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Oil and Gas Resources of Australia 2002

Geoscience Australia

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Glossary

AGSO	Australian Geological Survey Organisation (now Geoscience Australia).
°API	Degrees American Petroleum Institute — a measure of oil density: $\text{API gravity} = \frac{141.5}{\text{specific gravity at 60 degrees F}} - 131.5 .$
Basin	A geological depression filled with sediments. Several basins of different ages overlying each other are referred to as stacked basins (e.g. Cooper/Eromanga Basins).
Completion	The process by which a finished well is either sealed off or prepared for production.
Condensate	A liquid mixture of pentane and heavier hydrocarbons that is recoverable from a gas well through a separation system.
Crude oil	A mixture of hydrocarbons that existed in the liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities.
Demonstrated resources	The amount of petroleum that can be recovered from the part of identified resources whose existence is established and whose quantity is considered probable, based on well data and geological projection. In this publication, demonstrated resources are taken to be equal to remaining, proved plus probable, commercial and non-commercial reserves of petroleum as maintained at Geoscience Australia.
Development	Phase of the petroleum industry in which a proven oil or gas field is brought into production by drilling production wells.
Discovery	The first well (in a new field) from which any measurable amount of oil or gas has been recovered. A well that makes a discovery is classified as a new field discovery (NFD).
Exploration	The phase of operations in which a company searches for oil or gas by carrying out detailed geological and geophysical surveys followed up where appropriate by exploratory drilling in the most promising places.
Extension/appraisal wells	Wells drilled to determine the physical extent, reserves and likely production rate of a field.
Gross	Including both permeable and non-permeable intervals.
Identified resources	The total amount of petroleum that can be recovered from specific accumulations that have been identified by drilling.
Initial resources	Resources before subtraction of cumulative production.
LNG	Liquefied natural gas, gaseous at normal temperature and pressures, but held in the liquid state at very low temperatures to facilitate storage and transport.
LPG	Liquefied petroleum gas, a liquid mixture of all the propane and butane that are recoverable from a well through a separating facility.
Natural gas	A mixture of methane and ethane and up to 3% of carbon dioxide.
New-field wildcat well	A petroleum exploration well drilled on a structural or stratigraphic trap that has not previously been shown to contain petroleum.

Petroleum	A naturally occurring hydrocarbon or mixture of hydrocarbons. As oil or gas or in solution, it is widespread in Australian sedimentary rocks, but major concentrations are generally rare.
Petroleum resources	The part of Australia's petroleum endowment that may be produced profitably by currently feasible or near-feasible technology and for specified product prices. Petroleum resources are defined to include only those natural concentrations from which economic extraction of a part is feasible within the range of technology and prices likely to be seen within the next 20 to 25 years. Hence, petroleum resources are a subset of petroleum endowment that can change according to the assumed technological and economic conditions.
Play	A continuous portion of sedimentary volume, which contains pools, showing the following characteristics: (1) reservoirs within the same productive sequence occurring throughout the zone; (2) hydrocarbons of similar chemical composition; and (3) traps of the same type.
Production	The phase of bringing well fluids to the surface and separating them and storing, gauging and otherwise preparing the product for transportation.
Production test	A test on a cased well whereby the nature and quantity of the formation fluids in a possible oil or gas bearing stratum are determined by allowing them to flow to the surface through the drill string under carefully controlled conditions.
Prospective	Likely to contain producible petroleum.
Proved and probable reserves	Reserves established at the median value — that is with a 50% cumulative probability of existence.
Remaining resources	Resources after subtraction of cumulative production from the initial amount of resources.
Repeat formation test	Test run on a wireline in a well, to measure the pressure and temperature of the specific depths and to take small fluid samples from the reservoir.
Risked	Amount multiplied by the probability of existence.
Success rate	A ratio obtained by dividing the number of new-field discoveries by the number of new-field wildcat wells drilled.
Trap	Any barrier to the upward movement of oil or gas, allowing either or both to accumulate.
Undiscovered accumulation	A general term representing all undiscovered petroleum deposits irrespective of economic potential.
Undiscovered field	All of the petroleum accumulations that may occur in multiple reservoirs within the same structural or stratigraphic trap.
Undiscovered resources	The amount of conventional petroleum that can be recovered from unspecified accumulations that have not been identified by drilling, but may exist within a specific reservoir sequence wherever it lies within a structural or stratigraphic trap.

Abbreviations

°API	degrees American Petroleum Institute
AGSO	Australian Geological Survey Organisation
bbl	barrel
BCF	billion cubic feet = 10^9 cubic feet
BCM	billion cubic metres = 10^9 m ³
BNbbl	billion barrels = 10^9 barrels
BOPD	barrels of oil per day
BRS	Bureau of Resource Sciences
Bscf	billions of standard cubic feet
cc	cubic centimetre
d	day
DST	drill stem test
EOR	enhanced oil recovery
EUR	estimated ultimate recovery
EXT	extension to previously discovered petroleum fields
FPSO	floating production, storage and offloading
ft	feet
GL	gigalitre = 10^6 cubic metres
kbbl	thousands of barrels
kL	kilolitre
km	kilometre
km ²	square kilometre
kPa	kiloPascals, a unit of pressure
LPG	liquefied petroleum gas
m	metre
m ³	cubic metre
mmcf	million cubic feet
MCM	million cubic metres
ML	megalitres = million litres
mm	millimetre
Mm ³	millions of cubic metres
mmbbl	million barrels
mRT	metres below rotary table
na	not applicable
NFD	new-field discovery
NPD	new-pool discovery
PJ	petajoule = 10^{15} joules
ppm	parts per million
psi	pounds per square inch
RFT	repeat formation test
scf	standard cubic feet (cubic feet at standard atmospheric temperature and pressure)
SECWA	State Electricity Commission of Western Australia
stb	stocktank barrels
Tcf	trillion cubic feet = 10^{12} cubic feet
TJ	terajoule = 10^{12} joules
y	year
ZOCA	Australia–Indonesia Zone of Cooperation Area A

Conversion factors (approximate)

1 kilolitre = 6.2898 barrels

1 cubic metre = 1 kilolitre = 35.315 cubic feet

Throughout the text one thousand million (10^9) is referred to as one billion, and one million million (10^{12}) as one trillion.

