

A new turbidite play in the Otway Basin

The value of revisiting the rocks

Penola Trough, Otway Basin, South Australia

Sharon Tiainen | 28 November 2024

Acknowledgements | Rob Kirk, Chris Cubitt and Tim Rady



**GEOLOGICAL
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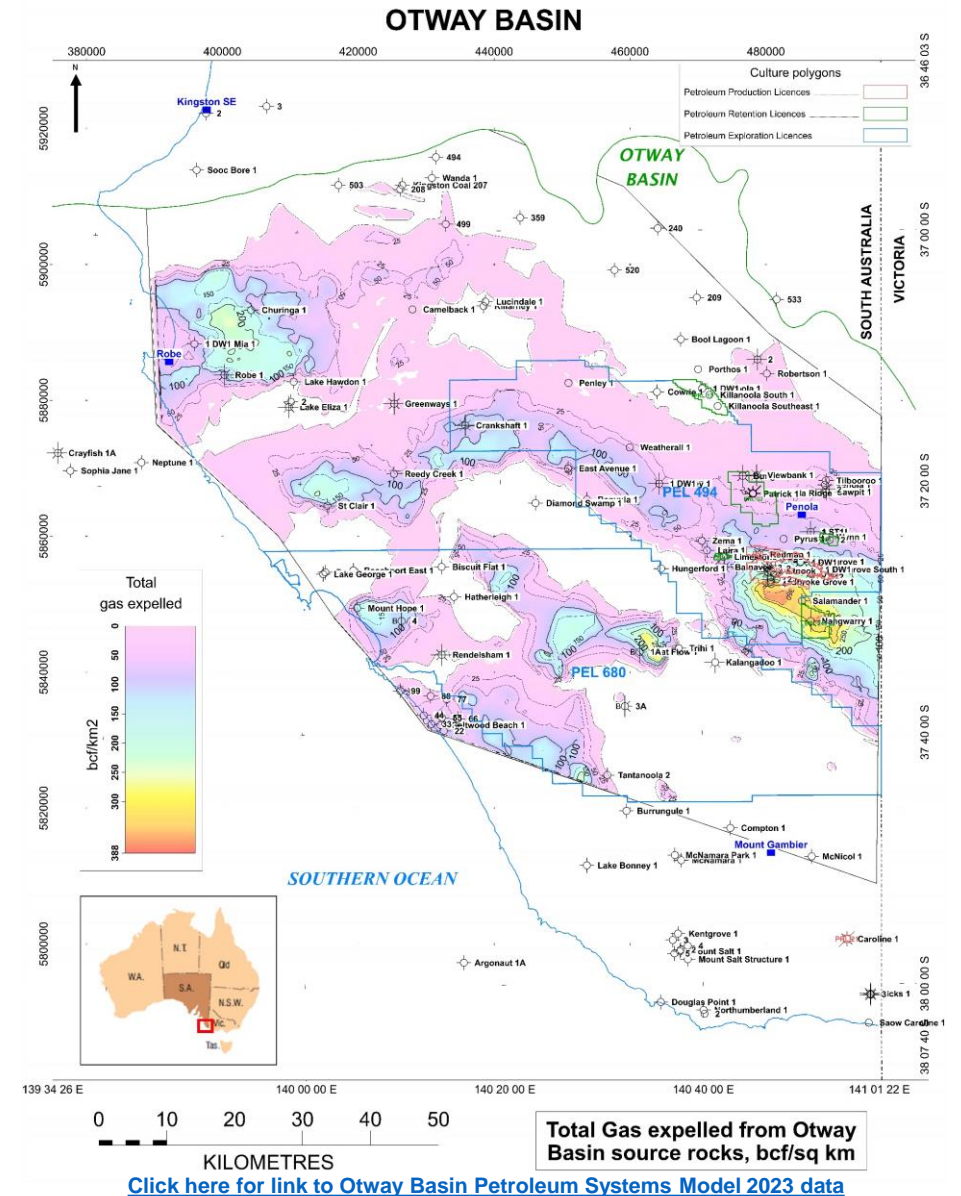
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Background Part of the Otway Project

- Whole of basin petroleum system model
- Commenced 2020 and completed Q4 2023
- Generate new datasets
- Generate new exploration concepts
- Stimulate the next phase of exploration in the onshore Otway Basin



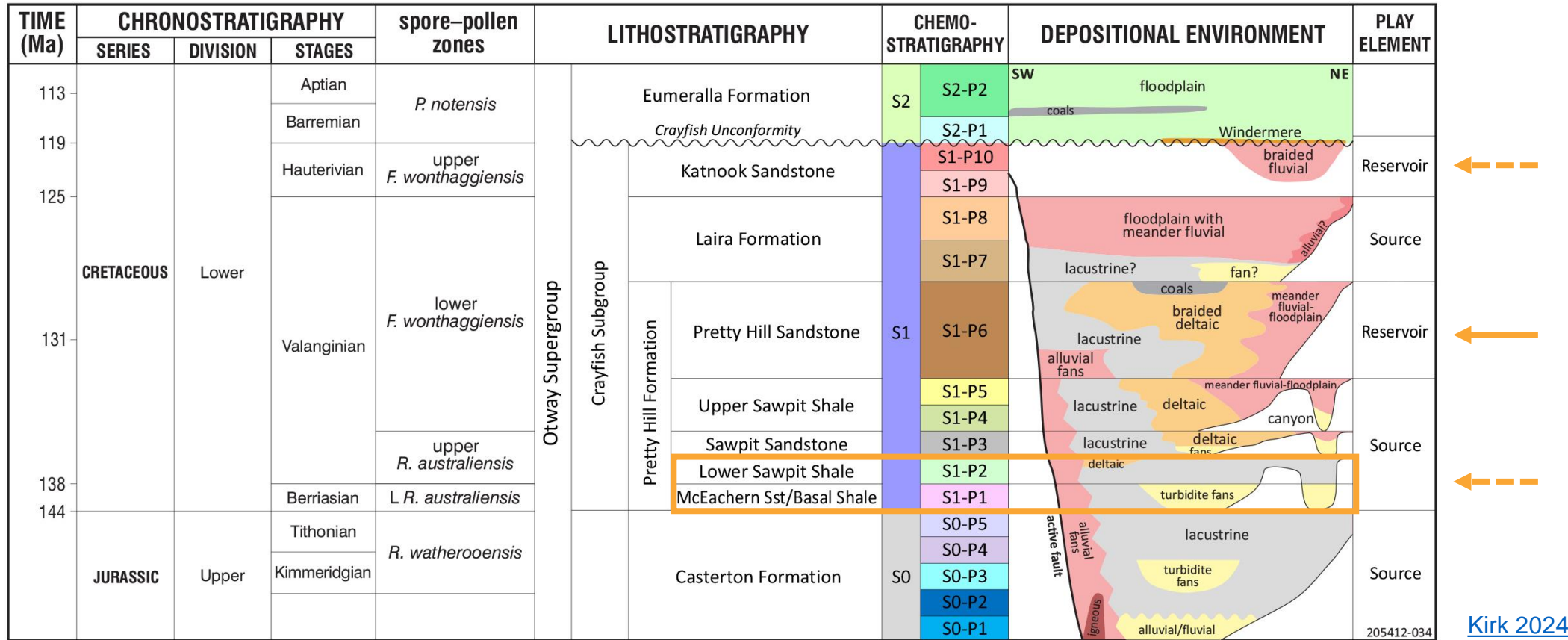
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Otway Basin

