



Réseau Pacte Mondial
France

Les hydrocarbures du futur

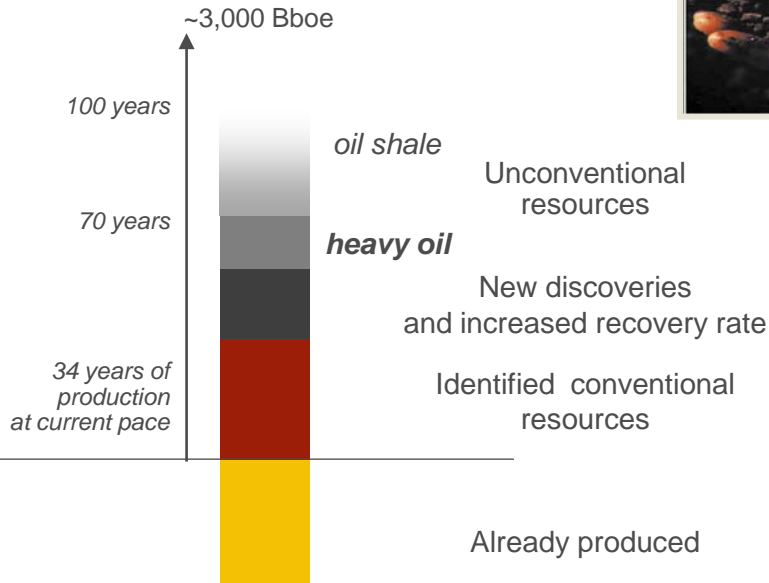
Les sables bitumineux

Déléguée Canada
Sophie Barthe

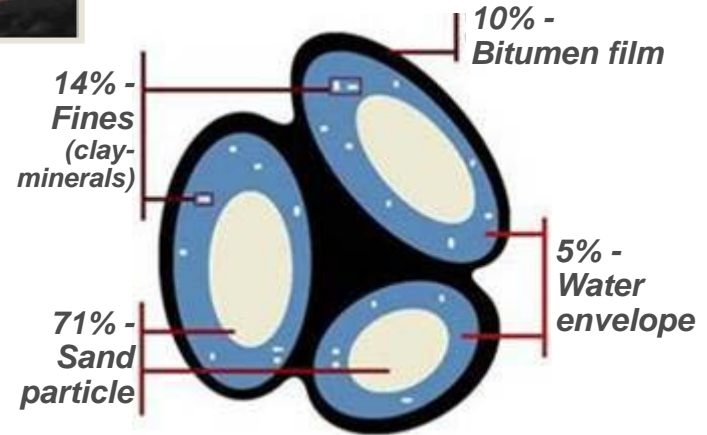


Oil sands, a world class resource to be developed

