
  - 170 B barrels proven bitumen reserves
  - 20% exploitable by surface mining

History of the surface mineable oil sands

- 1962 Great Canadian Oil Sands project recommended for approval
  - Government process assessed development proposals and granted rights to one deemed most likely to succeed
  - Government sought responsible development of the resource
- 1967 First bitumen produced, plant capacity of 45 000 bpd
- 1972 Syncrude project receives approval
- 1978 Syncrude project reaches production, plant capacity 80 000 bpd
- 1980s small plant expansions, significant increase in identified tailings requirements
- Late 1990s Syncrude and Suncor both pursue new mining leases and plant expansions, Shell revives Albian project
- 2000s Syncrude opens first 'satellite' mine (Aurora), Shell, Canadian Natural Resources, and Imperial Oil all begin commercial production
- 2011 Total production reaches 860 000 bpd

History of the surface mineable oil sands

1984

Suncor's original mine approval in production

- Tar Island Dyke has evolved from a few meters high to approaching 100m height

Syncrude's original mine approval in production

- MLSB settling basin has design capacity of 750M m^3

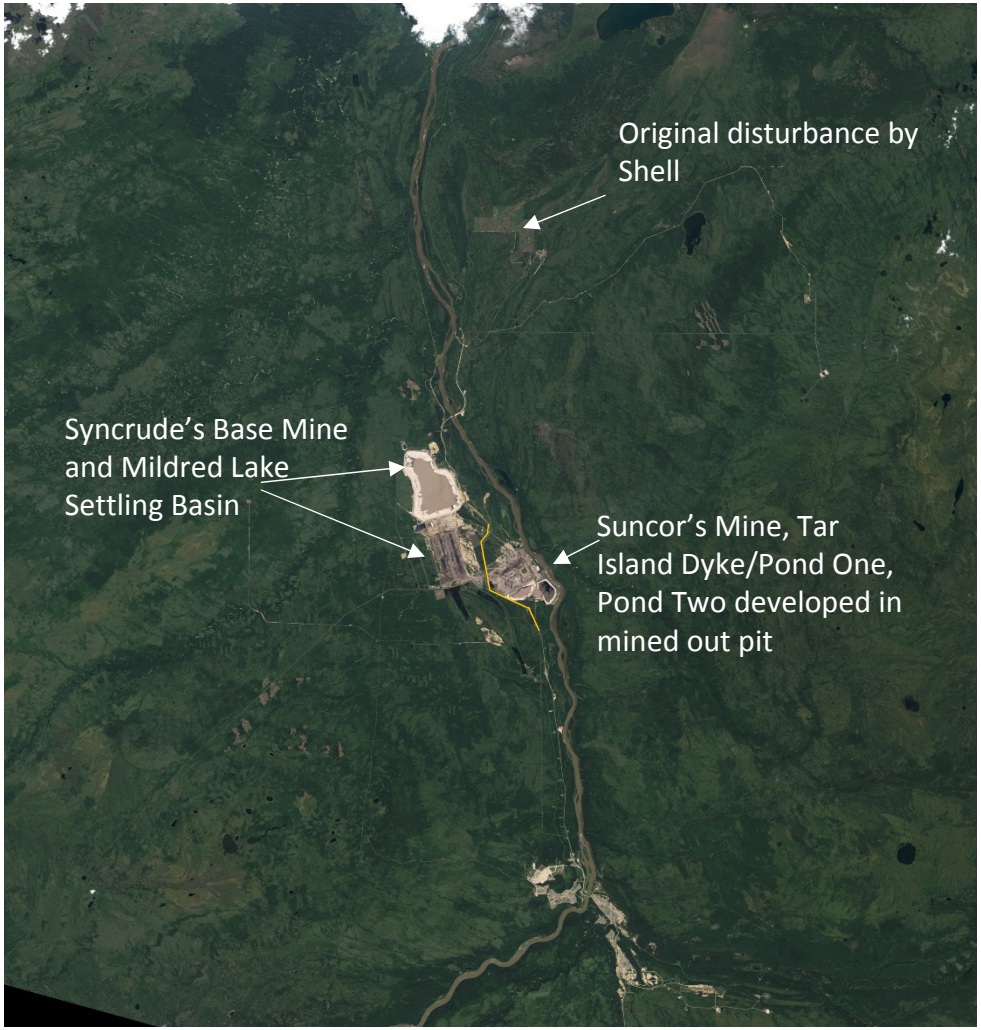


Image: NASA's Earth Observatory

History of the surface mineable oil sands

1994

Original mine approvals approaching end of production

MLSB proves insufficient; design capacity increased to 1 B m^3 and approval sought for SWSS Facility

