BP Alaska Heavy Oil Production from the Ugnu Fluvial-Deltaic Reservoir*

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Abstract

The Alaska North Slope is a prolific hydrocarbon basin that has produced billions of barrels of light oil. As the basin matures and production declines, it is necessary to investigate other means by which to extend field life. As a result, BP Alaska has appraised the fluvial-deltaic Ugnu reservoir and associated heavy oil fluids in order to demonstrate the technical viability of producing heavy oil on the North Slope. In 2011 and 2012, the large heavy oil resource (approximately 18Bn bbls) has been tested via a four-well-production pilot. Due to limited surface locations and permafrost issues, two horizontal wells with surface-drive progressive cavity pump were selected for appraisal of the Ugnu Formation. Acquisition of quality data and a proactive approach to well management allowed up to 20% sand production to be sustained over the test period. Data is shown to demonstrate the improvement in performance relative to conventional horizontal predictions and how the sand production is enhancing oil rates through wormhole extension. An update on continued production results is shared herein. Note: the heavy oil resources face significant technological and investment challenges in the current Alaska fiscal system. As such, in late 2012, BP announced it is scaling back its heavy oil efforts and will stop the pilot program in 2013.

Topics:

- Introduction
- Pilot Objectives
- Pilot Results
- Forward Plan

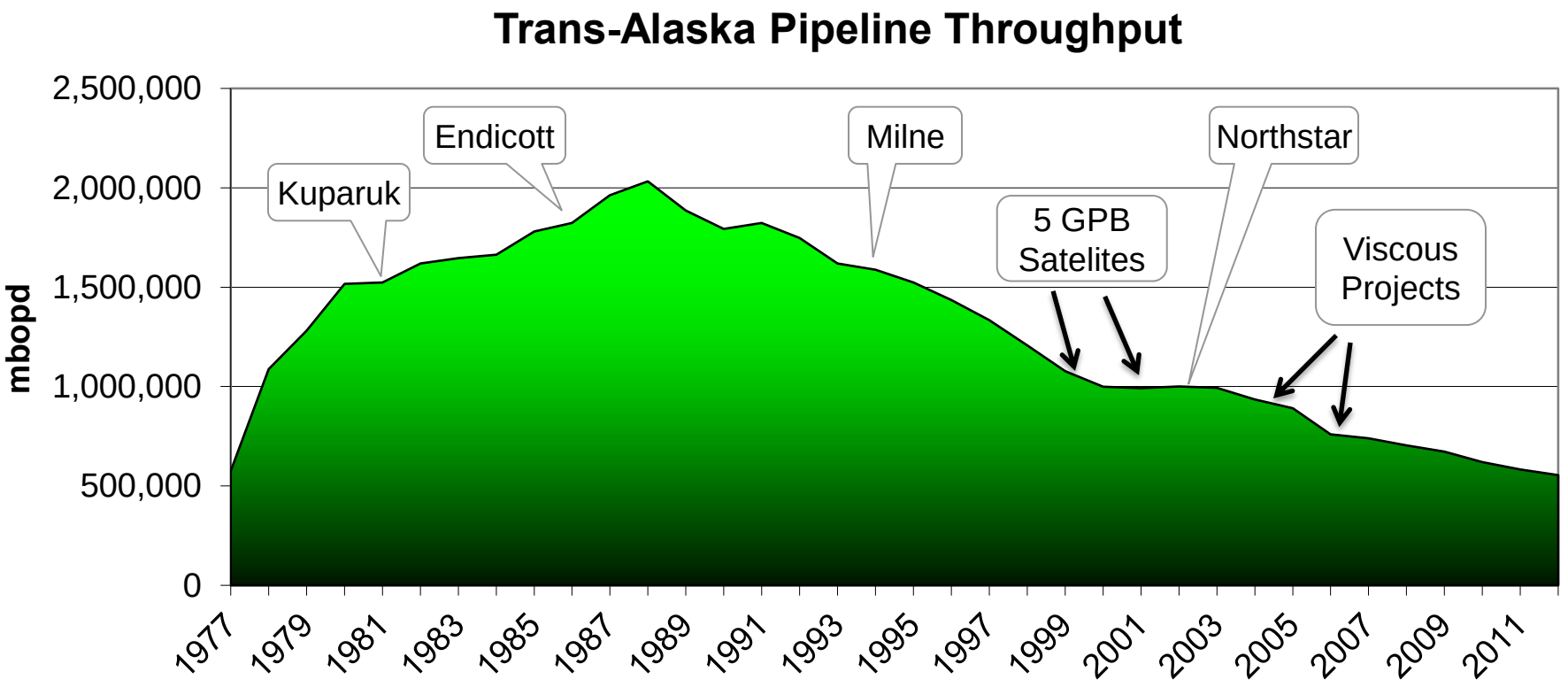
BP Alaska Heavy Oil Pilot

Josef Chmielowski

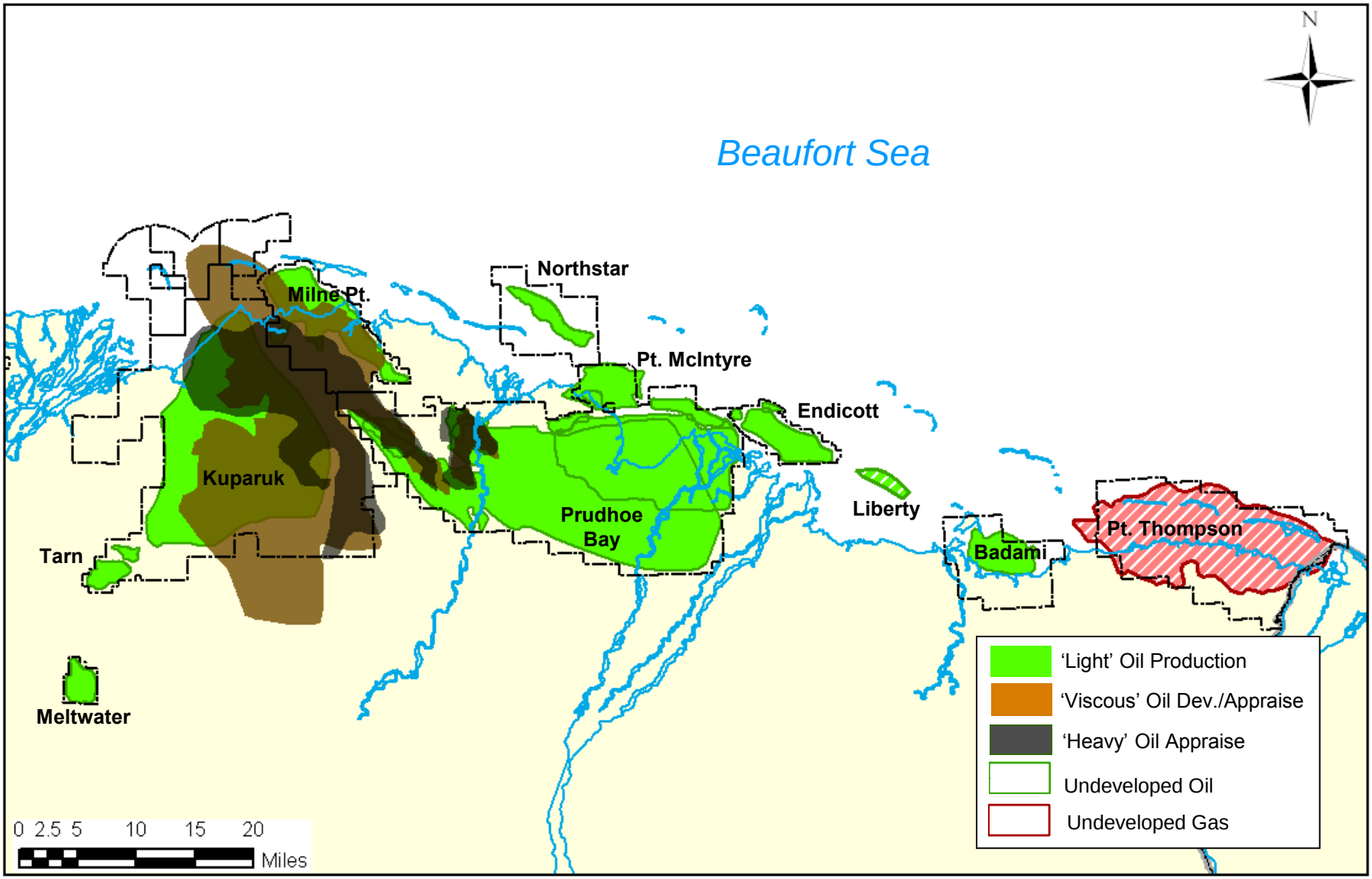
April 22, 2013 SPE-AAPG Joint Conference, Monterey CA

