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Western Canadian Crude Oil Production - an overview

Presentation to the National Petrochemical and Refiners Association

2007 Q&A and Technology Forum

Austin, TX

October 9-12, 2007

Crude Quality Inc.

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Principal Geology

- Predominant Geology
  - PreCambrian Shield
  - Rockies, et al thrust zones
  - Western Canadian Sedimentary Basin (WCSB)
- Four Provinces, Two Territories
  - All have hydrocarbon reserves

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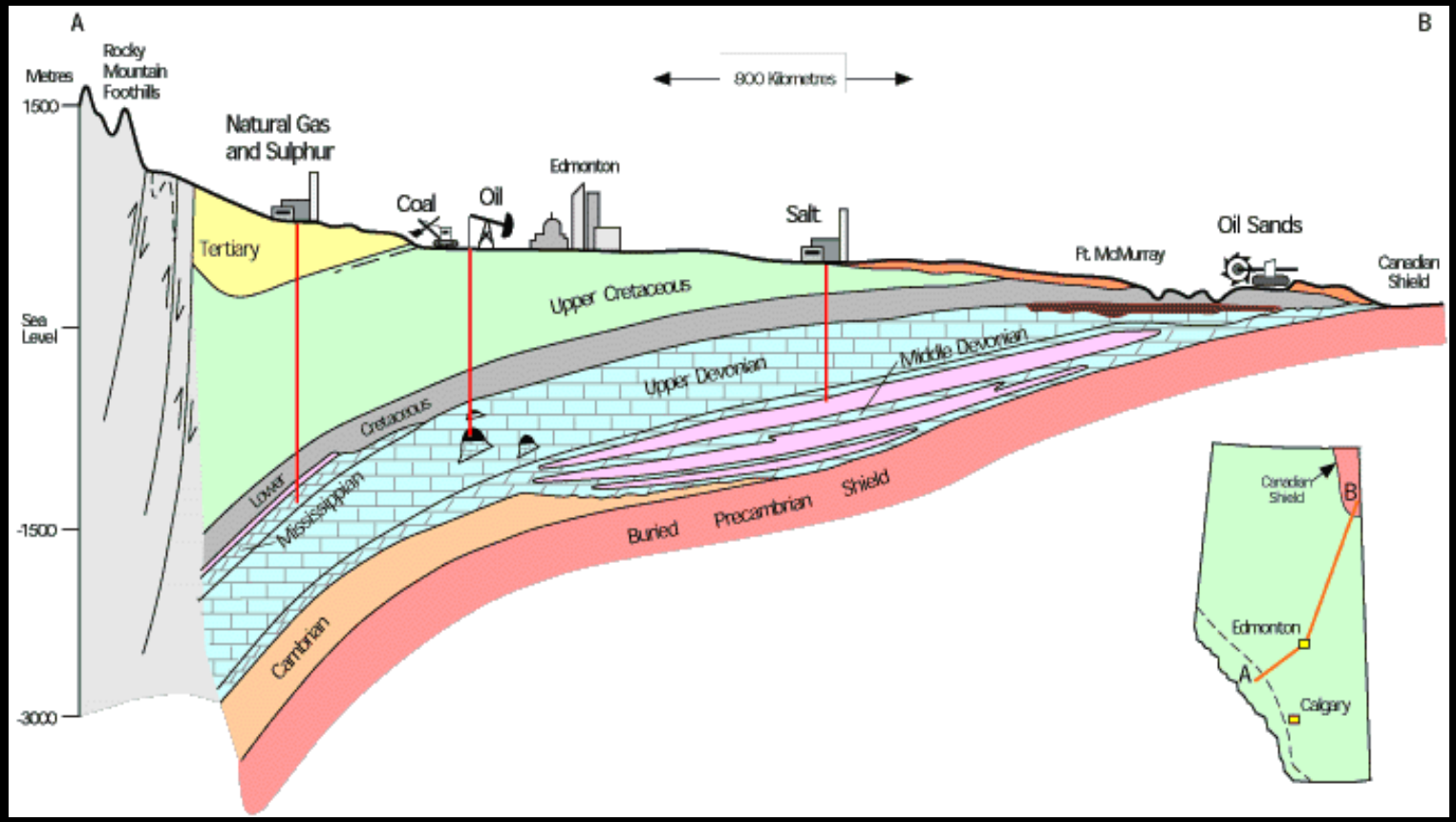
Alberta – Subterranean Cross Section