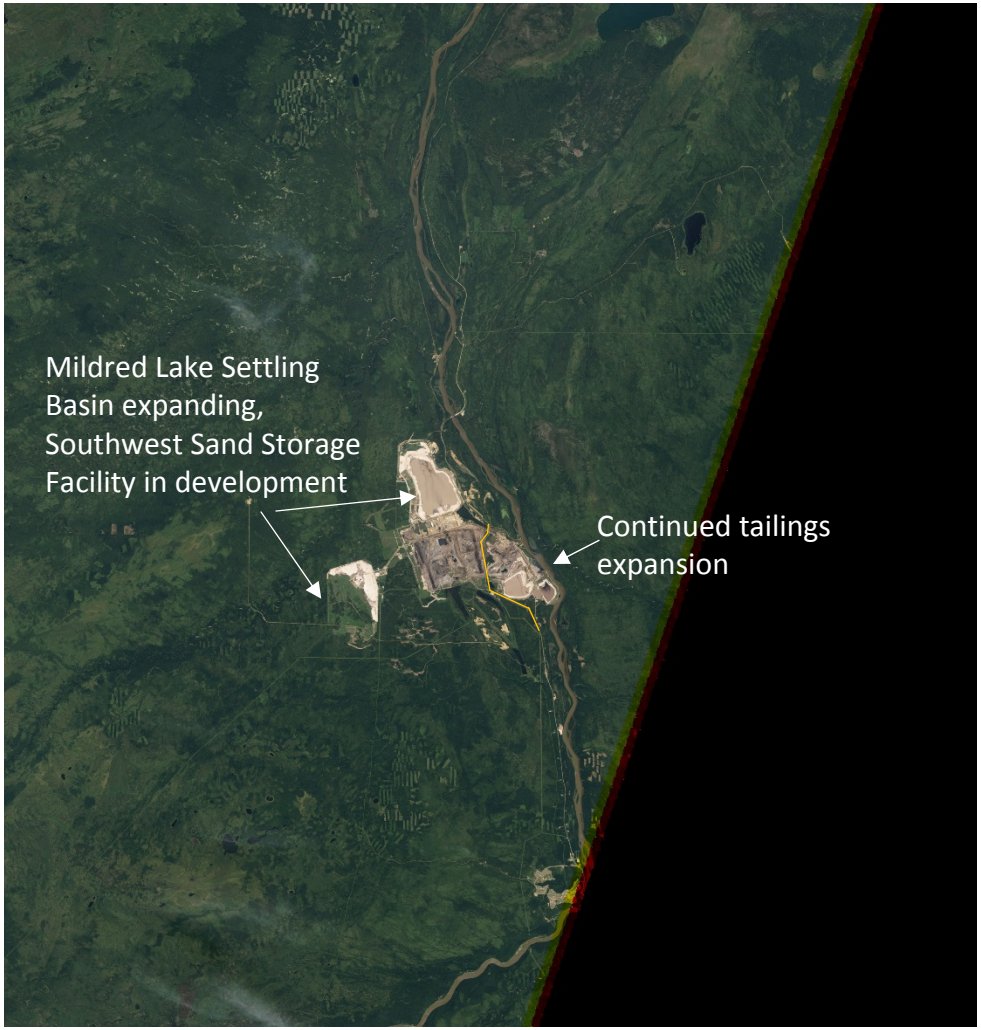


Image: NASA's Earth Observatory

History of the surface mineable oil sands

1998

Suncor moves across river to develop new mine approval

Syncurde expands north of their original approval with the North Mine and begins development of a remote mine, Aurora Mine