Proven province | 68 BCF



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205412-034

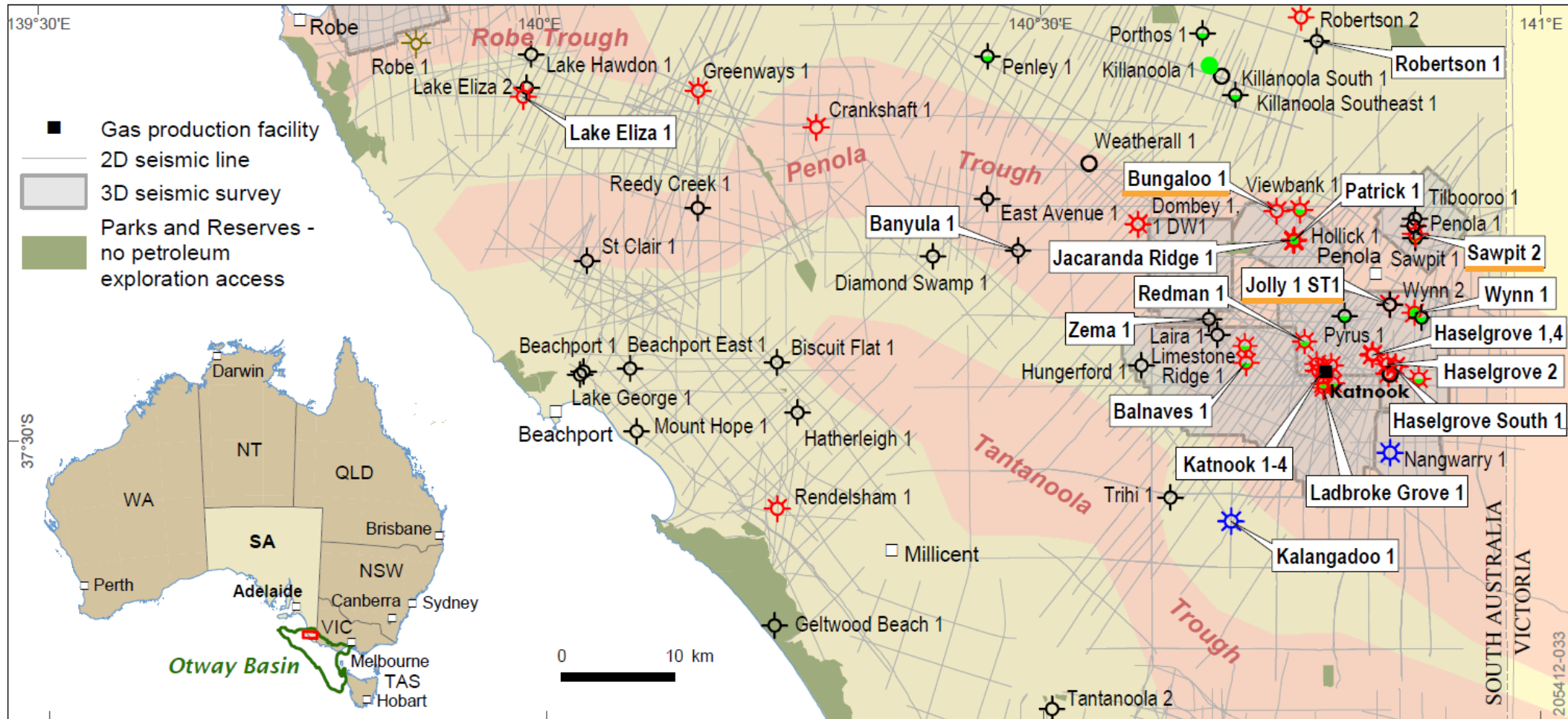


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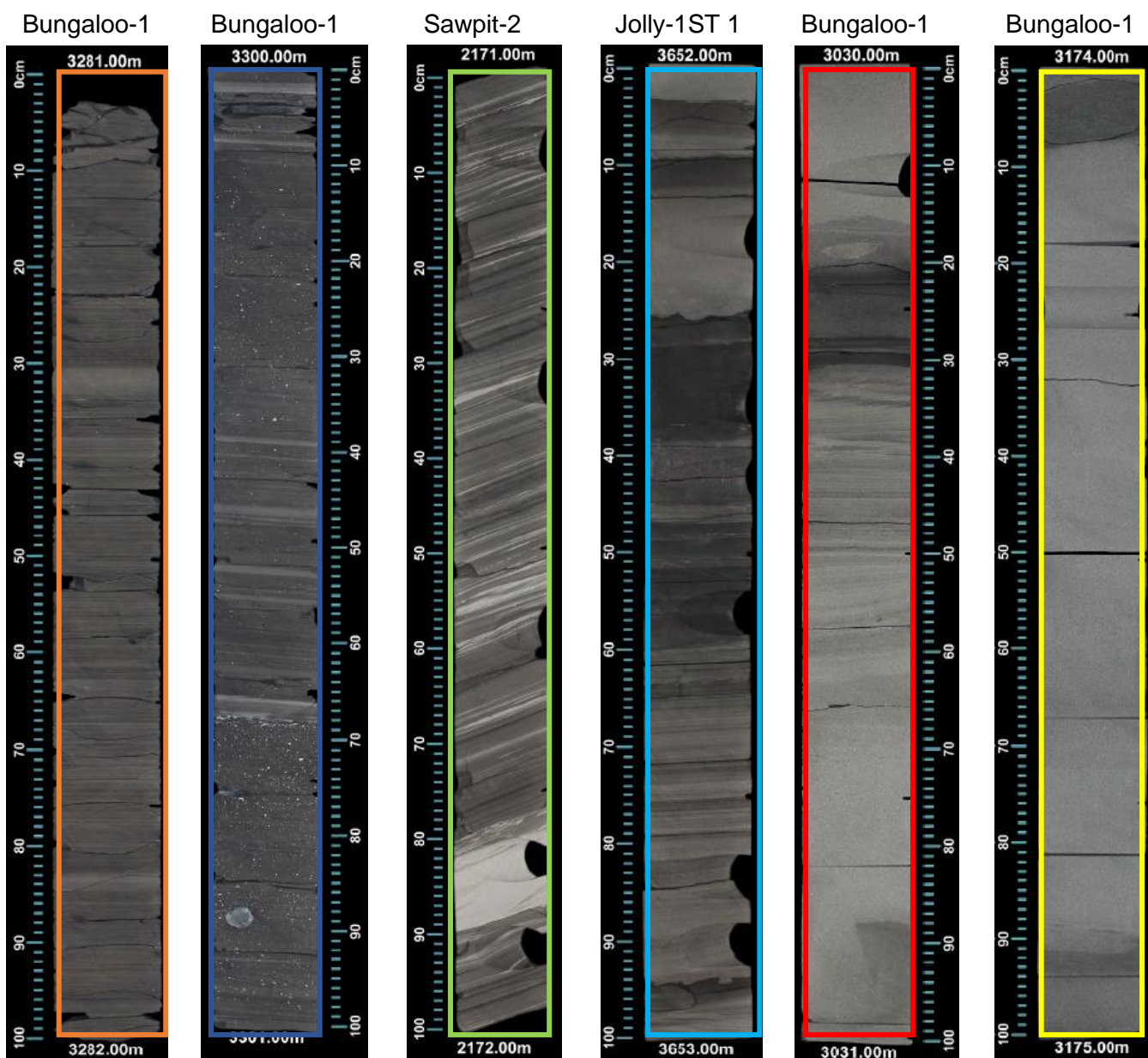