Alaska Heavy Oil - Why Now?

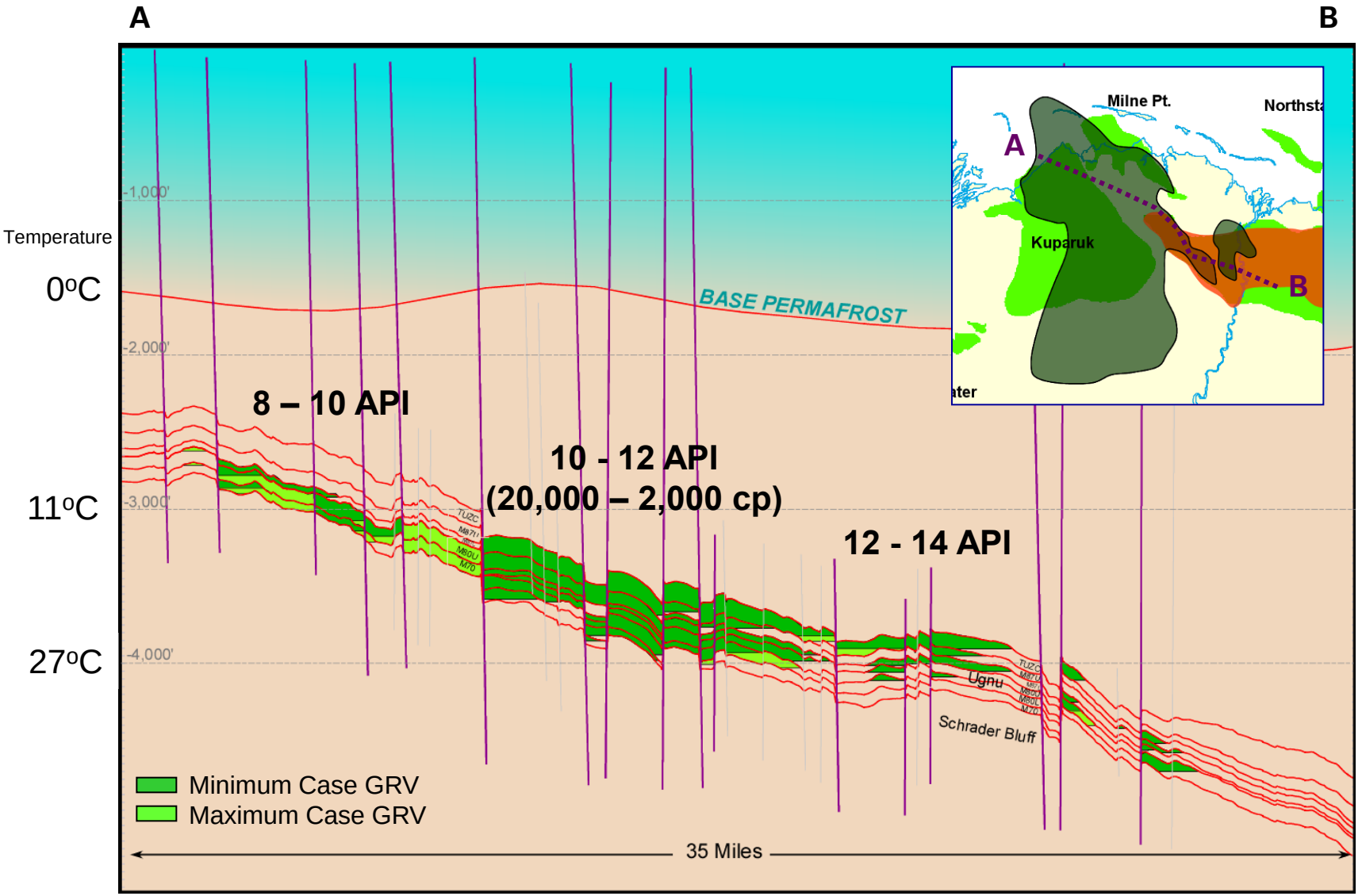
- Low hanging fruit (light oil) is becoming more challenged
- Heavy oil technology has been utilized globally for decades
- Oil price has stabilized in recent years around $60 - $100
- Diluent is running out (North Slope decline is 6-8% per year)



