

The Geological Storage Potential of Australia's Offshore Basins

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CO₂ Geological Storage and
Technology

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CO₂ storage in Offshore Basins

- Basins which hold oil and gas reserves are generally accepted to have the best potential for CO₂ storage.
- Many offshore basins on the continental shelf of countries around the world hold large reserves of oil and gas.
- Therefore many offshore basins can be expected to have a high potential for CO₂ storage



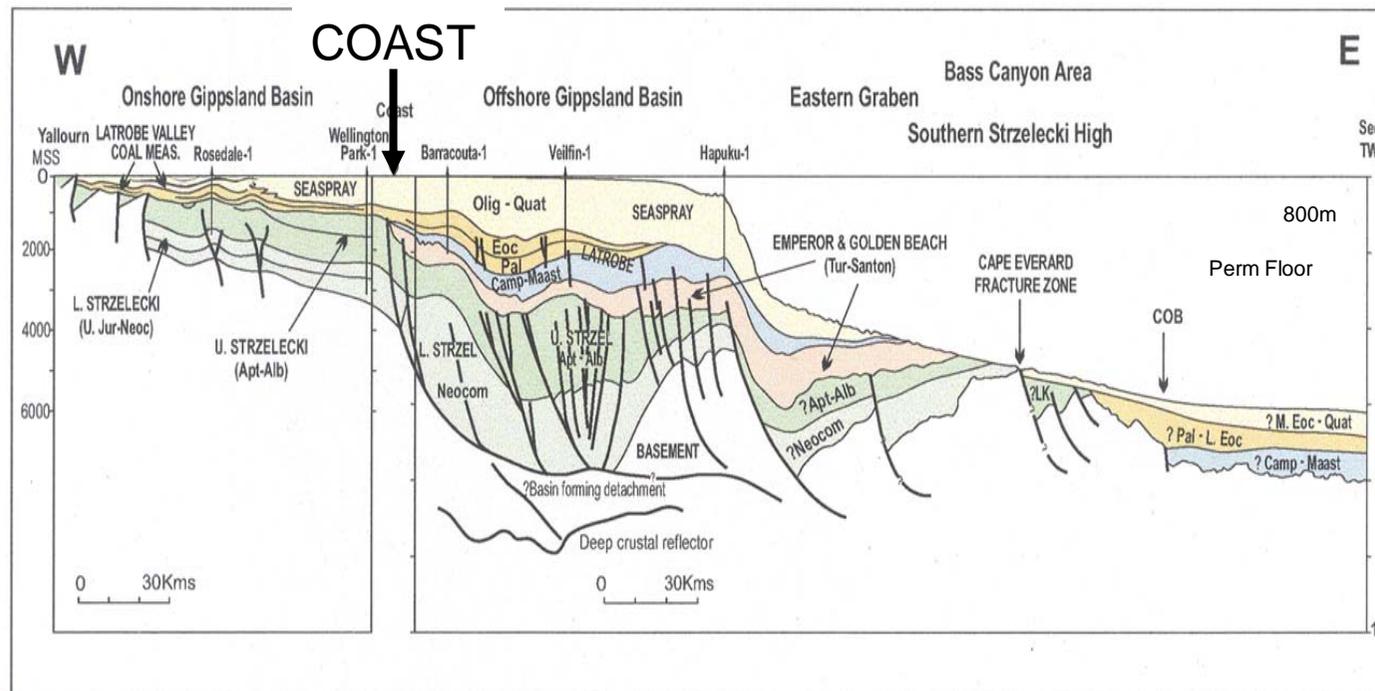
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Onshore or offshore – what is the difference.

- In many parts of the world, such as the Southern North Sea or Southern Australia onshore basins extend offshore under shallow seas.



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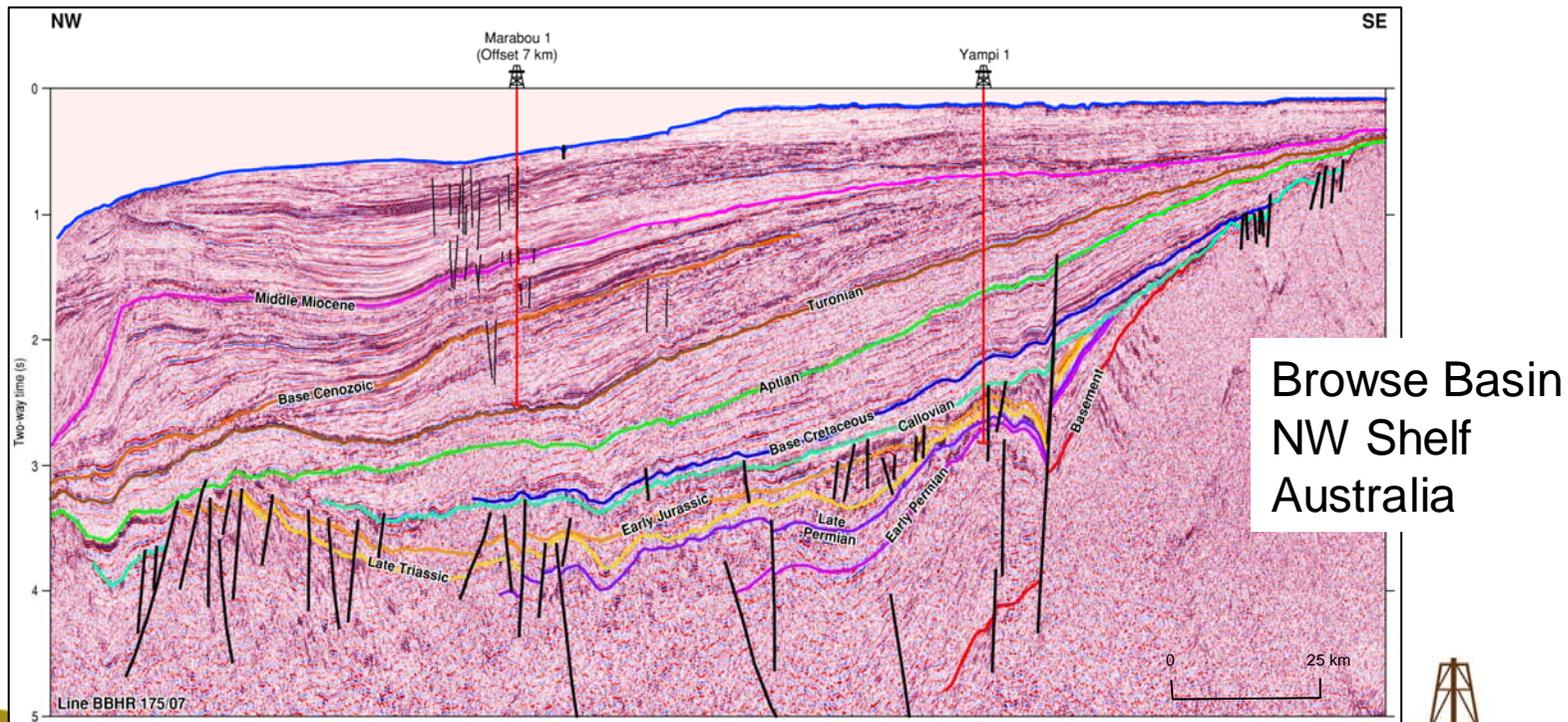
(After Norvick et al., 2001)

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Onshore or offshore – what is the difference

- In other places the rocks seen in the offshore basin may not occur onshore at all



Browse Basin
NW Shelf
Australia

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Onshore or offshore – what is the difference

- Around the world the offshore basins often have better geological characteristics for storage.
- But because of the water above them the engineering challenges can be much greater, for petroleum exploration as well as geological storage.