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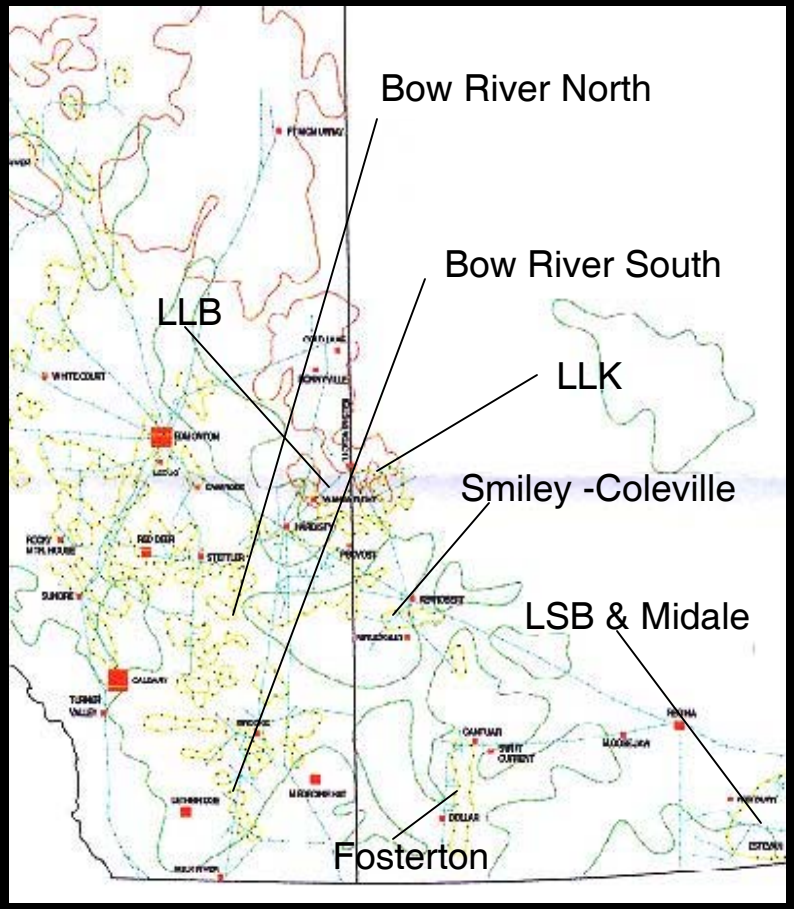
Western Canadian Sedimentary Basin (WCSB)

- Heavy Conventional
- Medium Conventional
- Light Conventional
- Bitumen regions
  - Cold Lake
  - Athabasca
  - Wabasca
  - Peace River