Cores | Bungaloo-1, Jolly-1ST1 and Sawpit-2



Revisiting the rocks and seismic



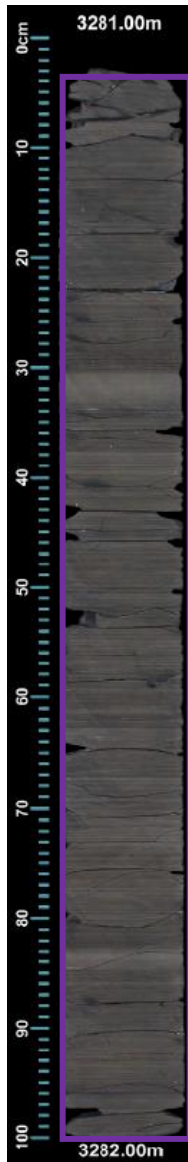


Past interpretation from WCRs

- Yellow rectangle = stacked crevasse splays
- Red rectangle = stacked crevasse splays and floodplain /floodplain lake
- Light blue rectangle = proximal crevasse, channel sands and crevasse splays
- Green rectangle = floodplain lake
- Dark blue rectangle = open lacustrine
- Orange rectangle = open lacustrine



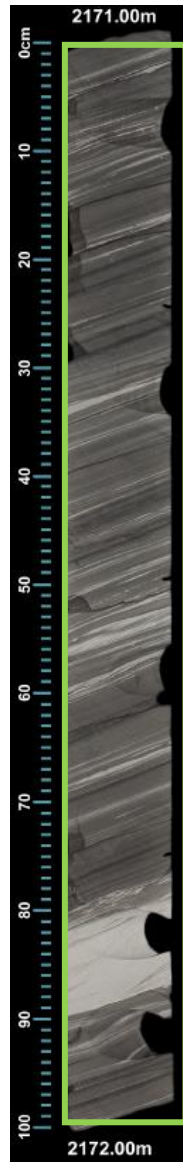
Bungaloo-1



Bungaloo-1



Sawpit-2



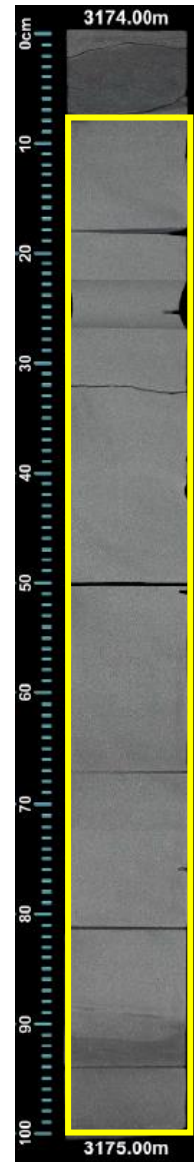
Jolly-1ST 1



Bungaloo-1



Bungaloo-1



Present observations and (interpretation)

- Yellow = sand-sized massive bedding (Ta)
- Orange = sand-sized planar bedding (Tb)
- Brown = sand-silt sized rippled bedding (Tc)
- Green = sand-silt-clay sized planar bedded (Td)
- Dark blue = clay-sized massive bedded (Te)
- Light blue = clay-sized planar with sand-pebble clasts (dropstones, deep-water lacustrine)
- Purple = clay-sized planar bedded (varves, deep-water lacustrine)
- Yellow arrows = scour and/or loading
- Blue arrow = pebble, note sand-sized clasts throughout (dropstones, deep-water lacustrine)



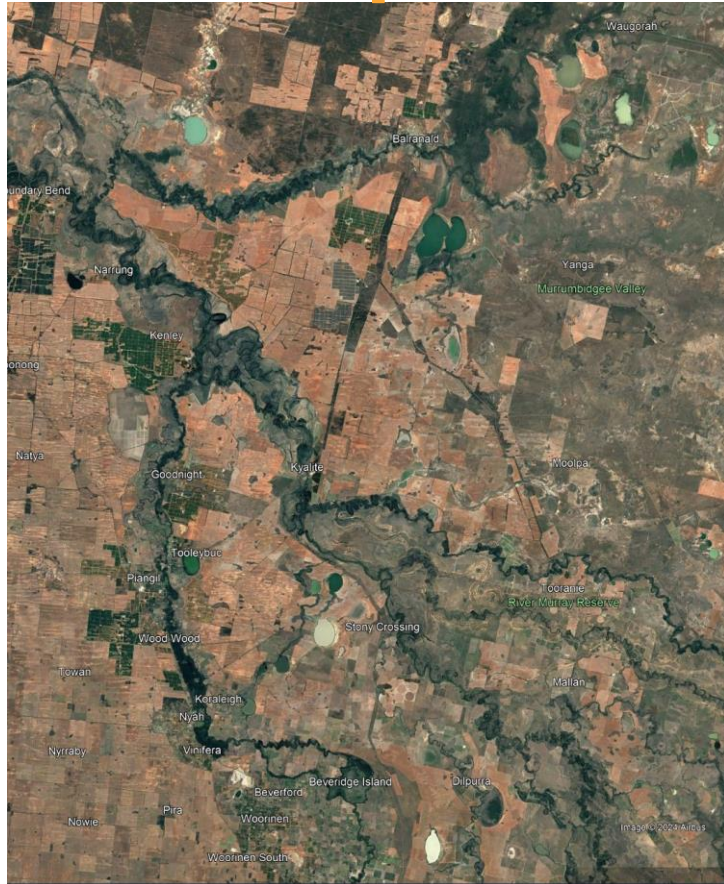
Past and present interpretations

Alluvial plain vs deep-water lacustrine

WELL	CORE	DEPTH (mDD)	PAST	PRESENT
Bungaloo-1	1	3019.0 – 3046.0	Crevasse splay and flood-plain lake	Deep-water lacustrine turbidite (BOUMA a-e)
	2	3148.0 – 3175.0	Crevasse splay and flood-plain lake	Deep-water lacustrine turbidite (BOUMA a-e)
	3	3277.0 – 3304.0	Lacustrine with dropstones	Deep-water lacustrine with varves and dropstones
	4	3304.6 – 3326.8	Lacustrine with dropstones	Deep-water lacustrine with varves and dropstones
Jolly-1ST1	1	3640.0 – 3667.0	Fluvial plain	Deep-water lacustrine turbidite (BOUMA a-e)
	2	3787.0 - 3788.0	Open lacustrine to pro delta	Deep-water lacustrine turbidite (BOUMA a-e)
	3	3788.0 – 3815.0	Open lacustrine to pro delta	Deep-water lacustrine with varves
	4	3815.0 – 3839.0	Open lacustrine to pro delta	Deep-water lacustrine with varves
Sawpit-2	1	2171.0 – 2198.0	Fluvial plain	Deep-water lacustrine turbidite (BOUMA a-e)
	2	2402.0 – 2415.6	Lacustrine	Deep-water lacustrine with varves and dropstones
	3	2415.6 – 2433.6	Lacustrine	Deep-water lacustrine with varves and dropstones