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Australia's Offshore Sedimentary Basins

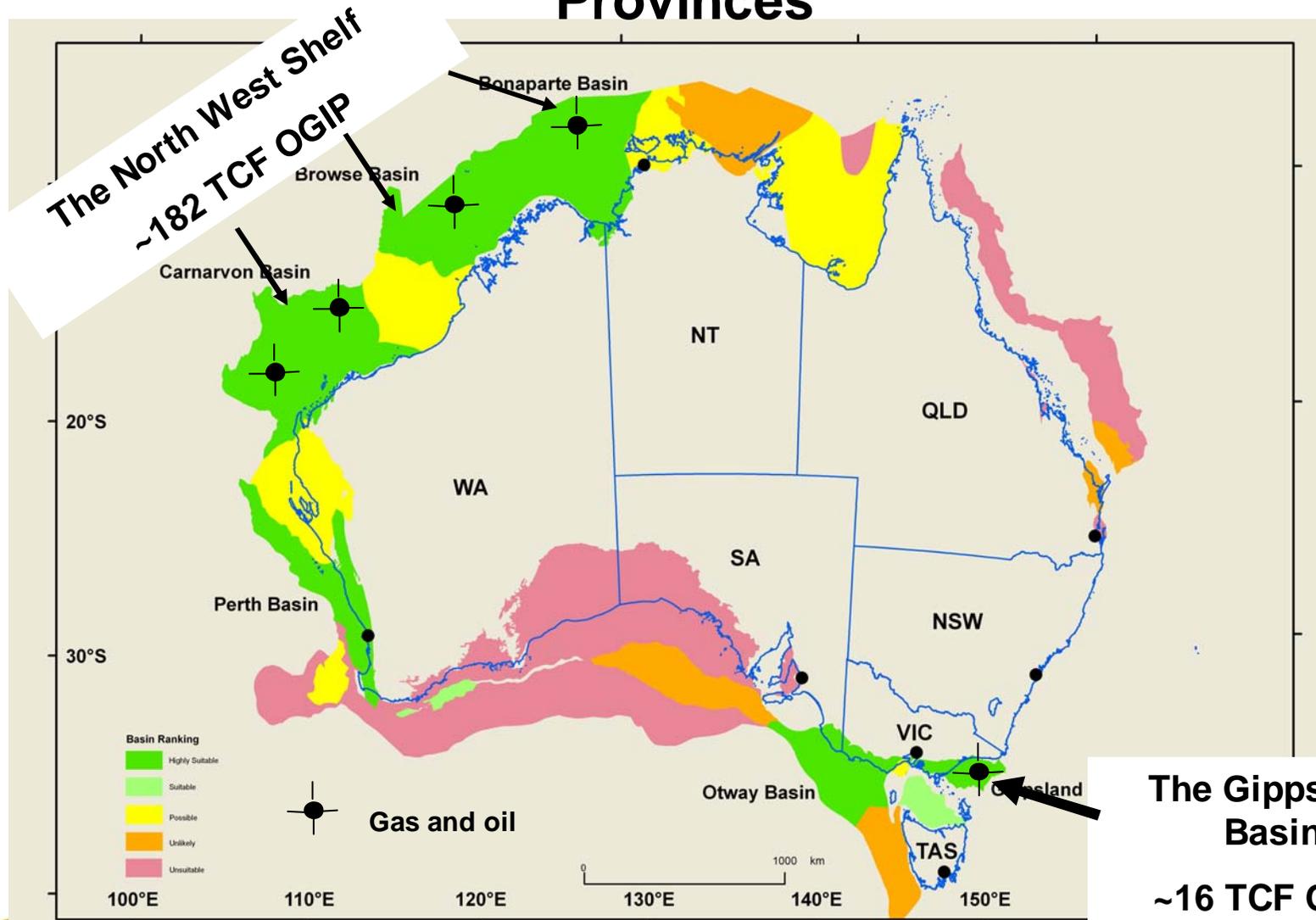
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Australia's Offshore Proven Oil and Gas Provinces



Source of Volumes: Australian Energy Resource Assessment - 2010



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The geological development of Australia's Offshore Sedimentary Basins

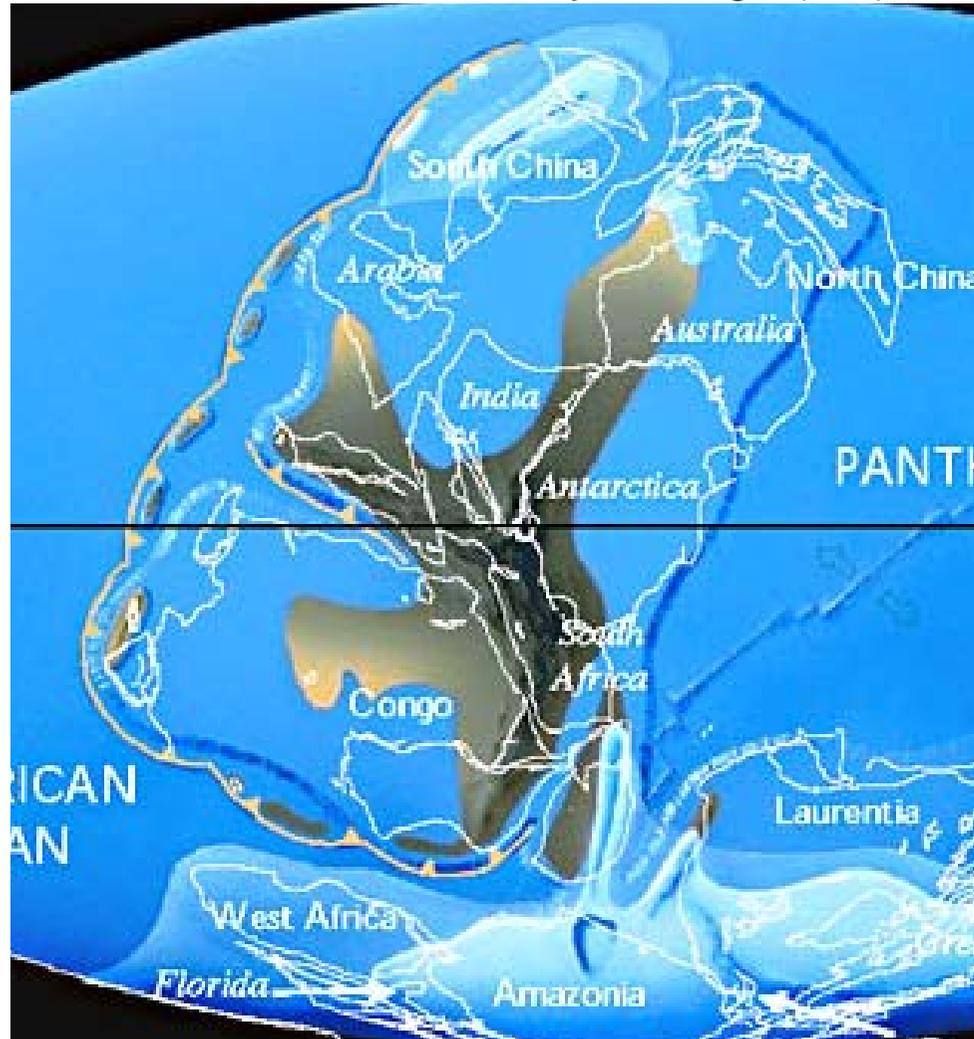
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Australia's position as part of a super-continent
650 million years ago (ma)