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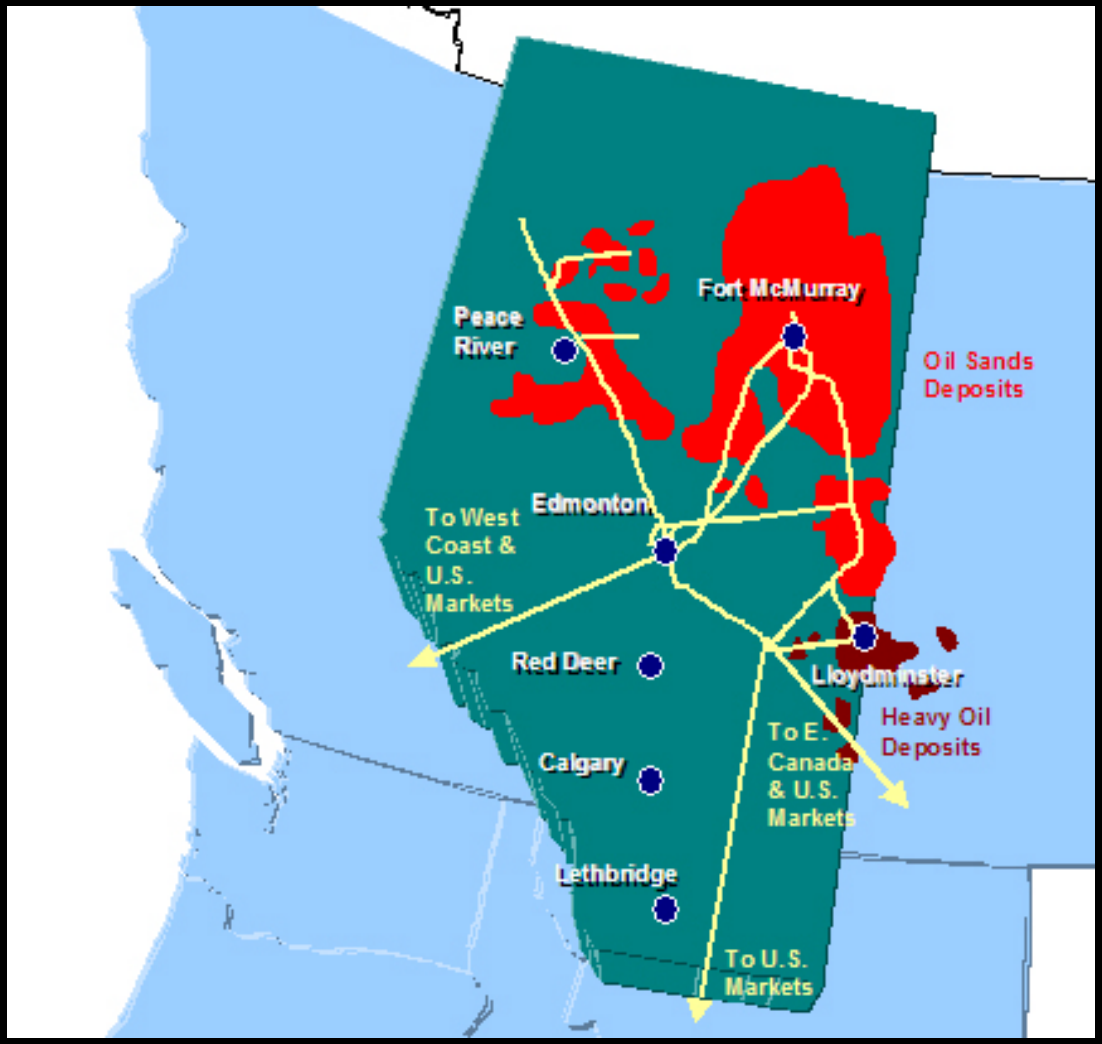
Heavy Oil and Oil Sands - Locations



Key Producers

Western Canada Production (kbpd)

	BC	AB	SK	MB	NWT	Total
1996	46	1 557	361	11	30	2 004
1997	53	1 620	404	11	29	2 117
1998	57	1 632	399	11	28	2 128
1999	50	1 536	374	10	28	1 999
2000	55	1 537	417	11	26	2 047
2001	55	1 550	427	11	26	2 070
2002	53	1 550	422	11	25	2 061
2003	49	1 643	420	11	24	2 147
2004	47	1 741	423	11	23	2 245
2005 est YTD	*42*	*1 712*	*421*	*12*	*20*	*2 208*
2006 est YTD	*46*	*2 030*	*477*	*13*	*23*	*2 589*