Alaska Light, Viscous and Heavy Oil



Ugnu Structure & Fluid Quality



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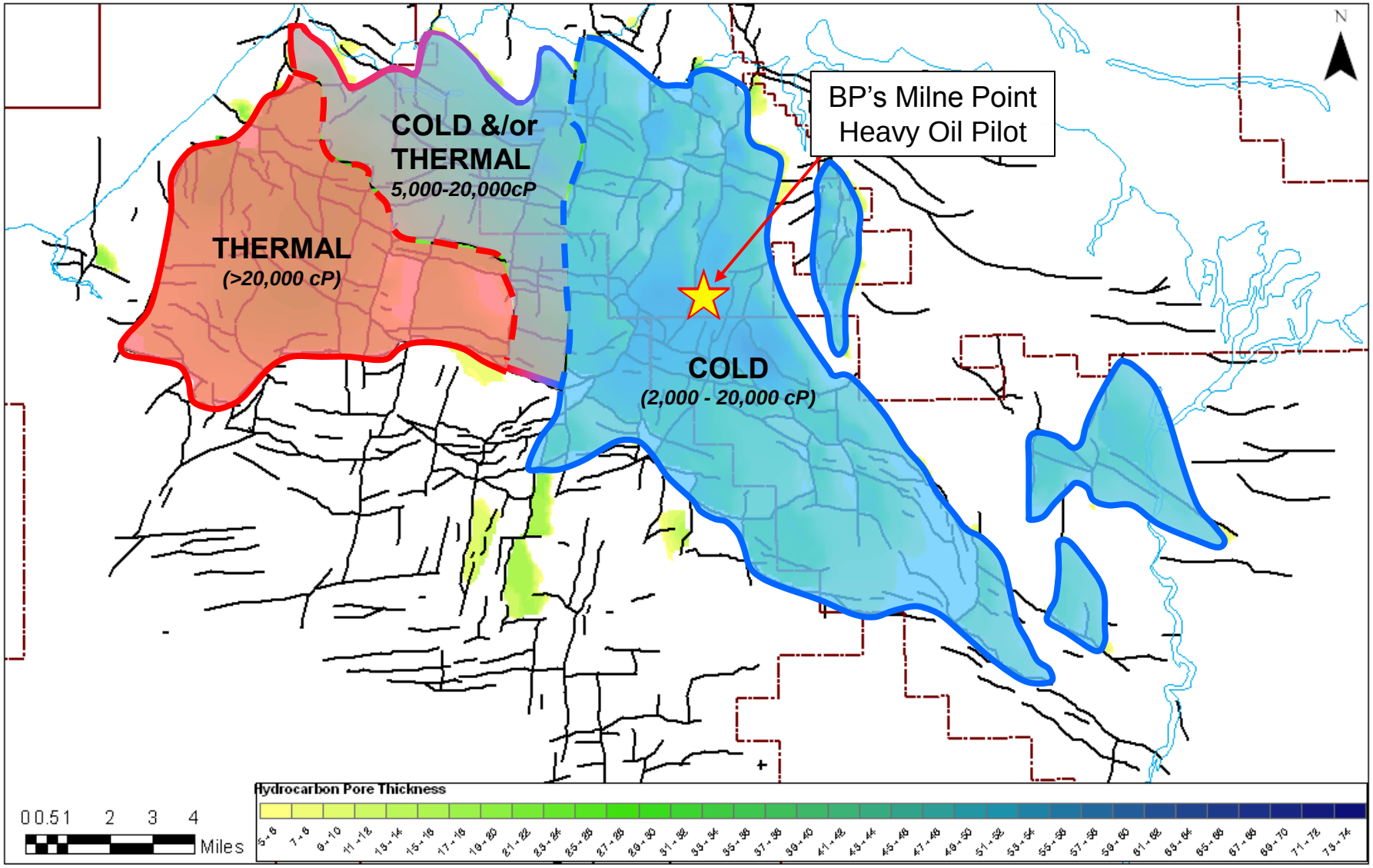
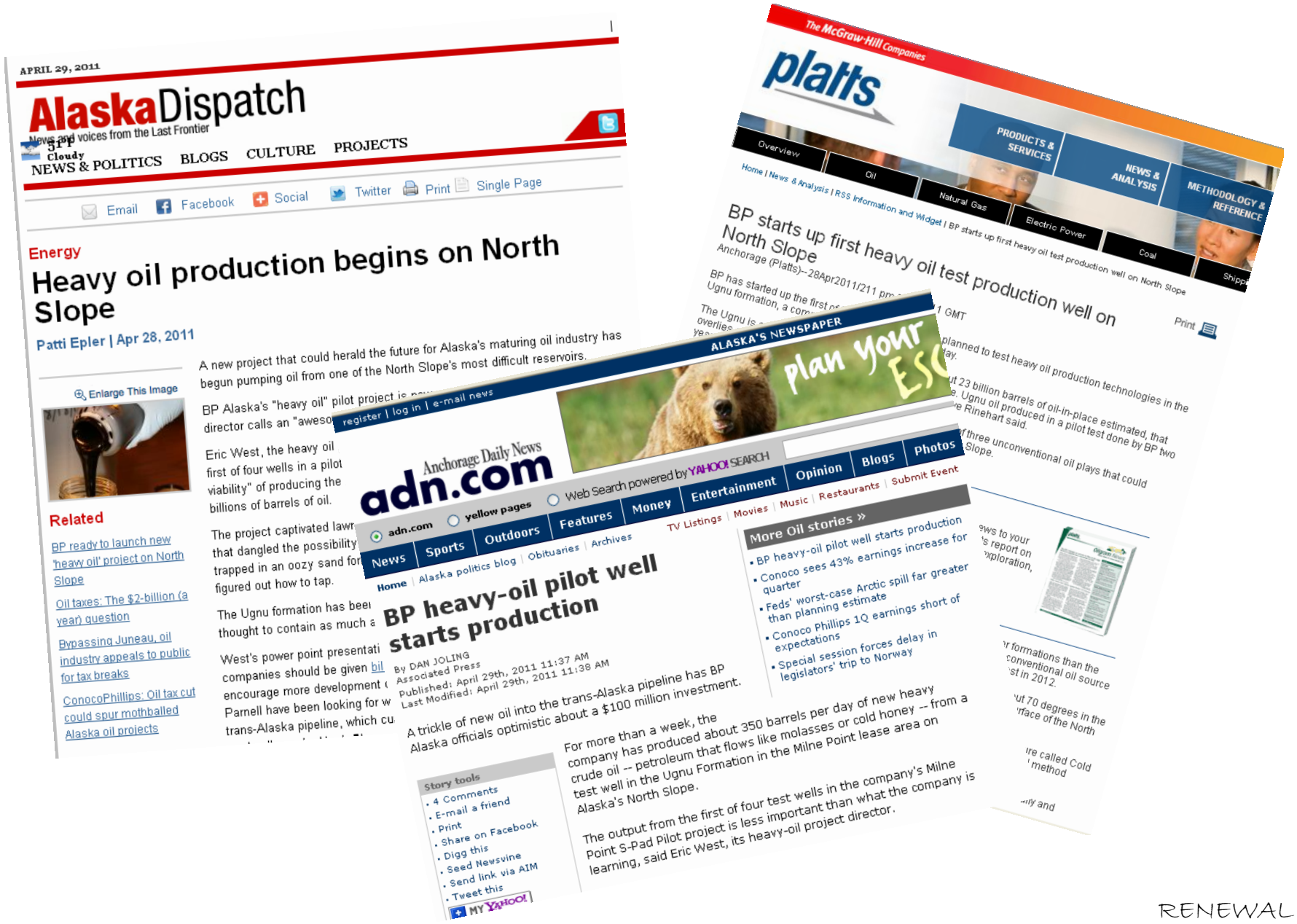
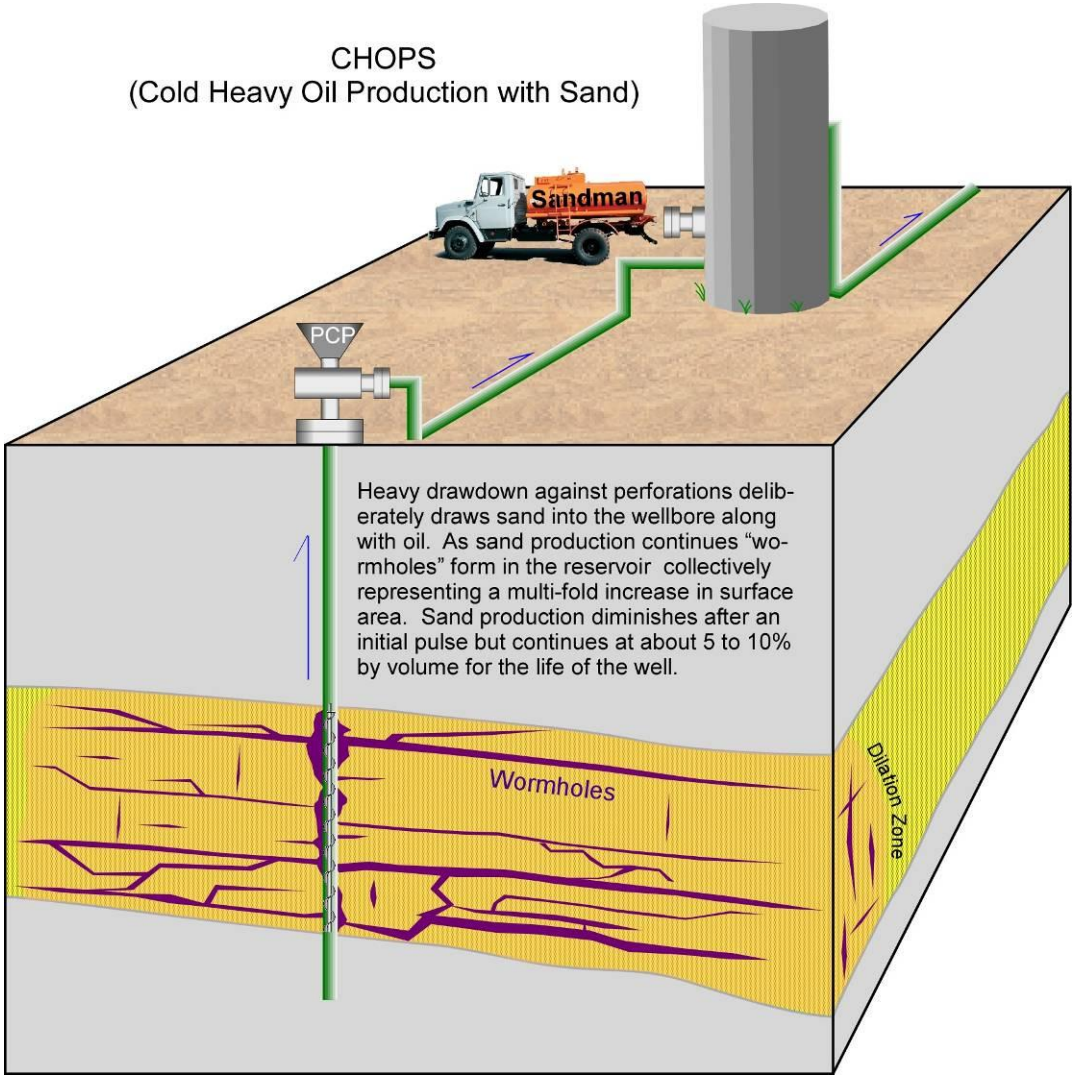
Heavy Oil Depletion Mechanisms