Summary

Exploration 2002

A total of 48 offshore exploration wells was drilled in 2002, 11 wells fewer than in 2001 and fewer than the record 74 wells drilled in 1998. Offshore, 31 new field wildcat wells and 17 extension/appraisal wells drilled resulted in 11 new field discoveries, including those discoveries inferred from well logs and repeat formation tests. In 2002 discoveries occurred in the:

- Bonaparte Basin at Cash (oil),
- Carnarvon Basin at Double Island, Exeter, Little Sandy, Hoover, Pedirka (oil),
- Otway Basin at Casino (gas).

Onshore 40 exploration wells were drilled in 2002, below last year's level of 68 wells drilled. There were 25 new-field wildcat wells drilled and 15 extension/appraisal wells drilled resulting in nine new-field discoveries. Most of the success and activity occurred in the Cooper and Eromanga Basins of South Australia and Queensland where exploration drilling continued to be driven by the relinquishment in 1999 of Petroleum Exploration Licences 5 and 6 in South Australia. Focus continues on exploration drilling throughout the numerous production licences held in the South Australian part of the Cooper and Eromanga Basins. There were five oil discoveries in the Cooper and Eromanga Basins, two gas discoveries in the Bowen/Surat Basins, one oil and gas discovery in the Otway Basin and one oil discovery in the Perth Basin.

In 2002, a total of 29 167 line km of 2D seismic and 7532 km² of 3D seismic were recorded in Australia. Offshore there were 30 seismic surveys carried out which collected 25 780 line km of 2D data and 6294 km² of 3D data. Onshore, there were 28 separate seismic surveys carried out which acquired 3387 line km of 2D data and 1237 km² of 3D data.

Petroleum exploration expenditure in 2002 was \$789 532 000 of which \$606 199 000 was expended offshore and \$183 333 000 onshore. Expenditure on development and production in 2002 was \$1 725 858 000 of which \$1 213 311 000 was offshore and \$512 547 000 onshore.

Timor Gap Joint Petroleum Development Area (JPDA)

On 20 May 2002, the date of East Timor's independence, Australia and East Timor signed the Timor Sea Treaty. This Treaty governs petroleum exploration and development in that part of the Timor Sea subject to overlapping jurisdictional claims.

The Treaty came into force on 2 April 2003 and sets the framework for joint administration by Australia and East Timor of petroleum exploration and development in the Timor Sea. The Treaty sets out matters such as fiscal and administrative arrangements, and importantly gives certainty to investors in the JPDA created by the Treaty. Petroleum activities in the JPDA are administered by the Timor Sea Designated Authority, currently located in both Darwin and Dili.

Part of the Timor Sea is subject to overlapping territorial claims by Australia and East Timor. This area contains extensive resources of oil and gas, and two major petroleum development projects are proposed — the Bayu-Undan field and the Greater Sunrise field. The Elang Kakatua oilfield located within the JPDA has been in production for several years. These fields are of major national interest to Australia, and revenue from them will support East Timor's future development. The revenue is to be shared 90% to East Timor and 10% to Australia.

Early development of the Bayu-Undan field has commenced with liquids revenue expected to flow from 2004. From 2006, gas from the field will be processed onshore in Darwin, providing employment opportunities and export revenue. Development of the Greater Sunrise field offers substantial long term benefits for Australia with investment decisions to be made at a later stage.

An international Unitization Agreement for the Greater Sunrise field, which straddles the edge of the JPDA and Australian territory (with 79.9% in Australian jurisdiction and 20.1% inside the JPDA), has also been finalised and provides the framework for the field to be developed as an integrated whole.

Reserves and resources

Most (612 of 959 GL) of Australia's initial commercial crude oil reserves have been discovered in offshore Tertiary reservoirs in the Gippsland Basin. Additional major oil reserves have been discovered in the Carnarvon and Bonaparte Basins. The most significant gas reserves are located in the Carnarvon, Gippsland, Browse, Bonaparte and Cooper Basins.

Remaining commercial reserves at 1 January 2002 are shown in Table S.1a. Estimates of reserves that have not yet been declared commercially viable (non-commercial reserves) are shown in Table S.1b.

Table S.1a Remaining commercial reserves at 1 January 2002 and estimates of reserves that have not yet been declared commercially viable (non-commercial) reserves

Commercial reserves			
Crude oil (GL)	Condensate (GL)	Liquid petroleum gas (GL)	Sales gas (Bcm)
161.7	117.1	130.1	847.6
(million barrels)	(million barrels)	(million barrels)	(Tcf)
1017	736	818	30
Non-commercial reserves			
Crude oil (GL)	Condensate (GL)	Liquid petroleum gas (GL)	Sales gas (Bcm)
112.1	287.4	242.5	3318.7
(million barrels)	(million barrels)	(million barrels)	(Tcf)
705	1808	1525	117

Table S.1b Remaining commercial reserves at 1 January 2003 and estimates of reserves that have not yet been declared commercially viable (non-commercial) reserves

Commercial reserves			
Crude oil (GL)	Condensate (GL)	Liquid petroleum gas (GL)	Sales gas (Bcm)
130.3	106.7	123.4	831.6
(million barrels)	(million barrels)	(million barrels)	(Tcf)
820	671	776	29
Non-commercial reserves			
Crude oil (GL)	Condensate (GL)	Liquid petroleum gas (GL)	Sales gas (Bcm)
113.9	278.9	230.2	3214.8
(million barrels)	(million barrels)	(million barrels)	(Tcf)
716	1755	1448	114

Development

In the Barrow Sub-Basin, the Woollybutt oil field was put in production in March 2003 by the operator Eni Australia Limited.

In the Perth Basin, ROC Oil is working towards the development of the Cliff Head oil field. The envisaged development concept consist of horizontal and deviated production wells, and an unmanned production platform connected by pipeline and power cable to onshore processing, storage and loading facilities. The development of the onshore Hovea field facilities has proceeded in parallel with the appraisal and development drilling program. The Hovea field was discovered by the Hovea 1 well in October 2001 and placed on test production. Encouraging results of this test led to the drilling of a series of appraisal and development wells.