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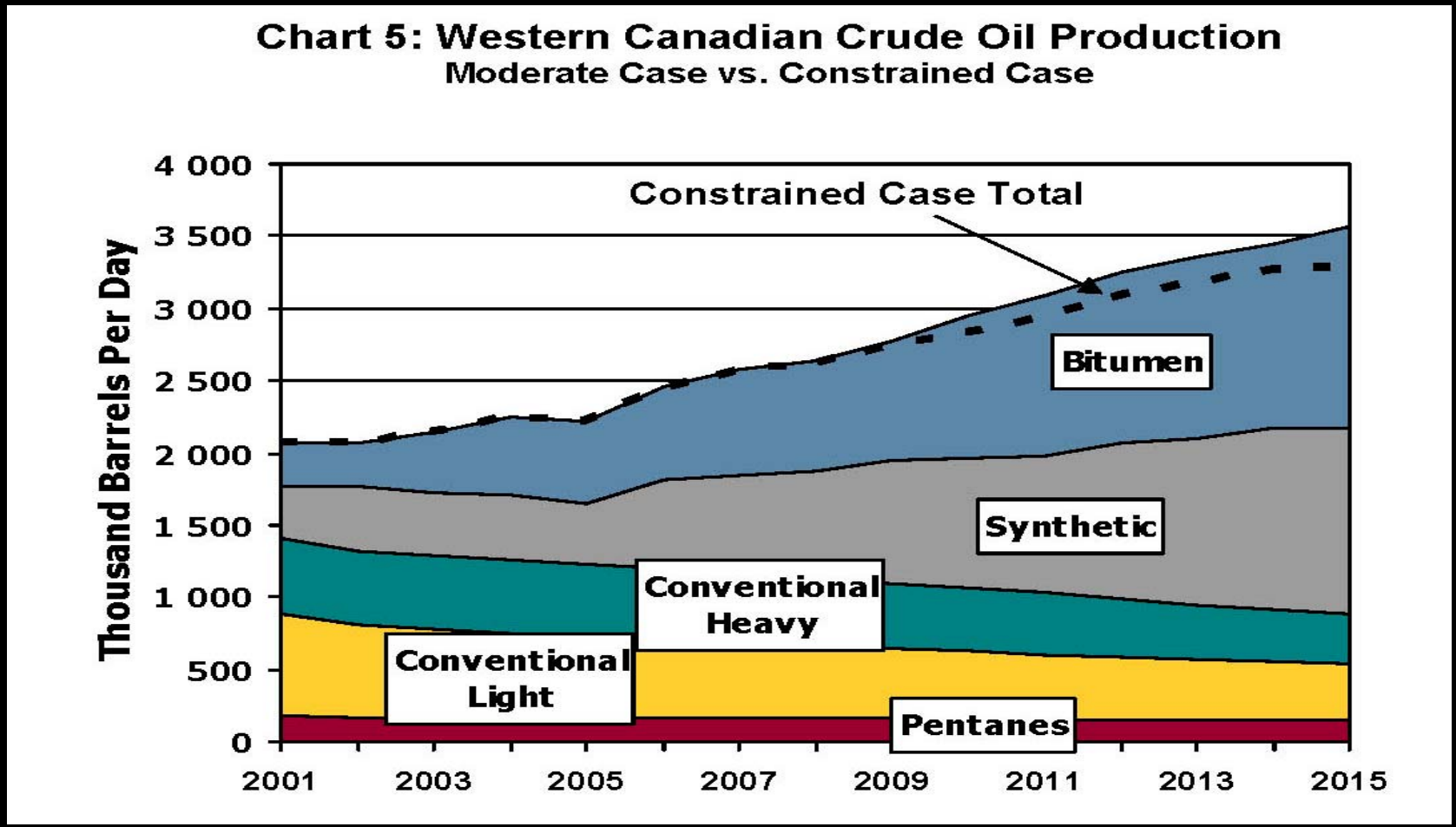
WCSB Production Estimates



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Production Techniques

- Conventional
  - Natural gas, light, medium, heavy crudes
  - Traditional drill a hole, mount a pump (if needed), connect a pipeline to a battery
- Non-conventional
  - Cyclic Steam Stimulation (CSS)
  - Steam Assisted Gravity Drainage (SAGD)
  - Vapour Extraction (VapEx)
  - Mining
  - Upgrading (full and partial)
  - Coal Bed Methane (CBM)

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Conventional Production Methods

- Natural gas, light, medium, heavy crudes
- Production Methods
  - Largely dependent on formation pressure, porosity, permeability, viscosity of the fluids and age of well
- "Pull" techniques
  - Reciprocating pumps (pump jacks)
  - Rotary pumps (vane submersibles, positive displacement)
- "Push" techniques
    - Water flood, gas/solvent flood, steam flood