Oil resources



Oil Sand composition

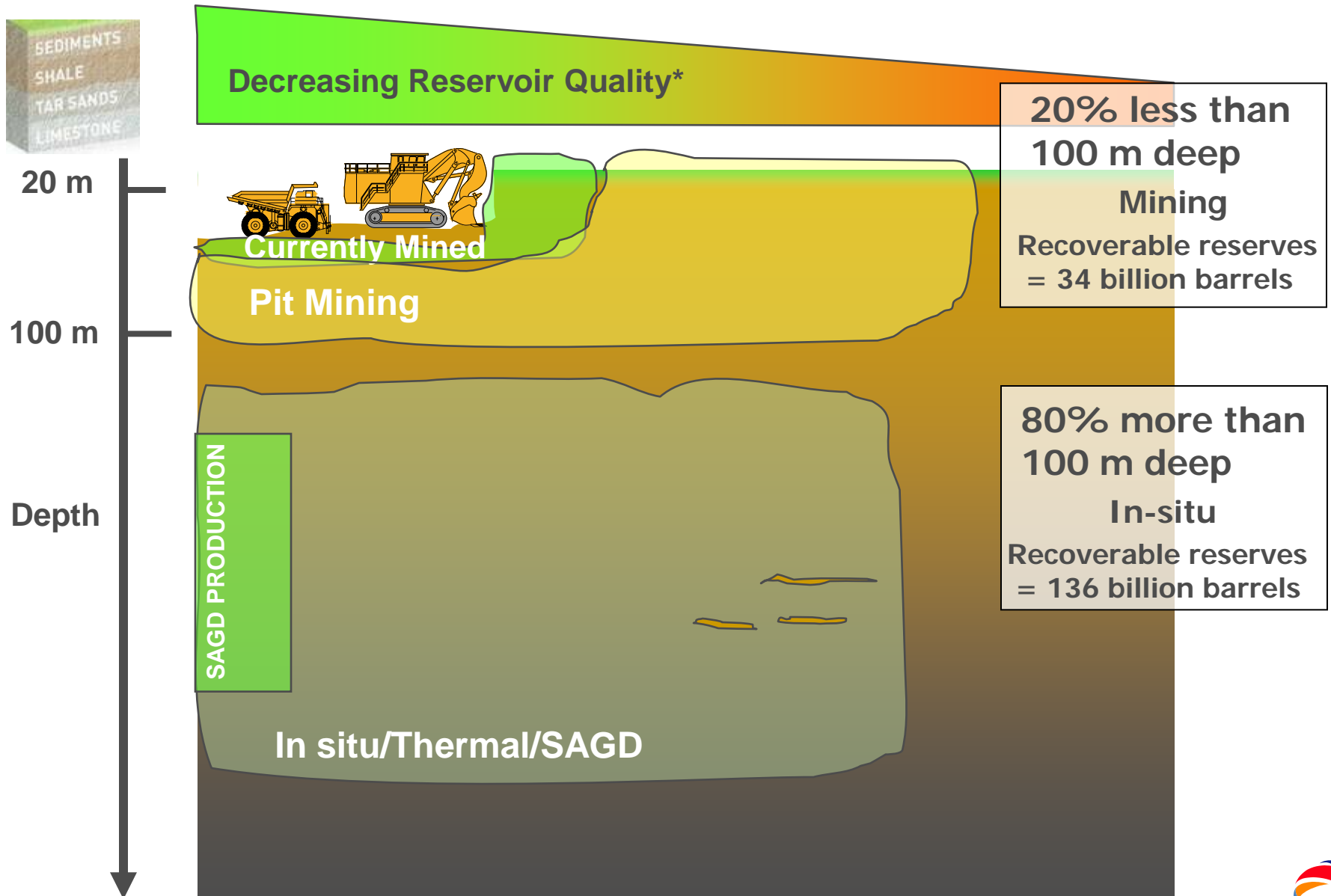


- > Oil Sands represent 170 Bbbl of resources
 - > Mining : 20% (34 Bbbl)
 - > In situ : 80% (136 Bbbl)
- > Challenging resources to produce requiring advanced technology



