



Quad 204
Deepsea Aberdeen: New 6th Gen' semi – dual derrick



Quad 204
New FPSO, Glen Lyon: biggest in N hemi-sphere



Quad 204, Schiehallion Field: Exploitation of a deeper reservoir fairway.

Mary Ward, BP
DEVEX, 9th May 2017



Outline

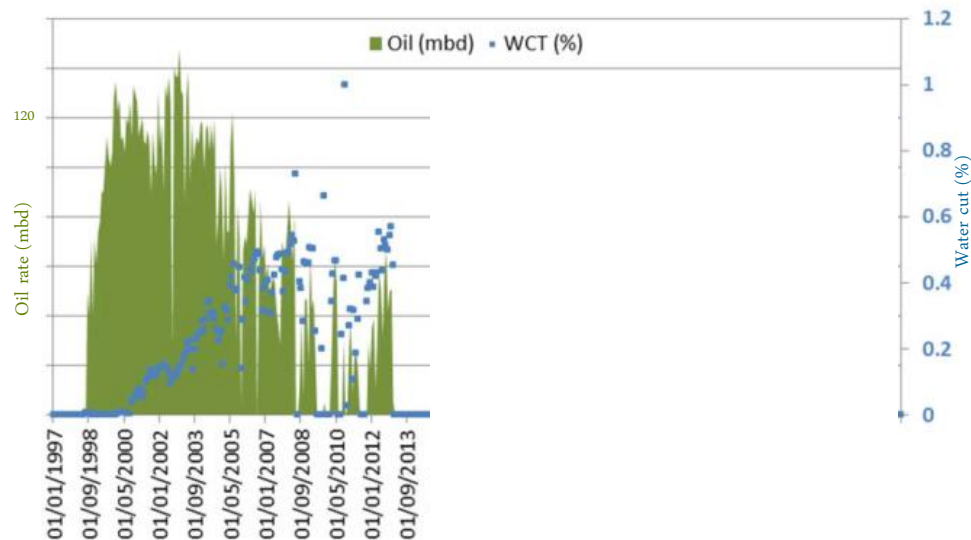
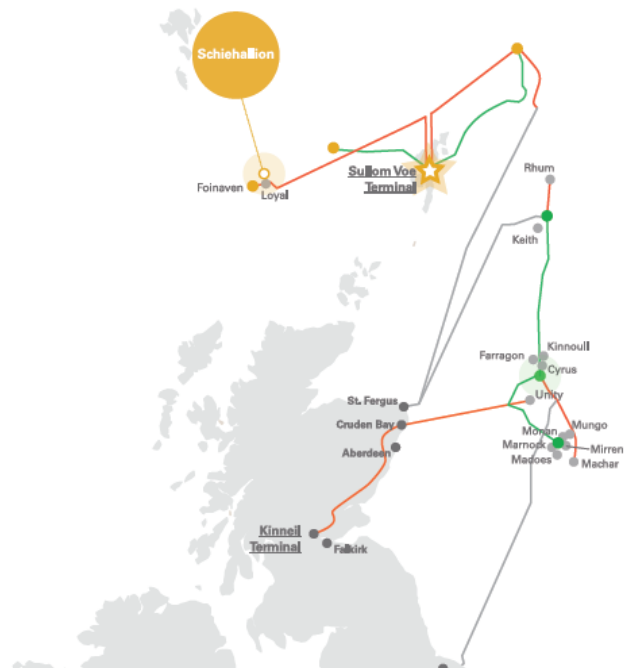


- Schiehallion Field Introduction.
- T28/T25 reservoir interval description.
- Challenges for T28/T25 development drilling in 2016/2017.
- Well results and future opportunities.

Schiehallion Field Introduction



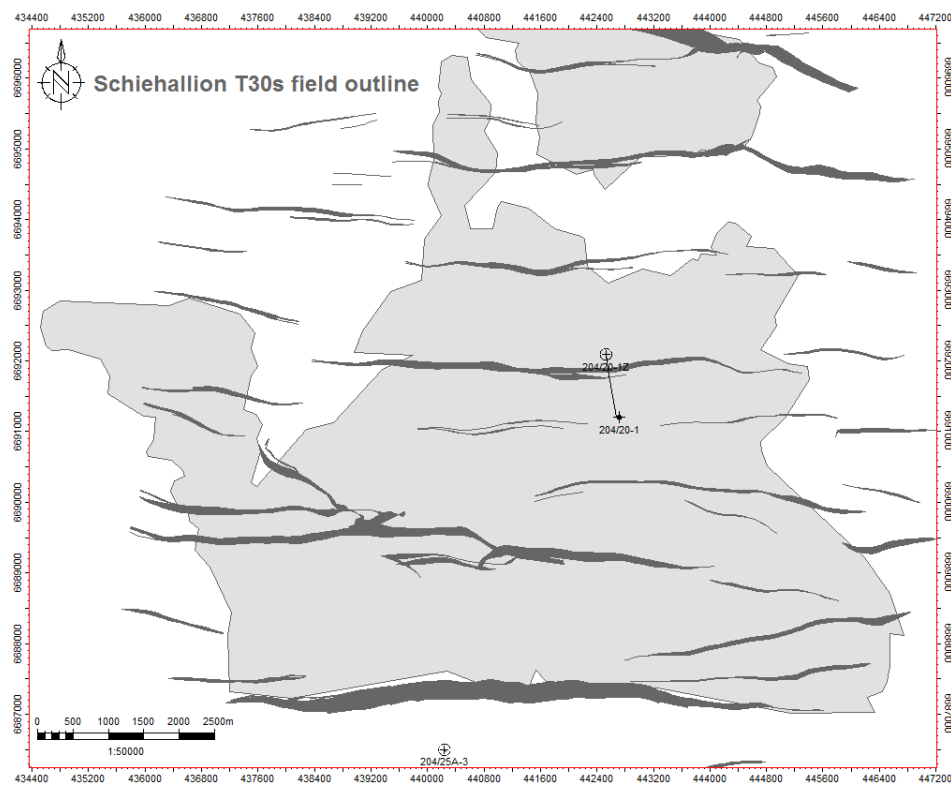
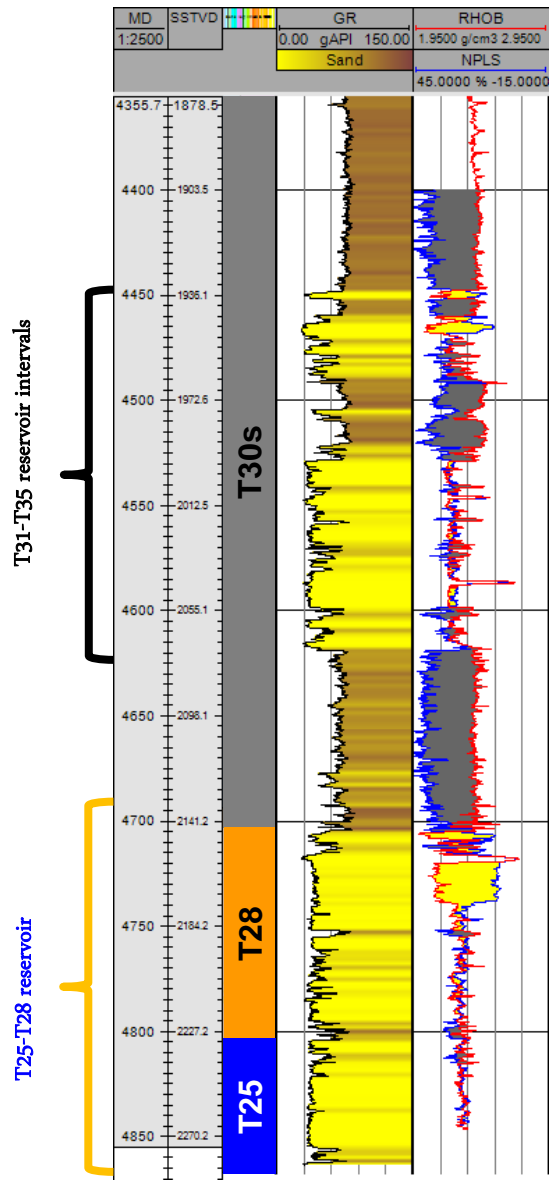
- The Schiehallion and Loyal fields
 - Located 175km to the West of the Shetland Isles in ~400m water depth.
- Discovered 1993, production start-up 1998
 - >2 bbn bbls in place.
 - ~400 mmboc produced to date.
- BP operate both fields
 - Schiehallion: BP 33.35%, Shell 54.896% Siccar Point Energy 11.754%. Loyal: BP 50%, Shell 50%.
- Sub-sea tie-back to Schiehallion FPSO
 - Developed under water flood
 - Over 90 E&A and development wells:
30 producer and 31 injector wells
 - Declining OE and large remaining resources led to Quad204 redevelopment.
- Replace FPSO
 - Glen Lyon start-up May 2017
 - ~20 infill well programme.