In the Carnarvon Basin, Woodside Energy Ltd has submitted the preliminary field development plan to the Government as a precursor to an application for a Production Licence over the Enfield oil field, and Santos Ltd has submitted the preliminary field development plan for a Production Licence over the Mutineer and Exeter oil fields. The preferred development option for the Enfield oil field is via subsea wells tied back to the floating production storage and offloading unit (FPSO), while the preferred development option for the Mutineer and Exeter oil fields is via an FPSO moored between the two fields and horizontal production wells equipped with down-hole electrical pumps.

In the Gippsland Basin, OMV Australia has submitted the preliminary field development plan to the Government as a precursor to an application for a Production Licence over the Sole gas field. The proposed development of the Sole field consist of two subsea production wells and a new connecting pipeline and umbilical control line between the wells and the existing Patricia Baleen Gas Plant.

In the Otway Basin, Woodside Energy Limited has submitted the preliminary field development concept to the Government as a precursor to an application for a Production Licence over the Thylacine and Geographe gas condensate fields. The preferred concept for Geographe and Thylacine developments consists of an unmanned wellhead platform at Thylacine, subsea wellheads in a clustered manifold arrangement at Geographe and an offshore/onshore wet gas pipeline linking the Thylacine and Geographe fields to an onshore processing facility near Port Campbell.

Production

Daily petroleum production rates in 2001 were as shown in Table S.2a.

Table S.2a Daily petroleum production rates in 2001

Crude oil plus condensate		Gas	
Megalitres/day	104.7	Million cubic metres/day	95.8
Barrels/day	658,000	Billion cubic feet/day	3.4

Daily petroleum production rates in 2002 were as shown in Table S.2b.

Table S.2b Daily petroleum production rates in 2002

Crude oil plus condensate		Gas	
Megalitres/day	103.8	Million cubic metres/day	100.6
Barrels/day	652,000	Billion cubic feet/day	3.6

Estimates by Geoscience Australia of future crude oil plus condensate production suggest production in 2004 of between 431 000 bbl/d and 629 000 bbl/d and a decline to between 159 000 bbl/d and 337 000 bbl/d by 2020.

Sufficiency

Crude oil and condensate remaining reserves in 2002 could sustain production of 26.8 GL/y for 16.9 years. This average production level was calculated for the period 1993 to 2002. The consumption of crude oil and condensate in 2003 could be sustained by remaining economic reserves for only 11.3 years.

1: Exploration 2002

1.1 Exploration drilling , seismic surveys , expenditure and discoveries

In 2002, 88 exploration wells were drilled (126 in 2001). These consisted of:

		2002
Onshore	New-field wildcats	25
	Extension/appraisal	15
Offshore	New-field wildcats	31
	Extension/appraisal	17

Total exploration metres drilled in 2002 were 212 305 m (303 630 m in 2001).

Seismic surveys

In 2002, 29 167 line km of 2D seismic data were recorded (63 377 in 2001) and 7532 km² of 3D data were also acquired (21 787 km² in 2001). Onshore, 3387 line km of 2D data were collected and 1237 km² of 3D data were acquired. Offshore, 25 780 line km of 2D data were recorded and 6294 km² of 3D data were collected. The 2002 level of seismic survey acquisition in Australia is significantly less than the 2001 level. The greatest fall in acquisition occurred offshore where 25 780 line km of 2D data were collected in 2002 compared with 62 079 line km of 2D data collected in 2001. Also offshore, 6294 km² of 3D data were acquired in 2002 compared with 18 537 km² of data collected in 2001. Onshore, the level of 2D data acquired increased from 1298 line km in 2001 to 3387 line km of data in 2002 (Table 1.1).

Offshore 30 surveys were conducted (27 completed) during 2002. This was a decrease from 2001 when 37 surveys were conducted, and a decrease from 2000 when 33 surveys were conducted. Of these 30 surveys eight were 3D surveys and 22 were 2D surveys. In 2002, 17 operators acquired survey data. Most of the offshore seismic survey acquisitions were carried out on the North West Shelf of Australia including the Timor Sea, in the Perth Basin and to a lesser extent in the Gippsland, Sorell, Bass and Otway Basins of south-east Australia.

Onshore there were 28 separate seismic surveys completed in 2002, a slight increase from the 22 completed in 2001 and the 23 surveys completed during 2000. Of these 28 seismic surveys there were 19 2D surveys and nine 3D surveys completed. During 2002, Trace and WesternGeco were the main onshore contractors, completing 15 and 12 surveys each in total; Velseis completed one survey.

Several different operating companies acquired data onshore during 2001, with Santos in the Cooper, Cooper/Eromanga and Otway Basins being the most active, followed by Beach Petroleum also in the Cooper, Cooper/Eromanga and Surat Basins, and Eastern Star

Gas in the Gunnedah and Surat Basins. Other onshore surveys were acquired by Oil Company of Australia in the Bowen and Surat Basins, Stuart Petroleum and Cooper Energy in the Cooper Basin, Mosaic and Victoria Petroleum in the Surat Basin, Origin Energy in the Otway Basin and Arc Energy in the Perth Basin.

Seismic survey activity in 2002 is summarised in Appendix B.

Expenditure

Petroleum exploration expenditure in 2002 was \$789 532 000 of which \$183 333 000 was spent onshore and \$606 199 000 offshore. Petroleum development and production expenditure incurred by operators in 2002 was \$512 547 000 onshore and \$1 213 311 000 offshore. Exploration, development and production expenditure incurred in the Joint Petroleum Development Area (previously known as Zone of Cooperation Area A (ZOC A)) is included in the above figures. Appendix E summarises petroleum exploration, development and production expenditure in 2002.

Note that the Northern Territory administers the Commonwealth Territory of Ashmore and Cartier Islands, for petroleum purposes, under an agency agreement with the Commonwealth.

Table 1.1 Seismic survey acquisition 2001-2002

Year	Onshore		Offshore		Total	
	2D line km	3D sq km	2D line km	3D sq km	Line km	Square km
2001	1 298	3 250	62 079	18 537	63 377	21 787
2002	3 387	1 237	25 780	6 294	29 167	7 532

Offshore drilling 2002

The level of offshore exploration drilling activity in 2002 (48 wells drilled) was below the average level over the last ten years and 11 wells fewer than the 59 wells drilled in 2001 (Figure 1.2). Offshore drilling in 2002 accounted for 31 new-field wildcat wells and 17 extension/appraisal wells (Appendices A, F and G). Drilling was undertaken in 2002 in the Bonaparte (8 wells), Browse (1 well), Carnarvon (32 wells), Gippsland (2 wells), Otway (3 wells) and Perth (2 wells) Basins.

