# BROWSE TO BONAPARTE BASIN SEQUENCE STRATIGRAPHIC STUDY

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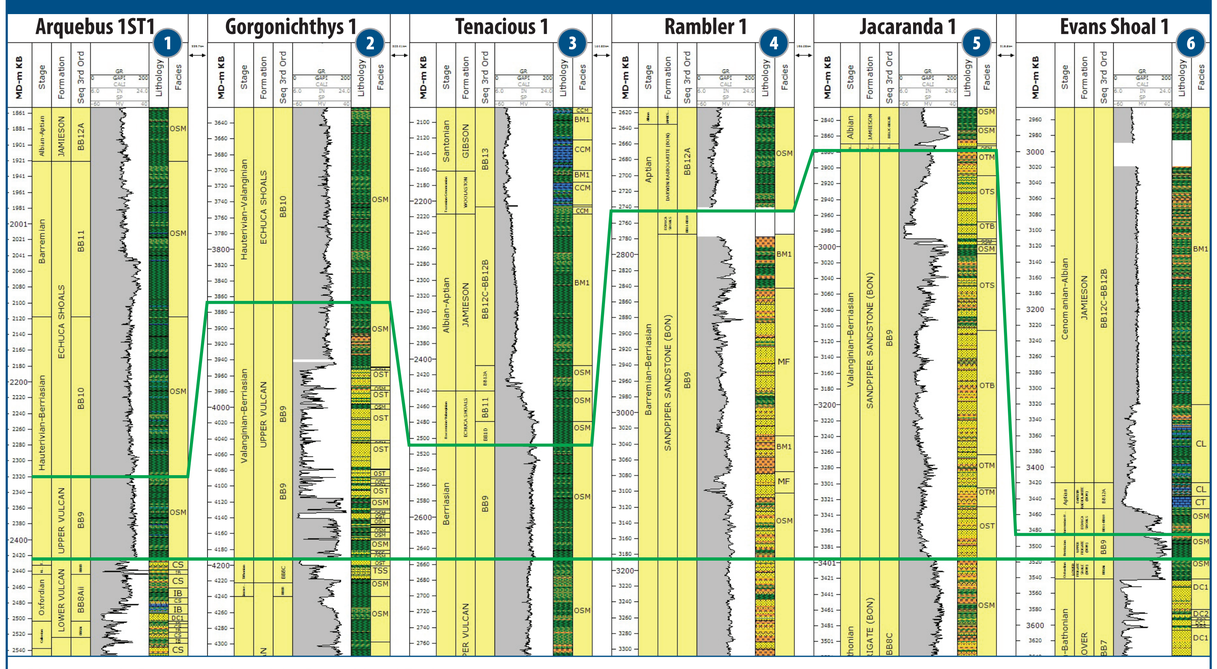
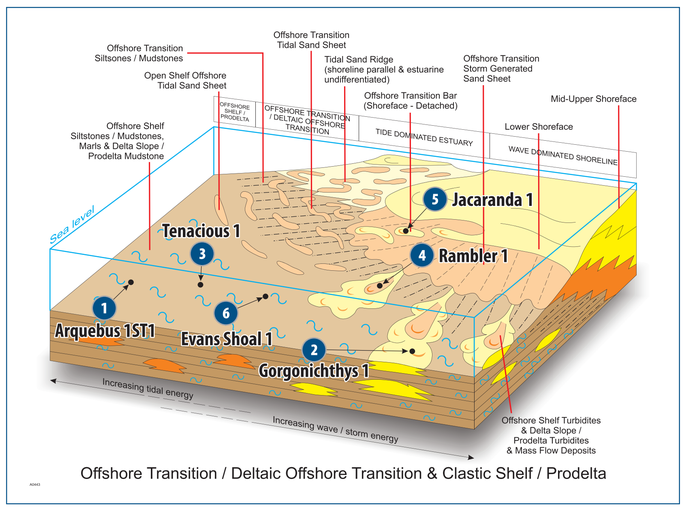
Following a 2010 Browse Basin study, TGS has pushed this sequence stratigraphic study north into the Bonaparte Basin. The aim was to create a consistent and robust model of both basins' depositional history. Interpretations from 238 key wells were used to constrain 32 sequence facies distribution maps. The study incorporated available public data, including wireline logs, well reports, and biostratigraphy, tied to a 2D seismic grid. This poster includes two examples from the Cretaceous.