Reservoir stratigraphy and T30s system outline



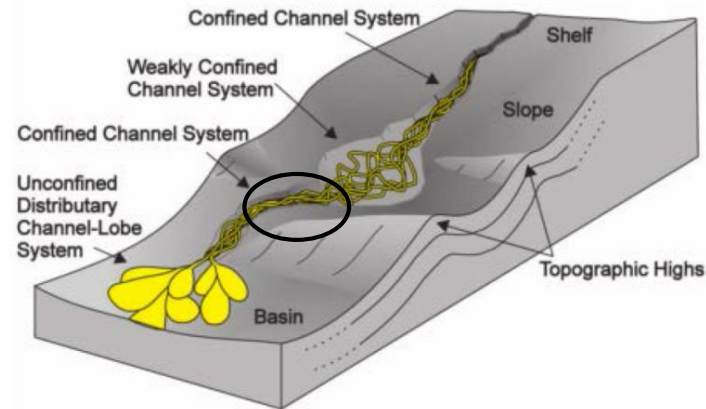
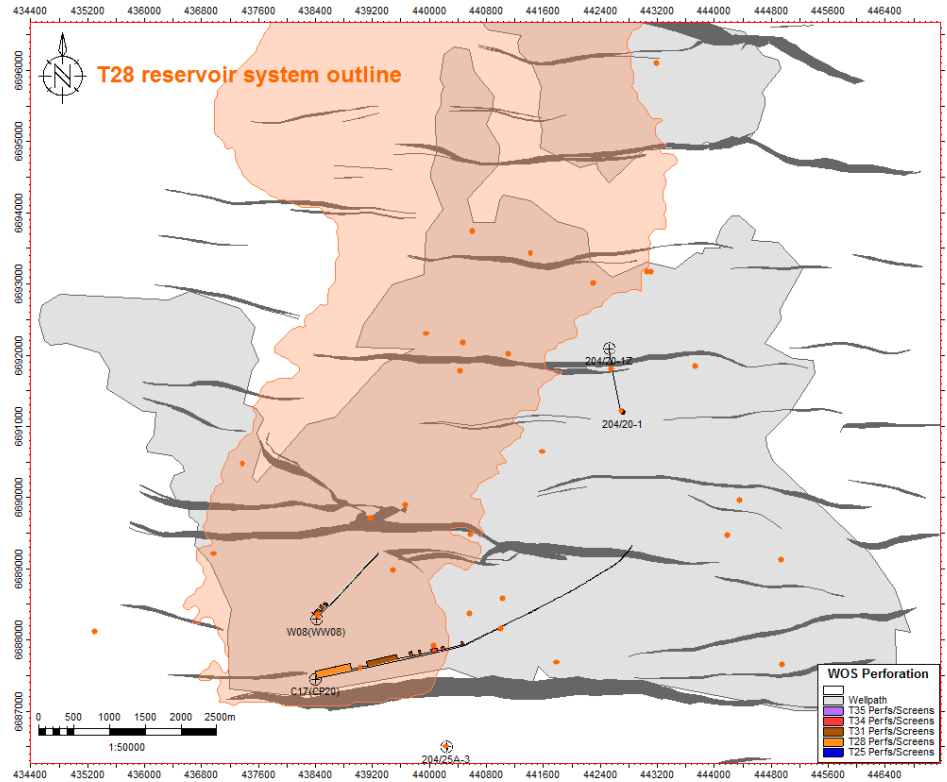
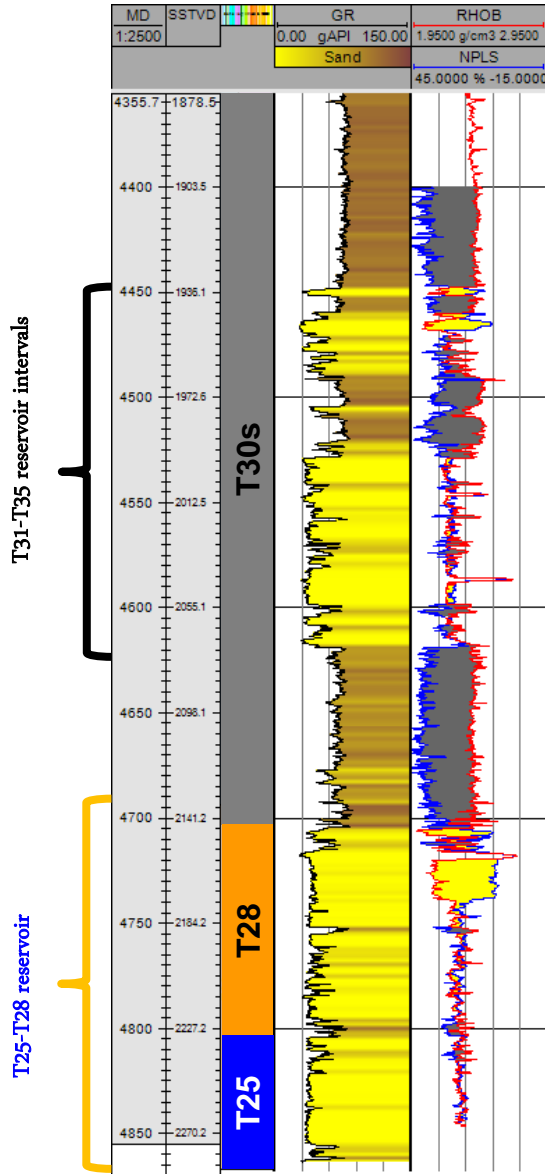
Type well



Reservoir stratigraphy and T28 system outline



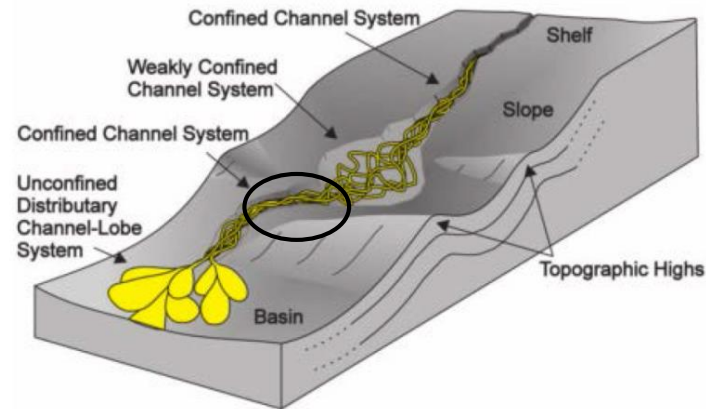
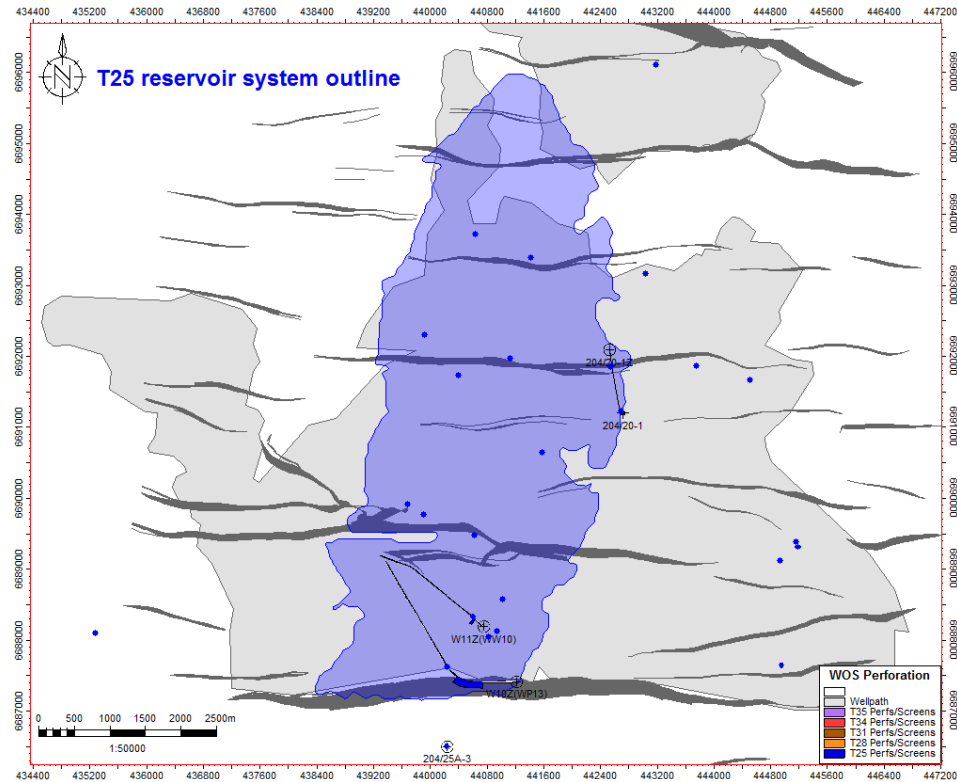
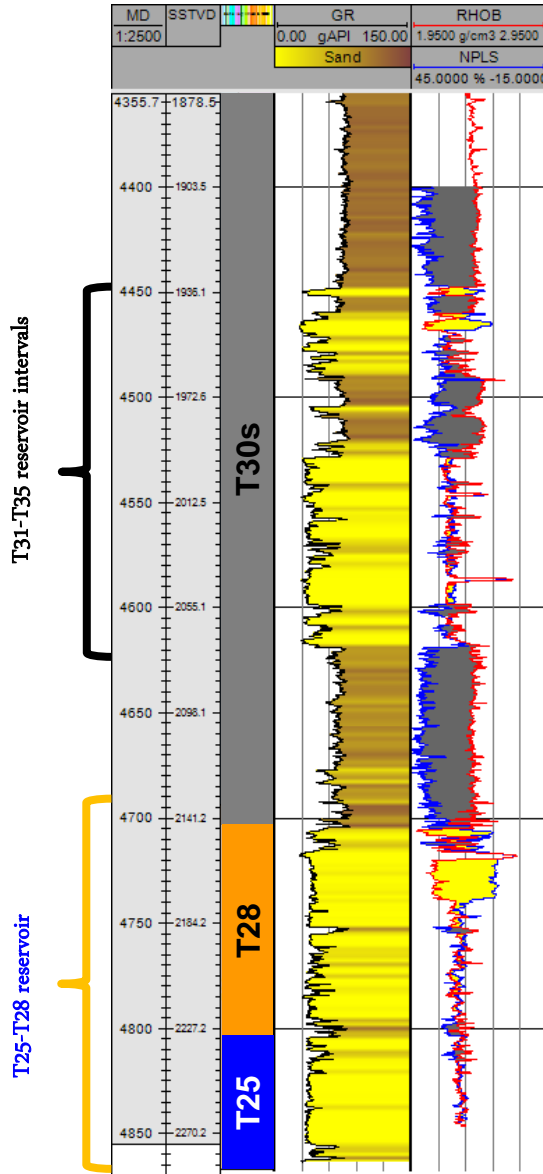
Type well