Offshore discoveries 2002

Following the record levels of 23 offshore discoveries in 2000 and 12 new-field wildcat discoveries in 2001, there were 11 new-field discoveries determined by the end of 2002. These discoveries consisted of six oil, two gas and three oil and gas discoveries and included those discoveries inferred from well logs and Repeat Formation Testing (RFT).

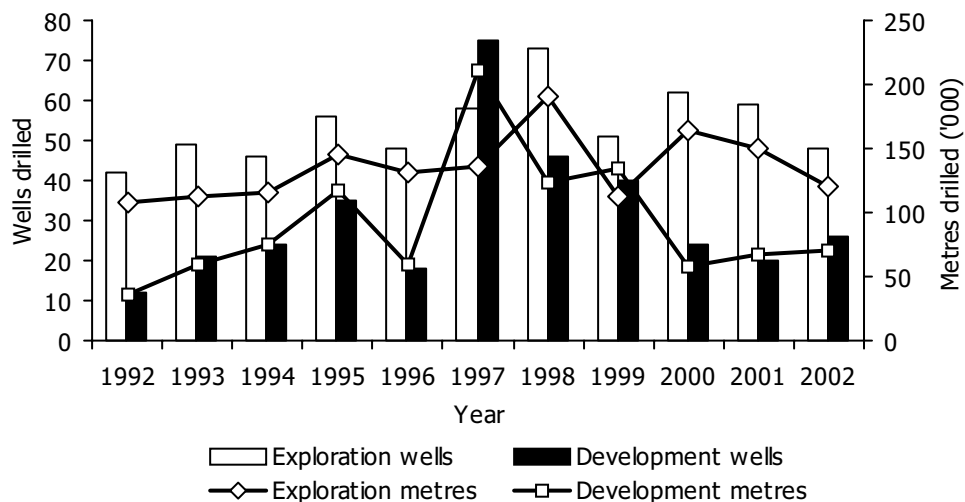


Figure 1.1 Wells and metres drilled offshore 1992–2002

A number of oil and gas finds in the Carnarvon Basin contributed to the upgrading of existing fields but are not considered to be new-field wildcat discoveries. Discoveries occurred in the:

- Bonaparte Basin at Cash (oil);
- Carnarvon Basin at Double Island, Exeter, Little Sandy, Hoover, Pedirka (oil), Endymion (gas), Imortelle, Taunton, Victoria (oil and gas);
- Otway Basin at Casino (gas).

Bonaparte Basin

Cash 1 ST1A was drilled in 127 m of water to a depth of 3929 m in Permit AC/P20 of the Bonaparte Basin to test potential reservoir sections in the Plover, Middle and Upper Challis Formations and the Nome Formation. The well recovered 8 L of 31.7 °API waxy oil from the Nome Formation and was subsequently plugged and abandoned.

Carnarvon Basin

Double Island 1 was drilled in 8 m of water to a depth of 2716 m in Production Licence TP/8. The well encountered a 16.9 m gross (15.5 m net) oil column in the Flag Sandstone. RDT sampling indicated the oil was of 47.5 °API gravity. On completion of the well a horizontal development well, Double Island 1H, was drilled and subsequently completed for future oil production.

Endymion 1 was drilled in 41 m of water as a deviated well from the Sinbad gas platform in Production Licence TL/1. The well encountered a 20.6 m gross (18.6 m net) gas column in the Flag Sandstone and was completed for gas production.

Exeter 1 was drilled in 143 m of water in exploration permit WA-191-P. The well intersected a 23 m gross oil column identified by wireline log interpretation in the Angel Formation sands. An appraisal well, Exeter 2, intersected an 11 m gross oil column and both wells were plugged and abandoned.

Hoover 1 was drilled in 11 m of water in Production Licence TL/1. The well encountered a 6 m gross oil column of 41 °API gravity in the Flag Sandstone sands. The well was plugged and abandoned but the accumulation may be developed at a later date with a deviated well from the Victoria Platform.

Immortelle 1 was drilled in 15 m of water in Exploration Permit TP/7 R2. The well logs indicated a sub-commercial oil and gas accumulation and the well was plugged and abandoned.

Little Sandy 1, Pedirka 1 and Victoria 1 located in Production Licence TL/6 were batch drilled from a common surface location in water depth of about 7.5 m. **Little Sandy 1** encountered oil at three separate intervals in the Flag Sandstone sands from RDT runs with gravities ranging from 46.6 to 47.1 °API. Logging at **Pedirka 1** indicated a 7 m 44 °API oil column also in the Flag Sandstone sands. **Victoria 1** encountered oil in three separate intervals overlain by a thin gas section in the Flag Sandstone. Testing indicated 6 m net of 46.2 °API oil. All three wells were completed for future production.

Taunton 2 ST1 was drilled in 15 m of water in Production Licence TL/2. The well flowed on test at a rate of 2895 bbl/d through a 3/4 inch choke from the Birdrong Sandstone. Minor gas was also encountered and the well was subsequently plugged and abandoned.

Otway Basin

Casino 1 was drilled in 70.5 m of water in exploration permit VIC P/44. The well encountered gas shows, and logging confirmed the presence of gas from over a 14 m interval. Further appraisal drilling of the structure failed to confirm a major gas discovery. If further discoveries are made in the near vicinity the field is thought to have the potential to mature into a commercial development.

Onshore drilling 2002

In 2002, 40 onshore exploration wells were drilled (Figure 1.2). Of these 25 were new-field wildcat wells and 15 were extension/appraisal wells (Appendices A, F and G). Drilling was undertaken in the Bowen (1 well), Bowen/Surat (3 wells), Cooper (1 well), Cooper/Eromanga (21 wells), Gippsland (1 well), Otway (4 wells), Perth (4 wells) and Surat (5 wells) Basins.

Onshore exploration drilling accounted for nine new discoveries (Appendix C). Most of the success has been in the Cooper/Eromanga Basin of South Australia and Queensland. A list of discoveries made during the year and other relevant information appears in Appendix C.