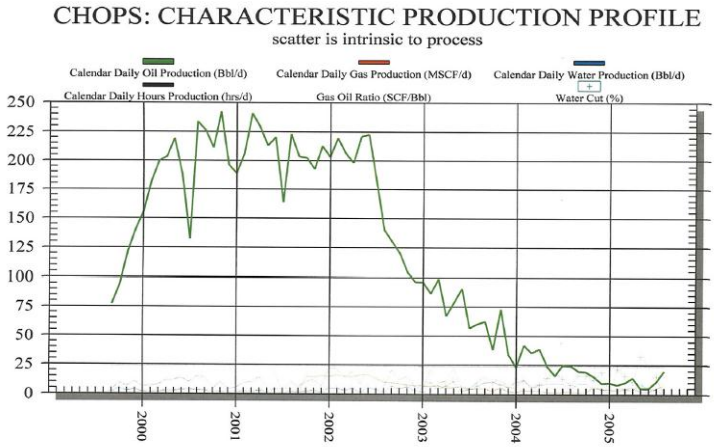
Alaska Heavy Oil Production Begins!



CHOPS Elements



- Foamy oil
- Sand production
- PCP pump
- Surface drive
- Heated separation tank
- Sand disposal



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Heavy Oil Pilot Objectives

Objective #1: Producibility

- Foamy Oil – demonstrate solution gas drive present in the reservoir
- Sand Production – demonstrate significant and sustained sand production

Objective #2: Repeatability

- Other wells, reservoir zones, other hydraulic units

Objective #3: Sustainability

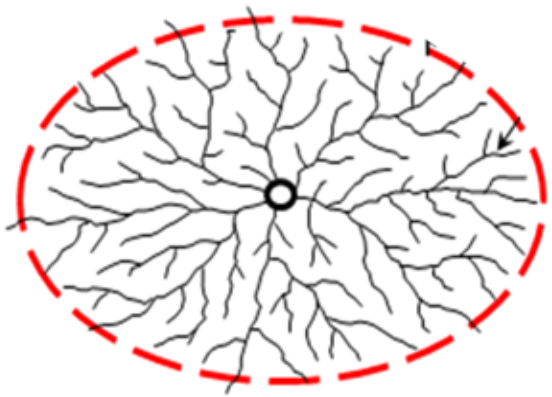
- Longterm Trends - oil rate, GOR, sand cut, water, well integrity

Objective #4: Commerciality

- Production profiles, peak rate, capex/opex profiles, well spacing & design, recovery factor