Reservoir stratigraphy and T25 system outline

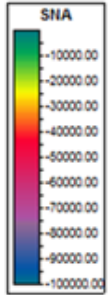


Type well

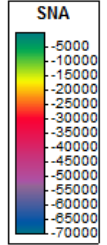
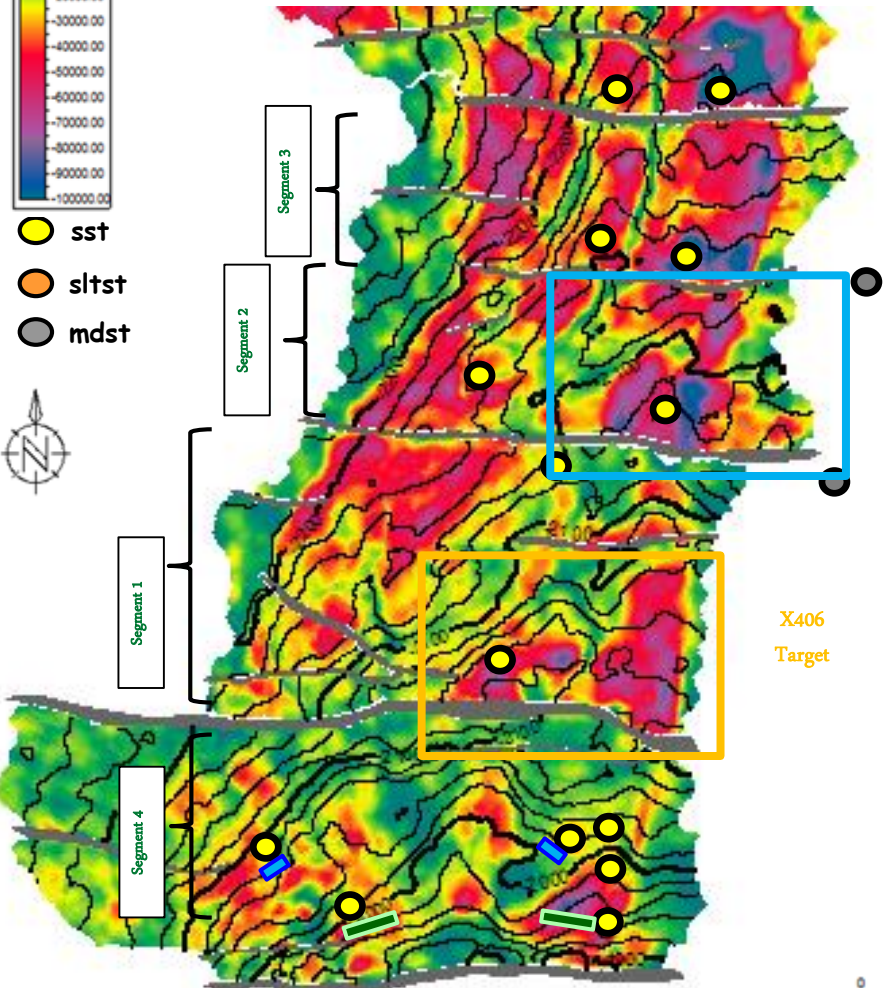


