

CHAPTER 1 Summary and introduction

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The Otway Basin comprises one of a series of Jurassic to Cretaceous basins with a Tertiary cover that occur along the southern coast of Australia and which were formed as a result of rifting between the Antarctic and Australian plates. It comprises sediments of Jurassic and Cretaceous age deposited in a rift to drift setting (Fig. 1.1). Its limits are generally defined by the extent of Mesozoic sediments which occur both on and offshore. It is overlain by the Tertiary Mount Gambier Embayment. The northern limit of the Otway Basin is defined by outcropping early Palaeozoic metamorphic and igneous rocks (the Padthaway Ridge) and sediments may occur up to 160 km offshore (Fig. 1.2). To the west, the basin passes into the Duntroon Basin, and in the east continues into Victoria. Offshore it is locally bound by a Palaeozoic outer-margin high or volcanics. Two major sedimentary sequences are targets for petroleum exploration in South Australia (Fig. 1.3). The Early Cretaceous sequence (Otway Supergroup) is known only from the northern area, where E–W and NW–SE trending half-grabens (Robe, Penola, St Clair and Tantanoola Troughs) contain fluvial to lacustrine sediments that are proven gas reservoirs. The Late Cretaceous sequence (Sherbrook Group) occurs as a deltaic to deep-water wedge (up to 9 km thick) south of the Tartwaup Hinge Zone. Down-to-basin normal and listric faults run parallel to the present coast. South of the Tartwaup Hinge Zone Otway Supergroup sediments are presumed to occur below the Sherbrook Group, but they are too deep to be considered as potential reservoirs.

Exploration for hydrocarbons commenced in the South Australian sector of the Otway Basin with the drilling of Robe 1 in 1915. A commercial CO₂ gasfield, was discovered in the Waarre Sandstone in 1966 by Caroline 1. However, first commercial hydrocarbons were not discovered in South Australia until January 1989 in the Early Cretaceous Pretty Hill Sandstone by Katnook 2. Since then five commercial gasfields have been found within the Penola Trough. These are Katnook, Ladbroke Grove, Haselgrove, Haselgrove South and Redman. Non-commercial oil has flowed to surface from production tests along the northern Penola Trough at Killanoola and Jacaranda Ridge. Available raw data is shown in Figure 1.4 and sediment thickness in Figure 1.5.

For the Otway Basin as a whole, perceived prospectivity has recently taken a dramatic upturn due to drilling results based on 3D seismic of the Late Cretaceous Waarre Sandstone. There have been nine commercial successes since 1999 — seven onshore in the Port Campbell Embayment, and two offshore in exploration wells Thylacine 1 and Geographe 1 in 2001. Reserves in these two wells are estimated at $42\,480 \times 10^6 \text{ m}^3$ (1.5 tcf).

The increase in perceived prospectivity offshore has sparked renewed interest in areas to the SW of the Tartwaup Hinge Zone in South Australia both on and offshore. A new slope fan – apron play has been interpreted in water depths between 500 and 1500 m. Breaksea Reef 1, which was abandoned due to mechanical difficulties, encountered an interpreted gas column with a small oil leg in overpressured turbiditic sands. This well appears to have clipped the feeder channel of a slope fan complex which is faulted and compartmentalised down dip. Flat spots on the seismic at the base of high amplitude anomalies, which are interpreted as slope fans, have been recognised to the SW of the Chama Terrace. Thus prospectivity offshore in the South Australian sector of the Otway Basin has been dramatically increased.

The main risk factors are structural integrity and small targets, however, regional 3D seismic surveys are being used to address the first risk factor and sophisticated fault leakage analysis of prospects is being conducted by some operators prior to drilling. The economic

viability of small gas discoveries has been improved by the proximity to markets for such discoveries, their potential use for peak electricity generation opportunities in the national electricity market (as demonstrated by the 80 MW Ladbroke Grove Power Station), and the proposal to construct a pipeline from Victoria to Adelaide through the region.