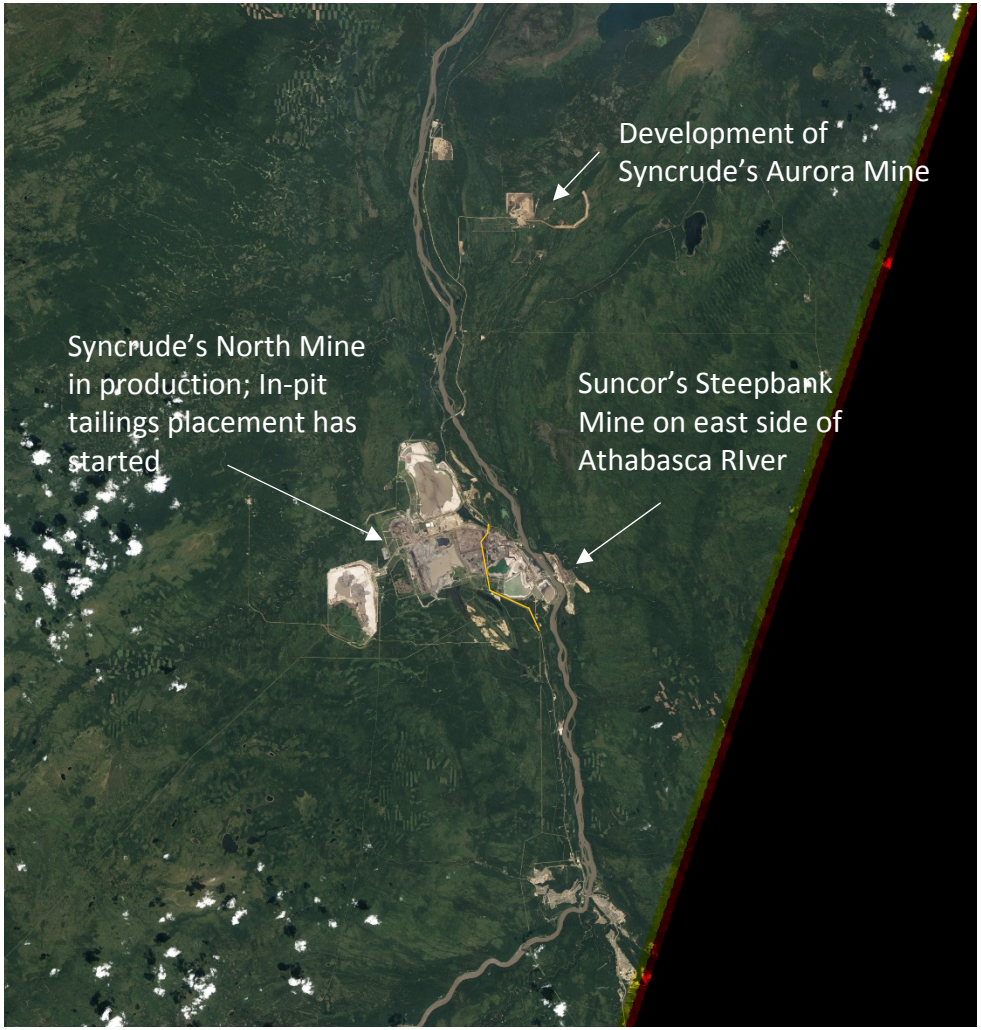


Image: NASA's Earth Observatory

History of the surface mineable oil sands

2002

Syncurde's Aurora Mine in production; bitumen froth shipped to the Base Mine site for final treatment

Shell's Muskeg River Mine in development

Suncor's Steepbank and Millenium mines in production; Millenium tailings pond proves insufficient and a second facility is sought