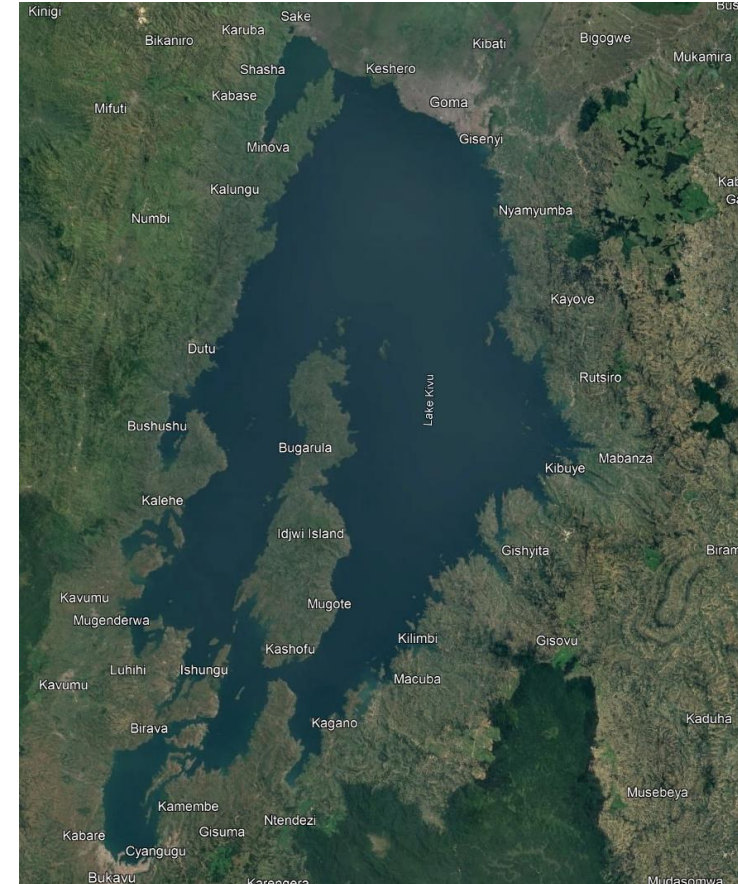


Alluvial plain and deep-water lacustrine Modern depositional environments



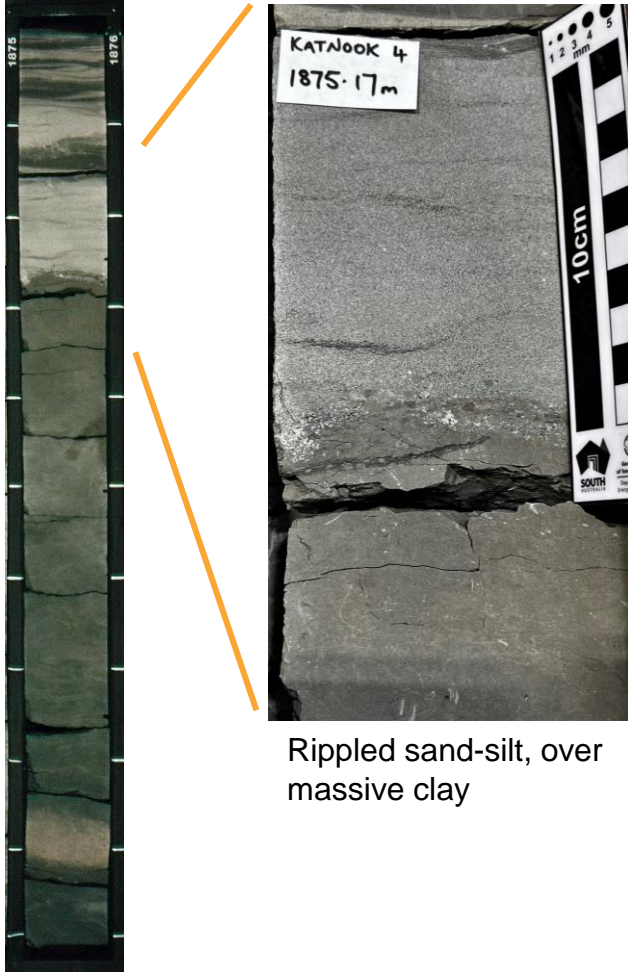
Left Balranald, Australia
Alluvial fluvial-flood plain
Right Lake Kivu, Africa
Rift deep-water lacustrine

~40 km



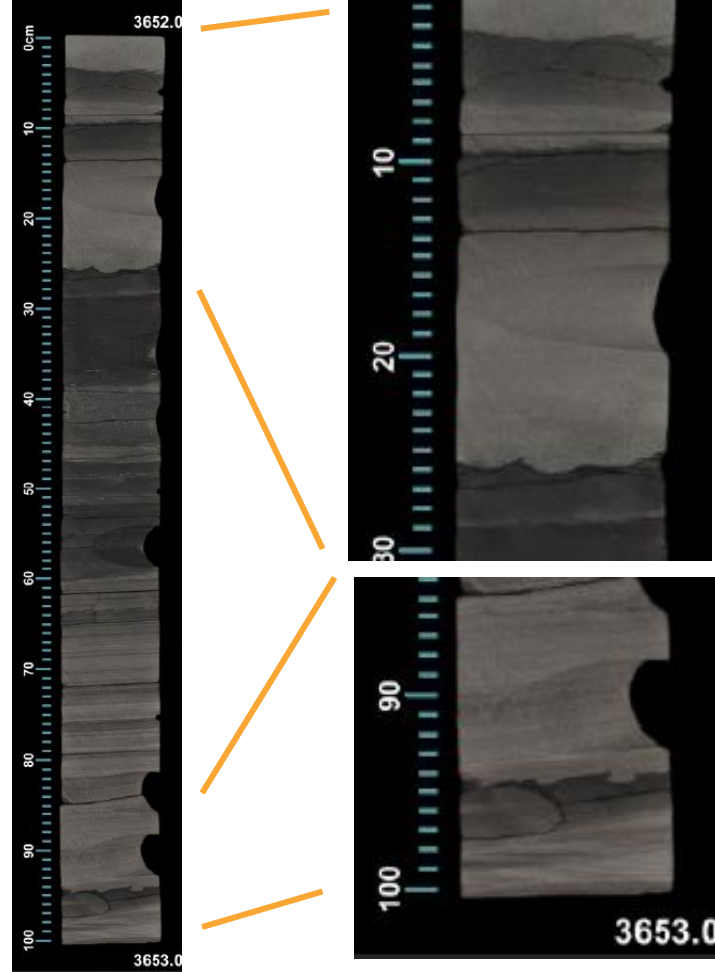
Crevasse up-section \neq crevasse down-section

