

INTRODUCTION

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Chapter 1

This volume represents the latest publication on the geology and hydrocarbon potential of the Eromanga Basin in South Australia (see O'Neil, 1989; Gravestock *et al.*, 1986; Moore and Mount, 1982). It aims to assist explorers to understand the geology of the Eromanga Basin in order to fully realise its petroleum potential.

The Eromanga Basin covers an area of 1 000 000 km² of central-eastern Australia, 360 000 km² of which lie in South Australia (Fig. 1.1; all references to physical quantities and measurements are in terms of the metric system. For conversions from metric to imperial units, see App. 1). Since 1954 over 1000 drillholes have intersected the Eromanga Basin and over 80 000 km of seismic has been recorded. However, exploration effort has been concentrated in the Cooper region and vast areas of the Eromanga Basin remain relatively unexplored (Fig. 1.2).

Exploration and development in the northeast of South Australia have taken place in three distinct phases. The first followed the discovery of gas at Gidgealpa in the Cooper Basin in 1963. The second was the \$1.5 billion liquids scheme in the early 1980s following Eromanga Basin oil discoveries and their combined development with that of Permian oil and liquids from the 'wetter' gas fields. The third phase, which began in 1982 and was completed in 1991, was the accelerated search for gas to ensure supplies for South Australia into the 21st century. A fourth phase commenced in early 1996 following proposals to create a more

competitive gas market Australia-wide and has led to a major increase in exploration drilling.

Pipelines now supply South Australian Cooper Basin gas to Adelaide and Sydney (49.2 and 102.3 petajoules (PJ) respectively in 1995), while a liquids pipeline carries oil, condensate and Liquefied Petroleum Gas (LPG) to Port Bonython (Fig. 1.3). South-West Queensland gas is piped from Ballera to Moomba for processing. A pipeline from Moomba to Sydney to supply 16 PJ of ethane per annum to ICI Australia will commence operation in mid 1996.

The Cooper region has been under licence held by Santos Ltd and partners continuously since 1954. Their Petroleum Exploration Licences (PELs) 5 and 6 originally covered the Pedirka, Arckaringa and Arrowie Basins, however relinquishments have reduced the area to cover the Cooper Sector, ~73 000 km² (Fig. 1.3). PELs 5 and 6 cover the productive area and are not subject to relinquishment before their expiry in February 1999. Farmins and company acquisitions have therefore been the traditional method of obtaining an interest in this sector.

PRODUCTION

Raw gas production commenced from the Cooper Basin in 1969. At 1 November 1995, 73 gas fields with a total of 308 gas wells were online (Fig. 1.4). A combined total of about 151.5 PJ of South Australian Cooper Basin sales gas is sold to Tenneco Gas South Australia Pty Ltd (formerly Pipelines Authority of South Australia) and the Australian Gas Light Co. annually.

The first crude oil production began in December 1982 from Eromanga Basin reservoirs in Strzelecki Field. At 1 November 1995, 48 oilfields (Cooper and Eromanga Basins) with a total of 191 oil wells were online (Fig. 1.4). During 1995, 0.76 x 10⁶ kilolitres (kL) of crude oil, 0.38 x 10⁶ tonnes (t) of LPG and 0.54 x 10⁶ kL of condensate were sold.

The Cooper Basin Liquids Project was initiated in 1980 and completed in stages from 1982 to 1984 at a cost of \$1.5 billion. The project involved the construction of a high vapour pressure liquids pipeline from Moomba to a processing plant and storage and loading facilities at Port Bonython, as well as field development, oil collection and crude stabilisation facilities at Moomba.