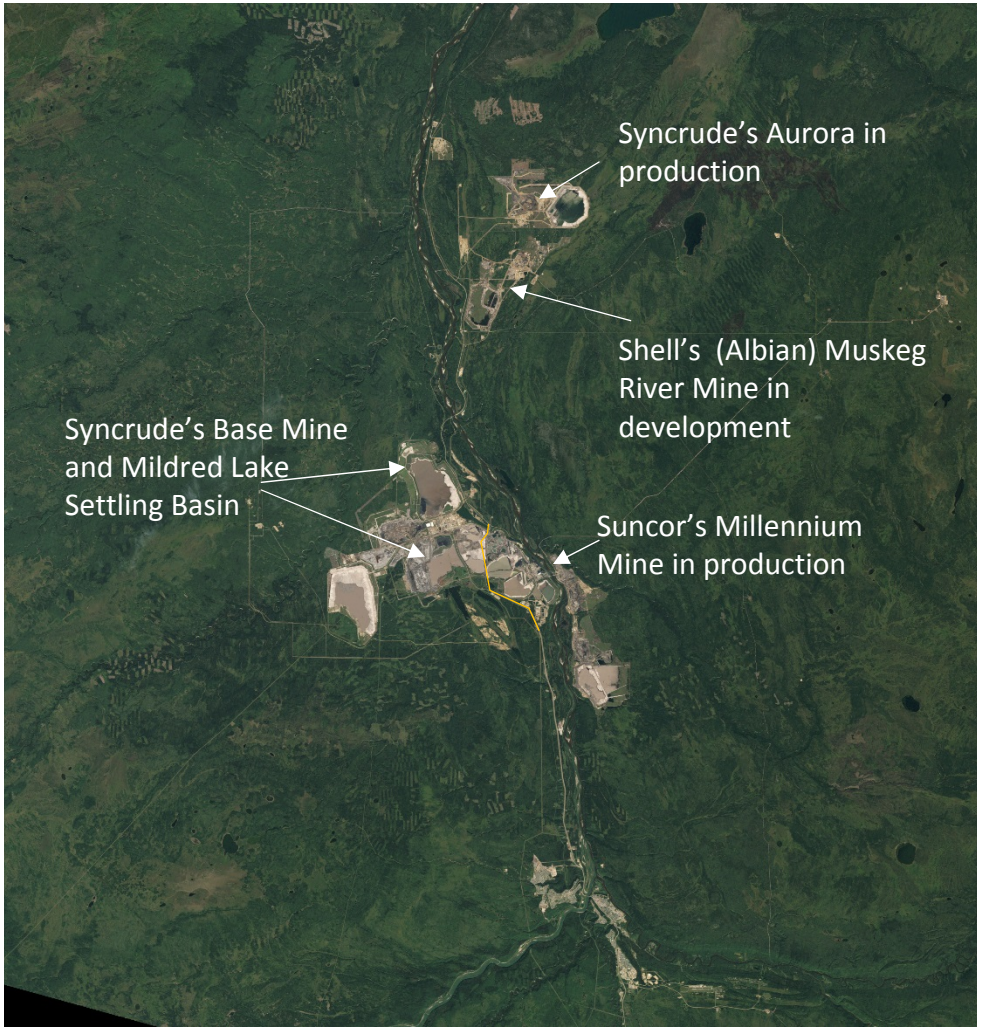


Image: NASA's Earth Observatory

History of the surface mineable oil sands

2006

Shell's Muskeg River Mine in production

Jackpine Mine in development

CNRL's Horizon Mine in development

Tailings ponds emerging as a critical (mine limiting) issue

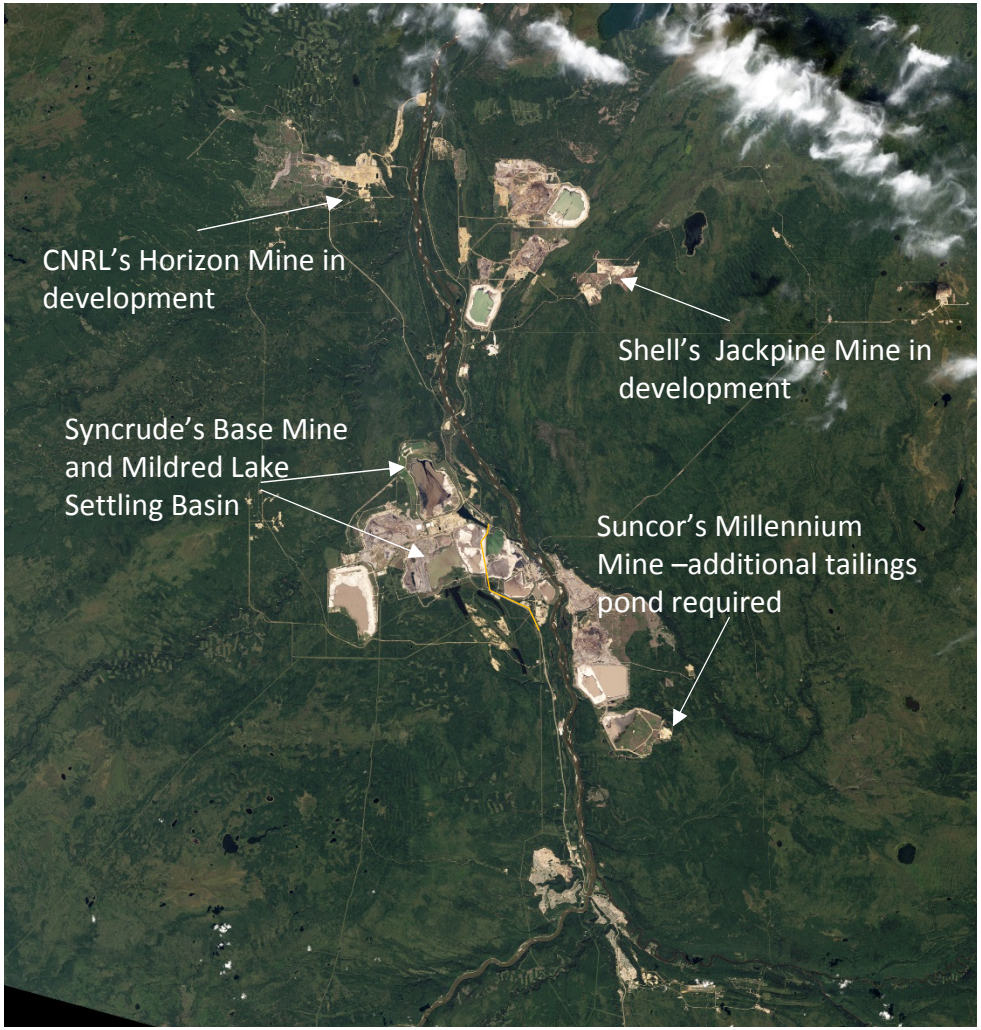


Image: NASA's Earth Observatory

History of the surface mineable oil sands

2011
Rapid intensification of mining

Currently Active Mines (2013)

Suncor	Millennium
	Steepbank North
Sycnrude	North Mine
	Aurora Mine
Shell	Muskeg River Mine
	Jackpine Mine
CNRL	Horizon Mine
Imperial Oil	Kearl Mine