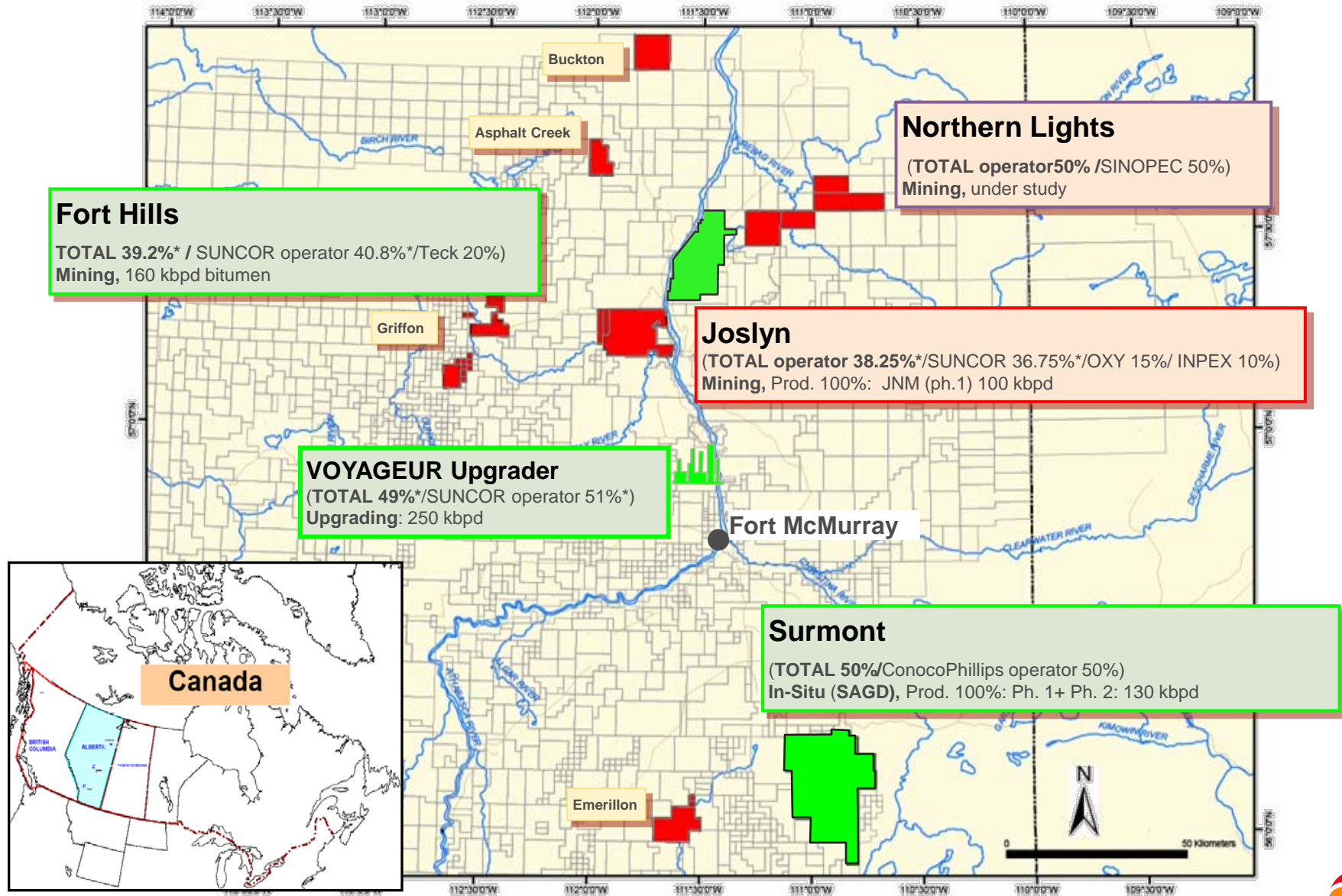
Extra Heavy Oil (Venezuela) & Bitumen (Canada), around 14 years of world production

Oil Sands Production Technologies: from mining to in-situ



(*) Bitumen content, Thickness, Heterogeneity, water....

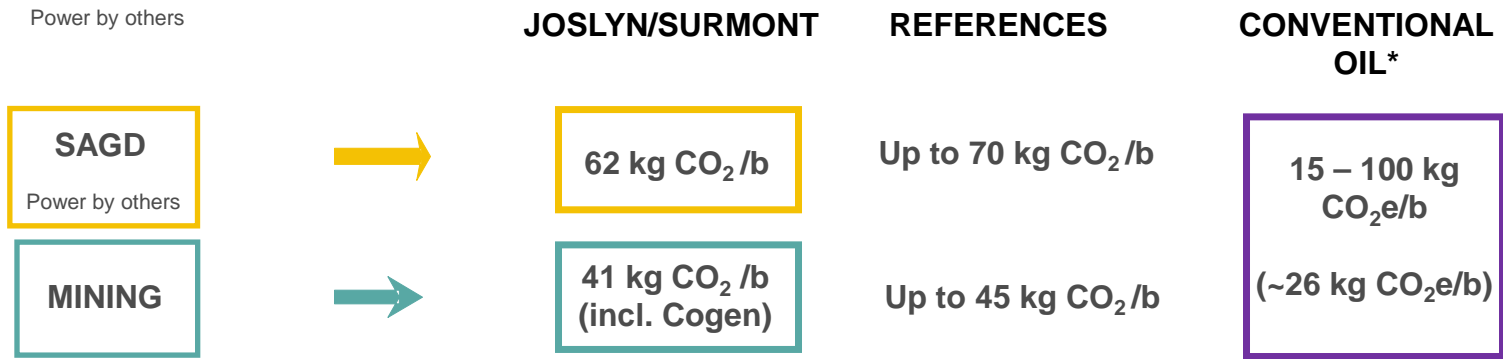
Total in Canada: developing a strong base to grow production