## EARLY CRETACEOUS UPPER SWAN/FLAMINGO GROUP, BB9

Well cross section hung on base BB9 and correlated to top BB9 (measured depth wells)



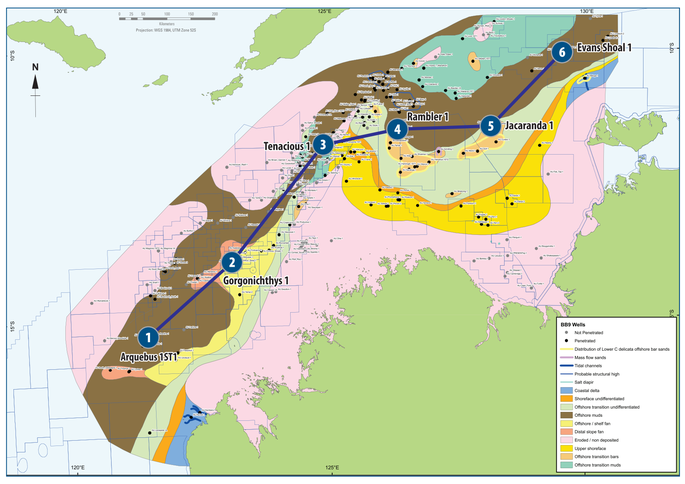

### Diagrammatic Representation of the Depositional Environments




Offshore Transition / Deltaic Offshore Transition & Clastic Shelf / Prodelta

- A regional lowstand during the Berriasian to Mid Valanginian is characterised by thick sand fans and muds deposited in a restricted marine environment. The base is often unconformable in proximal areas, incising into the Late Jurassic interval, but becomes more conformable in graben areas, where the sequence overlies thick Upper Vulcan and Flamingo Group Tithonian muds and shales.
- In Browse, thick shelfal fan sands are interpreted in the Eastern Caswell Sub-basin (Gorgonichthys-1), characterised by box-trough shaped Gamma Ray log responses. To the west, deposition is much finer grained, with the deposition of shales and siltstones (Arquebus-1ST1) indicating a decrease in energy in a distal setting.
- In Bonaparte, thick inner to mid shelf bars and shelfal fan sands are interpreted in Jacaranda-1 and Rambler-1 respectively. Here deposition is sand and siltstone prone commonly with upward coarsening and fining log responses. Eastwards, there is return to lower energy, finer grained lithologies (Evans Shoal-1).
- The sequence in both Browse and Bonaparte is overlain by the Valanginian-Barremian Echuca Shoals Formation or the Aptian