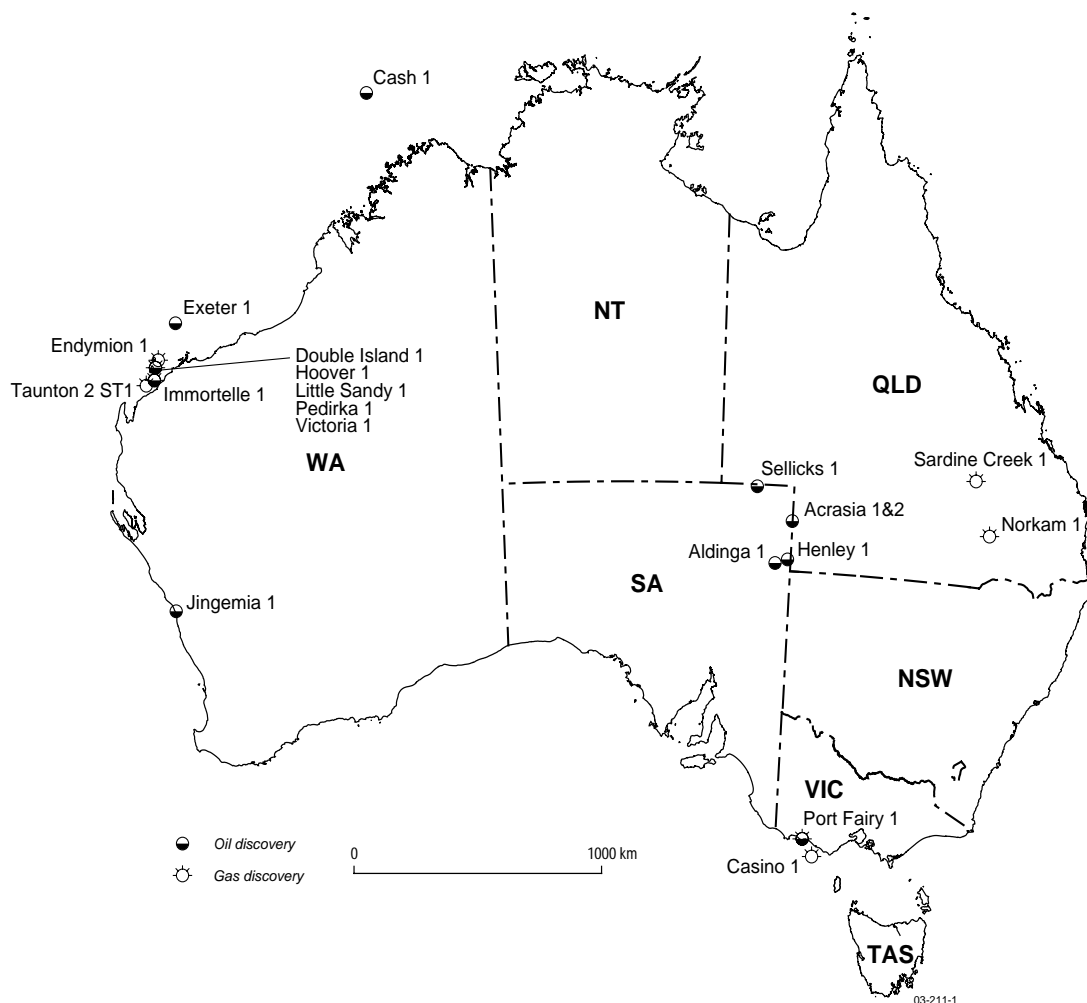


Figure 1.2 Locations of discoveries in 2002 (refer to Appendix C)

Similarly to last year, exploration drilling in the Cooper/Eromanga Basin continued to be driven by the relinquishment in 1999 of Petroleum Exploration Licences (PELs) 5 and 6 in South Australia, resulting in the entry of new operators into the area. The resumption of drilling by the new operators in the region during the year has resulted in four new oilfields being discovered at Acrasia, Aldinga, Henley and Sellicks.

There was one Bowen Basin gas discovery at Sardine Creek 1 which has been cased and suspended for future production. A further gas discovery was reported in the Bowen/Surat Basin at Norkam 1 which was also cased and suspended as a future gas producer. In the Otway Basin, the Port Fairy 1 oil and gas discovery was plugged and abandoned, and the Jingemina 1 oil discovery in the Perth Basin was completed for oil production.