FIGURES

- 1.1 Geological summary of the Otway Basin in South Australia
- 1.2 Regional cross-section of the Otway Basin in South Australia
- 1.3 Play fairway map for the Otway Basin in South Australia
- 1.4 Seismic surveys, drillhole data and aeromagnetic data in the Otway Basin. GIS project file attached.
- 1.5 Location of key wireline log and seismic sections in chapters 5, 6, 8, 11 and 12 displayed on Bouguer gravity image

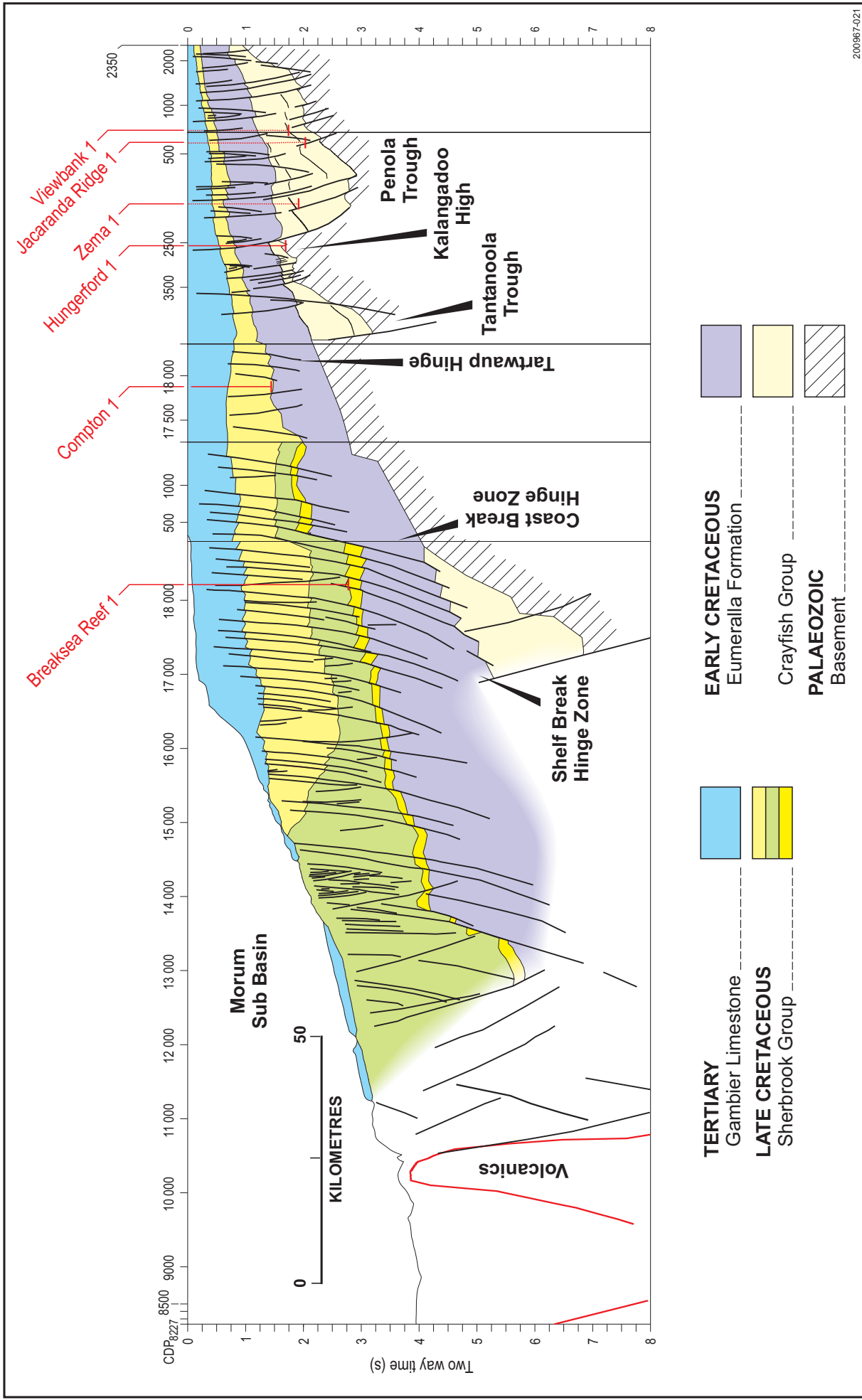


Figure 1.2 Regional cross-section of the Otway Basin in South Australia

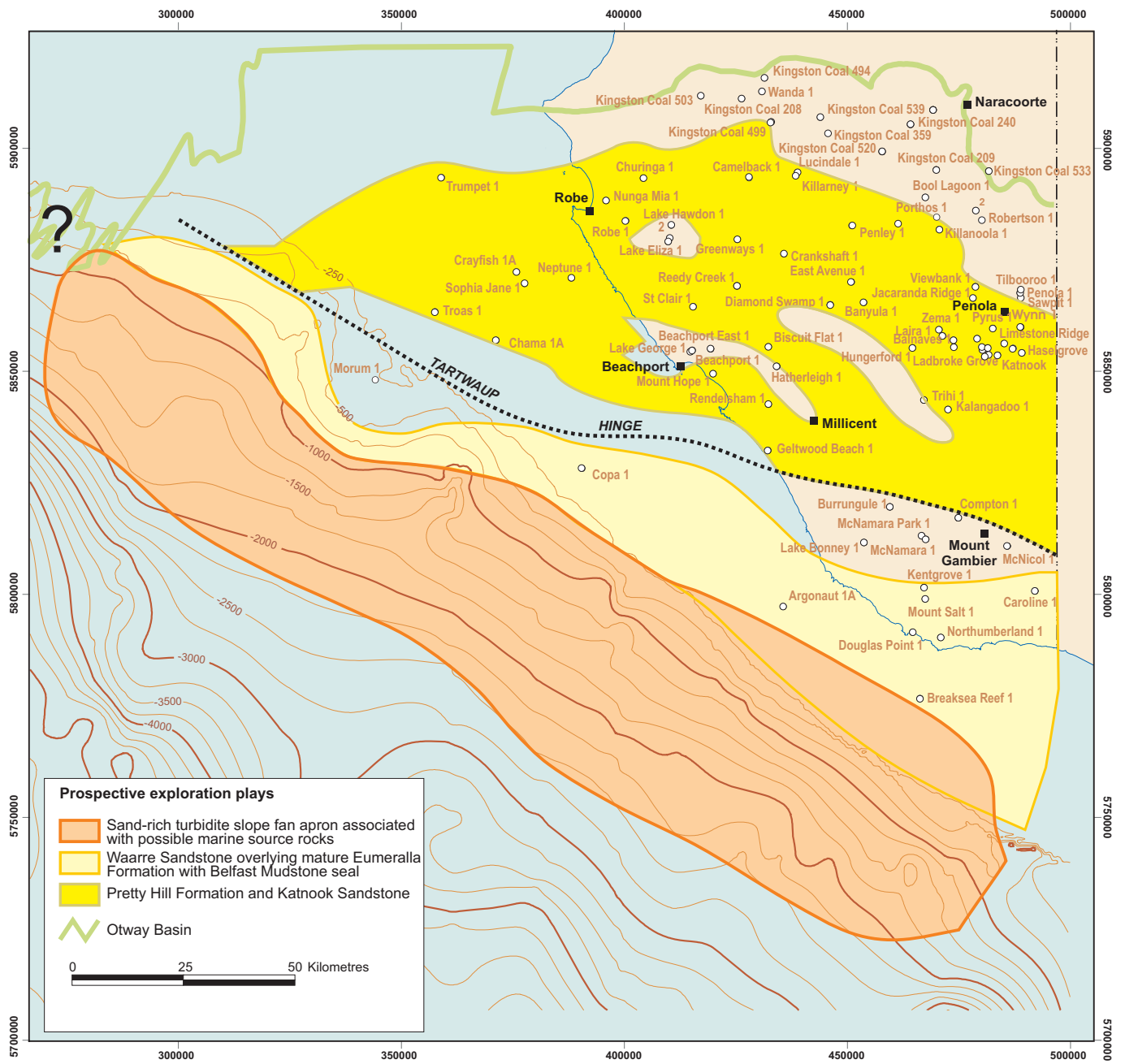


Figure 1.3 Play fairway map for the Otway Basin in South Australia

Load ArcExplorer

Open project

SEISMIC

3D surveys
(archive stack data in SEG Y format)

2D surveys
(archive stack data in SEG Y format)

Hard copy data
(available only as TIF image format or hard copy)