Schiehallion and Loyal fields

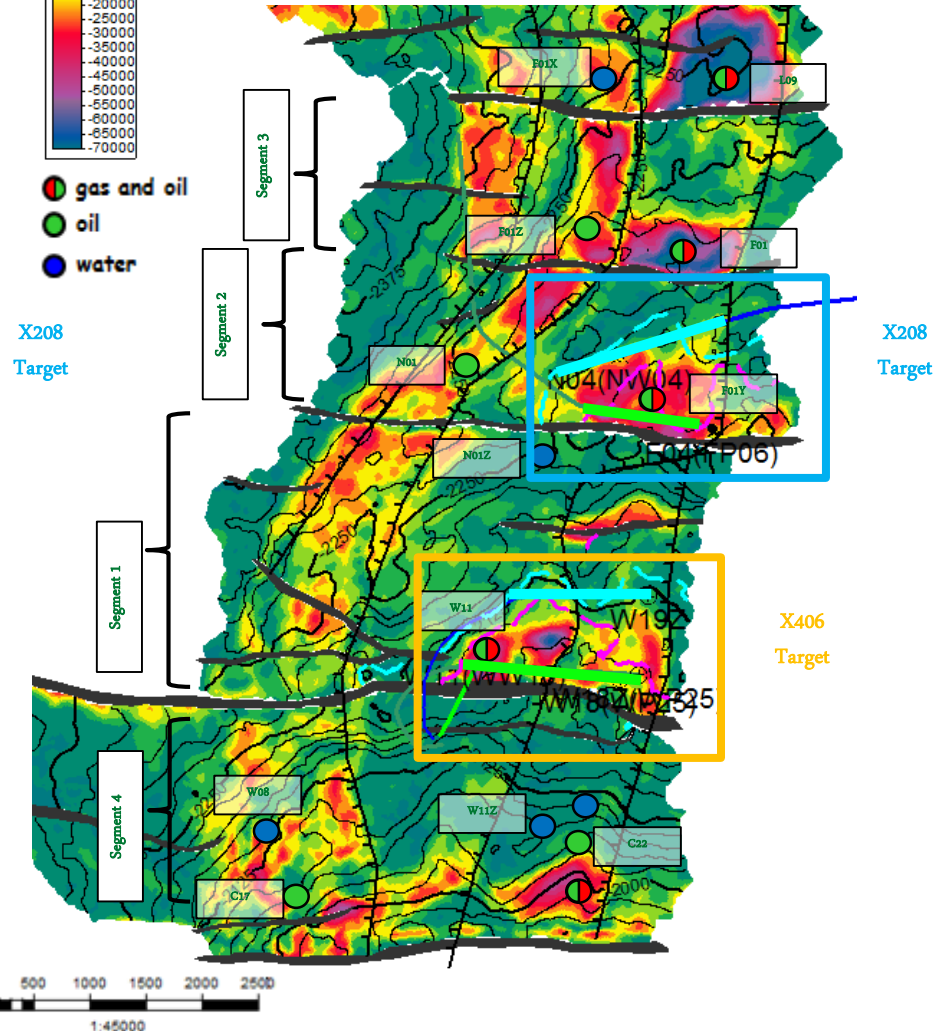
T28/T25 well control



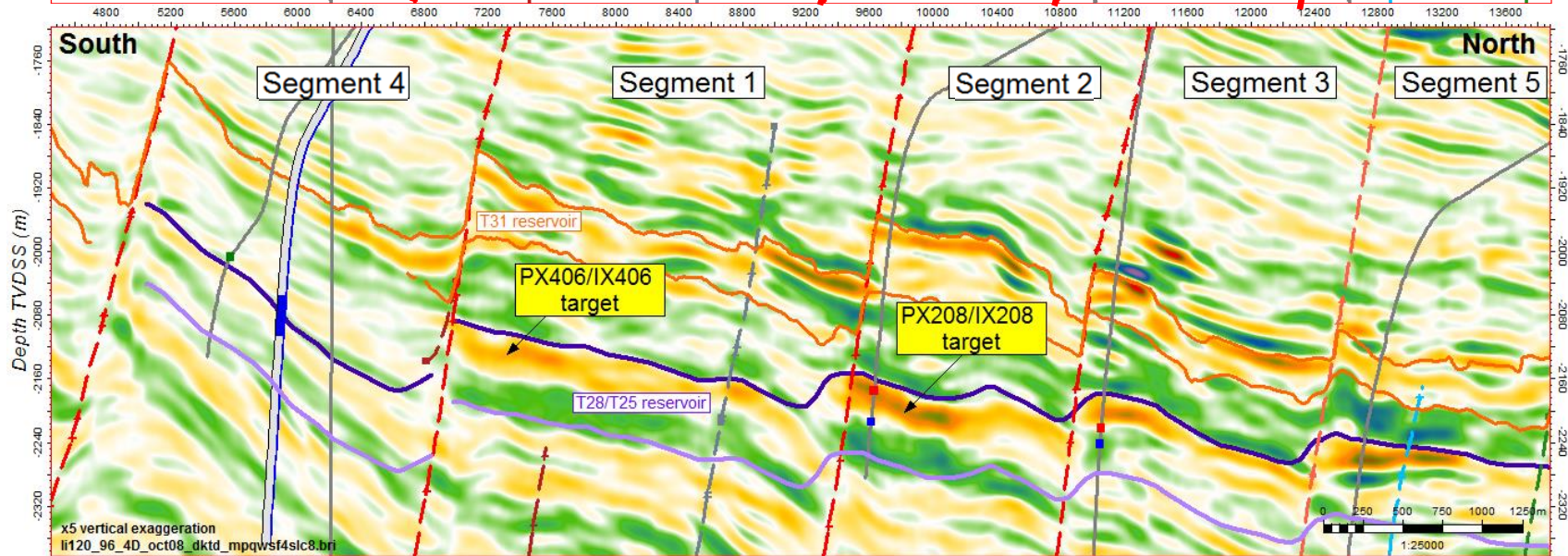
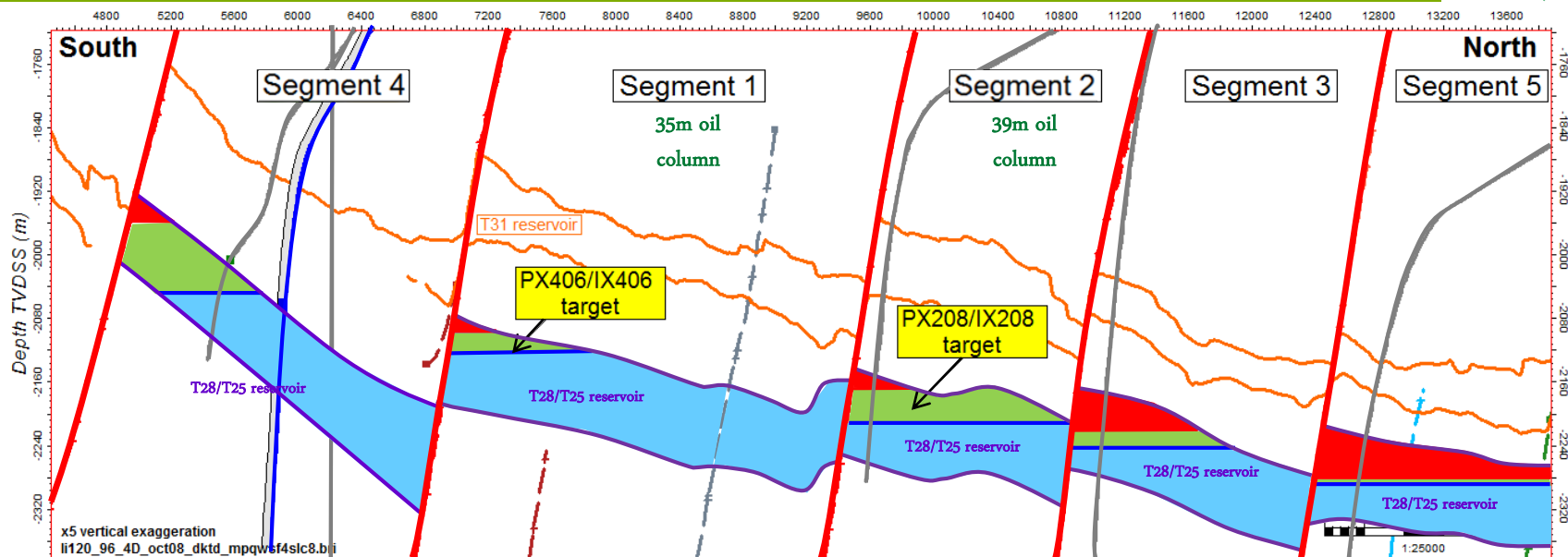
Sum of Negative Amplitudes Map 30ms below
Top T28/T25 performed on Lithology Volume



Sum of Negative Amplitudes Map 30ms below
Top T28/T25 performed on Fluid Impedance Volume