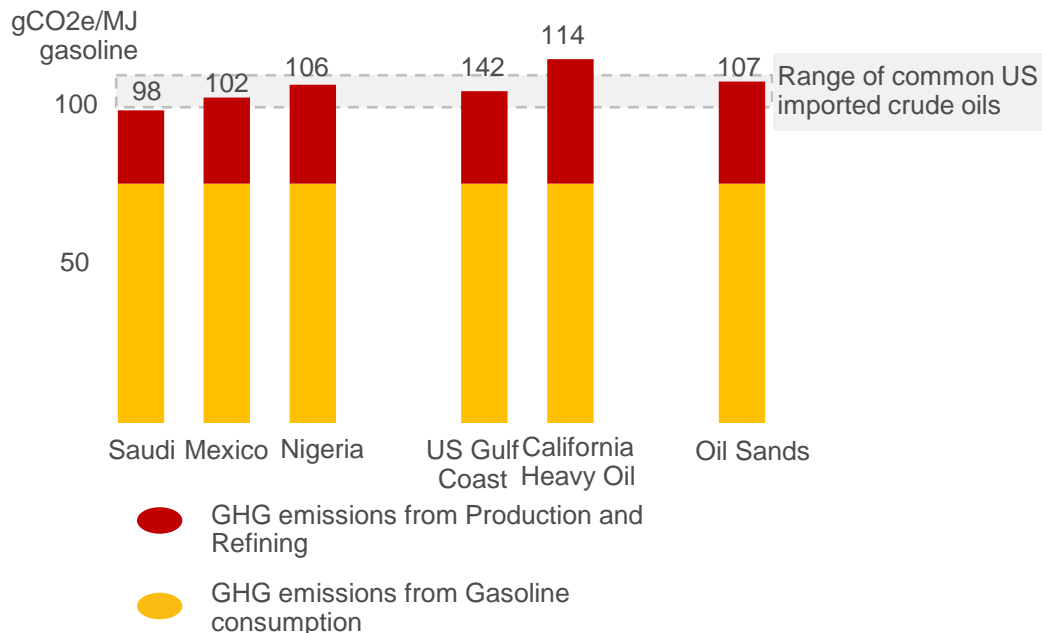
Environmental Challenges

- ▶ CO2
- ▶ Water
- ▶ Mine Footprint

CO₂ intensity of oil sands production



Well-to-wheels GHG emissions



Total's actions to further reduce CO₂ emission from oil sands

- Producing less CO₂ per barrel through improved energy efficiency and different production process
- Carbone Capture & Storage

Water Management for Oil Sands Projects

- ▶ **Abundant water resources but with high seasonality**
 - Off stream water storage

