



Regional Geology of the Roebuck Basin

Figure captions

- Figure 1** Location map showing the sedimentary basins of the Westralian Superbasin on Australia's North West Shelf.
- Figure 2** Map of the Roebuck Basin showing bathymetry, petroleum well distribution and oil and gas fields.
- Figure 3** Tectonic elements map of the Roebuck Basin showing major faults, petroleum well distribution and oil and gas fields. The locations of the seismic sections shown in Figures 5, 6 and 12 are also shown.
- Figure 4** Stratigraphic chart for the Roebuck Basin showing North West Shelf Supersequence Framework, basin phases and hydrocarbon occurrences (Geologic Time Scale after Ogg et al, 2016).
- Figure 5** Seismic line s120/01 across the Roebuck Basin and Argo Abyssal Plain. Interpretation by Geoscience Australia. Location of the seismic section is shown in Figure 3.
- Figure 6** **a)** Interpreted seismic line across the Bedout and Beagle sub-basins showing a basin thickening Triassic wedge and a transition from relatively unstructured to highly faulted structural style. The location of the Dorado Canyon is indicated. **b)** Seismic line from the Rowley Sub-basin showing the interpreted Lower Triassic volcanic depocentre, minor Middle to Late Triassic growth, conspicuous onlap on to the base Triassic horizon, and a Paleozoic growth wedge adjacent to the East Mermaid fault. The locations of the seismic sections are shown in Figure 3. Refer to Figure 4 for sequence boundary ages. Modified from Abbott et al, 2019a.
- Figure 7** **a)** Structure map of the base Triassic (TR10.0_SB seismic horizon) across the central North West Shelf. **b)** Triassic isochron map illustrating the location of major Triassic depocentres in the Rowley Sub-basin and Beagle Sub-basin/Exmouth Plateau. Modified from Abbott et al, 2019a.
- Figure 8** Palaeogeographic maps of four Triassic intervals on the central North West Shelf (after Abbott et al, 2019b): **a)** Early–Middle Triassic Interval (TR10.0_SB–TR15.0_SB); **b)** Middle Triassic Interval (TR15.0_SB–TR17.0_SB); **c)** Middle–Late Triassic Interval (TR17.0_SB–TR30.1_TS); **d)** Late Triassic Interval (TR30.1_TS–J10.0_SB). Intervals are bound by the mapped unconformities shown in Figure 6. Refer to Figure 4 for sequence boundary ages.
- Figure 9** Stratigraphy of the Bedout Sub-basin for the Triassic showing the informal members within the Keraudren Formation and their related lithology, petroleum system elements, discoveries and shows (after Thompson et al, 2018). Disc: Discovery, Res: Reservoir, SR: Source Rock.
- Figure 10** Map showing the current main operators, active exploration permits, retention leases and production licences in the Roebuck Basin.
- Figure 11** Petroleum production facilities, petroleum fields and pipeline infrastructure in the vicinity of the Roebuck Basin.
- Figure 12** Schematic cross-section showing Phoenix South, Roc and Dorado hydrocarbon discoveries in the Bedout Sub-basin. Informal stratigraphy is shown in Figure 9, location of the section is shown in Figure 3. Modified after Thompson et al, 2018.
- Figure 13** Carbon isotopic data of Phoenix South 1 oils compared to Perth Basin and other North West Shelf fluids (after Grosjean et al. 2018, 2019c).

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- Figure 14** Rock-Eval pyrolysis data plots indicating source rock type, quality and maturity for selected wells on the central North West Shelf. Plots are TOC vs HI and Tmax vs HI for: **a)** and **b)** the Early Triassic (sequences TR10–TR14); **c)** and **d)** the Middle Triassic (sequences TR15–TR16); and, **e)** and **f)** the late Middle–Late Triassic (sequences TR17–TR30). Wells are grouped by colour according to their location. Blue: Rowley Sub-basin; purple: Bedout Sub-basin; orange: Barcoo Sub-basin; green: Beagle Sub-basin (after Rollet et al, 2019a).
- Figure 15** Play diagram illustrating potential hydrocarbon plays in the Roebuck Basin. Modified from Carnarvon Petroleum Ltd., 2016f
- Figure 16** Map showing marine reserves, marine parks, multiple use zones and ecological features in the Roebuck Basin.