South-North structural cross-section: T28/T25 fluid contact variations

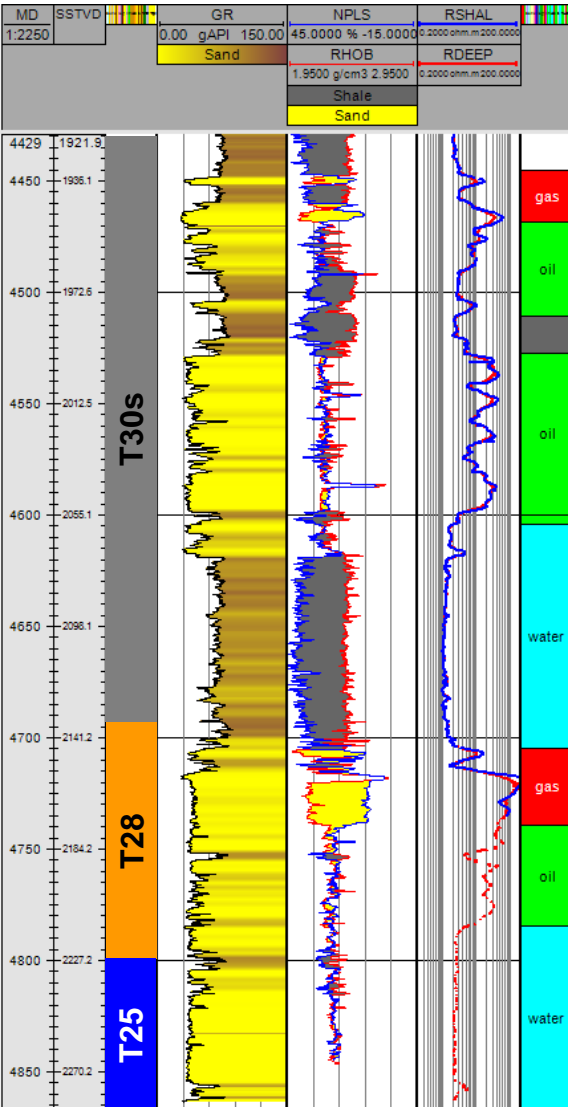


South-North cross-section from Segment 4 to Segment 5

Reservoir quality: comparison of T28/T25 with the T30s

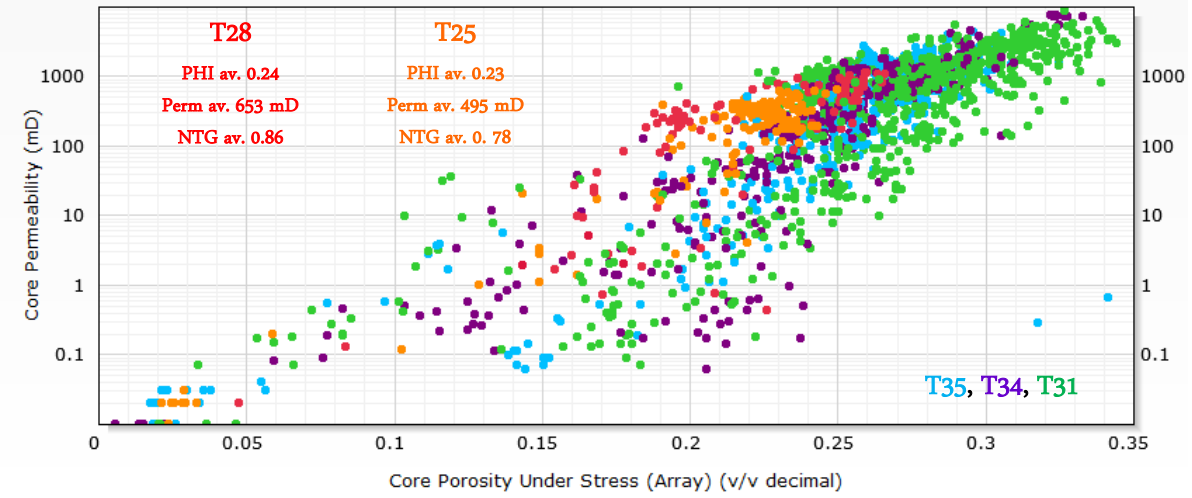


Segment 2 offset well

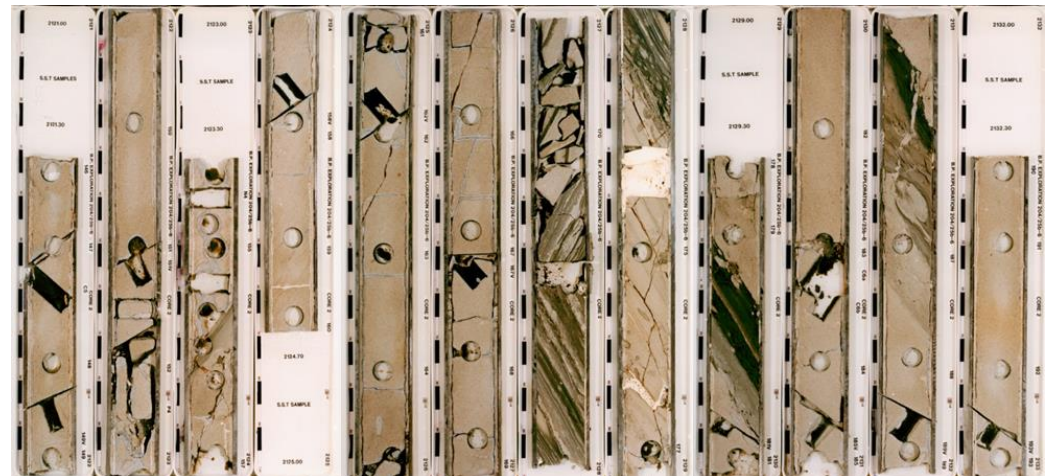


109m oil column in T30s.

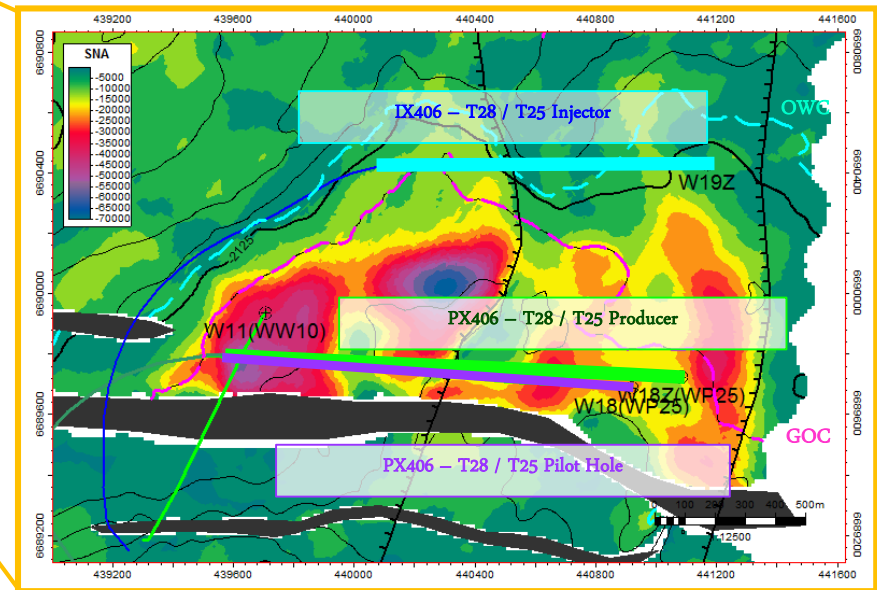
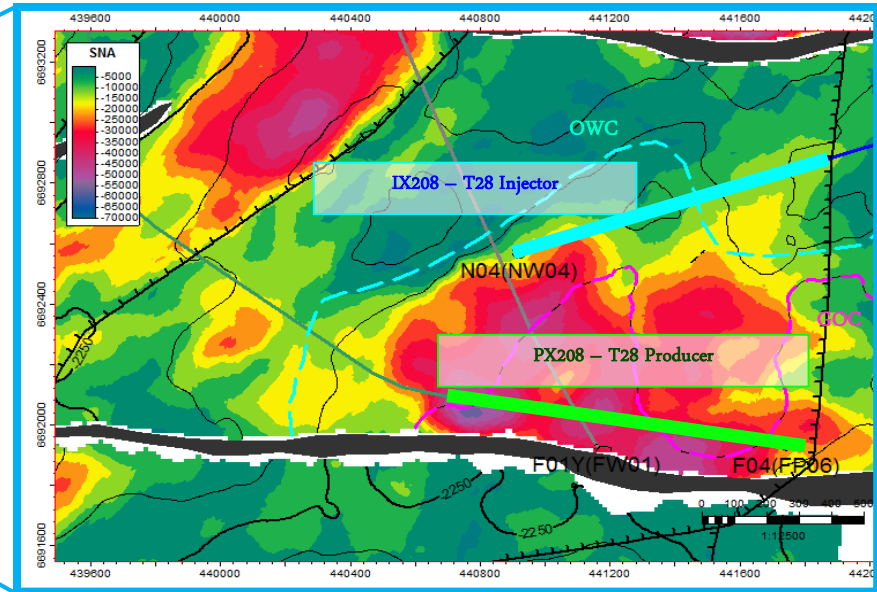
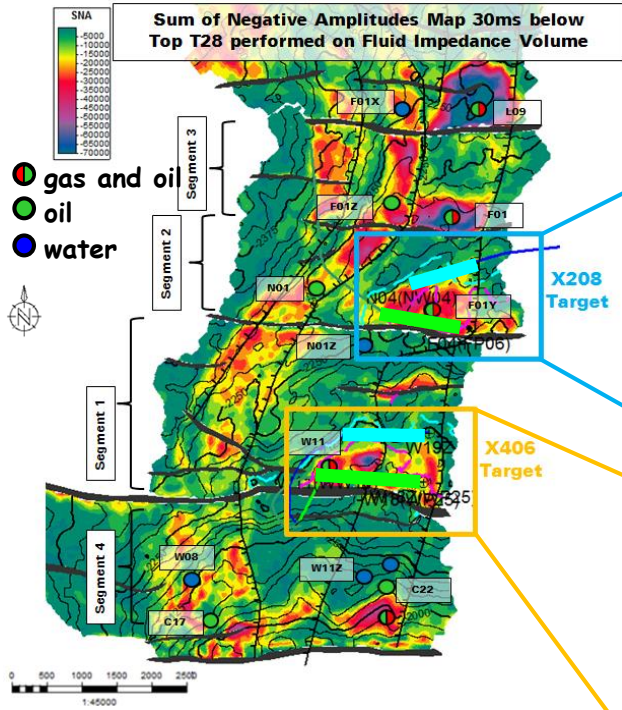
39m oil column in T28.



T28/T25 core example:
 high NTG, good reservoir quality, amalgamated to non-amalgamated sands with thin mudstone intervals.



Four of the 1st eight wells to target T28/T25



Challenges for

T28/T25 development:

- Depth uncertainty,
- Fluid contact uncertainty,
- Reservoir system and producer-injector connectivity.