Produciton capacity ~ 1 M barrels per day

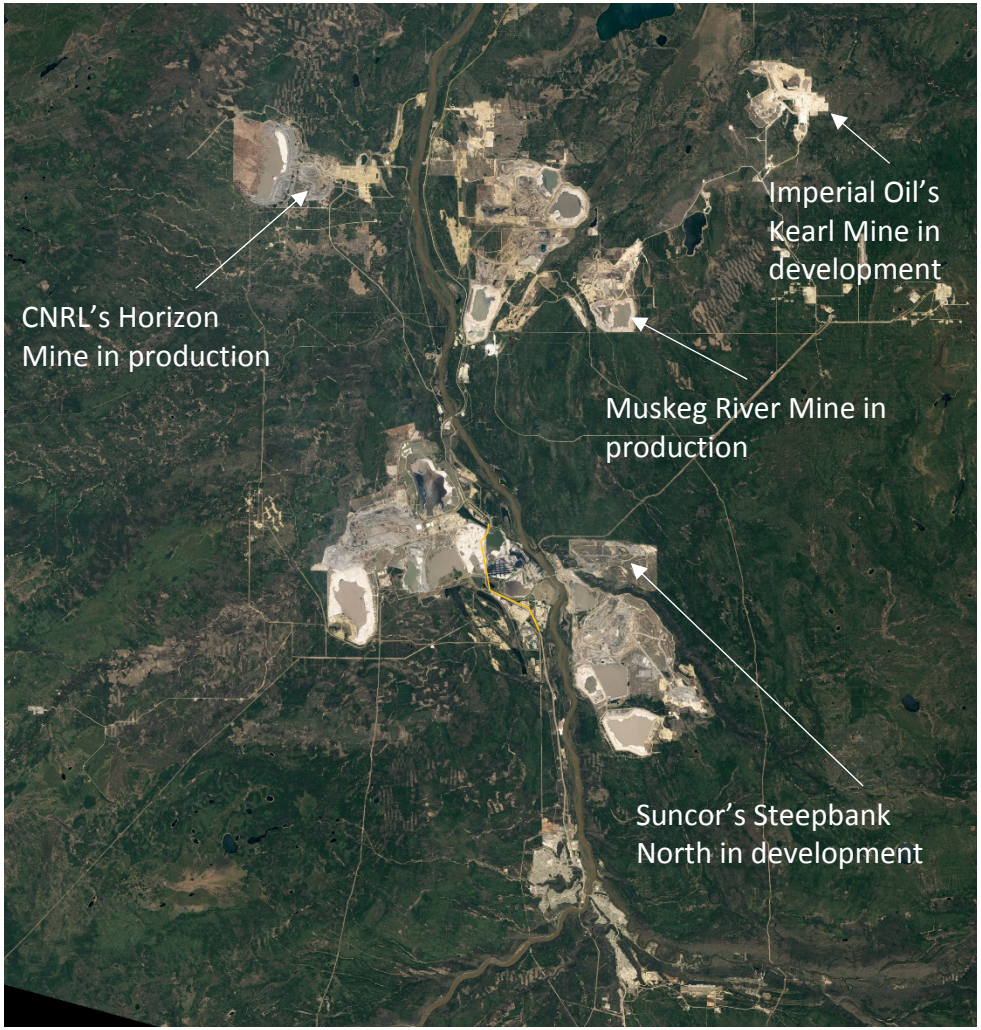
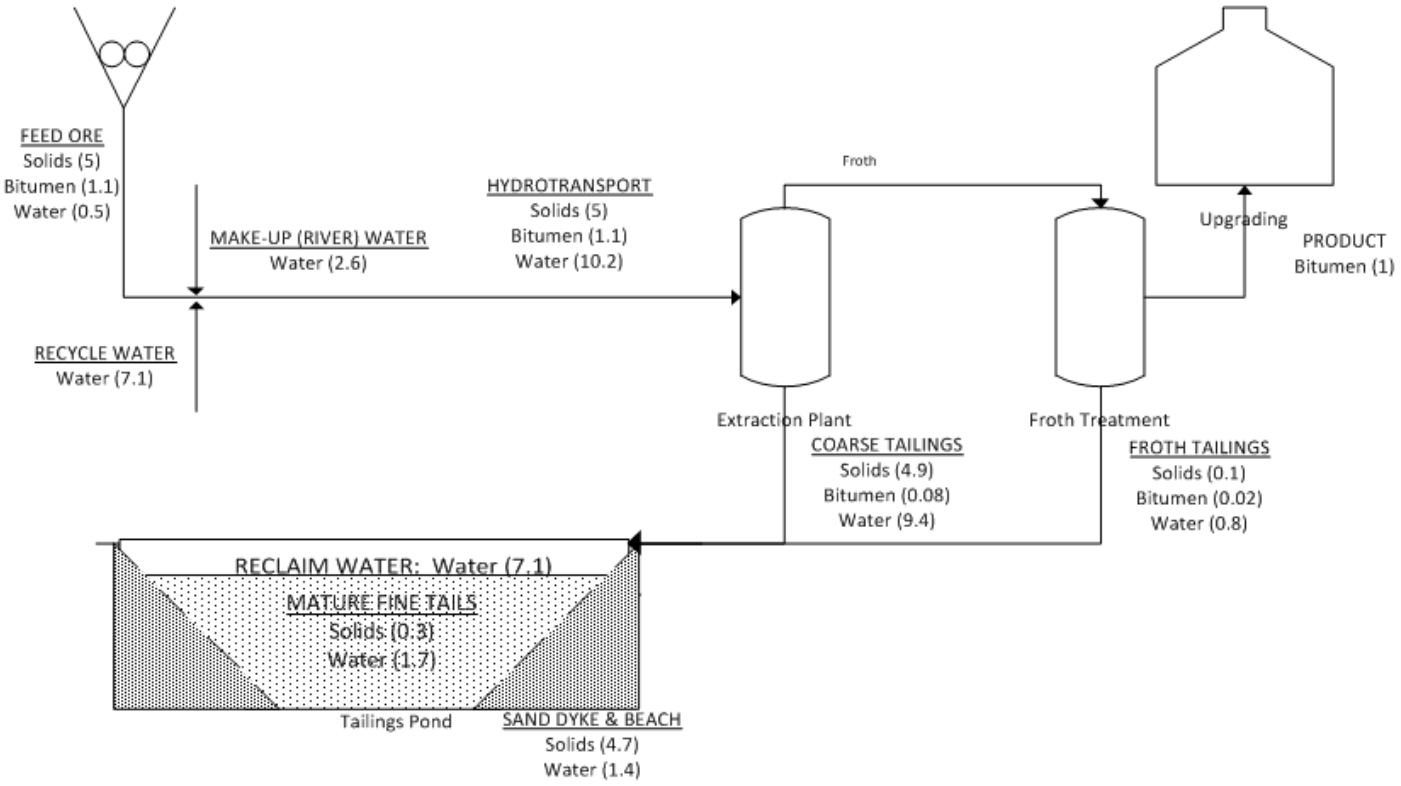