Shipments of crude oil and condensate commenced in 1983 and LPG handling facilities were commissioned in July 1984. The establishment of these facilities enabled the

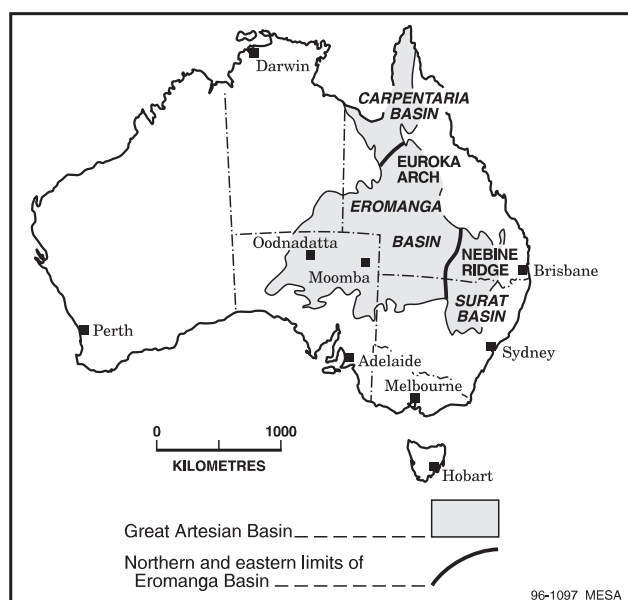


Fig. 1.1 The Great Artesian Basin showing component Eromanga, Surat and Carpentaria Basins.

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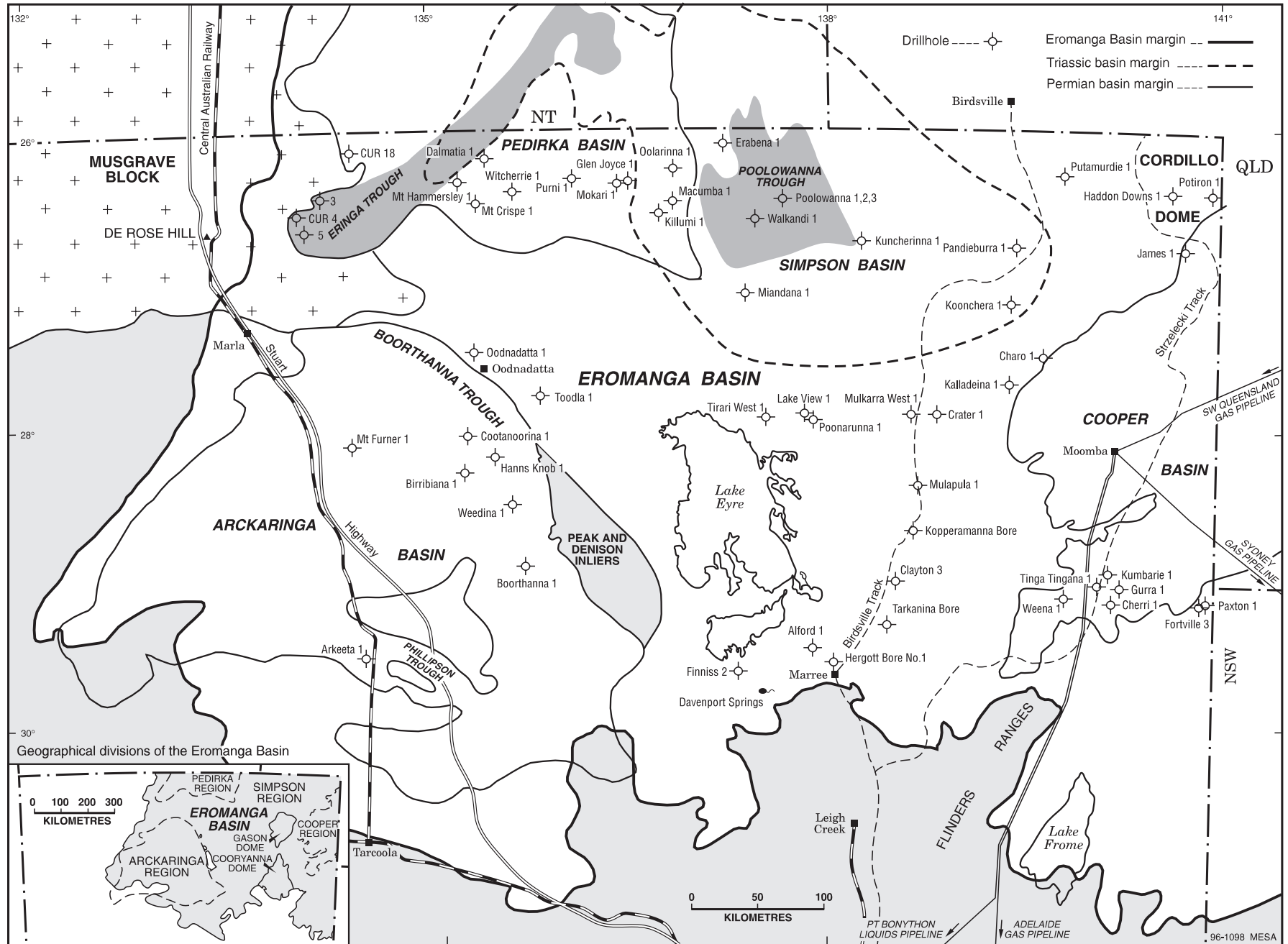