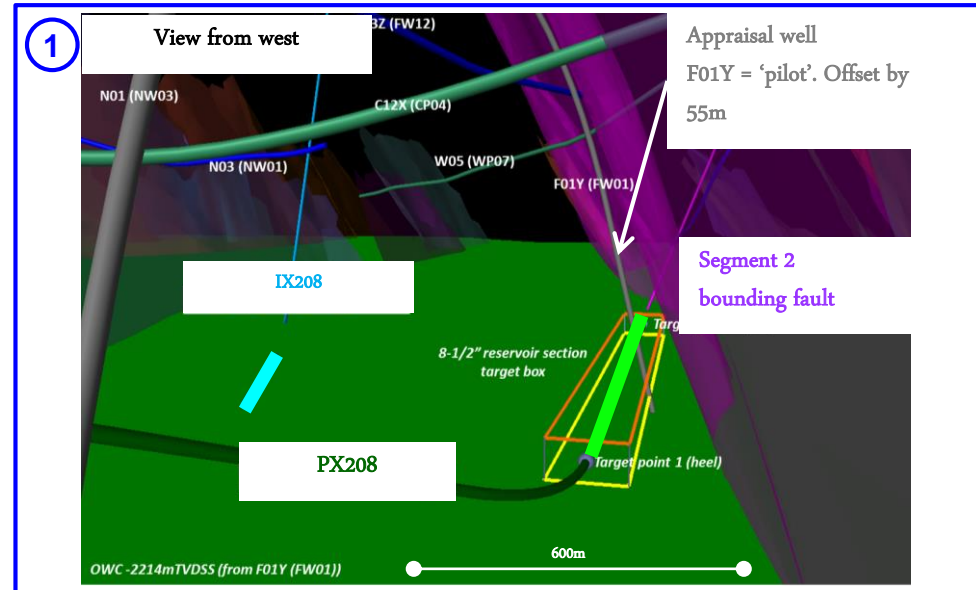
Depth and fluid contact uncertainties

Segment 2: PX208 and IX208

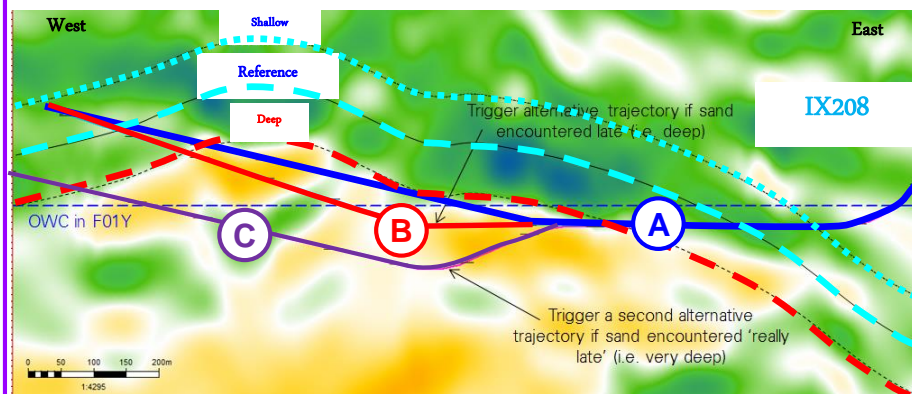


Well planning considerations

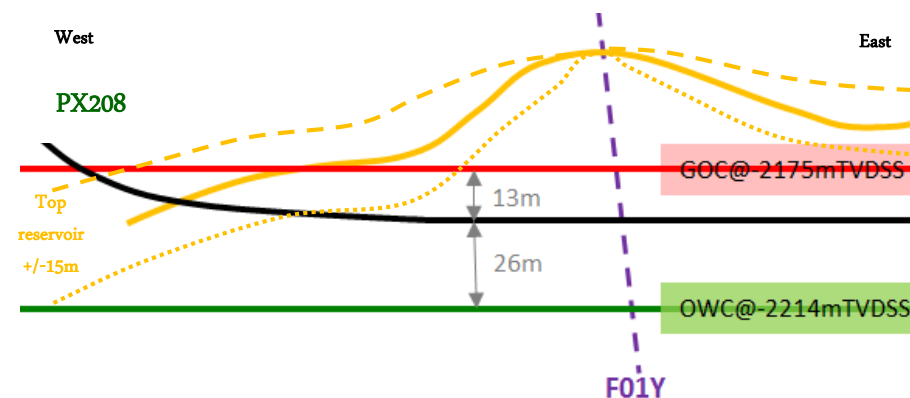
- 1 • Producer → proximity to Segment bounding fault.
- Anti-collision and zonal isolation.
- Attic appraisal well = equidistant from heel and toe of PX208 by 600m.
- 2 • Top reservoir depth uncertainty +/- 15m.
- Injector → designed well during planning to be robust to a range of depth uncertainty scenarios.



- 3 Alternative **IX208** trajectories:
- Shallow or reference top sand outcomes – drill well A.
 - Deep case top structure outcome – drill wells B or C.



- 2 Pilot well required for **PX208**? No – already have a pilot in F01Y, drilled at crest of structure, tested GOC and OWC, and rock properties.



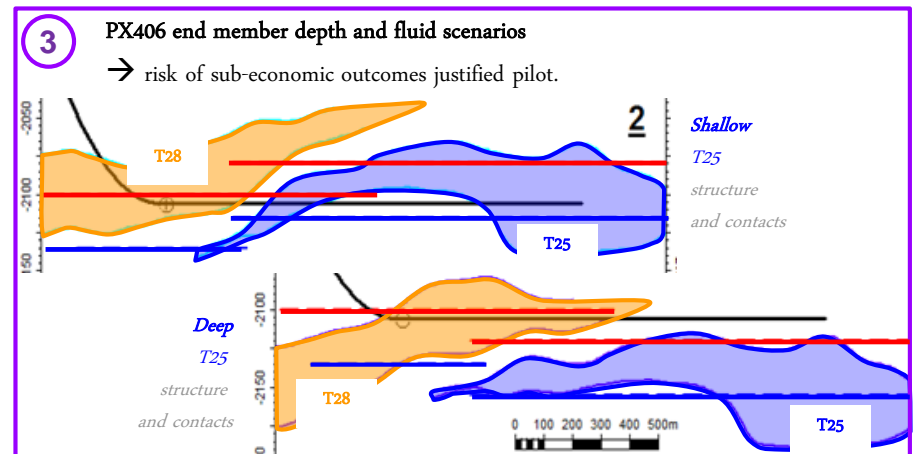
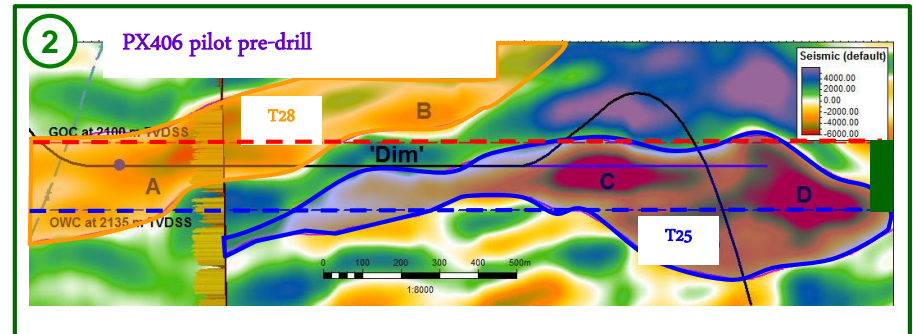
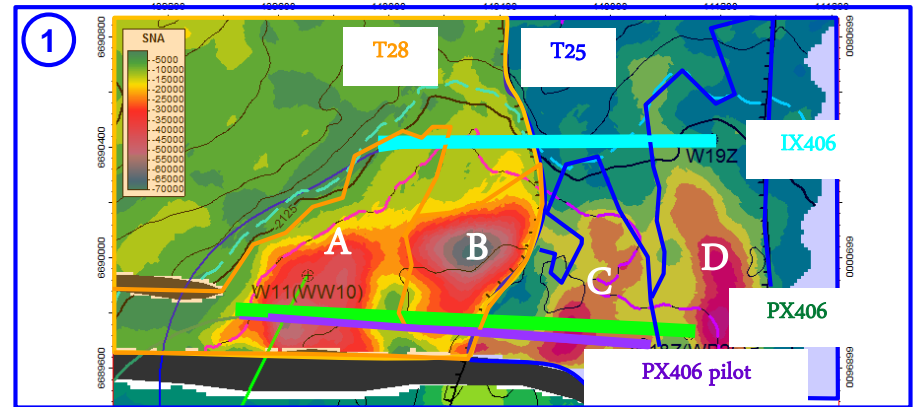
Depth and fluid contact uncertainties

Segment 1: PX406 and IX406



Well planning considerations

- 1
 - Producer -> proximity to Segment bounding fault.
 - Two fairways of different ages -> T28 / T25. Appraisal well only in the western T28 fairway.
 - No well control in eastern fairway, therefore uncertainty on depth (+/-25m), fluid contacts, reservoir age (T28 or T25), net sand presence and distribution.
- 2
 - Pilot well was justified for the producer target.
 - Injector depth uncertainty +/-25m -> optimised search angle for reservoir entry.
- 3



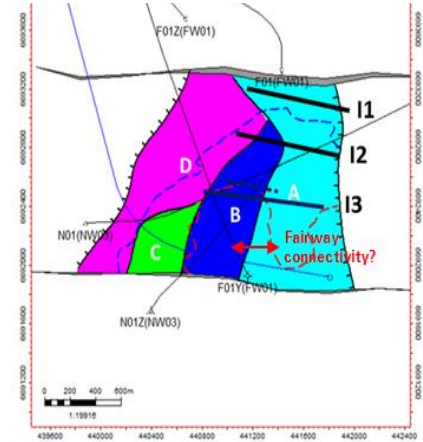
Reservoir sands connectivity uncertainties



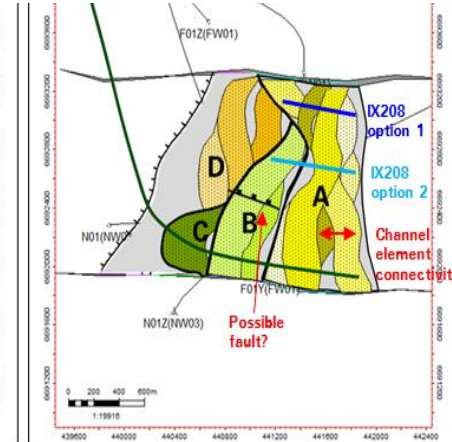
Segment 2: Sand distribution scenarios

Well planning considerations

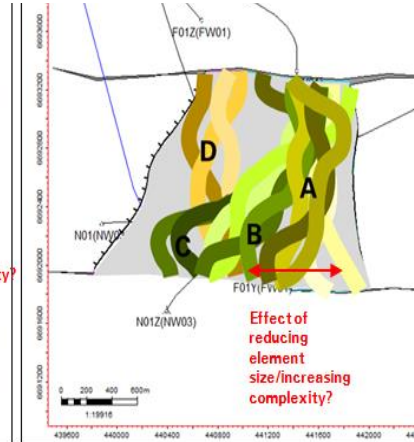
- Inter- and intra-sand system connectivity
- Affects producer and injector reservoir section lengths and well position.