Katnook-4



Rippled sand-silt, over massive clay

Jolly-1ST 1

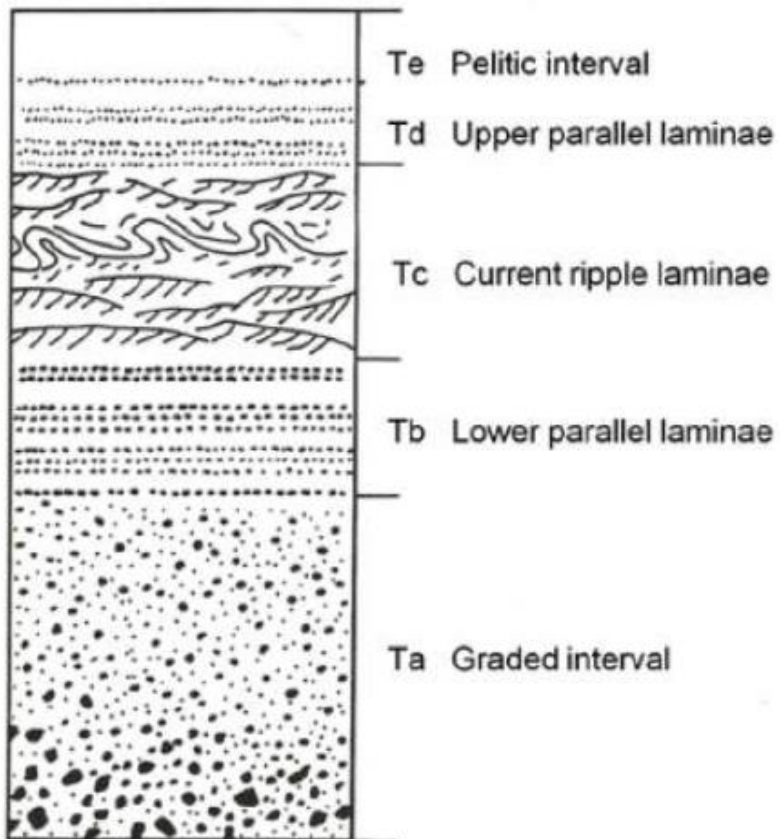


Interbedded sand-silt-clay with loading and flame structures

Sawpit-2



Bouma Sequence Sawpit-2



Planar clay

Planar silt and clay

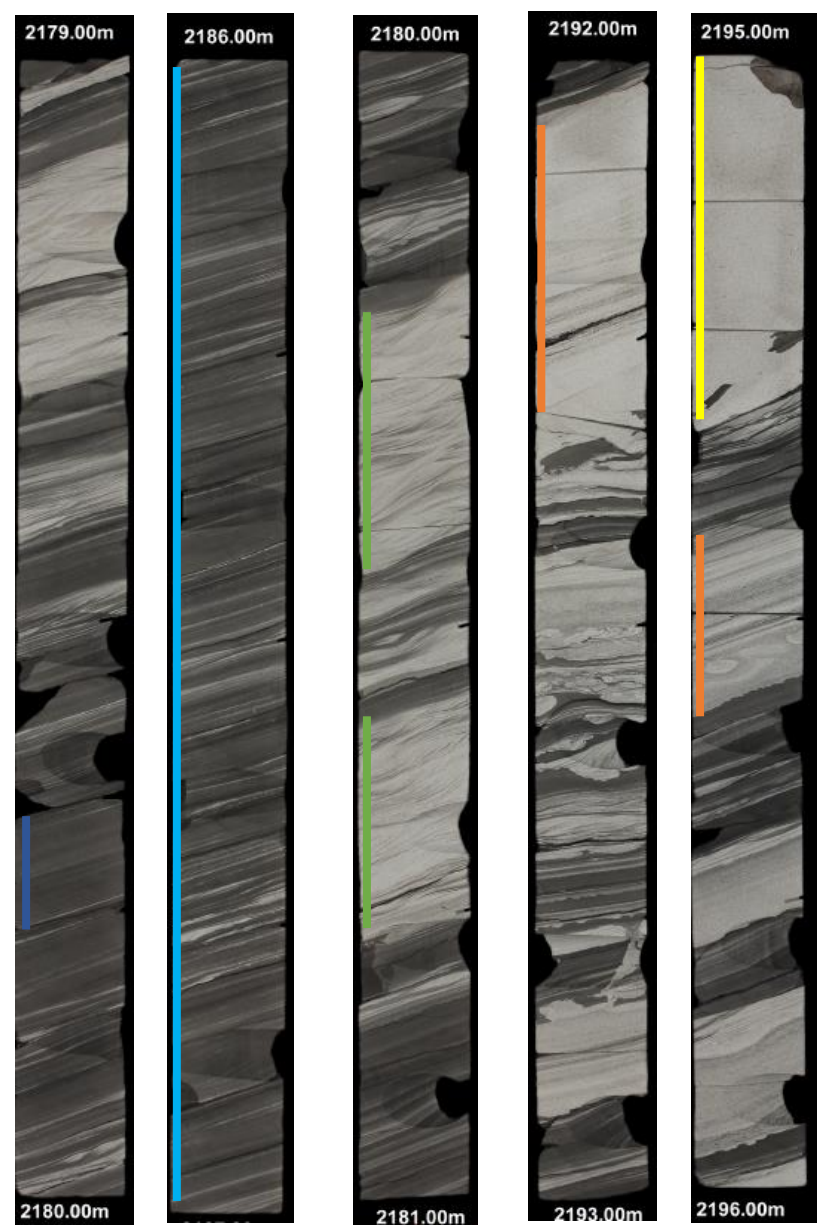
Rippled and/or wavy silt and sand

Planar bedded sand

Massive to normally graded bedding sand

After Bouma 1962

Soft sediment deformation/loading/flames



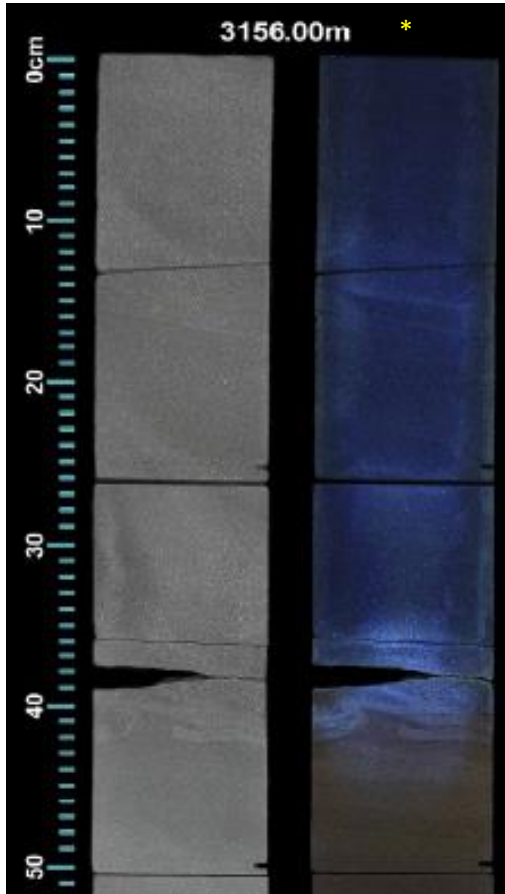
Observations | 7 x lithology types

Depositional environment (DE) interpretation

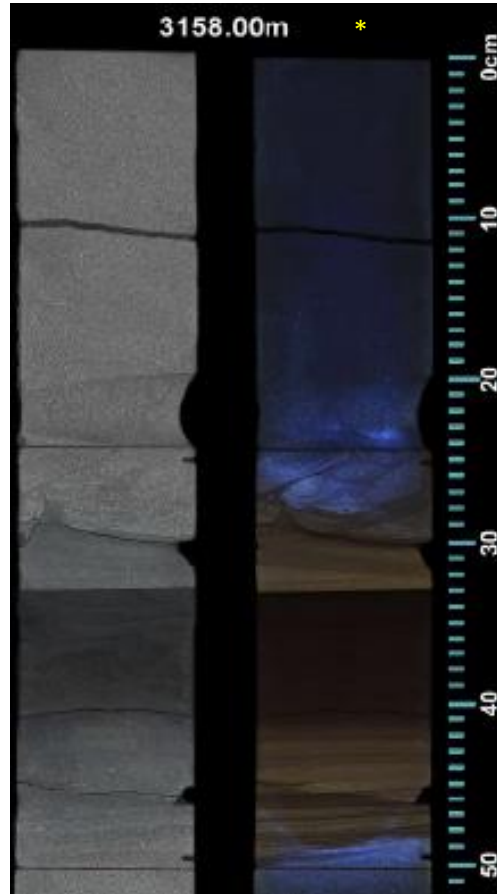
Lithology	Characteristic/s (interpretation)	DE interpretation (Bouma)
1 Clay-siltstone	Planar lamination (suspension varves)	Deep-water lacustrine
2 Diamictite	Planar lamination + clasts (suspension, drop-stones)	Deep-water lacustrine
3 Clay-siltstone	Massive-planar lamination (suspension)	Lacustrine turbidite (Te)
4 Silt-sandstone	Planar lamination (suspension + low flow)	Lacustrine turbidite (Td)
5 Sandstone	Ripple lamination (low flow)	Lacustrine turbidite (Tc)
6 Sandstone	Planar lamination (upper flow)	Lacustrine turbidite (Tb)
7 Sandstone	Massive bedding +/- rip-up clasts (upper flow)	Lacustrine turbidite (Ta)