Scotese, 2002

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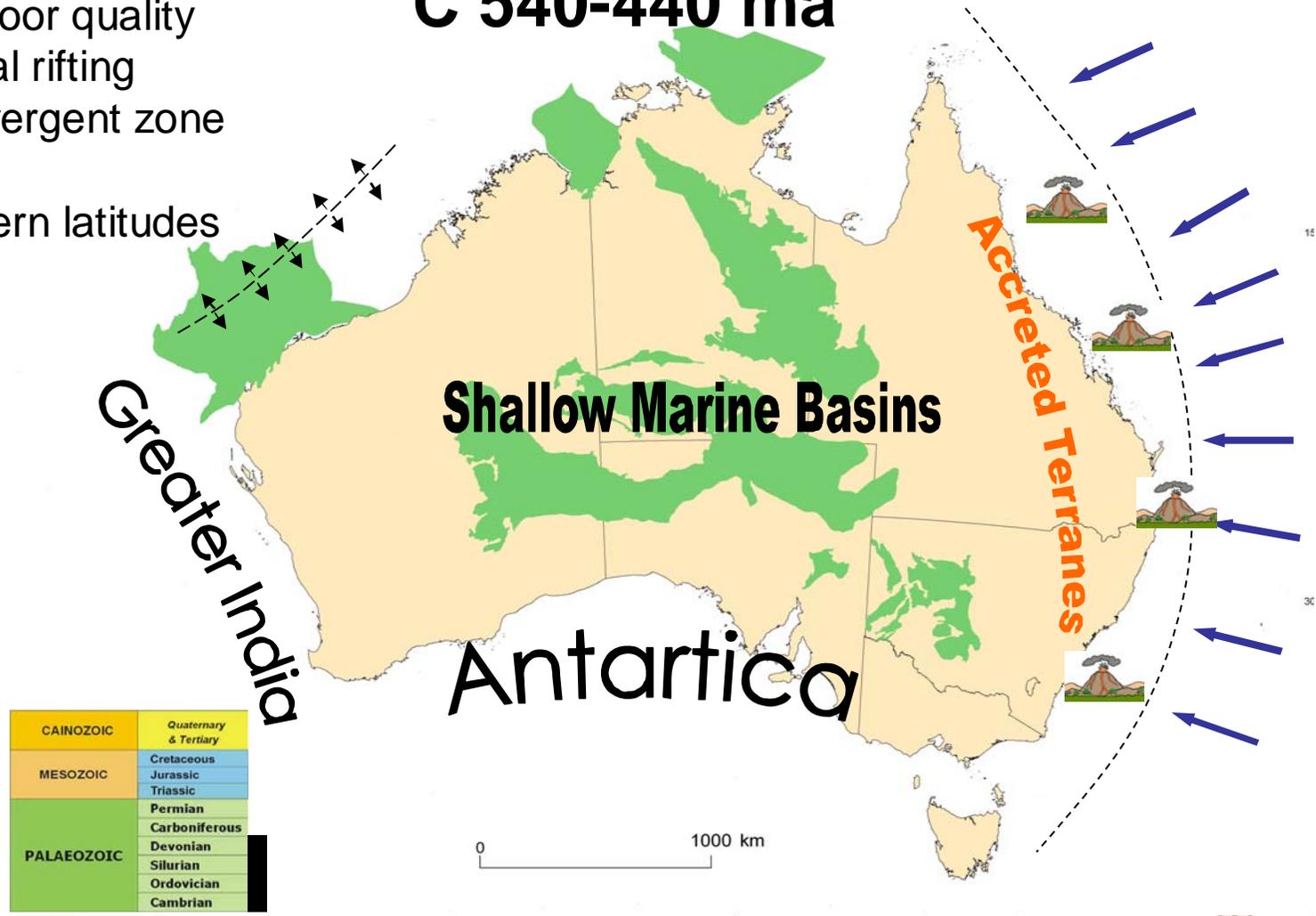
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Early-mid Paleozoic

- First real basins, although poor quality
- West: initial rifting
- East: convergent zone still active
- Low northern latitudes

C 540-440 ma



CAINOZOIC	Quaternary & Tertiary
MESOZOIC	Cretaceous
	Jurassic
	Triassic
PALAEOZOIC	Permian
	Carboniferous
	Devonian
	Silurian
	Ordovician
	Cambrian

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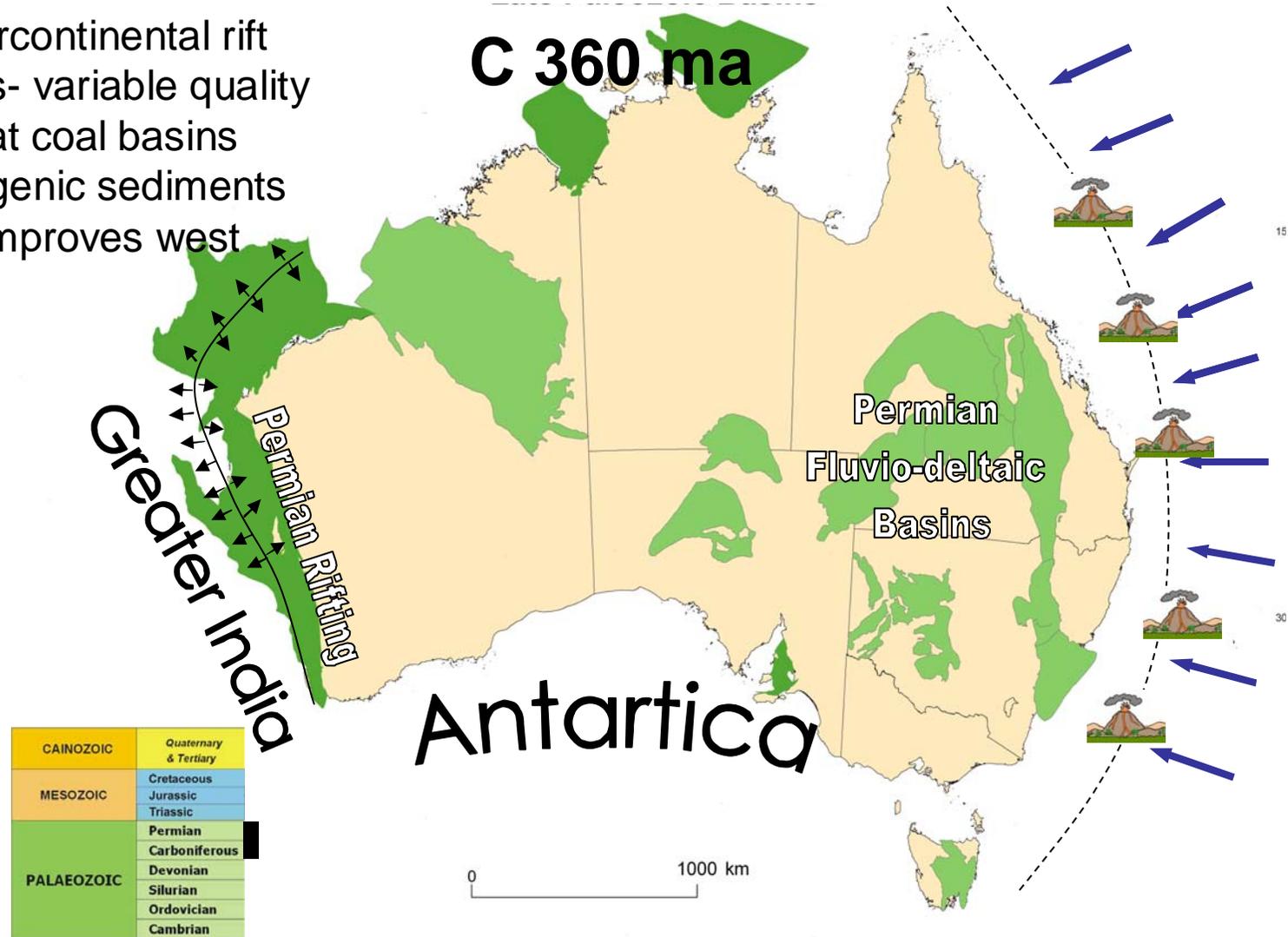
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Late Paleozoic

- West: Intercontinental rift sequences- variable quality
- East: Great coal basins
 - volcanogenic sediments
 - quality improves west