AEROMAGNETIC SURVEY

Aeromagnetic data

SAEI

All petroleum wells

Otway Basin

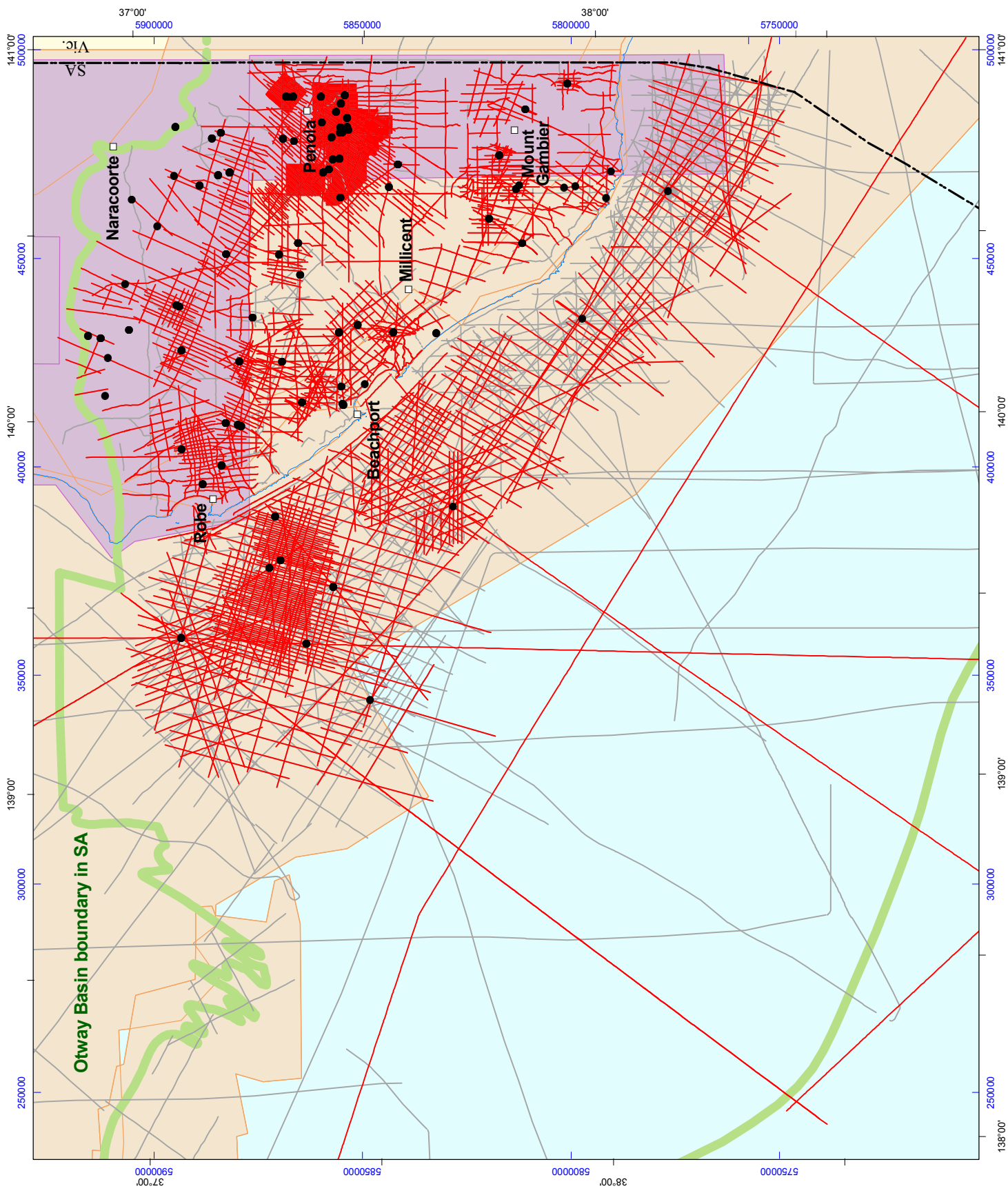
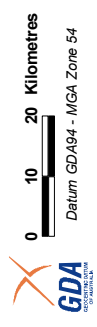


Figure 1.4 Seismic surveys, drillhole data and aeromagnetic data in the Otway Basin. GIS project file attached. Data is available from the PIRSA Office of Minerals and Energy Resources.