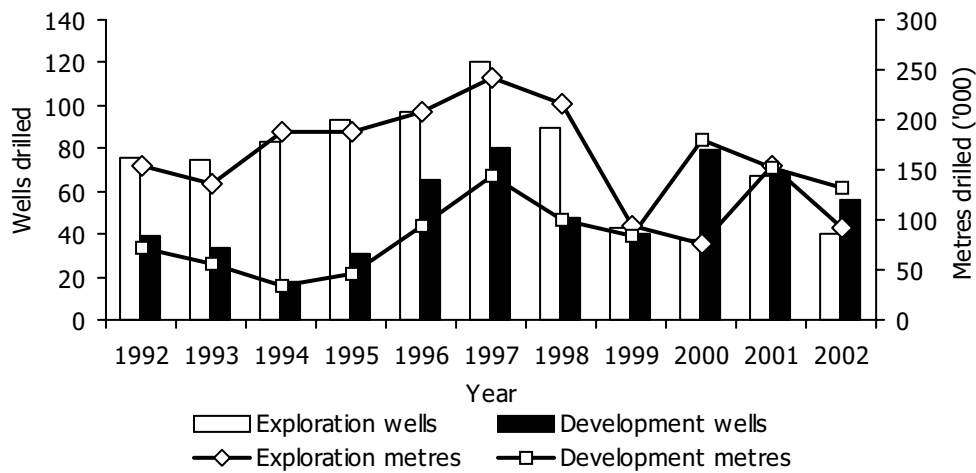


Figure 1.3 Wells and metres drilled onshore 1992–2002

1.2 Rig activity 2002

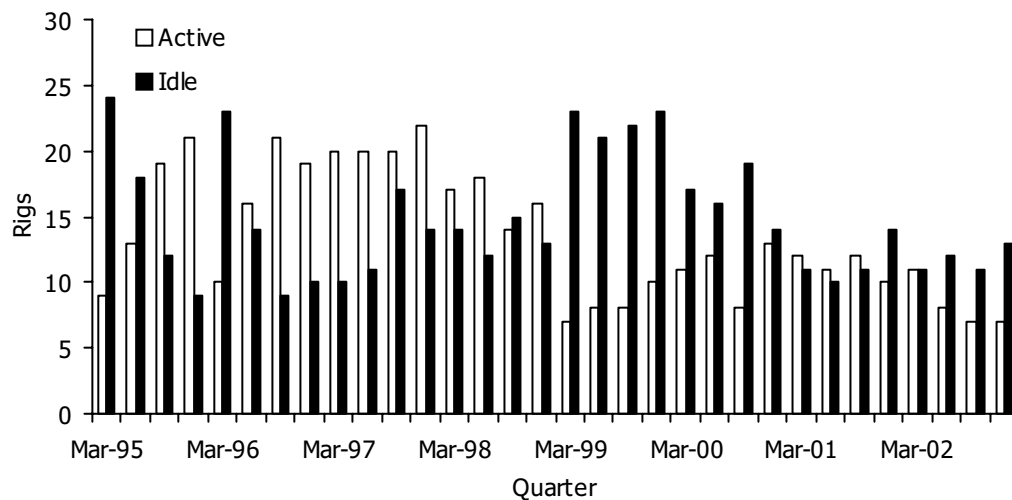


Figure 1.4 Onshore drilling rig activity 1995–2002

At the end of December 2002 there were 13 active rigs onshore and offshore, three fewer than at the end of 2001. Seven of the available onshore rigs were active and six of the seven offshore rigs were engaged or in the process of mobilising.

Onshore, the number of active rigs varied between six and 12 throughout the year. The year commenced with 12 rigs active, predominantly in the Cooper and Eromanga Basins and in the Canning, Gippsland and Bowen Basins. By the end of the year, rig activity had fallen to seven rigs active. At the end of the December quarter, the seven active rigs were engaged in drilling in the Cooper/Eromanga Basins, Bowen/Surat Basins, Surat and Eromanga Basins.

Offshore, rig activity varied between three and seven rigs active throughout 2002. The year commenced with six rigs active, working in the Bonaparte, Carnarvon and Gippsland Basins. In December there were also six rigs active, undertaking development drilling operations in the Carnarvon, Perth and Gippsland Basins and exploration drilling in the Gippsland, Otway, Carnarvon and Perth Basins, and operations were continuing in the Carnarvon, Canning, Bonaparte and Perth Basins.

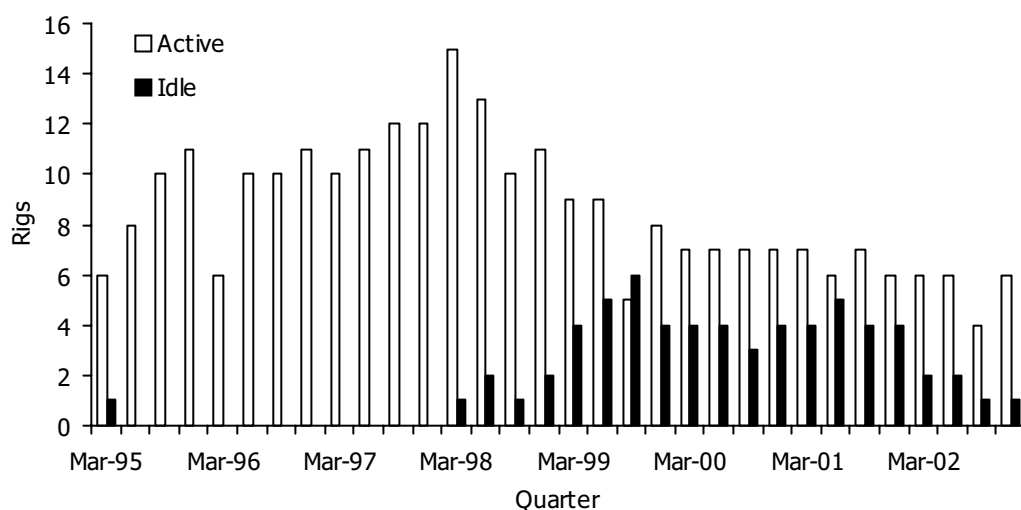


Figure 1.5 Offshore drilling rig activity 1995–2002

1.3 Petroleum permits, leases and licences

In 2002, petroleum permits, leases and licences in force or pending renewal both onshore and offshore in Australia covered about 1 402 168 km² (1 340 316 km² in 2001 revised) including the Joint Petroleum Development Area (JPDA). The onshore titles comprised about 827 538 km² (767 908 km² in 2001 revised) and the offshore titles comprised about 574 630 km² (572 408 km² in 2001 revised).

Onshore, exploration permits covered an area of 797 050 km² (738 990 km² in 2001 revised), production licences were in force over an area of 29 857 km² (28 287 km² in 2001 revised) and retention leases covered an area of 631 km² (631 km² in 2001 revised).

Offshore, exploration permits covered an area of 574 630 km² (550 982 km² in 2001 revised), production licences were in force over an area of 13 269 km² (13 303 km² in 2001 revised) and retention leases covered an area of 8264 km² (8122 km² in 2001 revised).

1.4 Success rates

The success rates shown (Table 1.2) are based on the number of new-field wildcat petroleum discoveries and new-field wildcat wells drilled in Australia onshore and offshore for each year from 1988 to 2002. No assumptions have been made as to whether a 'discovery' has proved or will prove to be commercial. Geoscience Australia (GA) defines a discovery for success rate purposes as a well from which any measurable amount of oil or gas has been recovered or inferred from well logs. A summary of exploration and development drilling is presented in Appendix A.