Defined sand fairways



300m channel element width

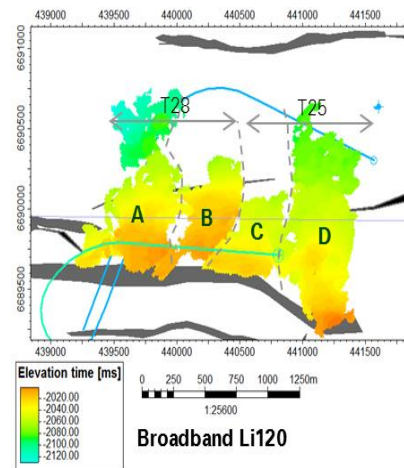


150m channel element width

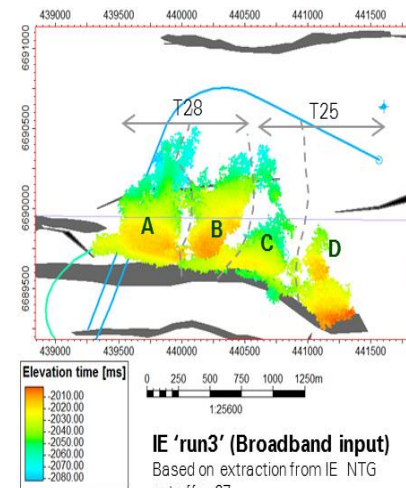
Segment 1: Sand distribution scenarios

➔ Designed long horizontal wells to cross-cut multiple sands,

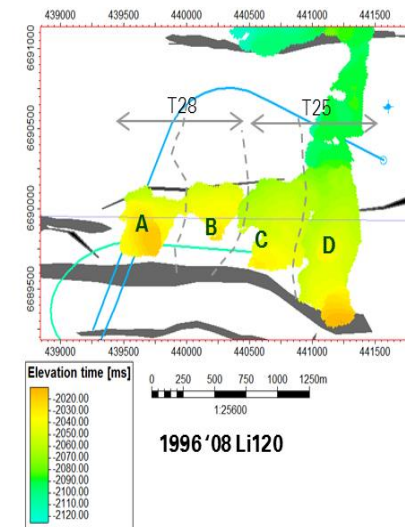
➔ Acquired LWD pressures.



Broadband Li120



IE 'run3' (Broadband input)
Based on extraction from IE NTG cut off > .67



1996'08 Li120

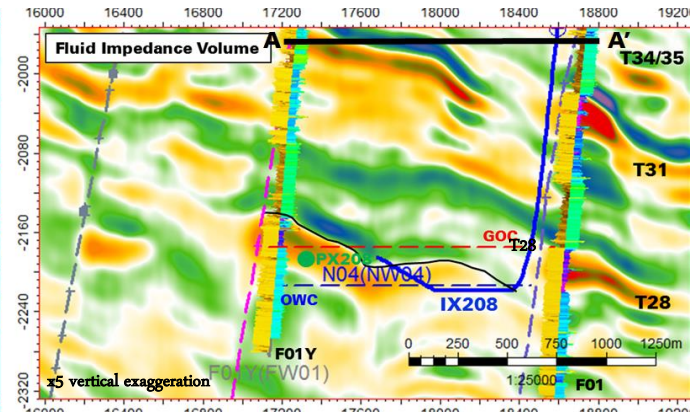
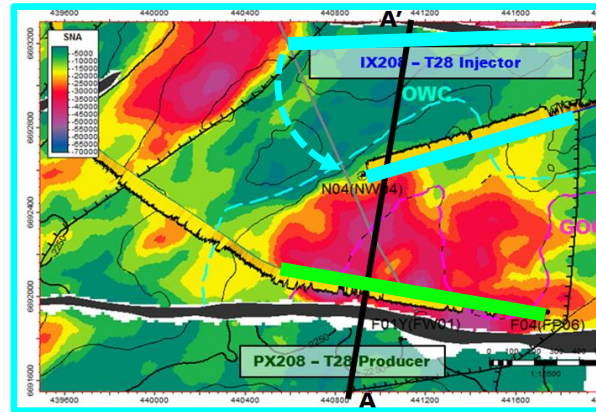
Producer-Injector connectivity uncertainties



Segment 2: PX208 and IX208

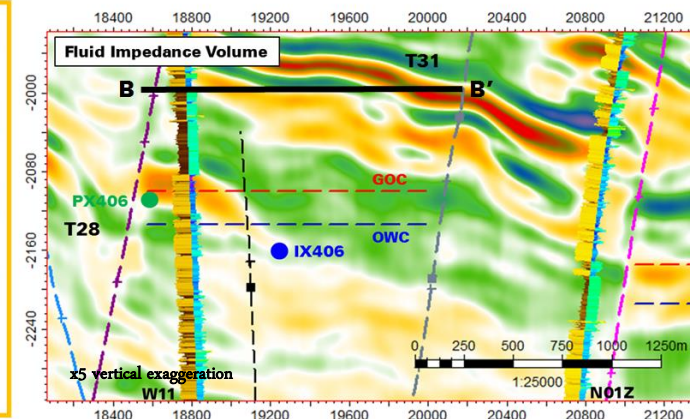
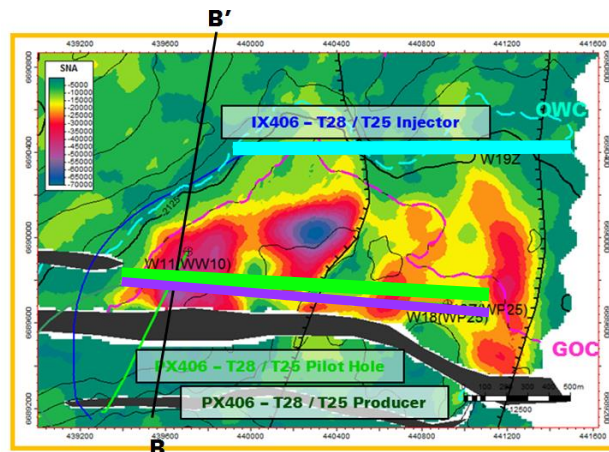
Well planning considerations

- Amplitude shut-off
- Related to faulting?
- Fluid affect?
- Reservoir absence in low amplitude areas?



Segment 1: Pilot-PX406 and IX406

- ➔ Positioned injectors within high-amplitude areas,
- ➔ Affects injector-producer spacing,
- ➔ Acquired LWD pressures,
- ➔ Assess well performance.



Segment 2: PX208 and IX208 well results



Depth uncertainty

- On depth or slightly shallow.

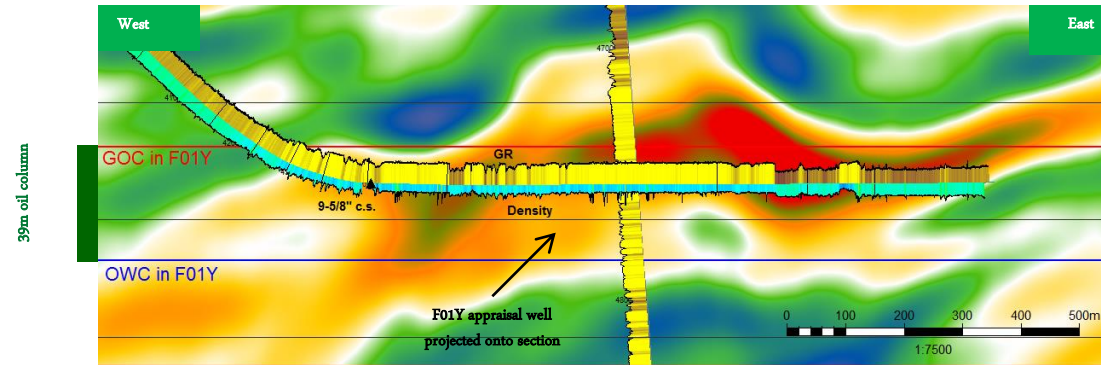
Fluid contact uncertainty

- PX208 remained within oil leg.
- IX208 OWC deeper than appraisal well. Sharper oil-water transition zone.