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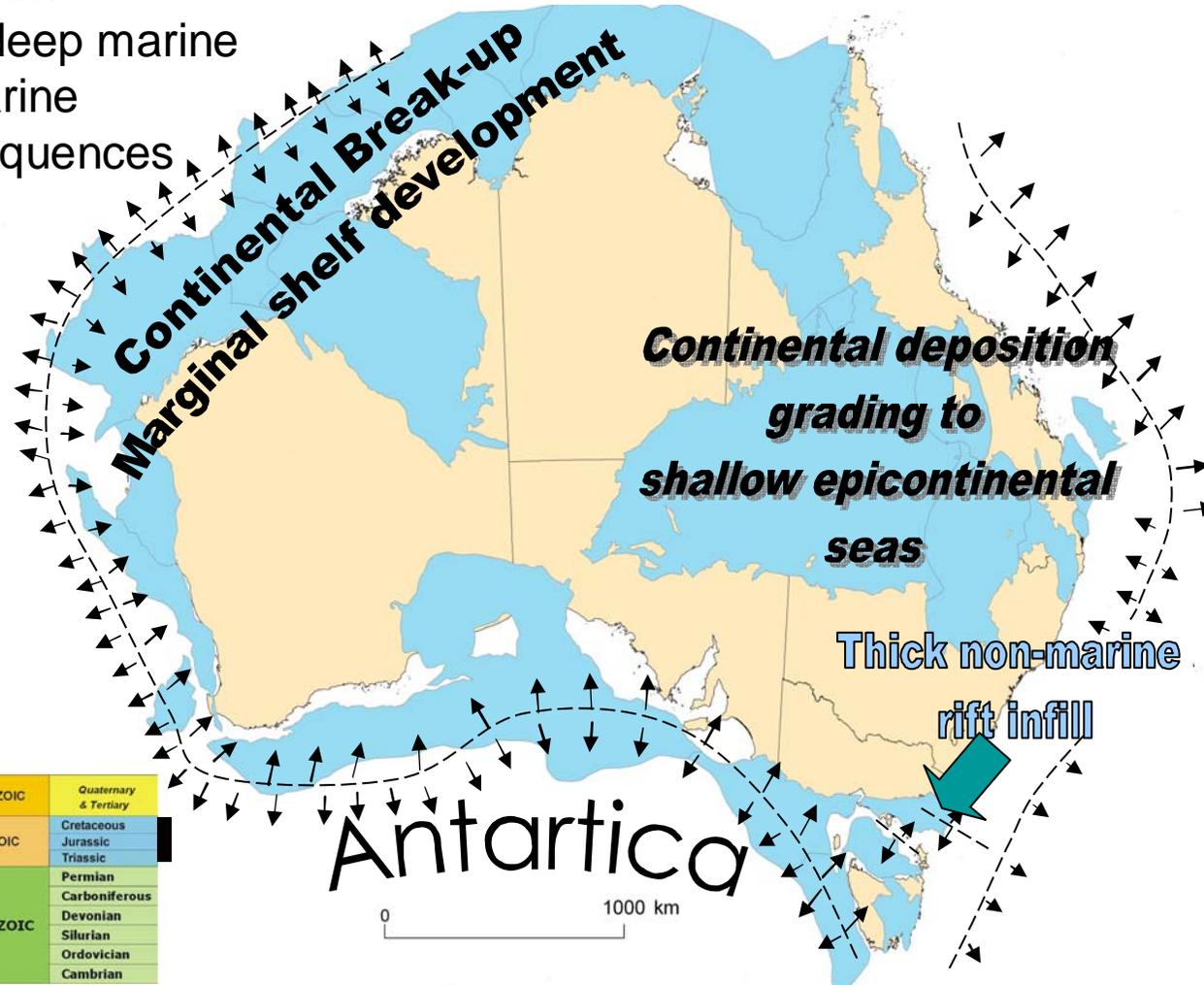
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Mesozoic Era

C 250-65 ma

- Triassic- high and dry
- Jurassic-Cretaceous:
 - West: deltaic to deep marine
 - East: shallow marine
 - Southeast: rift sequences
- Good to great reservoirs



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Cenozoic

- West and south:
- passive margins
- thick carbonates

65 Ma - recent

Shallow fluvial/marine basins

Sediment starved basins - thick carbonate deposits

Sediment starved basins - thick carbonate deposits

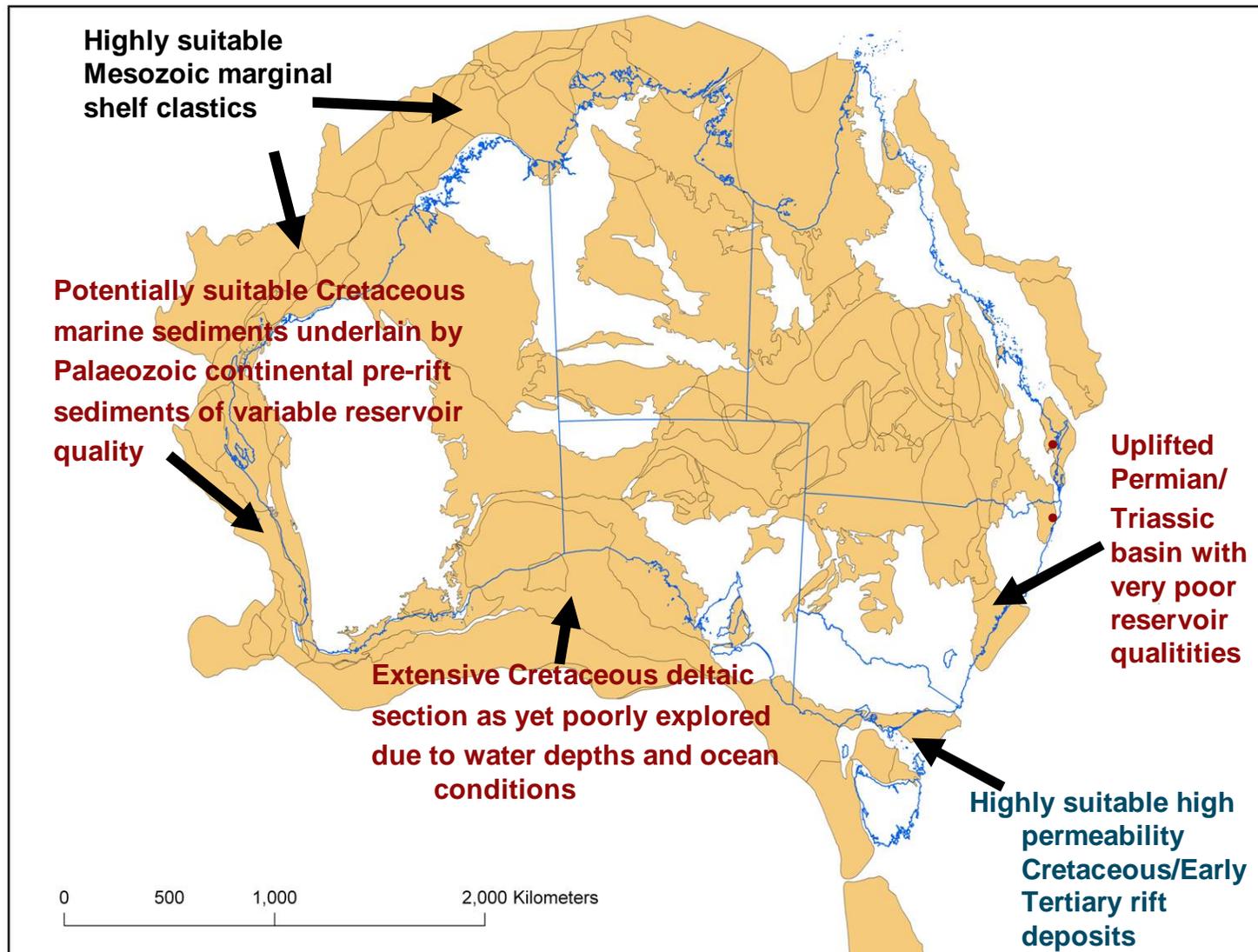
Continued extension with deposition of coarse clastics until mid-Eocene.

Continued extension with the deposition of coarse clastics until mid-Eocene.