Foamy Oil

Sand Cut



Wormholes

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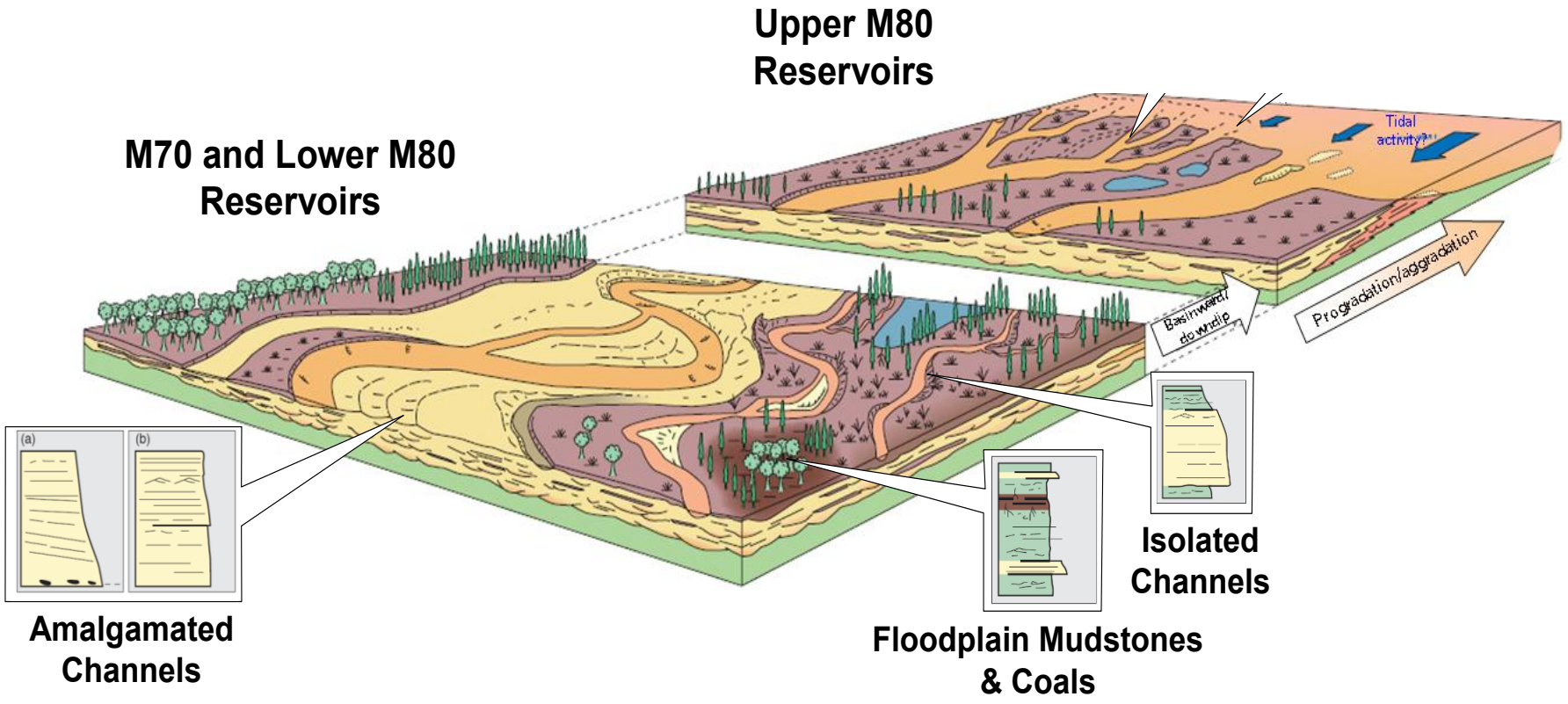
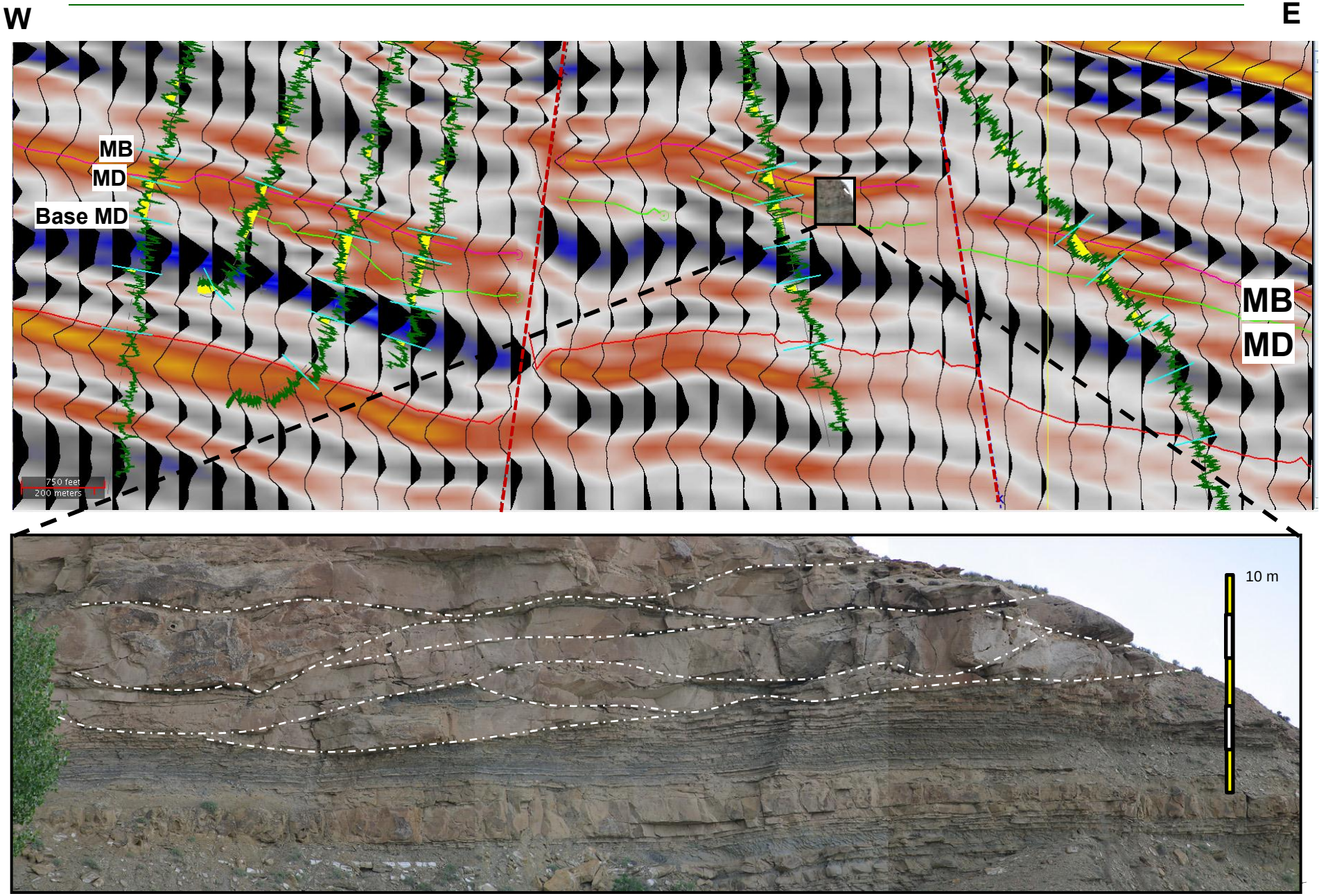
Integrated Subsurface Description