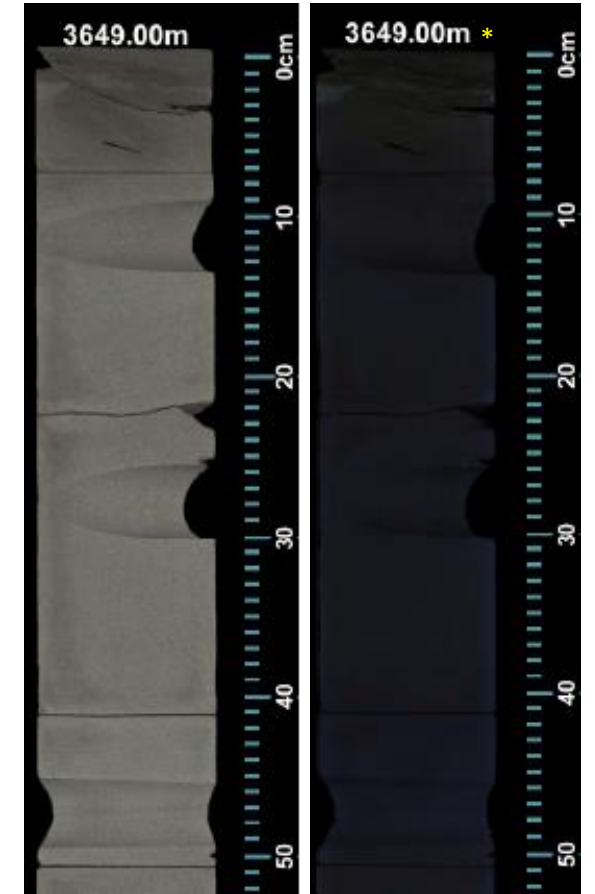
Hydrocarbon shows Bungalow-1 and Jolly-1ST1



Bungalow-1
Left and right
Blue fluorescence
under UV light *
Gas summary (ppm)
3148-3161 mDD
C1 7823, C2 1,614, C3
1113, iC4 190, nC4
303, iC5 91, nC5 88
70/14/10/2/3/1/1



Jolly-1ST 1
Right
Dull blue fluorescence
under UV light *
Gas summary ppm
3640-3667 mDD
C1 38526, C2 4577, C3
1015, iC4 230, nC4
121, iC5 68, nC5 19
86/10/2/1/<1/<1/<1



Revisiting the rocks and seismic

[Click here for link to Kirk, R. 2024 Seismic stratigraphy of the Jurassic – Early Cretaceous sequences of the onshore Otway Basin, South Australia.](#)



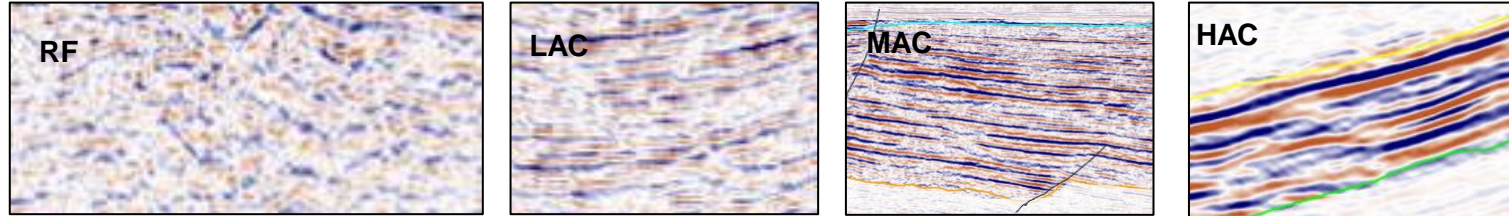
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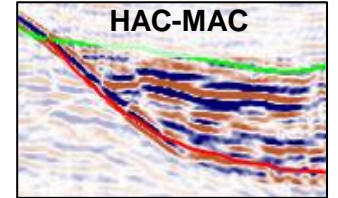