CAINOZOIC	Quaternary & Tertiary
MESOZOIC	Cretaceous
	Jurassic
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CO₂ Storage Suitability of Australian Offshore Basins



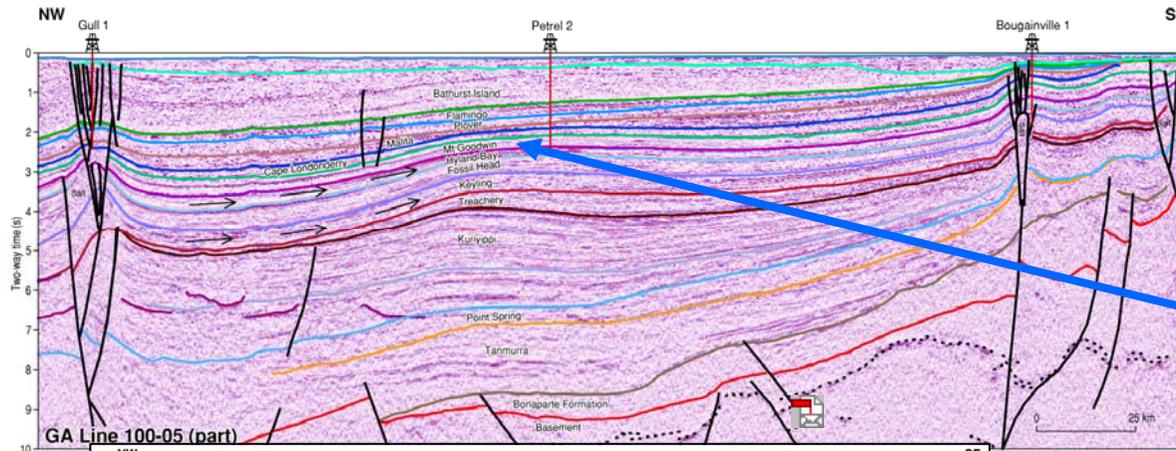
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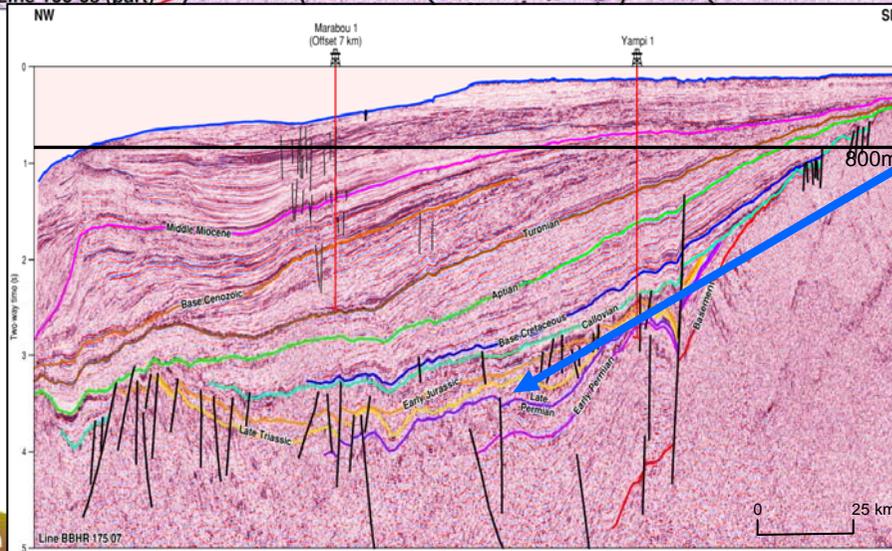


Seismic Cross-sections from the NW Shelf.

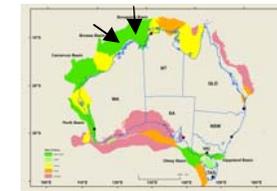


Bonaparte Basin

**Late Permian
Horizon
c 251 mya**



Browse Basin



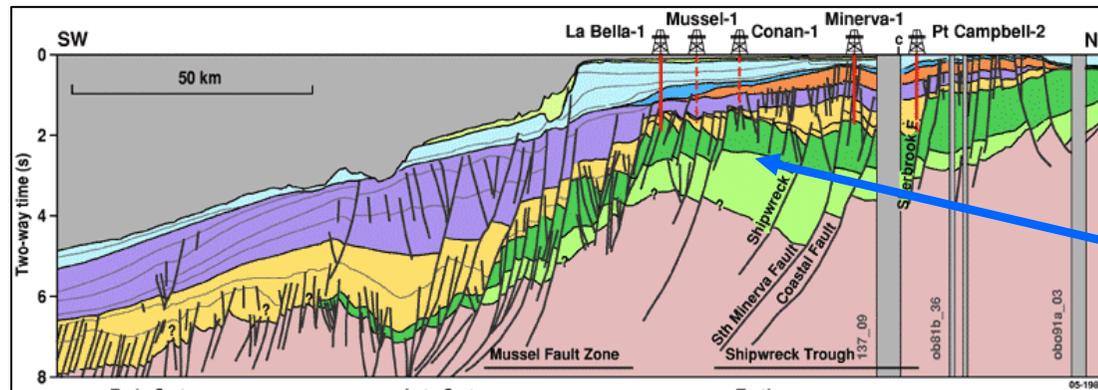
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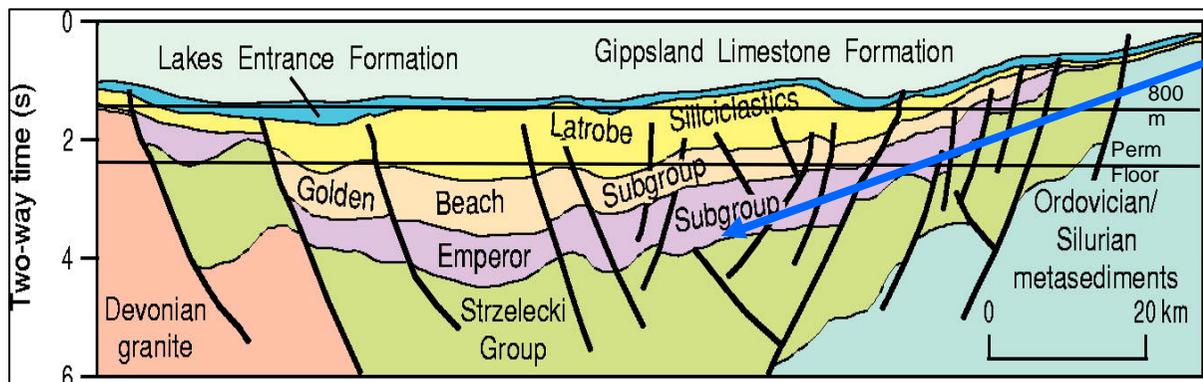
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Diagrammatic Cross-sections from Southern Australian Basins