API and Sulfur Trends -Conventional Production

Conventional Production





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Non-Conventional Production

- Coal Bed Methane (CBM)
- Mining
- Cyclic Steam Stimulation (CSS)
- Steam Assisted Gravity Drainage (SAGD)
- Vapour Extraction (VapEx)
- THAI (Toe to Heel Air Injection)
- Upgrading (full and partial)

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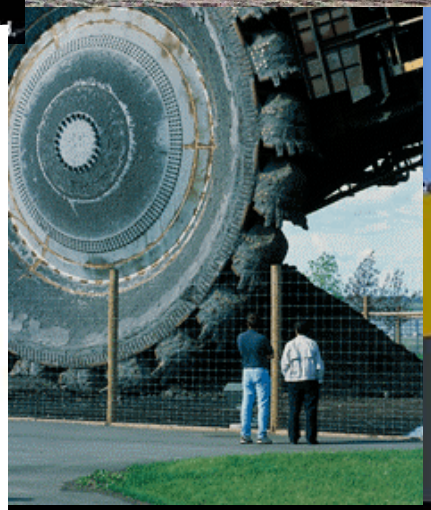
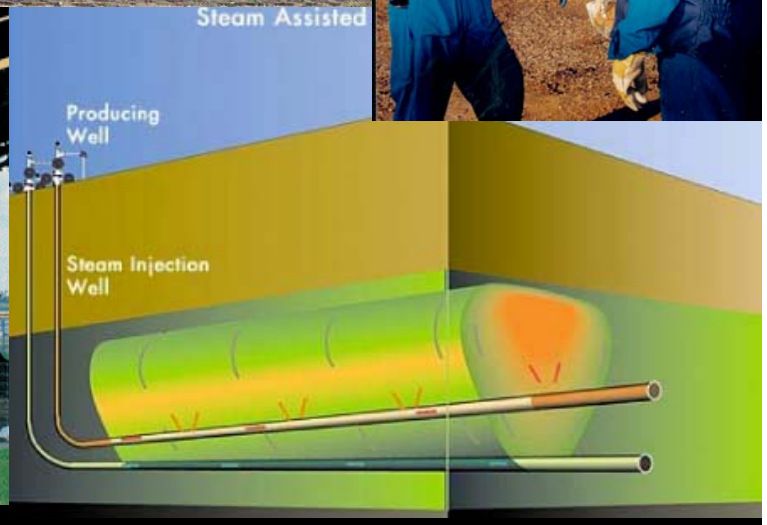
Non-Conventional Production





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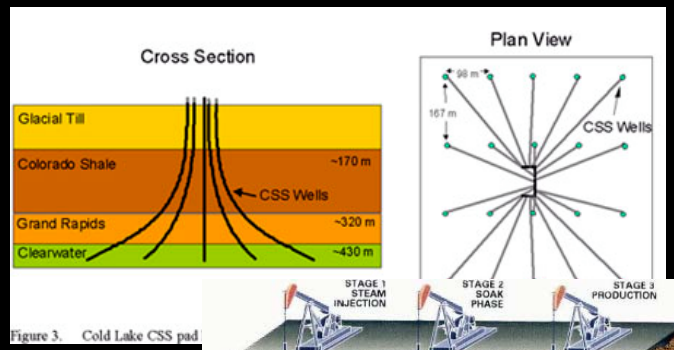
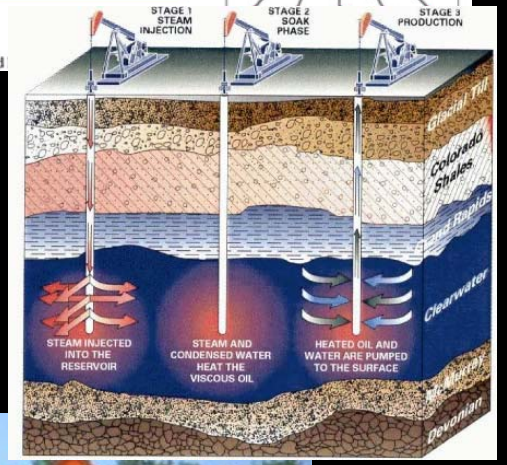
Cyclic Steam Stimulation (CSS)