Seismic facies variability

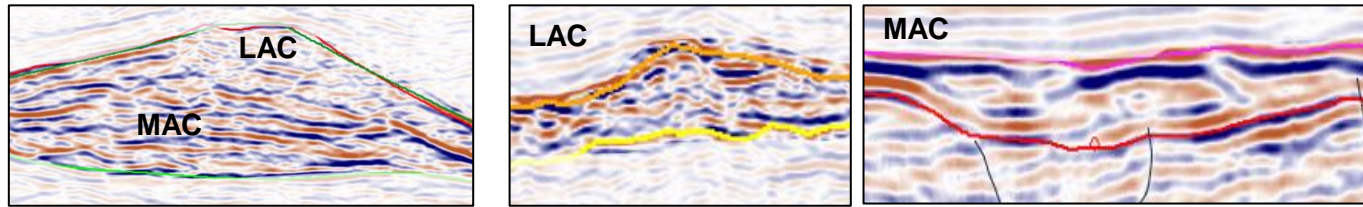
Parallel



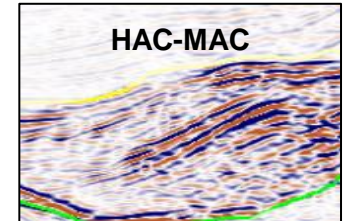
Onlapping



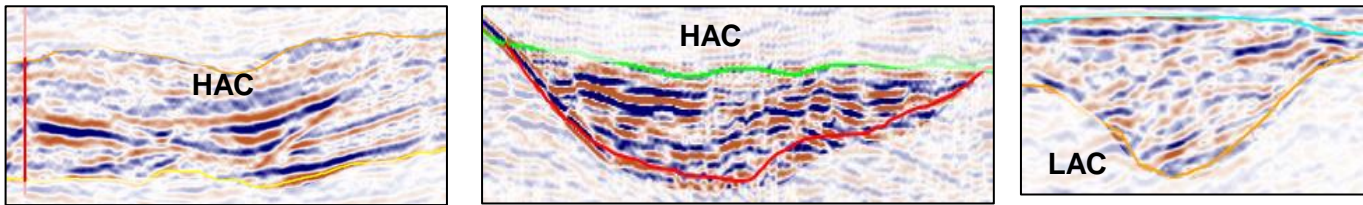
Mounds



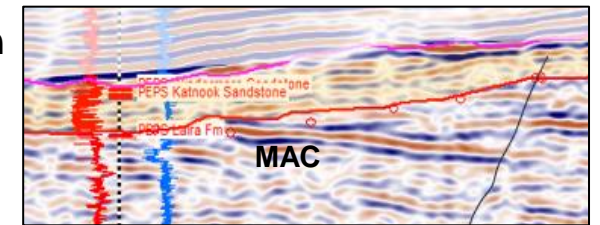
Downlapping



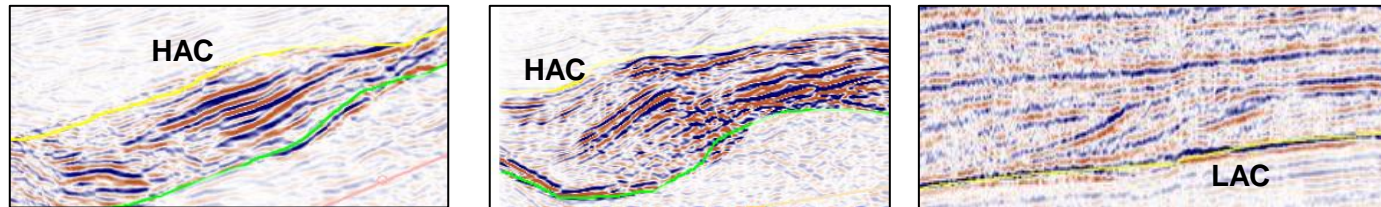
Channels



Truncation



Prograding

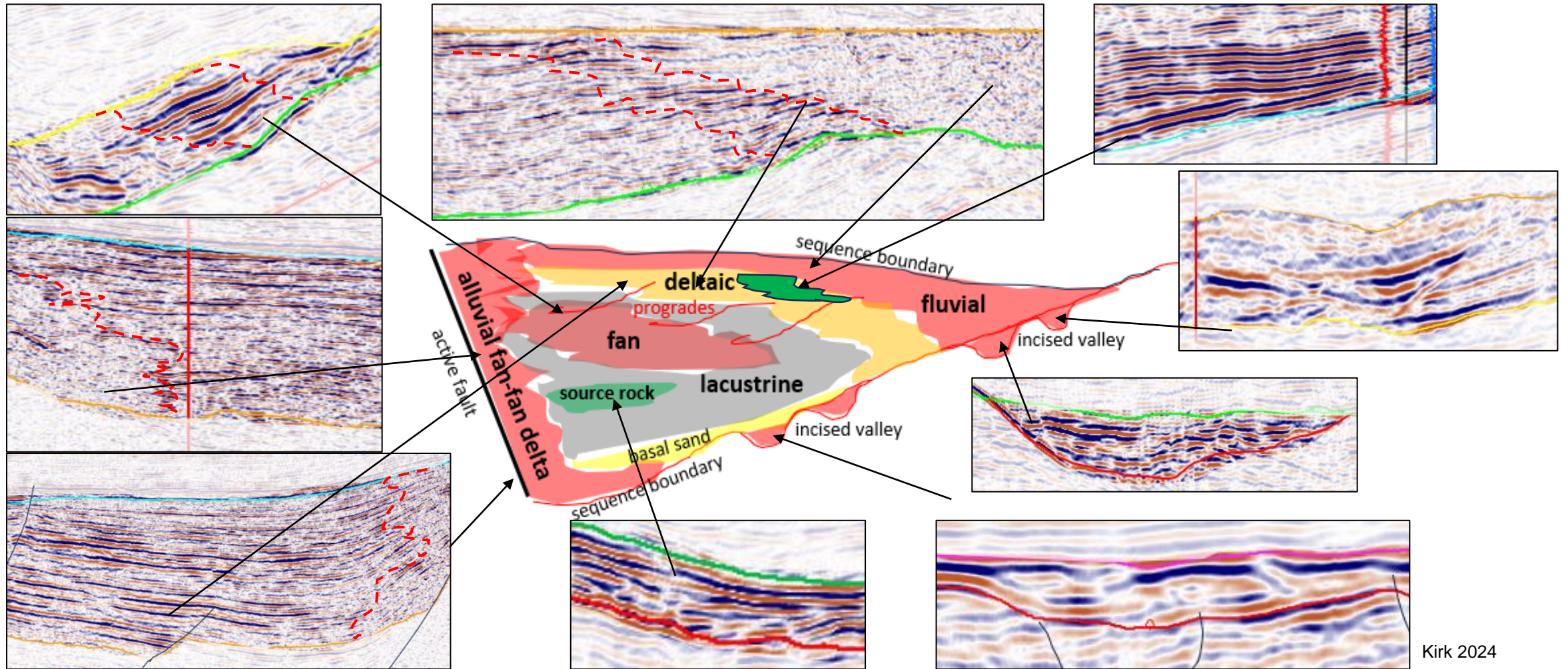


RF | reflection free-chaotic
 LAC | low amplitude and continuity
 MAC | moderate amplitude and continuity
 HAC | high amplitude and continuity

Kirk 2024



Seismic facies variability and geological model

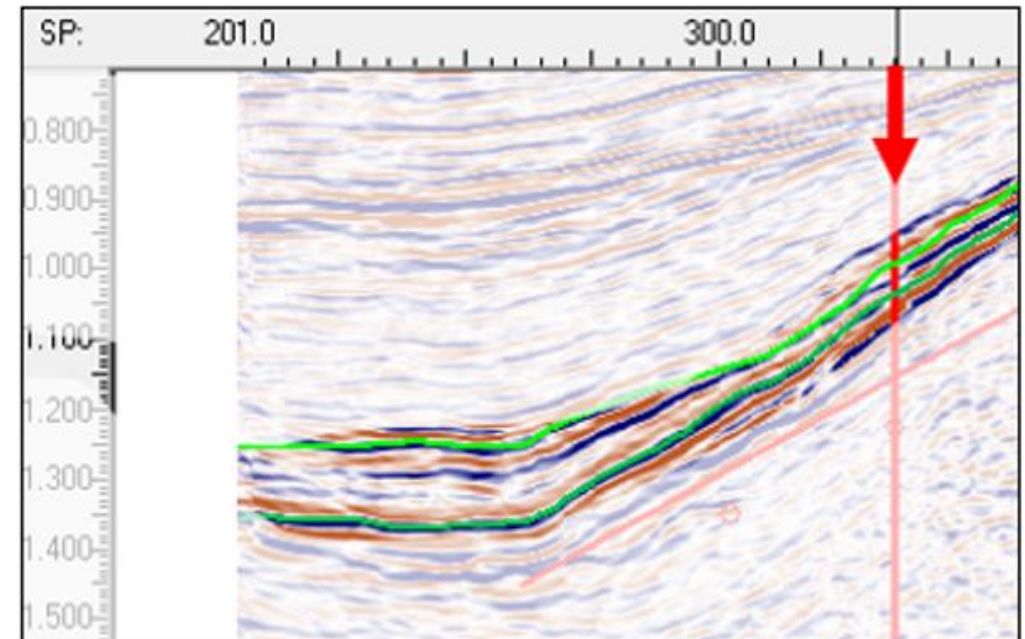
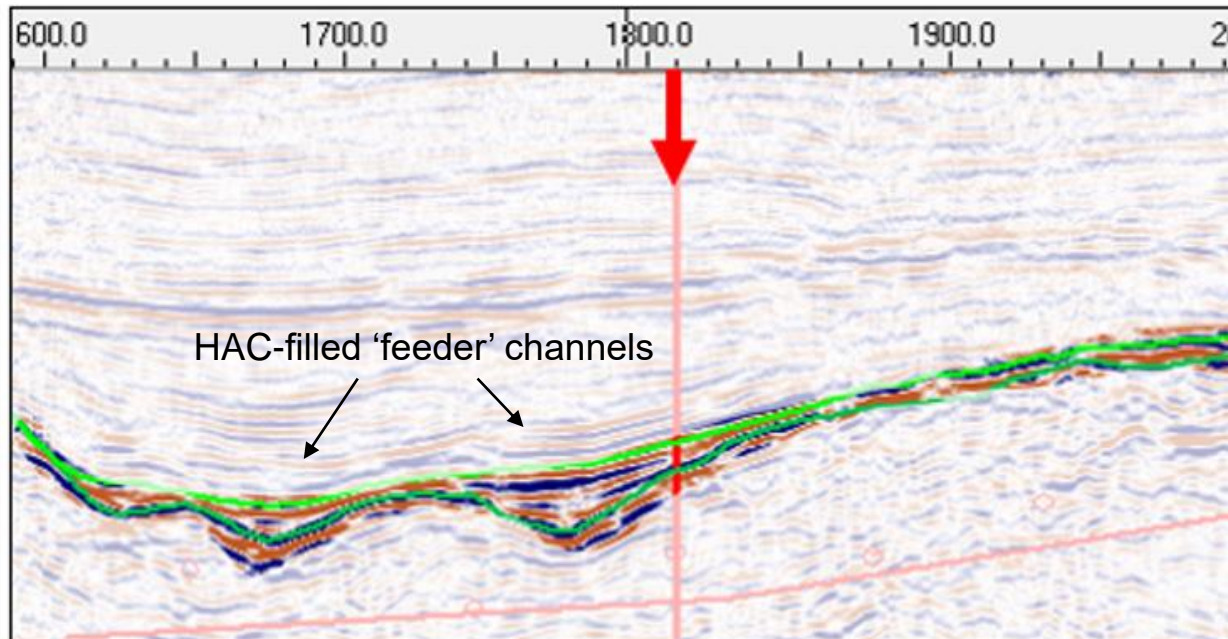
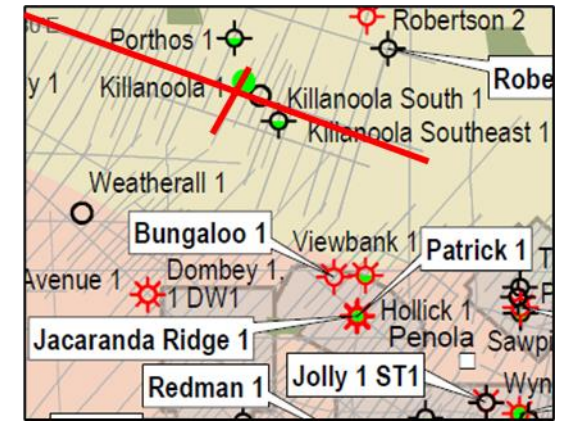