Intra Early Cretaceous
C134 ma

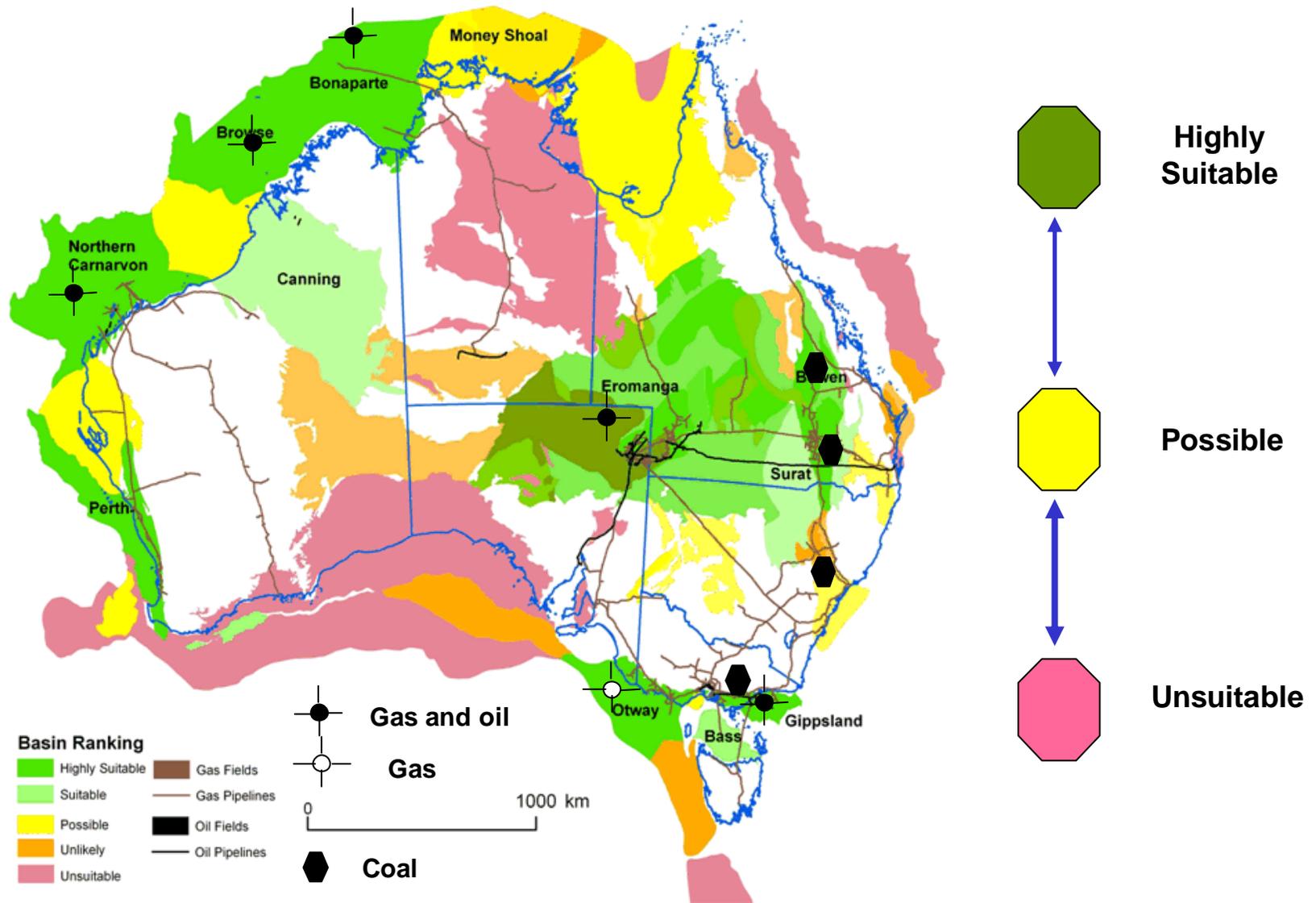


Top Early Cretaceous
C100 ma



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Assessed storage potential of Australian basins

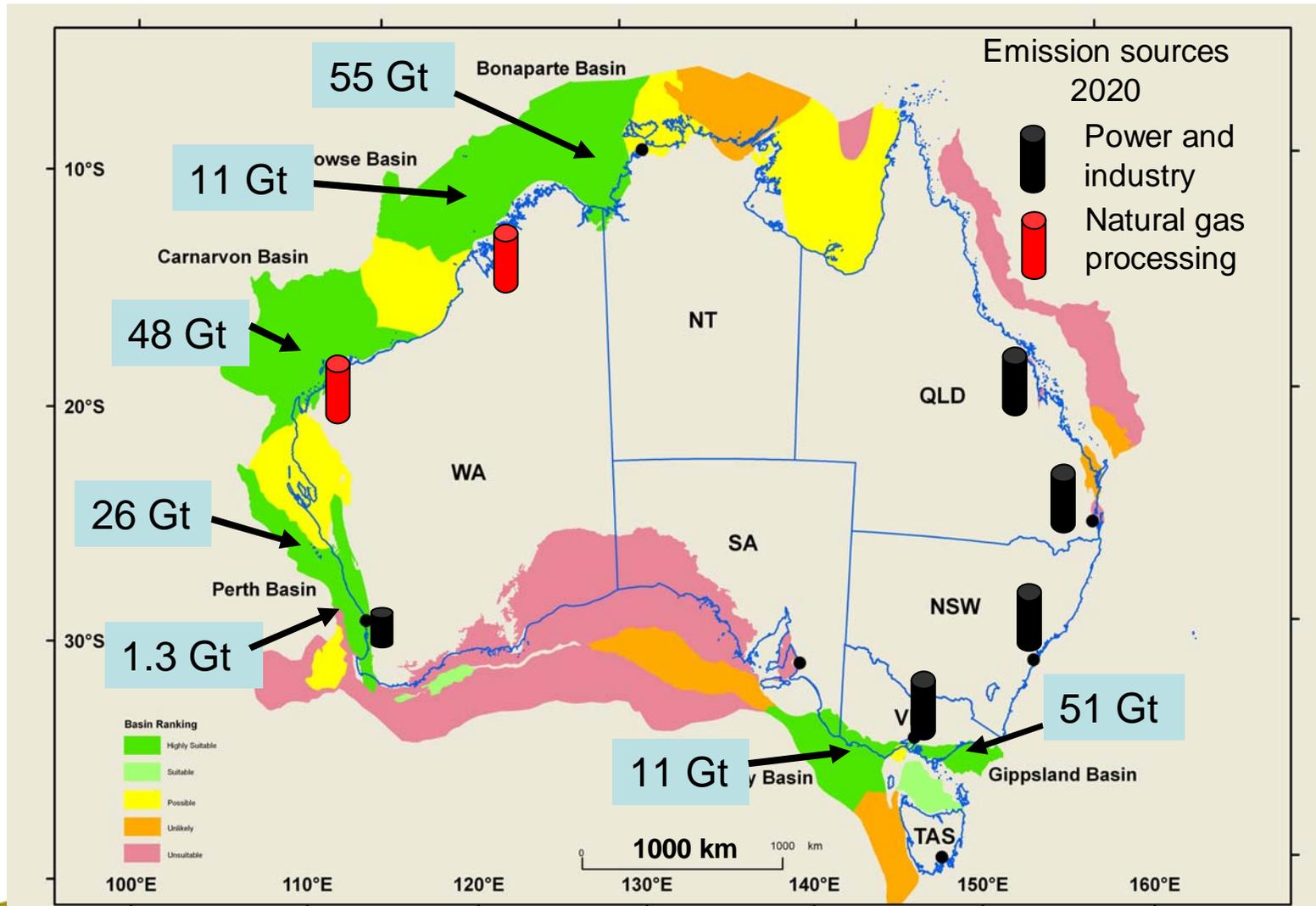


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National Carbon Mapping and Infrastructure Plan – Australia - 2009

Assessed Storage Potential of Key Australian Offshore Basins (P50 Gigatonnes)



National carbon Mapping and Infrastructure Plan- Australia- 2009

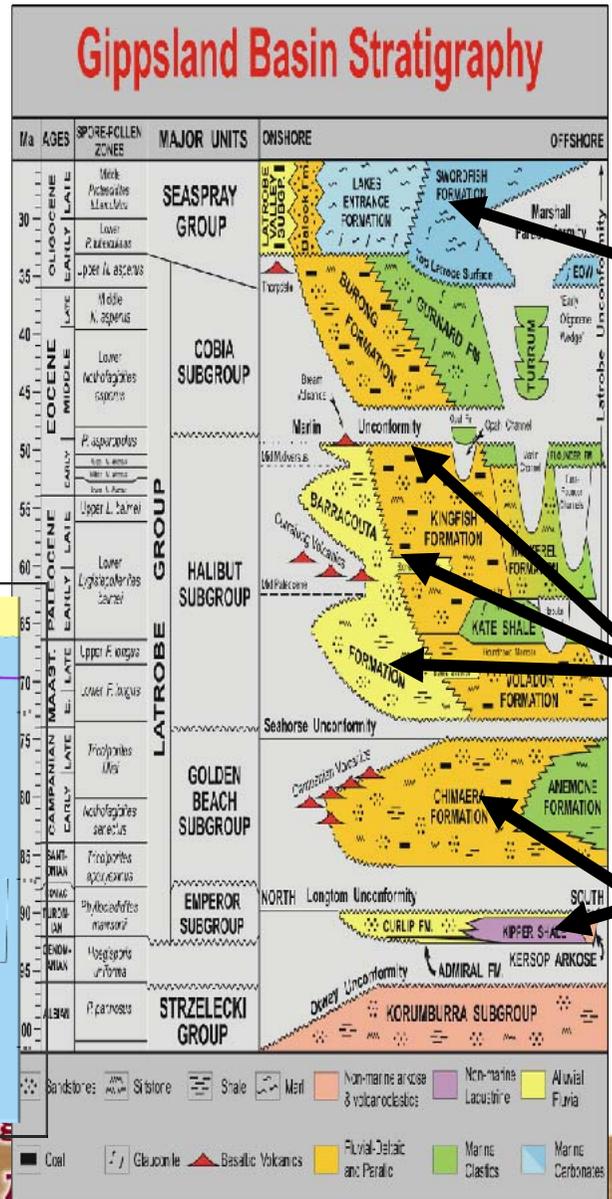
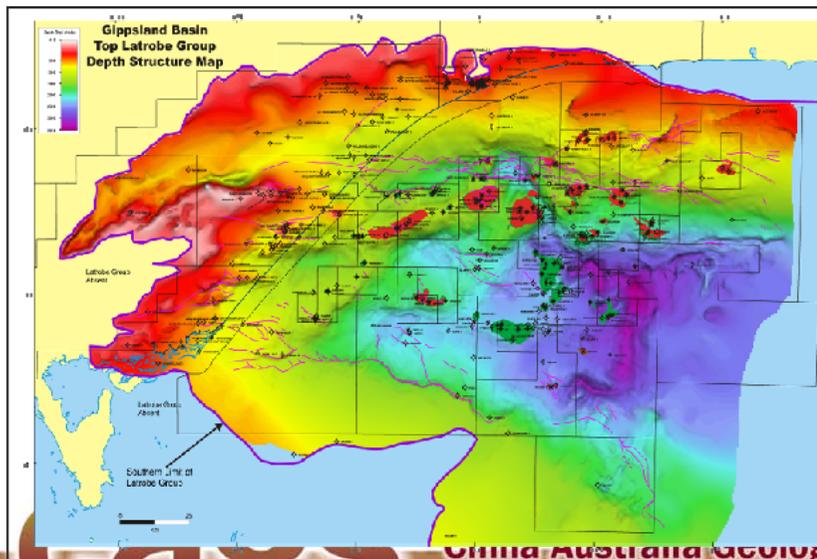