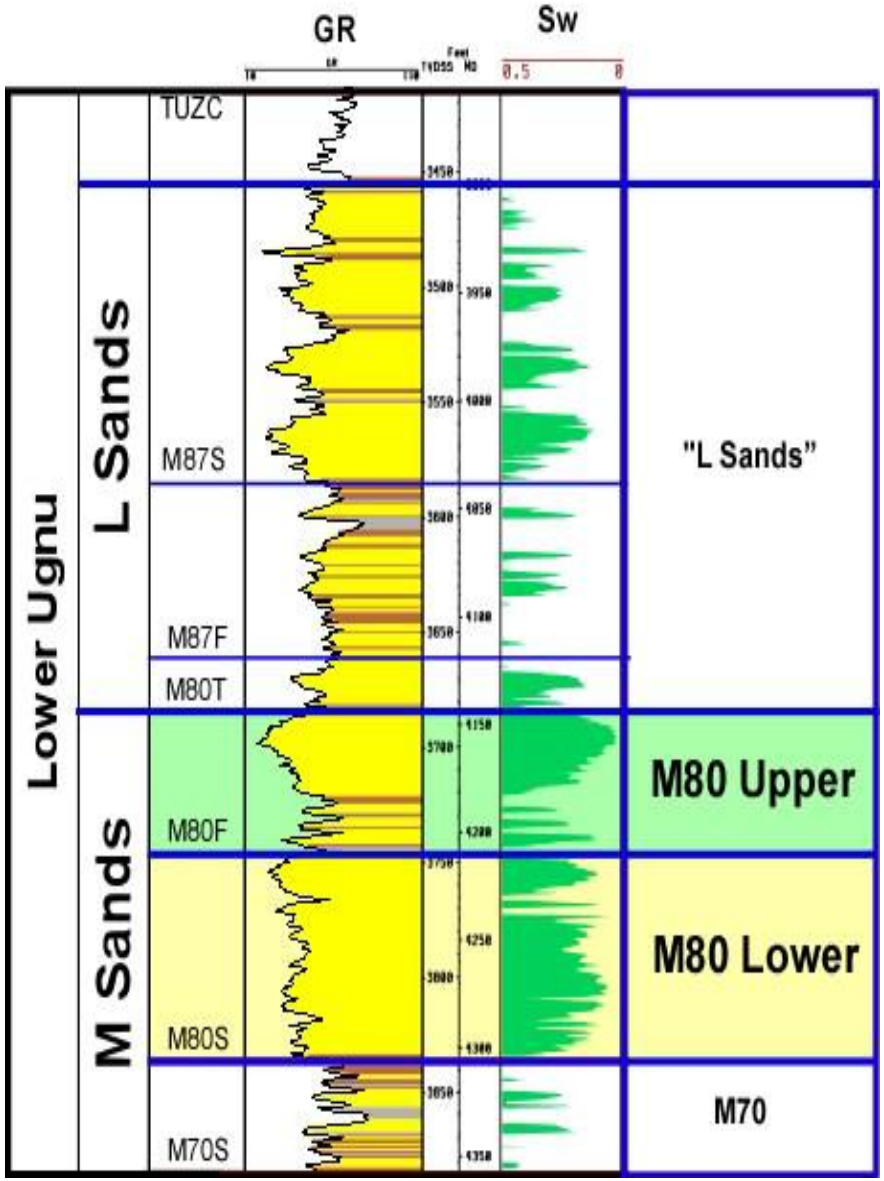
- Characterization of the resource is a key part of our remit
- Ugnu consists of fluvial-deltaic sands deposited in large, meandering rivers
- Reservoir is laterally discontinuous



What Should We Expect From Seismic?



Stratigraphic Column



Under Evaluation: No Wells

Horizontal Wells: MPS-41A & MPS-39

Vertical Wells: MPS-43 & MPS-37

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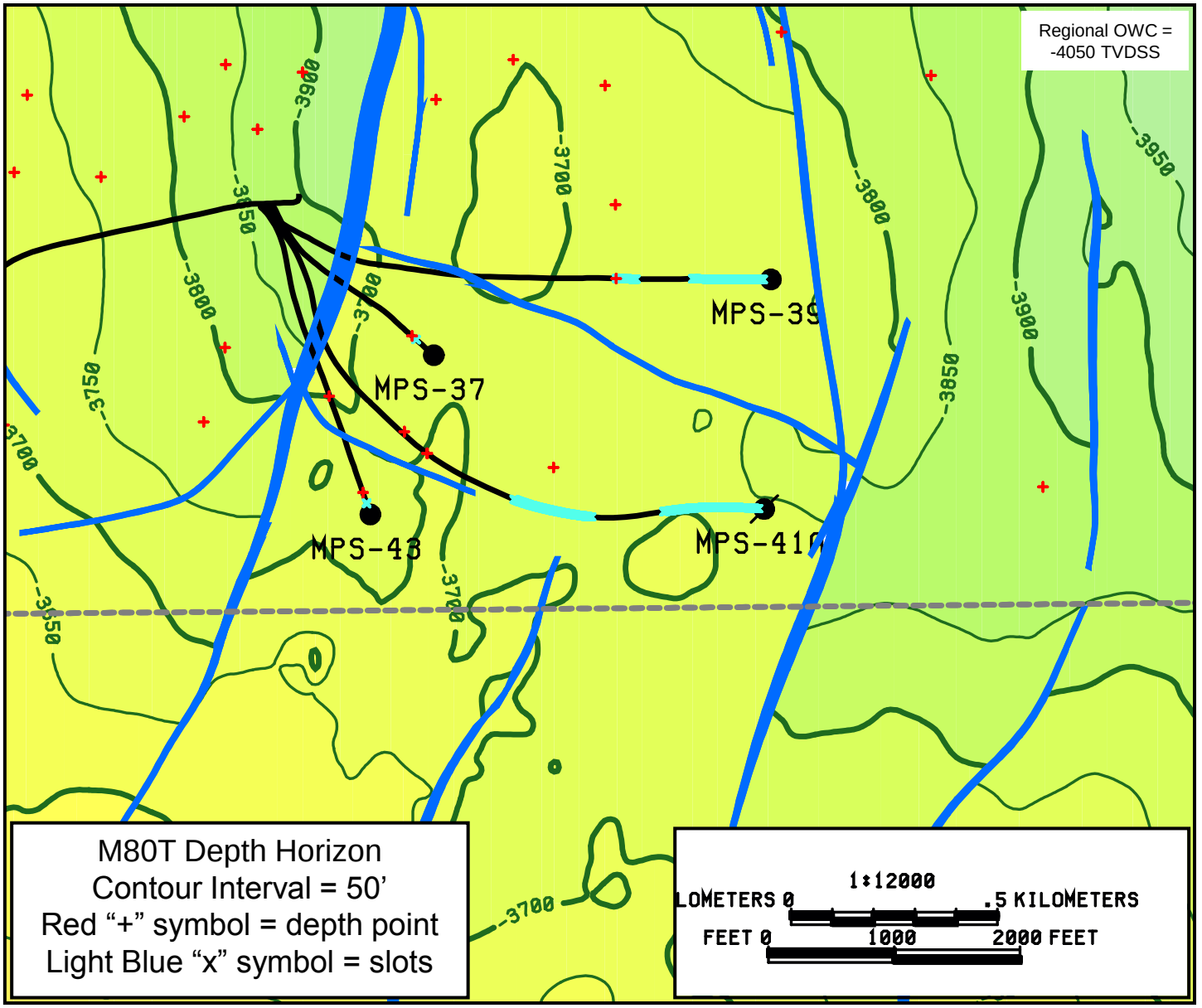
Milne Point S-pad Ugnu Depth Map



MPS-41A versus MPS-39 Horizontal Profiles

MPS-41A

Peak Rate: 550 bopd (not fully ramped up)

Lateral Length: 2700' (not constrained by faulting)

Drilling Operations: sidetracked twice to stay in high quality sand

Slotted Length: 1800'

Slot Size: .125"