Table 1.2 New-field wildcat success rates 1990–2002

Year	Success rate			Percentage success rate		
	Onshore	Offshore	Combined	Onshore	Offshore	Combined
1990	1:2.7	1:5.2	1:3.5	36.9	19.3	28.7
1991	1:2.7	1:5.1	1:3.2	37.3	19.4	31.1
1992	1:3.4	1:4.3	1:3.7	29.1	23.3	27.1
1993	1:3.4	1:3.5	1:3.4	29.8	28.9	29.4
1994	1:1.9	1:4.0	1:2.3	53.3	25.0	43.5
1995	1:2.8	1:4.7	1:3.4	35.5	21.4	29.8
1996	1:2.9	1:3.5	1:3.1	34.7	28.9	32.7
1997	1:2.1	1:4.6	1:2.6	46.6	21.6	39.2
1998	1:2.2	1:4.9	1:3.0	44.6	20.3	33.3
1999	1:4.0	1:4.0	1:4.0	25.0	25.0	25.0
2000	1:3.3	1:2.9	1:3.0	30.4	34.9	33.7
2001	1:1.9	1:4.0	1:2.6	52.0	25.0	38.2
2002	1:1.5	1:2.8	1:2.2	65.0	35.3	46.3

1.5 Release of offshore petroleum exploration areas

Offshore petroleum exploration in Australia operates under a work program bidding system. Vacant offshore acreage is released annually by the Commonwealth in two tranches, with closing dates for bids approximately six and twelve months after the date of release. The first closing generally includes mature to sub-mature acreage together with

other areas requested by stakeholders for early release. Immature to frontier acreage is generally included in the second closing as these areas require a greater lead-time for explorers to develop a pre-bid assessment.

The processes and requirements when applying for and being granted an exploration permit are detailed in three administrative guidelines: Applications for Exploration Areas; Bid Assessment Criteria; Permit Conditions and Administration. These guidelines are published by the Department of Industry, Tourism and Resources (DITR) in the *Guidance Notes for Applicants* and *An Overview for Investors* which accompany the promotional material associated with the annual release of acreage. The guidelines are also available at internet address: www.industry.gov.au/petexp

In 1999, the Commonwealth published the *Australian Offshore Petroleum Strategy* document which gave guidance on the size of release areas/exploration permits. This new guide provided a framework for a more focussed approach to offshore petroleum exploration and was applied to both the 2000 and subsequent acreage release programs.

In the mature regions, release areas are generally restricted to a maximum of eight graticular blocks (approximately 640 km²) while in frontier regions, areas of up to 80 graticular blocks (approximately 6400 km²) are released. The maximum recommended size of immature release areas is 40 graticular blocks, while sub-mature areas generally do not exceed 20 graticular blocks in size.

During 1999, an Acreage Re-release Program was initiated by the Joint Authority to allow exploration companies to maintain 'good standing' in the event of default in their work program conditions in a permit. These arrangements allow defaulting companies to spend the full amount of any outstanding commitments on new field-work in the minimum guaranteed period of new permits awarded from the Re-release Program. Although the re-release of any area is at the discretion of the Joint Authority, it is generally intended that any area that does not attract a successful bid in the annual Acreage Release Program will be included in the Re-release Program. The re-released areas are open to all interested bidders under the work program bidding system, with closing dates for bids coinciding with the next closing date under the normal acreage release process.

2001 Offshore Acreage Release Program

In 2001, 42 offshore exploration areas were offered to the petroleum industry in two tranches, with closing dates for bids in October 2001 (13 areas) and April 2002 (29 areas). Nineteen release areas (45%) were offered on the North West Shelf with the remainder located in the offshore Perth, Money Shoal, Sorell and Duntroon Basins.

Of the 42 areas offered in 2001, 18 were awarded as exploration permits (Table 1.3). Seven of the exploration permits were awarded over frontier areas in the Sorell, Perth and Duntroon Basins. Five of these constitute predominantly deepwater acreage, with water depths ranging from around 200 to 3000 m.

Table 1.3 Offshore exploration permits awarded from the 2001 Acreage Release Program

Release Area	Basin / Sub-basin	Awarded as Exploration Permit	Operator	Indicative Expenditure in Permit Years 1 to 3 (\$A)
T01-1	Sorell	T/32P	Santos	\$2 800 000
T01-3	Sorell	T/33P	Santos	\$2 900 000
W01-7	Browse	WA-332-P	Batavia Oil & Gas	\$1 500 000
W01-8	Browse	WA-333-P	Batavia Oil & Gas	\$1 500 000
W01-9	Browse	WA-331-P	Rawson Resources	\$1 350 000
W01-12*	Carnarvon / Dampier	WA-321-P	Octanex	\$1 400 000
W01-13*	Carnarvon / Exmouth	WA-322-P	Octanex	\$1 900 000
W01-15*	Carnarvon / Barrow	WA-320-P	OMV	\$1 400 000
W01-22	Perth / Edel	WA-327-P	Apache	\$1 950 000
W01-23	Perth / Houtman	WA-328-P	AGIP	\$9 370 000
W01-24	Perth / Abrolhos	WA-325-P	Roc Oil	\$17 500 000
W01-25	Perth / Houtman	WA-326-P	AGIP	\$1 700 000
V01-1	Otway	VIC/P50	Essential	\$8 070 000
V01-2	Otway	VIC/P51	Santos	\$39 400 000
V01-3	Otway	VIC/P52	Santos	\$28 600 000
V01-4	Gippsland	VIC/P53	Australia Crude Oil	\$40 200 000
S01-1	Duntroon	EPP 31	Woodside	\$6 600 000
NT01-1*	Bonaparte-Money Shoal	NT/P61	Santos	\$17 000 000

* first closing of 2001

2001 Offshore Acreage Re-release Program

In 2001, 24 of the 42 offshore areas offered to the petroleum industry failed to attract a bid. These areas were re-offered in two tranches as part of the 2001 Acreage Re-release Program. Of the 24 areas included in the 2001 Re-release Program, 13 were subsequently awarded as exploration permits (Table 1.4).

2002 Offshore Acreage Release Program

During 2002, 41 offshore exploration areas were offered to petroleum explorers in two tranches. Closing dates for bids were 24 October 2002 (seven areas) and 10 April 2003 (34 areas).

Approximately half the exploration areas released in 2002 were located on the North West Shelf. Acreage was made available in frontier to mature areas, in a variety of geological settings and in a range of water depths.

At date of writing, of the 41 areas offered to industry in 2002, four had been awarded as exploration permits (Table 1.5). Bids on a further 12 release areas are currently under consideration. Assuming these 12 release areas are awarded as exploration permits, this will result in an annual take-up rate for offshore exploration acreage in 2002 of 39%. This take-up rate is similar to that observed in the previous year (43%) but significantly greater than the take-up rate for offshore acreage released in 2000 (19%). (It should be noted, however, that the 2000 release of offshore acreage comprised 86 areas — approximately twice the number of areas released in 2001 and 2002.)