- Cold Lake bitumen production
- Production zones are deeper than in SAGD and mining operations
- Inject steam into zone, then allow heat to diffuse into formation
- Move in pump jacks and start production





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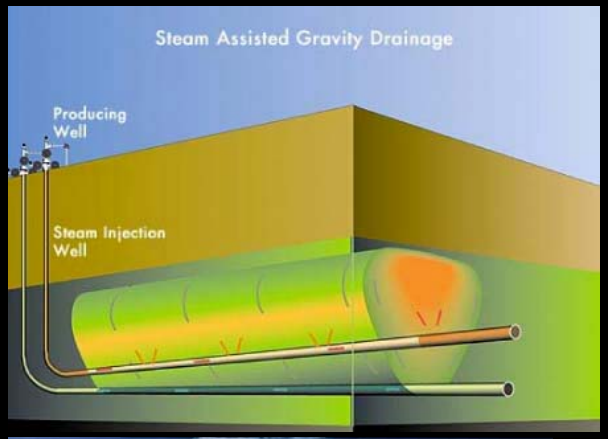
SAGD (Steam Assisted Gravity Drainage)

- Series of horizontal wells (upper and lower)
- Steam is applied to upper well, formation is heated
- Bitumen and condensed steam produced from lower well
- Unlike CSS, heating and production are simultaneous



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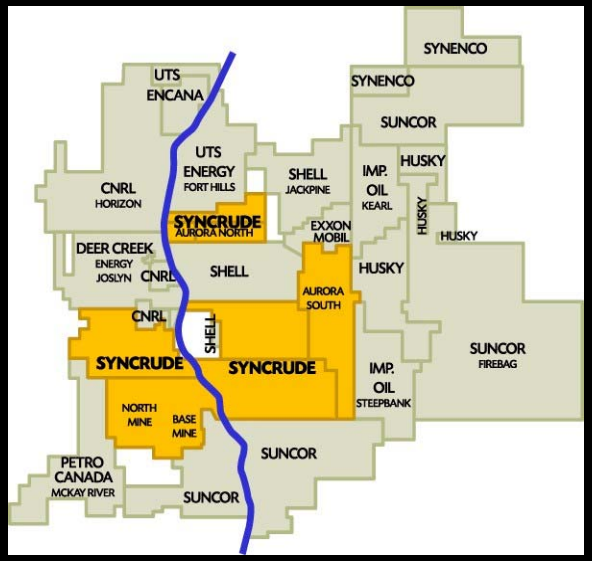
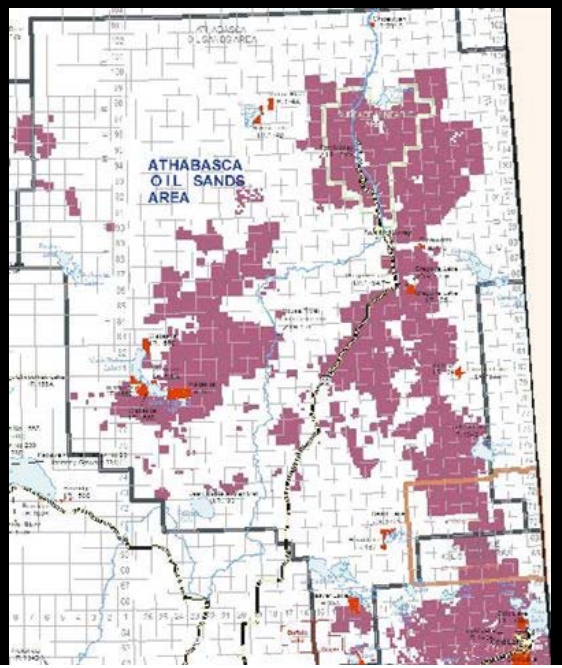
Mining

- Driven by standard strip ratio, recovery economics
- All operations are now truck and shovel
- Bitumen production is fully or partially upgraded
- Current mining economics do have geographical limits





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Upgrading

- Conventional process is to extract bitumen from sand, then coke, and hydrotreat coker products
- Hydrocracking extracted bitumen recently more prominent
- HGO conversion will improve marketability
- Market upgraders