MPS-39

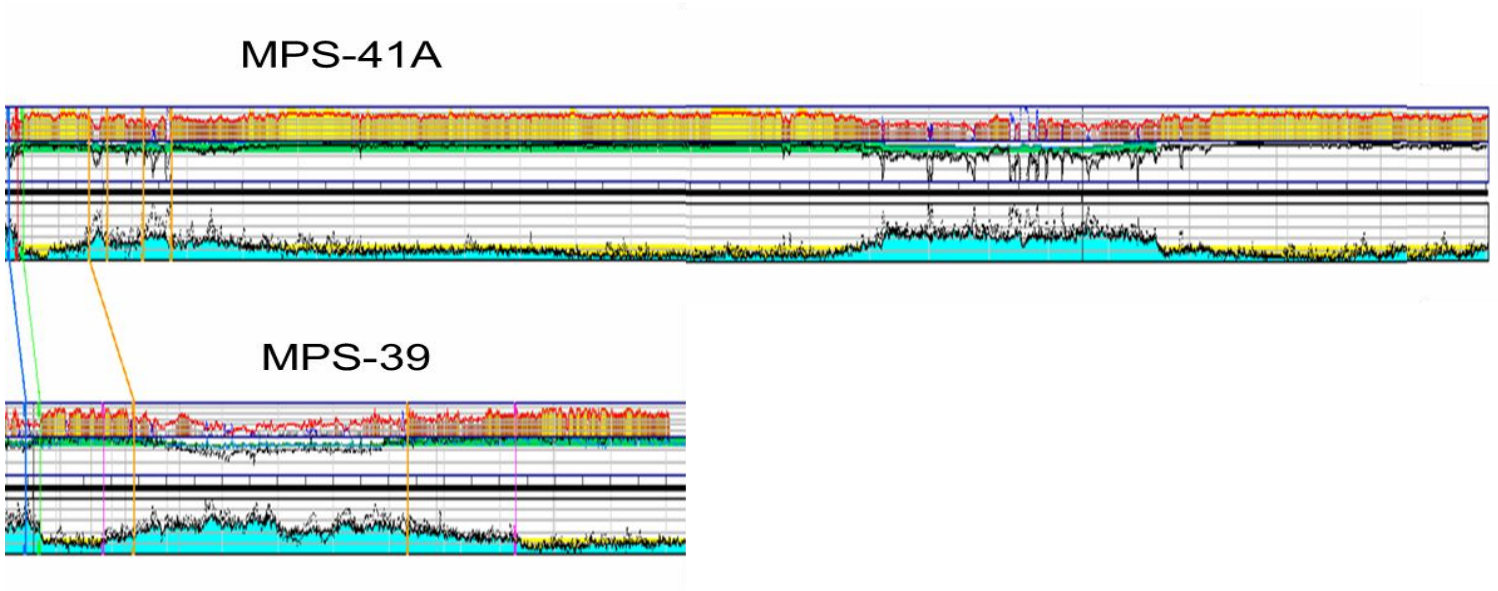
Peak Rate: 500 bopd (not fully ramped up)

Lateral Length: 1400' (constrained by fault near heel & toe)

Drilling Operations: bit drilled out bottom of UM80, no sidetracks

Slotted Length: 720'

Slot Size: .028"



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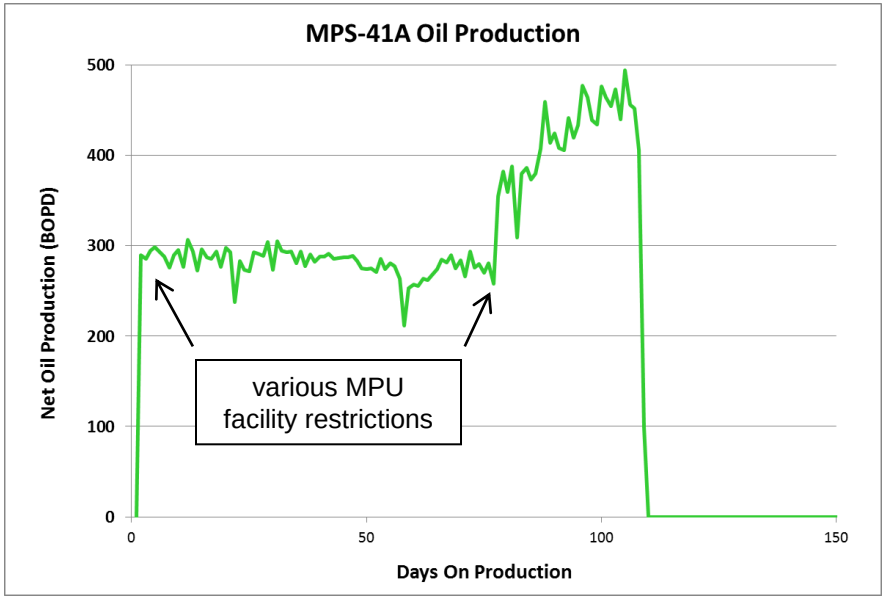
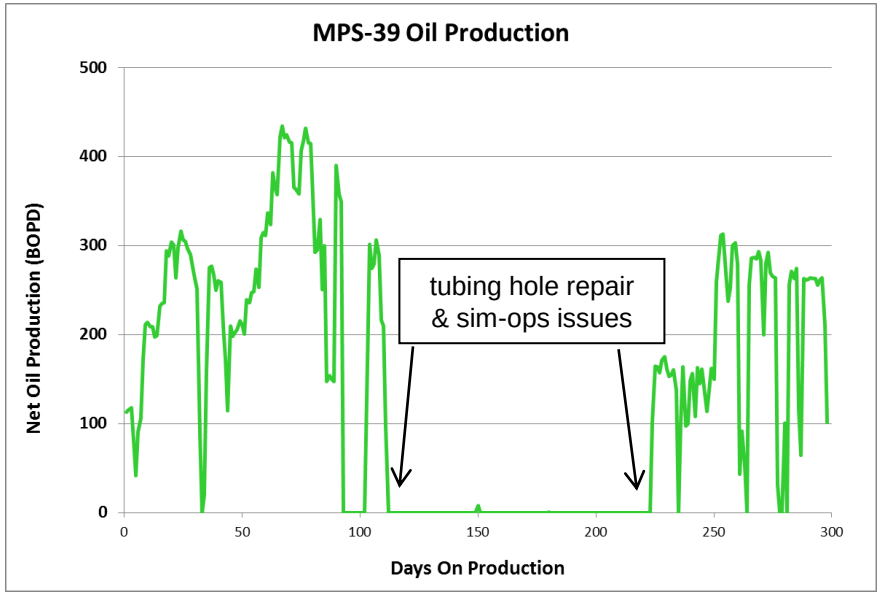
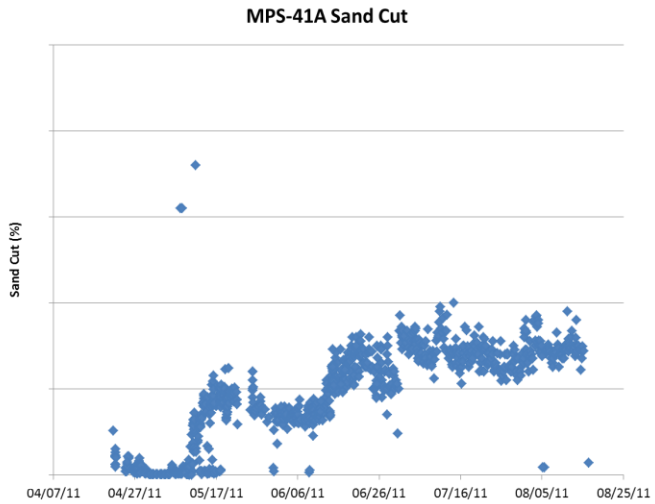
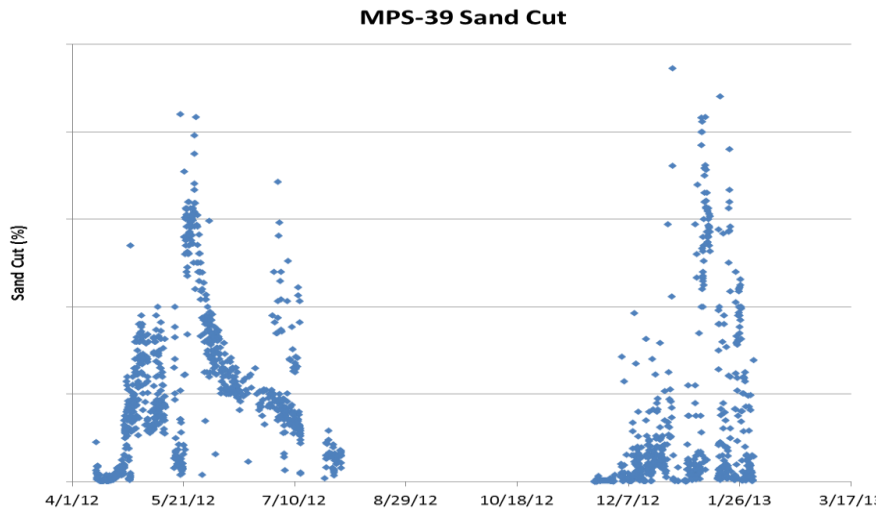
Production Results: Net Oil & Sand Cut