Image: NASA's Earth Observatory

The key impediment to reclamation

- Oil sand tailings contain fluid-suspended fine clays
  - Mature Fine Tailings (MFT) or Fine Fluid Tailings (FFT)
  - Clays do not settle naturally
  - Water becomes unavailable for recycle and MFT must be stored in dams
- Large volumes of tailings are produced
  - $1m^3$ of ore produces 1.2 to $1.5m^3$ of tailings
  - Over 900M m^3 of **fluid** tailings is now being stored
- No technology has been demonstrated to be effective AND successfully implementable on a large-scale

The key impediment to reclamation



Schematic of historical oil sands tailings management (after BGC Engineering Inc., 2010)

Evolution of Alberta's financial assurance requirements

<u>Original Suncor and Syncrude Mine approvals</u>

- Included stipulations that land would be reclaimed
- Establishment of a fund was required to ensure reclamation could be paid for
  - 3 cents (Canadian) per barrel of bitumen produced (cash deposit)
  - Not inflation adjusted
  - Not based on a detailed assessment of potential costs
  - Reclamation was intended to be progressive
  - MFT was not anticipated when GCOS (Suncor) granted original approval

Evolution of Alberta's financial assurance requirements

<u>Environmental Protection Security Fund</u>

- Introduced in response to concerns about underfunding of reclamation liabilities
- Intended to produce a level-playing field and ensure that operators had a degree of regulatory certainty surrounding reclamation assurance requirements
- Required assurance be provided as land was disturbed
  - All depositors used letters of credit on deposit with Alberta government

Evolution of Alberta's financial assurance requirements

Environmental Protection Security Fund

Was subject to significant criticism

- Operator generated estimates not subject to audit
- Original mine approvals were grandfathered, and waste from new approvals allowed to go into original approval areas without increase in assurance requirements
- Obvious inadequacy of assurance provided
- Lack of transparency
- Inconsistencies in assurance levels

Evolution of Alberta's financial assurance requirements

<u>Mine Financial Security Program</u>

- Introduced in 2011 response to concerns about EPSF
- Employs an asset-to-liability approach to reduce burden on operators to provide reclamation guarantee
- Requires minimum assurance for most of a mine's life
  - A Cdn$30M assurance deposit is required for a mine, $60M for a mine and upgrader combined
  - Has provisions to require assurance above minimum levels

Evolution of Alberta's financial assurance requirements

<u>Mine Financial Security Program</u>

Assurance is increased at earliest of

- Asset value : reclamation liability estimate < 3
- Operator fails to meet their own reclamation plan
  - Deposit increased by Cdn$75 000/hectare
  - Per hectare amount subject to review (every 3 years)
- There are fewer than 15 years of reserves remaining—assurance will be increased to provide full coverage of the liability by the end of mine life
  - Provisions for mine's with waste material going to another site not made

Conclusions from the Alberta experience

Transparency

- Program must be clearly articulated
- Method of determining assurance requirements must be communicated

Consistency

- Same requirements must apply to all projects
- Method of determining assurance requirements must be comparable

Adequacy

- Must be realistic about the costs of reclamation

Supportive of Government's aims:

- Industry needs to be closely regulated to achieve desired outcomes
- Need 'exit strategy' for initial programs to encourage development