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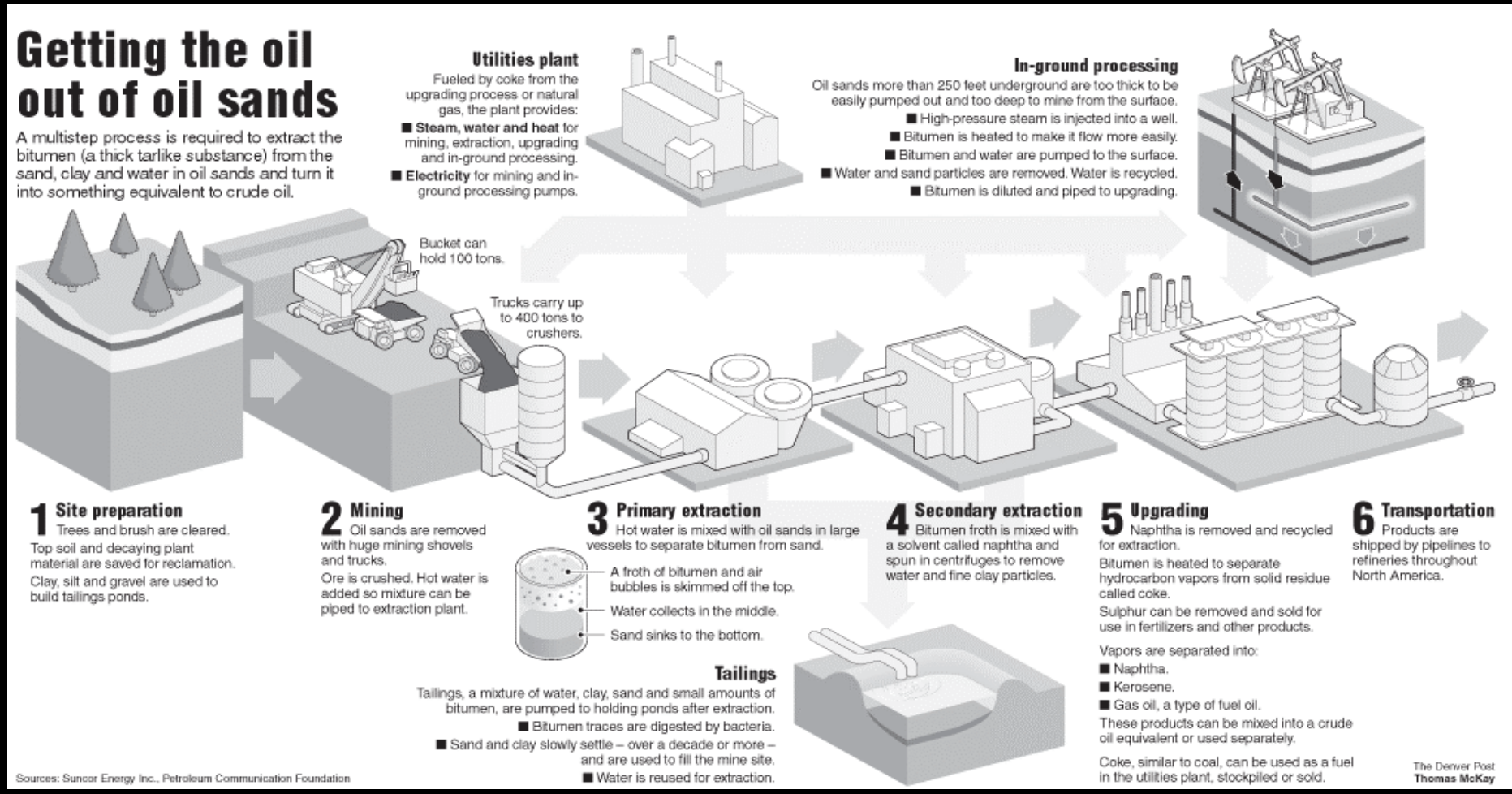
Upgrading Mined Oil Sands