Connectivity

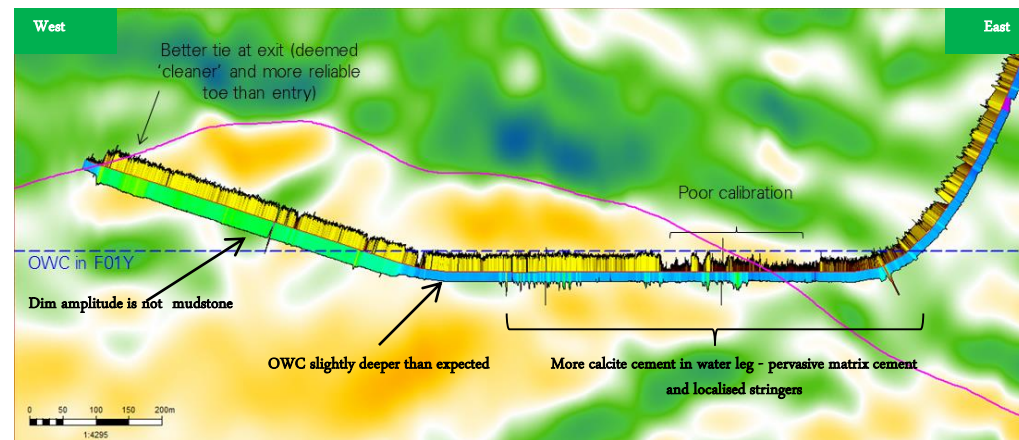
- Improved net sandstone distribution in injector location than prognosed.
- Pressure connectivity between the producer and injector wells and across T28 and T25 systems.

PX208 producer result

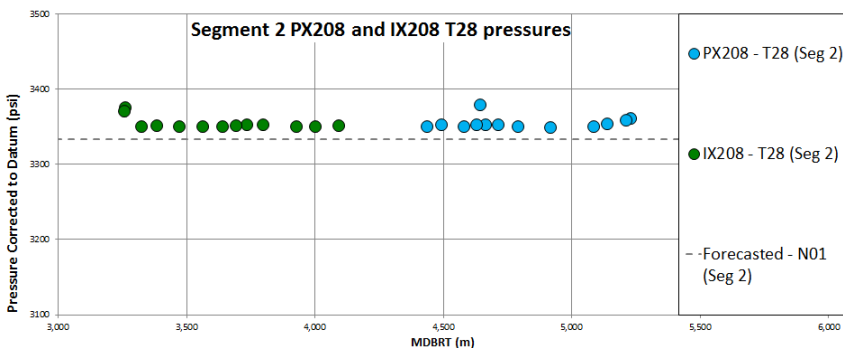


Producer: 1068m long reservoir section.

IX208 injector result



Injector: 1118m long reservoir section.



Segment 1: PX406 pilot, producer and IX406 injector well results



Depth uncertainty

- On depth or slightly shallow.

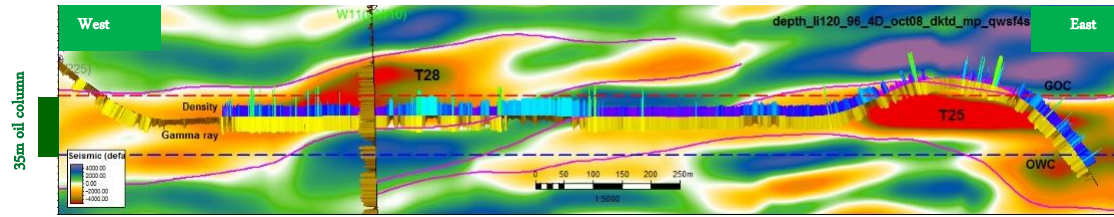
Fluid contact uncertainty

- Common contacts between T28 and T25.
- Sharper oil-water transition zone found in pilot well.

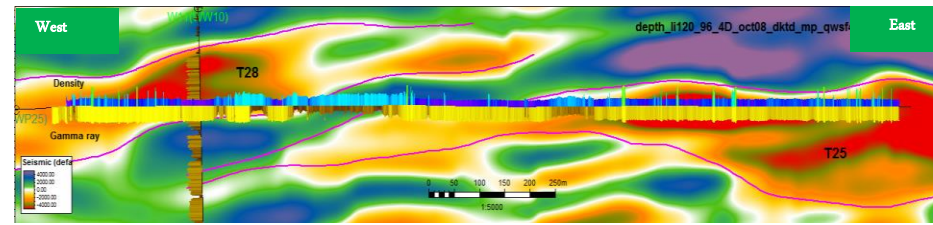
Connectivity

- Higher reservoir quality than prognosed.
- Pressure connectivity between the producer and injector wells and across T28 and T25 systems.

PX406 pilot result

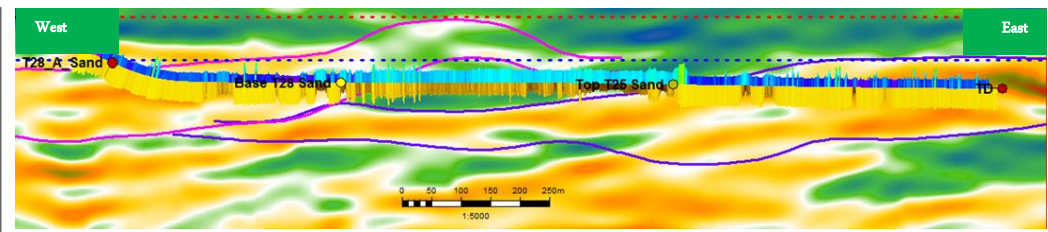


PX406 producer result

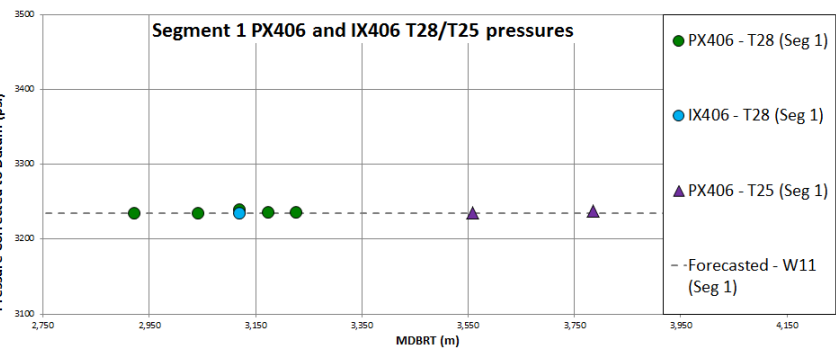


Producer: 1675m long reservoir section.

IX406 Injector result



Injector: 1553m long reservoir section.

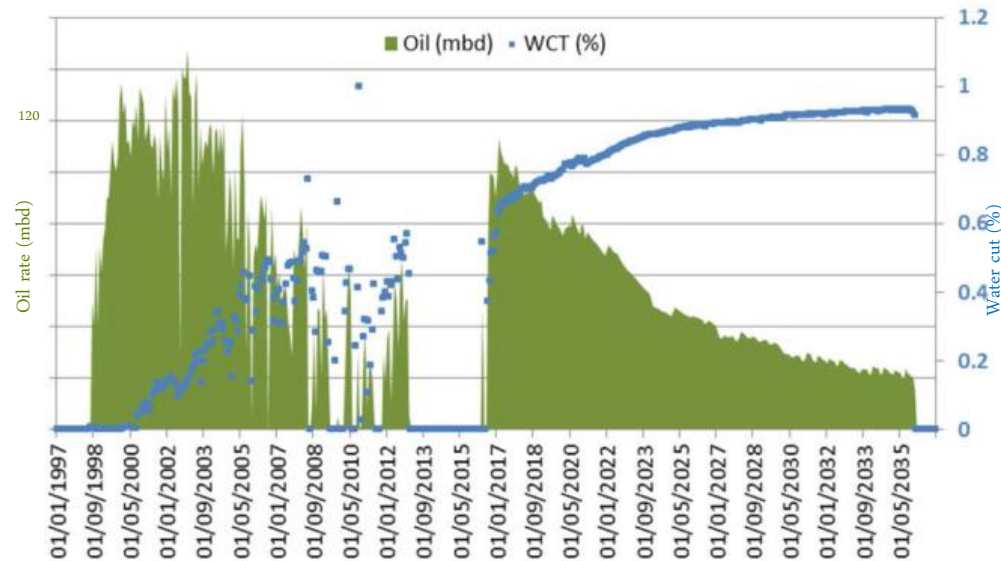


Conclusions and future opportunities



- Overall, positive well results.
- Play came in better than predicted.
- NTG higher than predicted.
- Transition zone thinner -> updated saturation height function being applied to full field model.
- Currently assessing further potential to develop T28/T25 accumulations elsewhere in the field.
- T28/T25 development expected to contribute 8% of the future field production.

	Segment 2		Segment 1	
Uncertainties	PX208	IX208	PX406	IX406
Depth uncertainty				
Fluid uncertainty				
Connectivity – NTG				
STOIP				
Connectivity - Pressures				



Acknowledgments



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 - *Miriam Gordon, Jason Scott, Tim Primmer*
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- JV Partners

- Shell
- Siccar Point Energy