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Gippsland Basin

Resources Conflict in a High Quality Basin



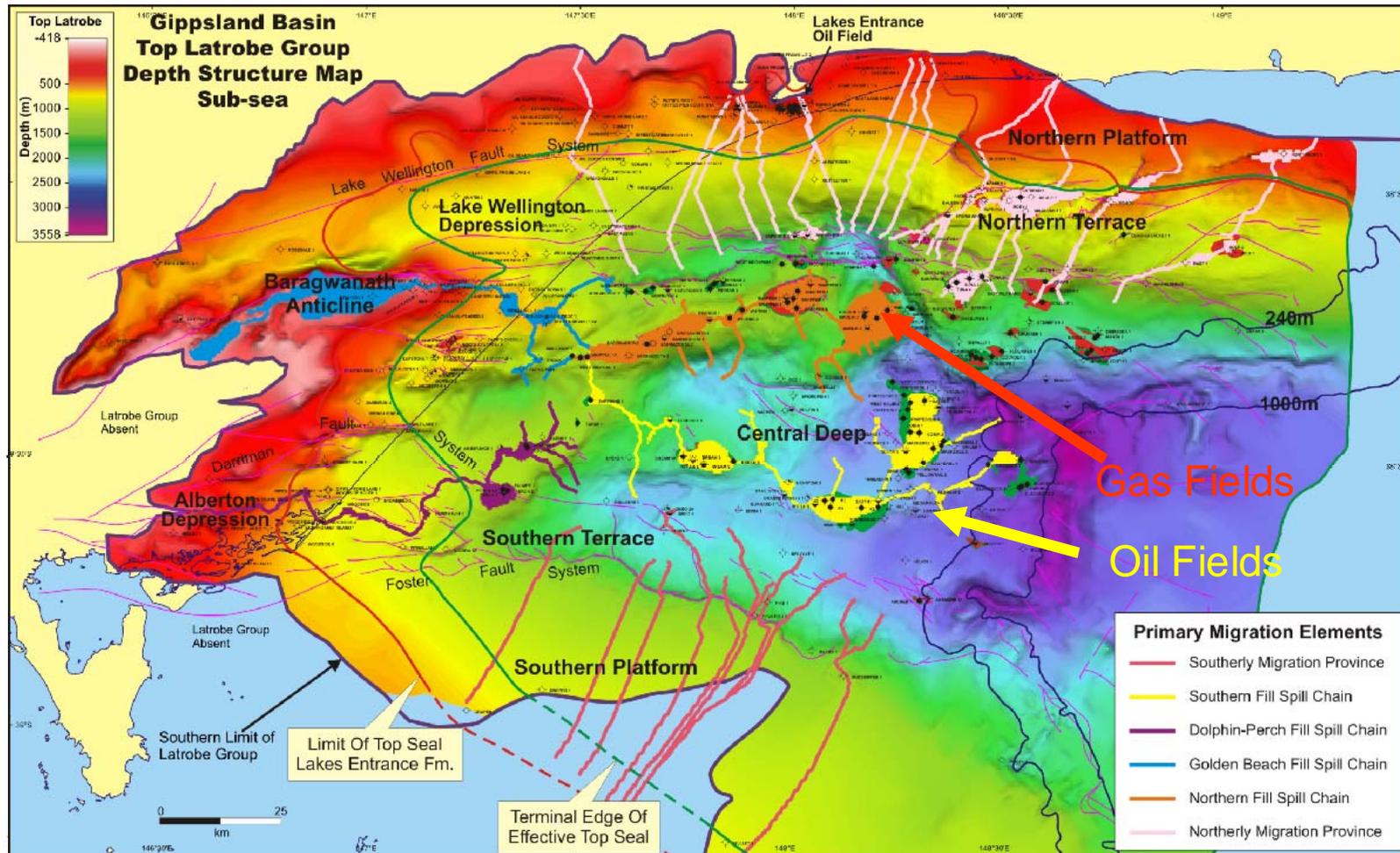
Regional top seal for oil and gas, CO₂ and water

Reservoirs for oil and gas, CO₂ and water

Reservoirs for geothermal



Gippsland Basin – resource conflict in a highly suitable

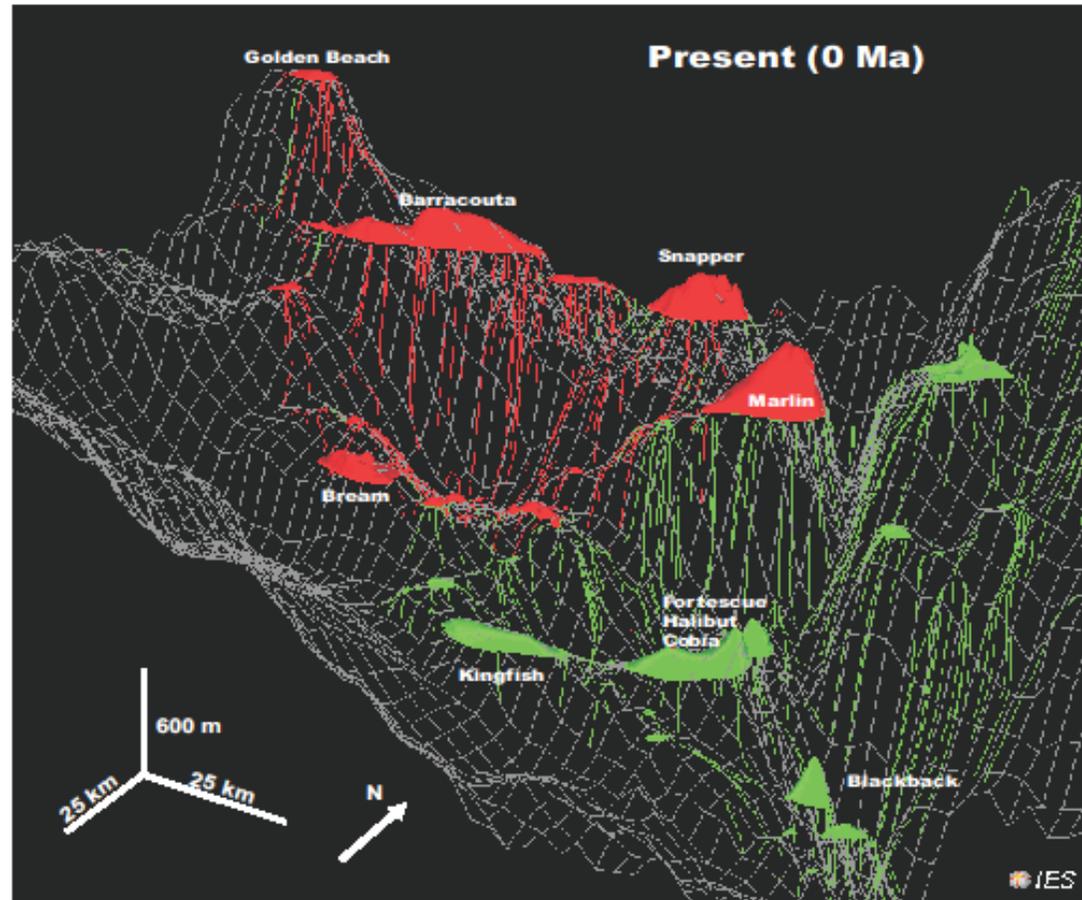


Carbon

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3D Modelling to show Migration Paths