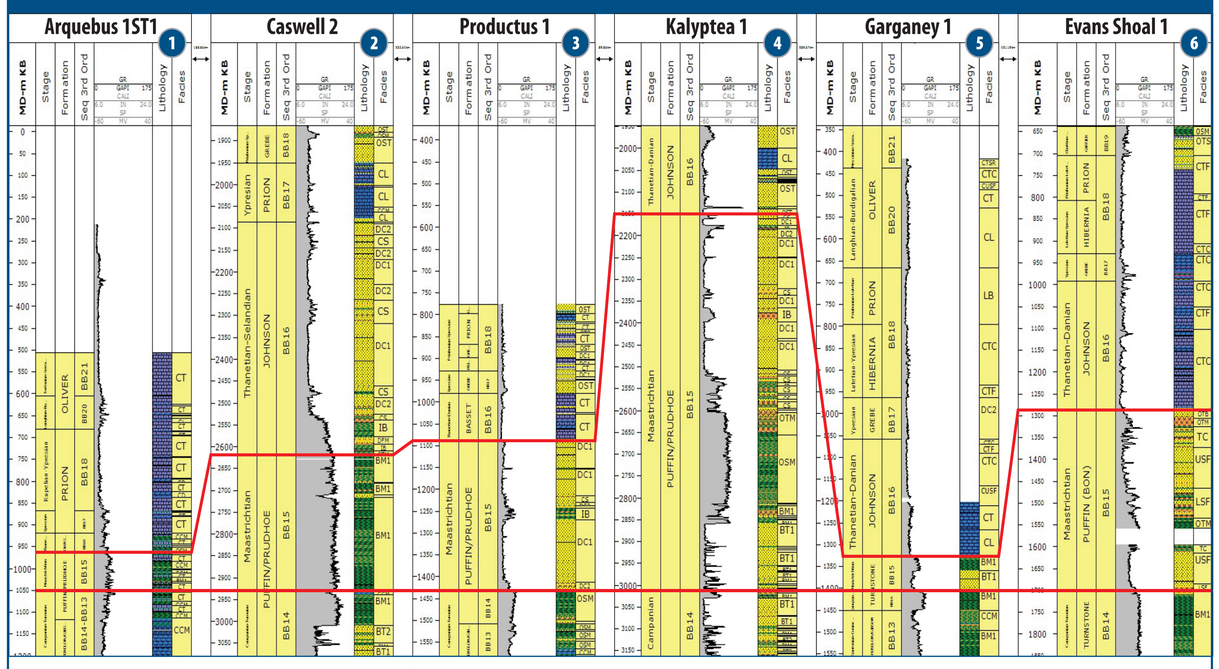
### BB9 Facies Distribution Map



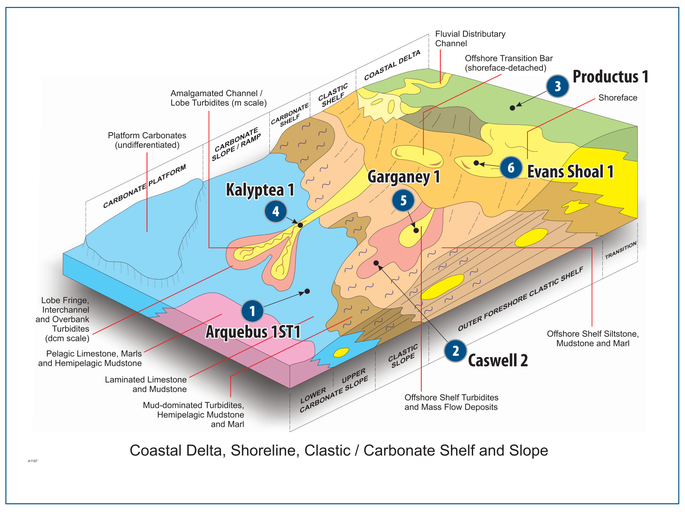

- This map shows the facies distribution of the Berriasian to Mid Valanginian BB9 sequence. The base of the interval is marked by a second order sea level fall in the earliest Cretaceous caused by minor events near the end of the rift phase. Deposition was largely controlled by the NE-SW trending structures that developed in the Late Jurassic.
- The thickest deposition in Browse was in the Caswell sub-basin and in Bonaparte the Malita graben and Sahul Syncline. These graben areas were restricted to the West and North by a series of structural highs (Brecknock-Scott Reef, Ashmore Platform and Sahul Platform). Sediment was supplied from the South and South East (Yampi Shelf, Southern Petrel Sub-basin).
- In the Caswell sub-basin, thick Brewster Member fan sands are interpreted to have been deposited on a clastic shelf (Brewster, Echuca Shoals), these sands thin to the west reflecting a more distal setting such as in the Caswell area. Toward the Brecknock Scott Reef, deposition was primarily shale prone on a low energy distal outer neritic environment.
- In Bonaparte deposition was largely separated from Browse by the Ashmore Platform and Londonderry High. A broad clastic shelf is interpreted to have developed on the Plover Shelf and Petrel Sub-basin with inner to mid shelf shoreface sands of the Sandpiper Formation deposited in the Plover, Tern and Petrel areas.
- To the North, the interval thickens and becomes more cyclical, with shoreface and fan sands deposited in the Northern Petrel Sub-basin and into the Malita Graben. It was likely that some of the outboard platform areas were still being uplifted, possibly providing a northerly sediment source, such as the occasional mid shelf sands interpreted on the Sahul Platform.