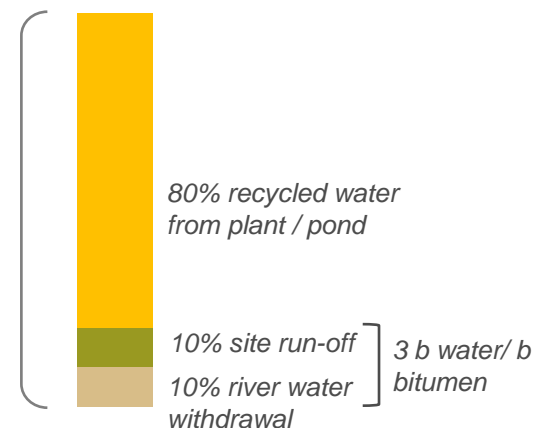
- ▶ **Minimize fresh water withdrawal**
 - Maximize water recycling
 - Use saline water for in situ process

- ▶ **Management of process water**
 - Zero discharge of process affected water
 - Industry leading tailing management practices : reduced pond size and mature fine tailings free pit lake

Water Management for Joslyn North Mine (JNM)

Limited withdrawal compared to allocations

- JNM water allocation (river and run-off) 26Mm³/yr
- Average JNM water make-up from river 9.3 Mm³/yr



Project	Joslyn North Mine	Fort Hills Mine	Surmont In situ
Water Intensity (bbl water per bbl bitumen)	3.1 (steady state)	3.6 (steady state)	0.5
% of Water Needs from Recycled Water	80%	80%	80%

All Projects implementing industry leading water management practices

Impact on Boreal Forest

- ▶ **Canada's boreal forest** : 3.2 million km²
- ▶ **Oil sands** : 140,000 km² of which
 - 4,800 km² is mineable (0.1% of Canada's or 1% of Alberta's boreal forest)
 - ~ 20 000 km² considered for in situ developments
- ▶ **Currently disturbed by oil sands mines** : 662 km² (< Calgary)

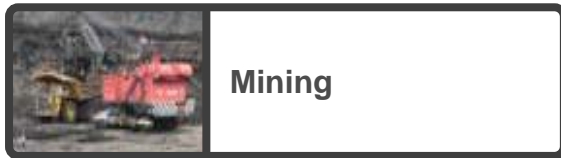


Project	Joslyn North Mine	Fort Hills Mine	Surmont Insitu	Voyageur Upgrader
Footprint (km ²)	70 ⁽¹⁾	160 ⁽²⁾	Ph1: 1.2 Ph2: 4.0	11.5
Reclamation	Progressive, 60% by closure, full within 7 yrs	Progressive, 50% by closure, full within 9 yrs	Faster forests and progressive reclamation	Full reclamation at end of upgrader life

1 Source: JNMP February 2010 Project Update (modified for schedule change)
 2 Source: Fort Hills Energy Corporation Updated Project Application December 2010



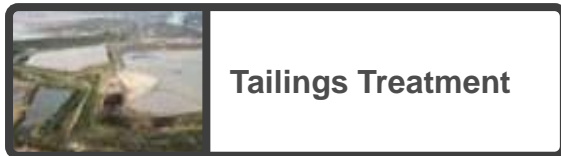
Ongoing R&D on oil sands



Mining



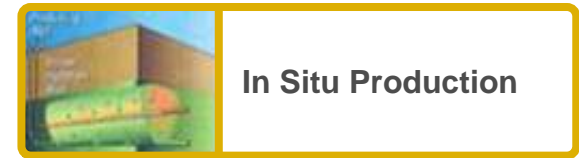
Bitumen Production



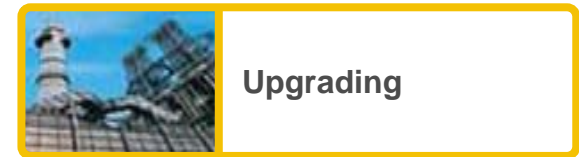
Tailings Treatment



Management
of
Resources
& Environment



In Situ Production



Upgrading



Transportation

► At Total level since 2001

- 2 research centres in France (Pau, Lacq)
- Calgary research centre

► Partner in consortium to leverage R&D investment

- Canadian oil sands network for R&D environmental research & reclamation Group (CONRAD)
- Oil sands tailings consortium (OSTC)
- Oil sands leadership initiative (OSLI)

Securing best technologies for our projects



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