Fig. 1.2 Locality map of the Eromanga Basin in South Australia.

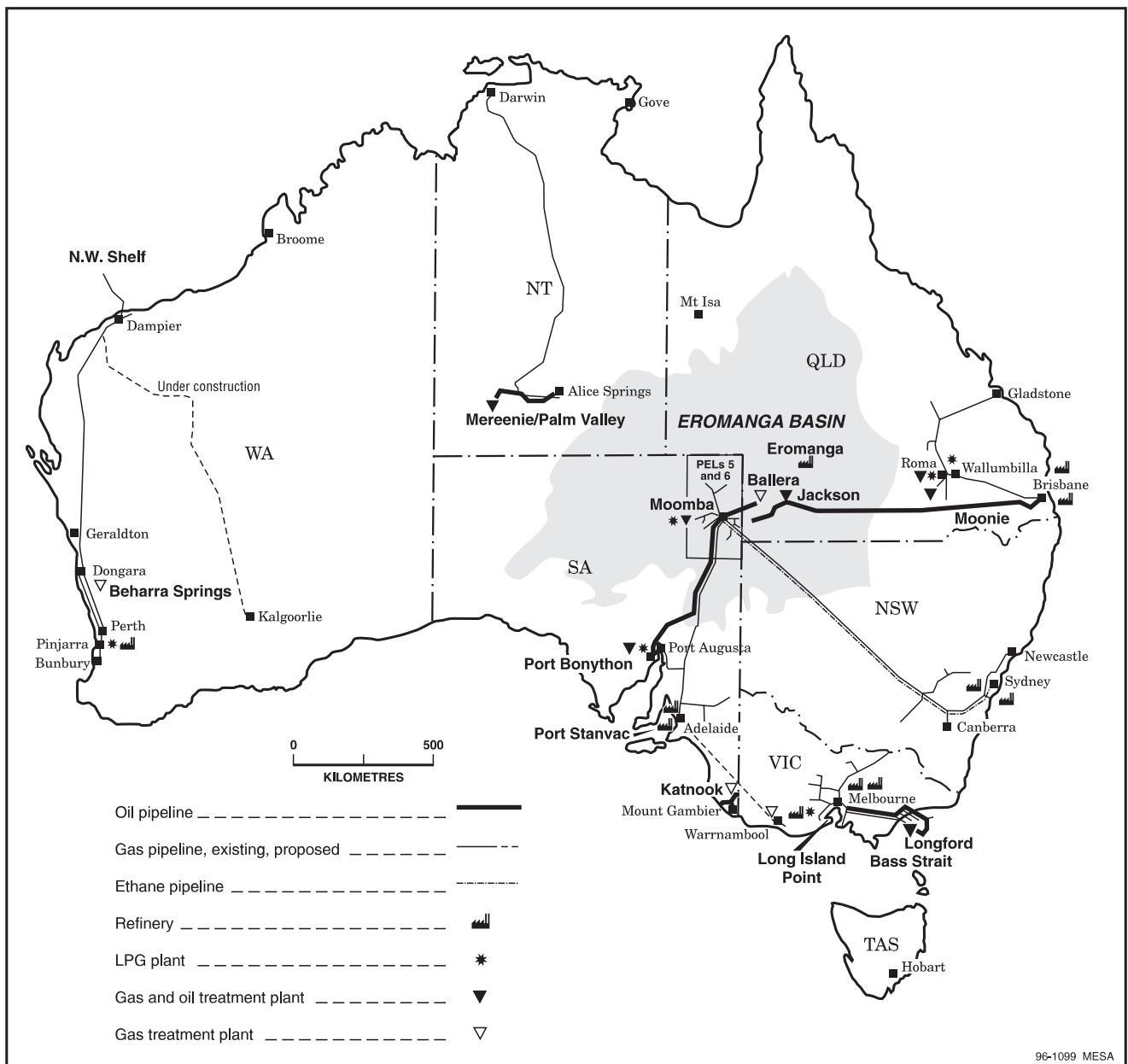


Fig. 1.3 Gas and liquids pipelines, treatment plants and refineries.

Cooper Basin Producers Unit to bring the ‘wet’ gas reservoirs (those containing significant quantities of propane, butane and condensate) into production, which further enhanced production flexibility. In 1991, Port Bonython was modified to enable the production of full range naphtha.

INFRASTRUCTURE

Production facilities

A total of 3740 km of pipelines, nearly 900 km of trunklines and roughly 1500 km of flowlines have been laid from the Cooper Basin to gas markets and to Port Bonython (Fig. 1.3). Key pipelines in the region are the Moomba–Port Bonython liquids line and the Moomba–Adelaide pipeline, operated by Tenneco Australia. The Moomba–Adelaide pipeline is 781 km long (excluding laterals), has an outside diameter of 0.56 m and the maximum allowable operating pressure is 7300 kilopascals (kPa). The Moomba – Port

Bonython liquids line is 659 km long, has an outside diameter of 0.36 m and a maximum allowable operating pressure of 10 380 kPa.

Gas emerges at the wellhead at pressures up to 25 000 kPa and temperatures up to 116°C. Gas from individual wells passes via field gathering systems (flowlines) to field satellite stations which separate gas, free water and condensate. The essentially water-free gas and condensate pass to the central Moomba treatment plant through trunklines. Crude oil is transported by either pipeline or truck to the Moomba plant. Currently, nine oil and eleven gas satellites are in operation in the Cooper and Eromanga Basins.

At the Moomba plant (Fig. 1.5), any free condensate and water are initially removed from the raw gas at the slug catchers. The gas stream then proceeds to the Benfield unit to ensure that no greater than 3% by volume of carbon dioxide (CO₂) remains in the sales gas stream. The gas is dehydrated at the molecular sieves before it proceeds to the

and the tourism industry. Groundwater is extracted from borefields on the southwestern margin of the GAB for the Olympic Dam copper–gold–uranium mine and ore processing plant, operated by Western Mining Corporation Ltd.

There are two major confined aquifers: a lower aquifer of Algebuckina Sandstone and Cadna-owie Formation and an upper aquifer which comprises the Winton and Mackunda Formations. The lower aquifer is a source of hot (up to 100°C), good quality artesian water with total dissolved solids ~1000 milligrams per litre (mg/L; Fig. 1.6). Water is predominantly of the sodium bicarbonate type. The upper aquifer produces poorer quality water.

ACCESS TO MARKETS

A free market was introduced in 1988 for all oil and condensate produced in Australia. There is no restriction on imports or exports of crude oil or refined petroleum products. A similar regime has applied since 1991 for LPG.