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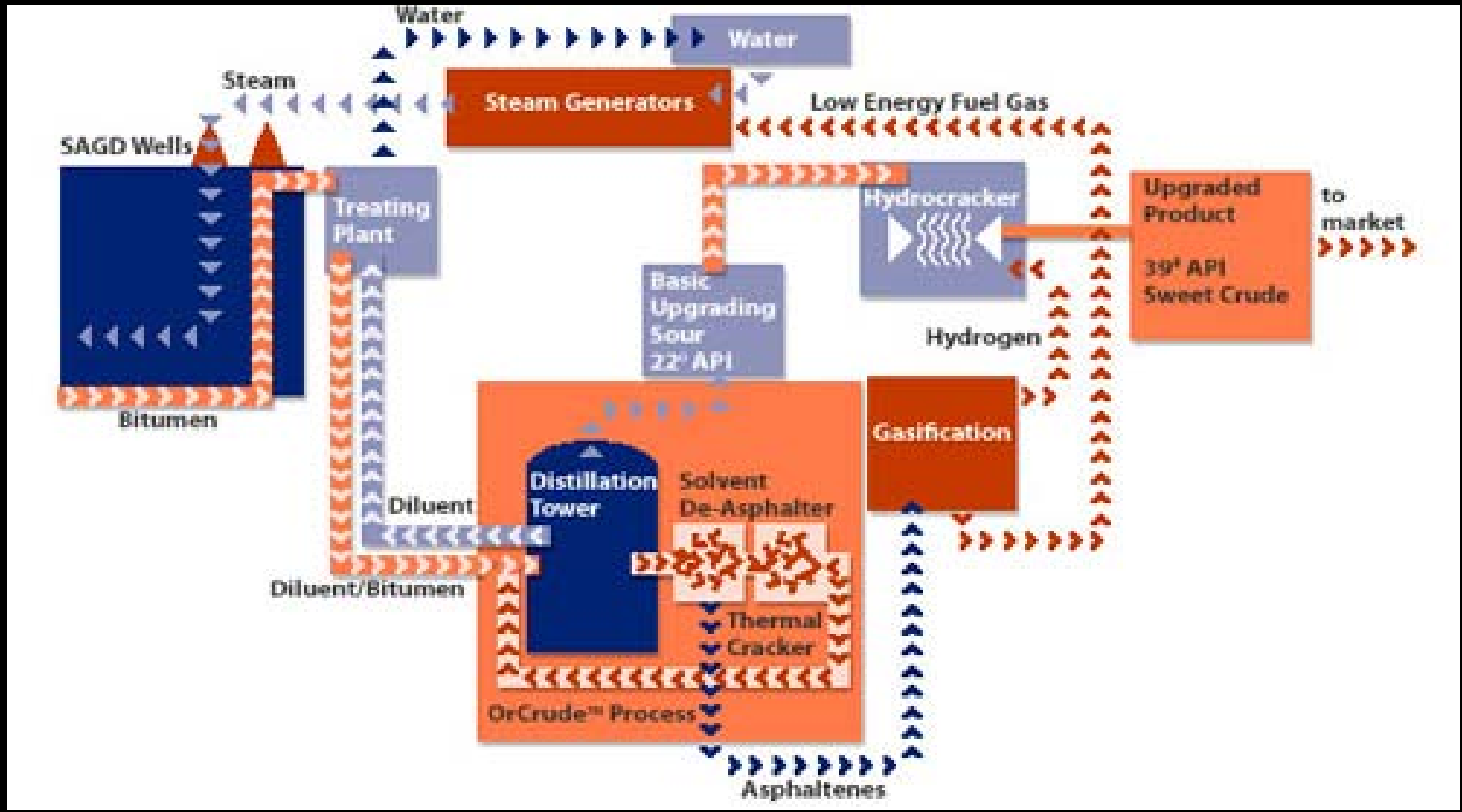
Upgrading – New Version(s)



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WCSB Product Quality

- Products
  - Conventional light, medium, heavy
  - Non-conventional dilbit, synbit, synthetic
  - Custom blended products
- Conventional streams should remain consistent into future though volumes are predicted to decrease
- Non-conventional streams will attempt to develop market differentiation (SSB→SSP, OS_n)
- Light/ heavy spread will determine upgrading versus direct-to-dilbit decisions

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Q & A

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