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McEachern-Lower Sawpit Incised valley or feeder canyon

Strike (left) and dip (right) views



OHB88-218_FMIG_09CE

AE10-23 Kirk 2024

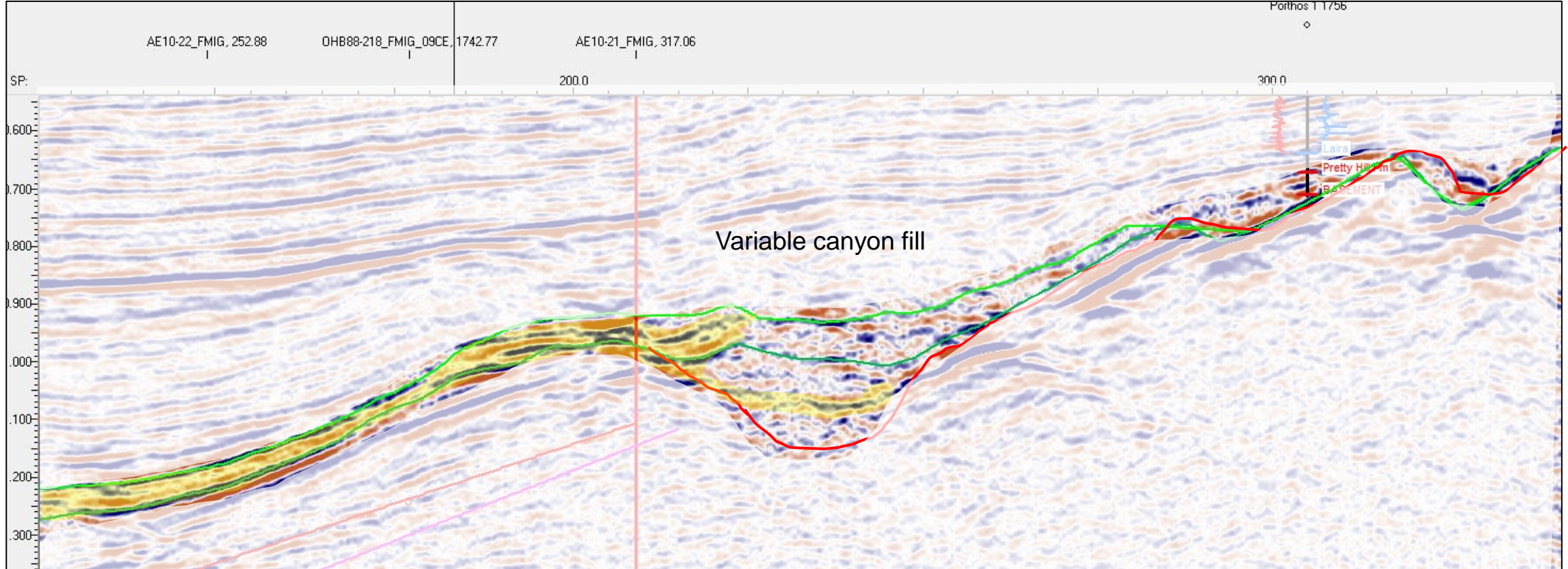
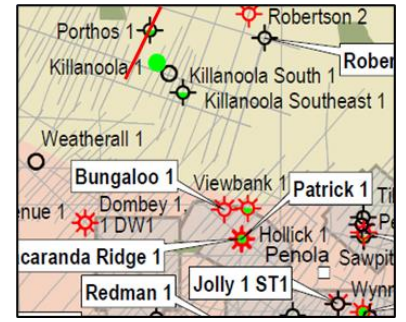


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McEachern-Lower Sawpit Canyon fill



OHL86-110_RMIG Kirk 2024

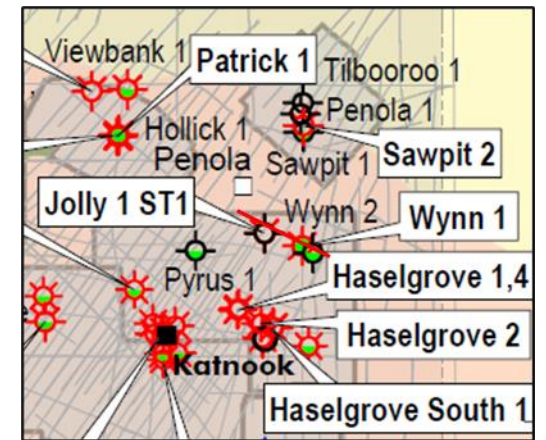


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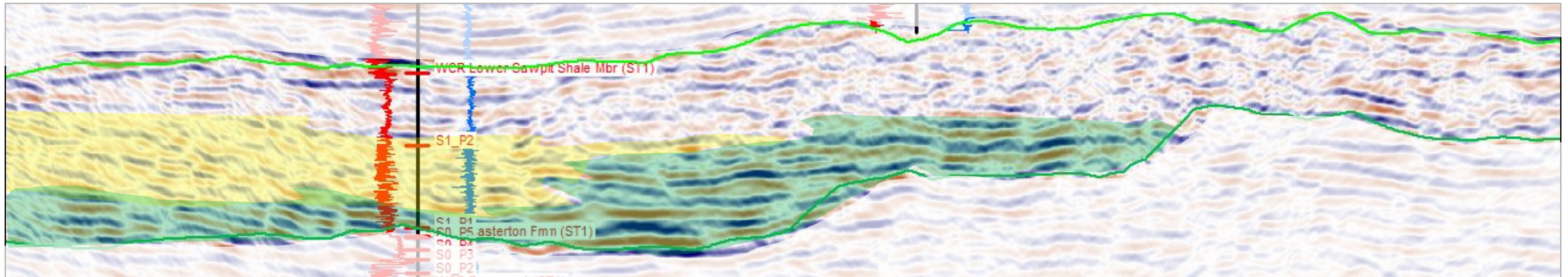
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McEachern-Lower Sawpit Slope-basal fan



Jolly-1/1ST1



R93-33_FMIG_09CE

Kirk 2024



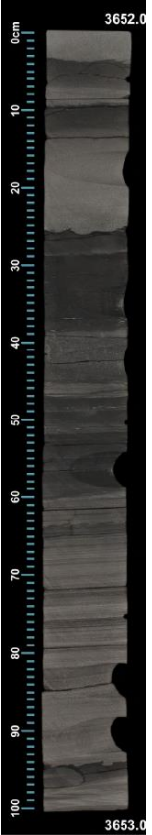
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Summing up New turbidite play in the Otway Basin

Jolly-1ST 1



- Revisiting and reinterpreting legacy rock and seismic data provides an alternative reservoir model
- From alluvial plain
- To lacustrine turbidite
- And a new exploration concept/play
- Association with proven source rocks and seals provide for stratigraphic trapping, in addition to structural traps
- Basin margin entry valley and/or canyons have been identified on seismic
- Demonstrates value of integration and iteration of all data as interpretation develops and matures



Thank you ... and remember to revisit the rocks!



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