Ex-field natural gas prices in South Australia are also freely negotiated between buyer and seller. The approval of the Minister under the *Natural Gas (Interim Supply) Act 1985* is required for contracts for the sale of gas interstate for gas sourced outside the core area of the Cooper Basin. These provisions are due to be repealed as the Commonwealth, States and Territories have agreed to remove impediments across state borders to trade in gas. The rights of access to gas transmission and reticulation pipelines will be provided, and direct negotiations between consumers and producers facilitated.

Markets for crude oil and condensate exist locally and discoveries in the Cooper and Eromanga Basins to date are of the highly desirable low sulphur light crude oil type which finds a ready domestic and overseas market.



Eromanga mini refinery, South-West Queensland.
(Courtesy of Inland Oil Refiners)

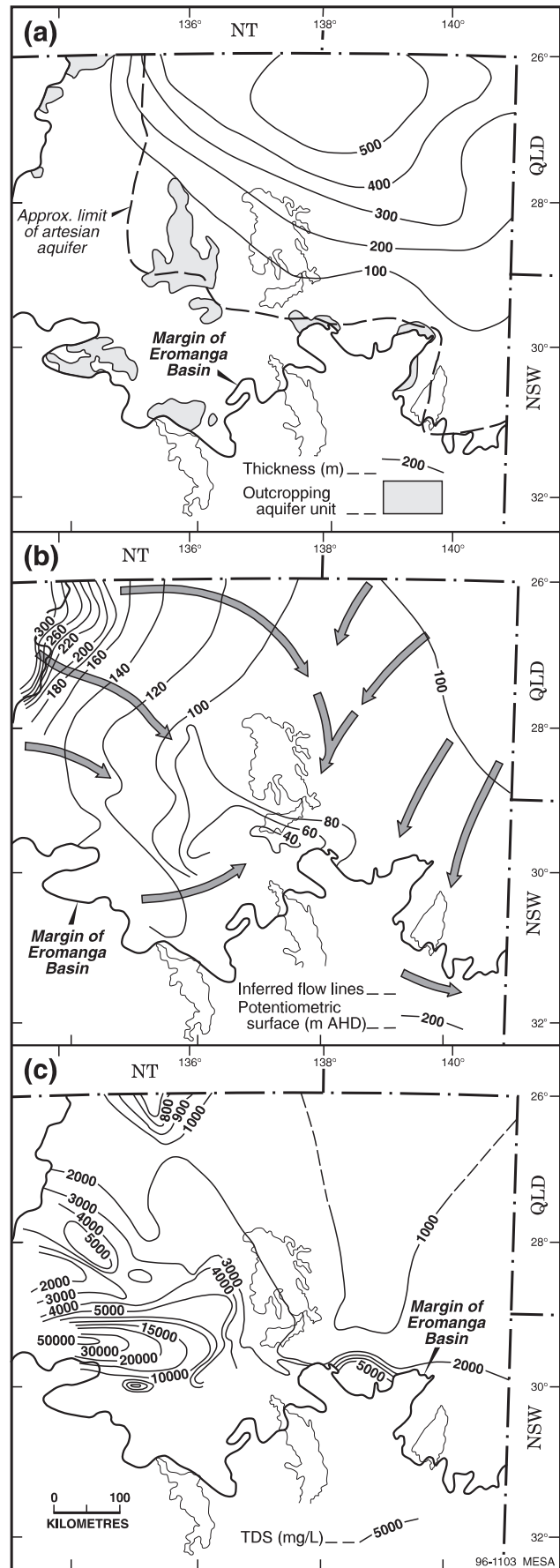


Fig. 1.6 Aquifer properties of the GAB in South Australia: (a) effective thickness of the aquifer. (b) potentiometric surface corrected to 15°C, and inferred flowlines. (c) total dissolved solids.