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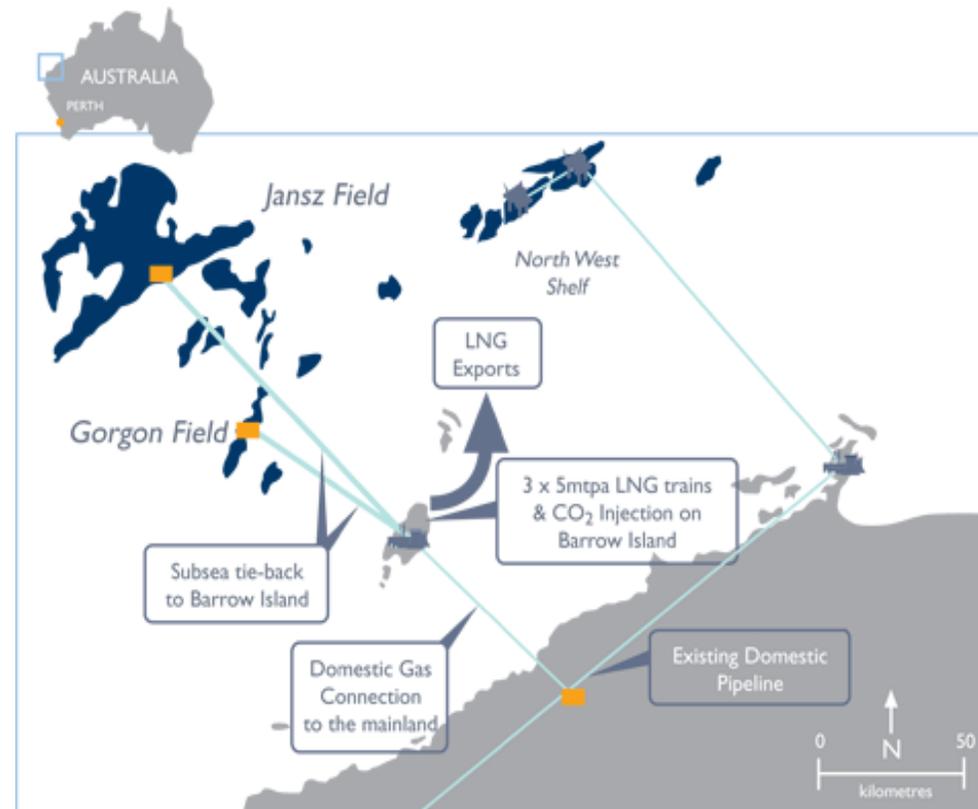
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Courtesy GeoScience Victoria



The Gorgon Project: Almost Offshore Storage

- Greater Gorgon Fields lie 130-200km offshore and contain about 40 trillion cubic feet of gas
- Average 14% CO₂ in Gorgon Field
- 0% In Jansz
- ~ 0.7% average
- Processing Facility onshore Barrow Island
3x5Mtpa trains.



<http://www.gorgon.com.au/index.html>

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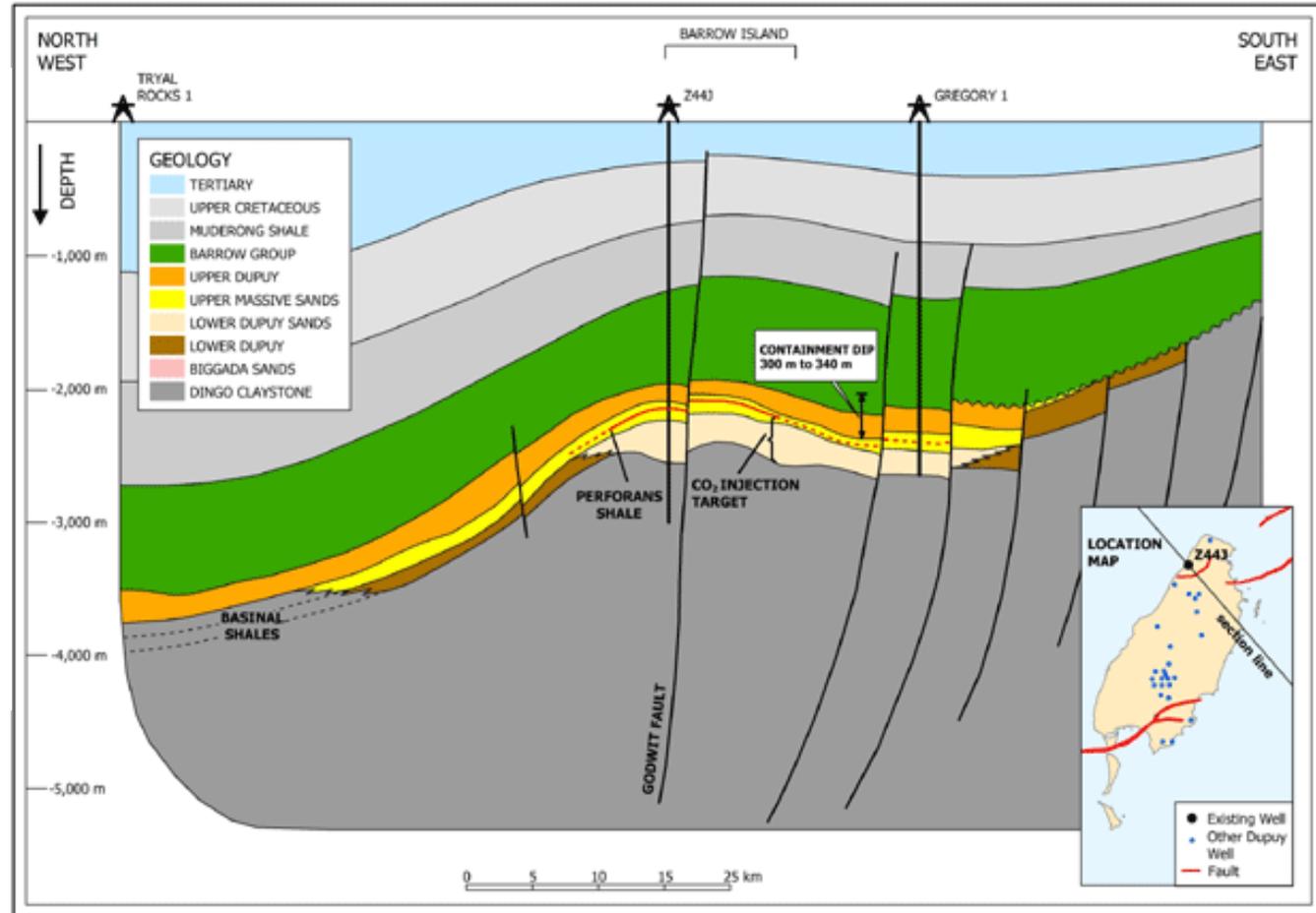
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Geology

- Depth: 2300 m
- Reservoir
 - Dupuy Formation
 - Massive sands
 - Turbidite fan deposit
- Seal
 - Barrow Group



<http://www.gorgon.com.au/index.html>

Chapter 13 Gorgon Draft Environmental Impact Statement/Environmental Review



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Conclusions

- Australia's offshore basins have the potential for the storage of large volumes of CO₂
- However most of this potential is remote from the industrial centres of the country and would require long distance transport for these to be used other than for natural gas processing.
- The basin with the best potential close to a major industrial centre may not be fully available for many years to come because of potential conflicts with oil and gas production.



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- Thank you for your attention
 - Questions

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