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Heavy Oil Pilot Performance

MPS-41A (P&A'd 2012)

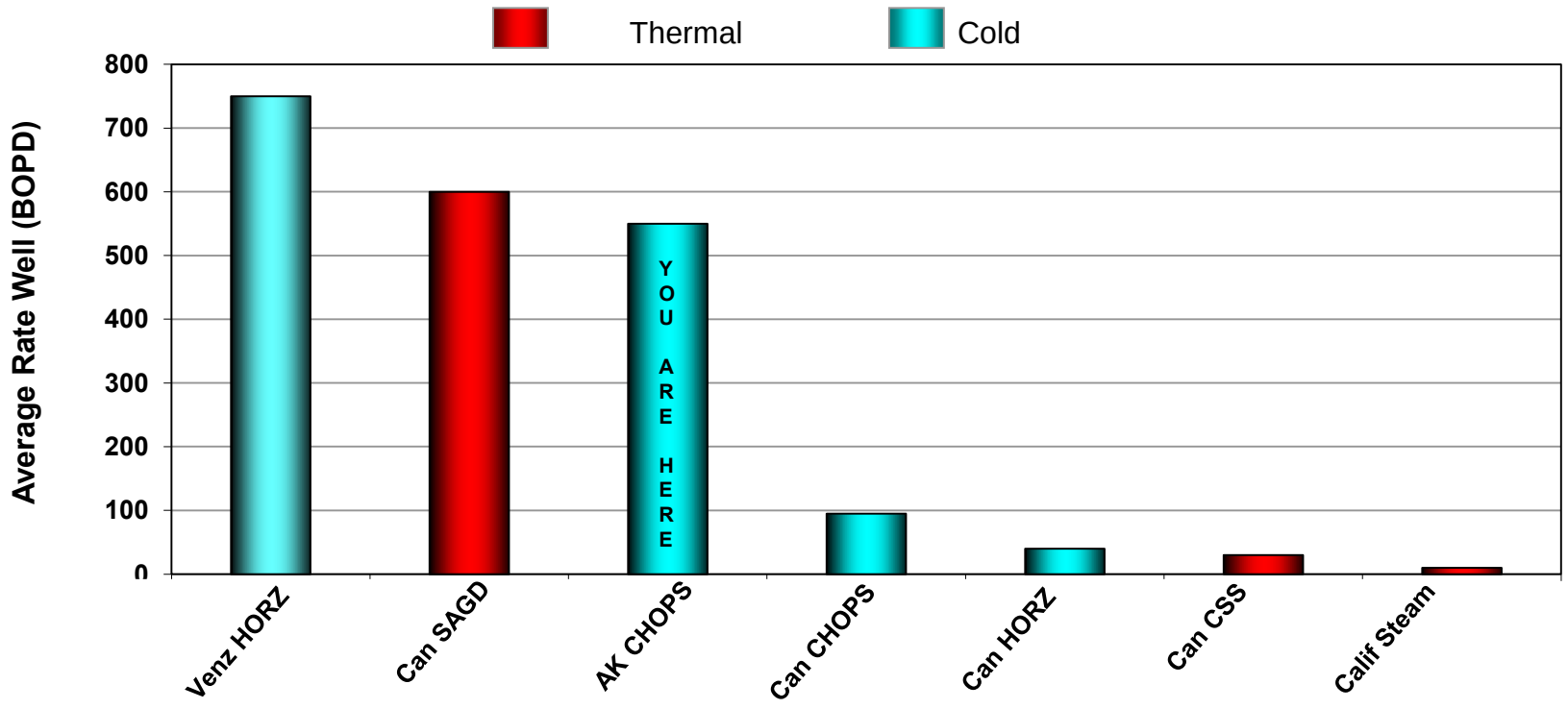
- 117 day pilot production run
- Peak rate ~550 gross (500 net of sand)
- 35,000 bbls cumulative production
- Foamy oil drive established
- Sand production variable at 5 - 20%

MPS-39 (currently shut-in)

- 177 day pilot production run
- Peak rate ~500 gross (430 net of sand)
- 40,000 bbls cumulative production
- Foamy oil drive repeated
- Sand production variable at 5 – 40%

How do Alaska Heavy Oil Wells Compare?

- **Pressure:** Ugnu reservoir pressure is much greater than Canadian analogs
- **GOR:** Ugnu gas oil ratio is optimum for solution gas drive
- **Fluids:** Ugnu viscosity is poorer then Venezuela, but typically better than Canada
- **Rocks:** thickness, porosity and permeability between Venezuela & Canada



Key Messages

1) BP Heavy Oil Pilot has exceeded expectations:

- CHOPS extraction technique is viable
- On-pad processing works
- Production rates for horizontal wells are >500bpd
- 75,000 barrels produced to date, shipped via TAPS, refined at Cherry Point and sold to market

2) Forward Plans:

- Produce deviated wells until mechanical failure
- Pilot project shutdown
- Document results

3) Heavy oil is technically and commercially challenged

Thank You

- BP Alaska for permission to share our progress and the vision to step into a challenging resource
- All past and current employees involved with the project
- Heavy Oil Advisory Board, AITF, Weatherford, C-FER, and many others in the Canadian & Venezuelan oil industry

Questions