## LATE CRETACEOUS PUFFIN, PRUDHOE, TURNSTONE AND BORDE MARL FORMATIONS, BB15

Well cross section hung on base BB9 and correlated to top BB9 (measured depth wells)



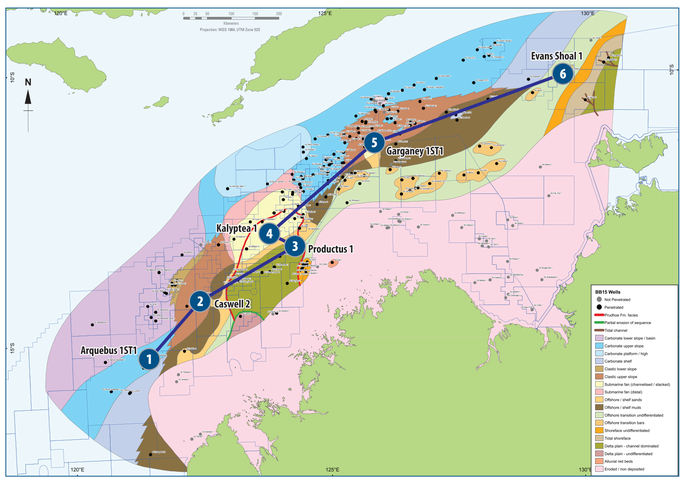

### Diagrammatic Representation of the Depositional Environments




Coastal Delta, Shoreline, Clastic / Carbonate Shelf and Slope

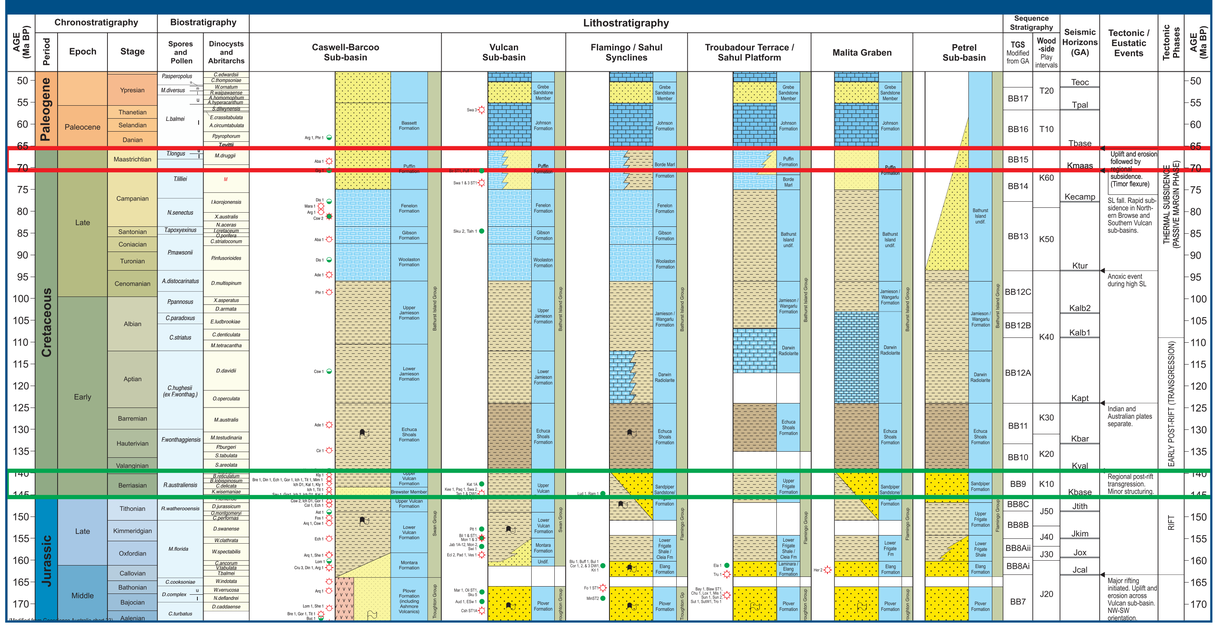
- A regional sea level fall in the earliest Maastrichtian marks the deposition of the BB15 sequence. In wells, the interval conformably and unconformably overlies the Campanian sands and shales of the Puffin and Turnstone Formations or the carbonates of the Fenelon Formation.
- Thick sands were deposited in the Northern Caswell sub-basin (Kalyptea-1, Gorgonichthys-1), characterised by box-trough Gamma Ray log responses. These are interpreted as lowstand fans deposited in the Early Maastrichtian. These sands were transgressed by Turnstone Formation shales.
- On the Yampi Shelf, a fluvial-deltaic system is interpreted (Productus-1). These channel and shoreface sands are present to the North, toward the Vulcan sub-basin eventually overlying both the Puffin and Turnstone Formations (Kalyptea-1).
- Deposition is largely fine grained in Caswell-2 with muds and shales, indicating a decrease in sediment supply. Toward the Brecknock Scott Reef, deposition thins and becomes more carbonate prone, with the deposition of such as in Arquebus-1ST1, indicating distal, open marine conditions prevail in the outboard areas.
- In the Malita and Calder Graben areas, upward coarsening sands, deposited in an inner shelf, shoreface setting, are interpreted (Evans Shoal-1).
- The upper boundary of the sequence is marked by an unconformity caused by uplift in the Early Tertiary. Unlike the BB9 interval, the Maastrichtian is not regionally sealed, the overlying BB16 deposition is characterised by mixed fine to coarse grained clastic and carbonate sediments deposited on a ramp.

### BB15 Facies Distribution Map

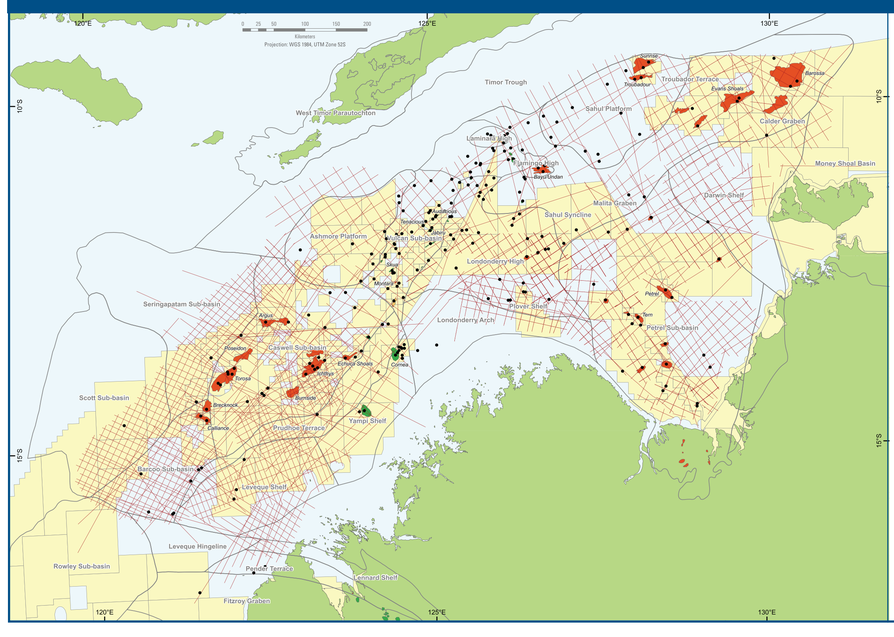



- This map shows the facies distribution of the Maastrichtian BB15 sequence. By the Late Cretaceous the North West Shelf had become an established Passive Margin, deposition was largely controlled by eustasy. In both Browse and Bonaparte, the shelf began to be prograde North Westwards as sediment supply outpaced accommodation.
- Open marine conditions developed across much of the study area following maximum sea level in the Turonian. Mixed clastic/carbonate lithologies dominate the interval, with carbonates in the outboard areas and clastic shelf deposition in the proximal areas to the south and east.
- During the Maastrichtian, the Northern Caswell and Southern Vulcan Sub-basins rapidly subsided, leading to the deposition of thick sand-prone fans of the Puffin Formation. These fans were fed by fluvial-deltaic and delta front sediments of the Prudhoe Formation, sourced from the Kimberley Block. The fans were confined to the north by the Ashmore Platform which was possibly still an isolated carbonate platform
- Away from the Puffin Fan area, localised fans have been interpreted such as in the Garganey and Caswell areas, however these were much smaller and confined, restricted by sediment supply.
- The Southern Petrel Sub-basin and Plover Shelf were largely sub-arial, supplying sediments to a clastic shelf on the northern flanks of the Petrel Sub basin and into the Malita Graben area. To the North, into the Sahul Platform area, the deposition changes from being on a clastic shelf/slope to a carbonate dominated slope.

## JURASSIC TO CRETACEOUS STRATIGRAPHY




## REGIONAL TECTONIC SETTING




- 238 exploration and appraisal wells interpreted
- Depositional facies maps for 32 sequences
- Interpretation used corrected wireline logs, biostratigraphy, well reports and regional studies - tied to 2D seismic grid
- Dynamic database with data query and download functions

## PRINCIPAL RESOURCES USED DURING THIS INTERPRETATION

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