Table 1.4 Offshore exploration permits awarded from areas re-released from the 2001 Acreage Release Program

Re-released Area	Basin / Sub-basin	Awarded as Exploration Permit	Operator	Indicative Expenditure in Permit Years 1 to 3 (\$A)
W01-2	Browse	WA-343-P	National Gas Aust.	\$1 050 000
W01-3	Browse	WA-341-P	Batavia Oil & Gas	\$1 400 000
W01-4	Browse	WA-342-P	West Oil	\$3 700 000
W01-5	Browse	WA-338-P	Santos	\$1 550 000
W01-6	Browse	WA-344-P	National Gas Aust.	\$700 000
W01-14*	Carnarvon / Exmouth	WA-329-P	Octanex	\$1 750 000
W01-20	Perth / Houtman	WA-336-P	Petroz	\$2 400 000
W01-21	Perth / Houtman	WA-339-P	Santos	\$2 600 000
W01-26	Perth / Houtman	WA-337-P	Kerr McGee	\$2 400 000
S01-2	Duntroon	EPP 32	Santos	\$2 200 000
NT01-3*	Bonaparte / Petrel	NT/P62	National Oil & Gas	\$1 150 000
NT01-4*	Bonaparte / Petrel	NT/P63	National Oil & Gas	\$1 150 000
NT01-5*	Bonaparte / Petrel	NT/P64	National Oil & Gas	\$1 150 000

* Re-released from the first closing of 2001

Table 1.5 Offshore exploration permits either awarded or under consideration for award from the 2002 Acreage Release Program

Release Area	Basin / Sub-basin	Awarded as Exploration Permit	Operator	Indicative Expenditure in Permit Years 1 to 3 (\$A)
T02-1	Otway	To be announced		
T02-2	Otway	To be announced		
V02-2	Gippsland	VIC/P54	Liberty	\$38 200 000
V02-3	Gippsland	To be announced		
V02-4	Gippsland	To be announced		
W02-7	Carnarvon / Exmouth Plateau	To be announced		
W02-8	Carnarvon / Exmouth Plateau	To be announced		
W02-10	Carnarvon / Exmouth Plateau	To be announced		
W02-12	Carnarvon / Dampier	WA-340-P	Strike Oil	\$280 000
W02-13	Carnarvon / Barrow	WA-334-P	Apache	\$5 450 000
W02-15	Carnarvon / Exmouth	WA-335-P	Apache	\$26 500 000
NT02-1	Bonaparte / Sahul Platform	To be announced		
NT02-4	Bonaparte / Petrel	To be announced		
NT02-5	Bonaparte / Petrel	To be announced		
S02-4	Bight / Ceduna	To be announced		
S02-5	Bight / Ceduna	To be announced		

Fifteen frontier exploration areas in the Roebuck, Arafura/Money Shoal and Bight Basins were offered in 2002. Of these, two (S02-4 and S02-5 in the Bight Basin) are currently under consideration for award as exploration permits (Table 1.5).

Twenty of the 41 offshore areas released in 2002 were located either entirely or predominantly in deepwater parts (greater than 400 m water depth) of the Roebuck, Otway, Bight and Carnarvon Basins. One of these deepwater areas (W02-15, Exmouth Sub-basin) has subsequently been awarded as exploration permit WA-335-P. A further seven deepwater release areas (two in the Otway Basin, three on the Exmouth Plateau and two in the Bight Basin) are currently under consideration for award (Table 1.5).

2002 Offshore Acreage Re-release Program

Of the seven offshore areas included in the first tranche of acreage released in 2002, only one failed to attract a bid (Area W02-14). Located in the Barrow Sub-basin, this small release area (comprising three graticular blocks) was re-released with a closing date for bids coinciding with the closing date for the second tranche of acreage released in 2002. Area W02-14 attracted one bid on re-release and award as an exploration permit is currently under consideration (Table 1.6).

At date of writing, areas to be re-released from the second tranche of acreage released in 2002 had not been finalised.

Table 1.6 Offshore exploration permits under consideration for award from areas re-released from the first tranche of the 2002 Acreage Release Program

Release Area	Basin / Sub-basin	Awarded as Exploration Permit	Operator	Indicative Expenditure in Permit Years 1 to 3 (\$A)
W02-14	Carnarvon / Barrow	To be announced		

2003 Offshore Acreage Release Program

In April 2003, 35 offshore exploration areas were offered to petroleum explorers in two tranches.

As in previous releases of offshore acreage, areas offered to the petroleum industry include frontier to mature areas, located in a variety of geological settings and in a range of water depths. Twenty one of the 35 areas (60%) offered in 2003 lie on the North West Shelf. Seven release areas (20%) are classified as 'frontier' while 13 (37%) comprise predominantly deepwater (greater than 400 m water depth) acreage.

The closing date for bids for the first tranche of acreage (comprising 18 areas) is 25 September 2003. Bids for acreage included in the second tranche (17 areas) close on 25 March 2004.

1.6 Recent trends in deepwater exploration

Release of deepwater acreage

The last decade has seen an increasing worldwide interest in deepwater exploration and production. The conditions that currently constitute deepwater exploration and development are poorly defined. As dynamically positioned drilling rigs are usually required for drilling in water depths greater than 800 m, the 800 m bathymetric contour is commonly used to define the limits of deepwater acreage. For the purpose of this publication, however, the 400 m bathymetric contour (which defines the limit of conventional steel jacket platform development), is used to define the shallow limit of deepwater drilling.

Since 1996, increasing numbers of deepwater permits have been awarded to petroleum explorers offshore Australia. In the mid to late 1990s, most of the deepwater acreage awarded to exploration companies was situated on the North West Shelf. From 1999 onwards, however, increasing numbers of permits were taken up in deepwater, frontier to immature areas of the Bight, Sorell, Gippsland, Perth, Duntroon and Otway Basins.

Although deepwater acreage has typically been awarded to large explorers, in 2000 two deepwater permits in the outer Browse Basin were awarded to a small American company (exploration permits WA-314-P and WA-315-P, Liberty Petroleum) and one to a small Canadian explorer (exploration permit WA-306-P, Antrim Energy Incorporated). At date of writing, the award of a further two deepwater permits in the Bight Basin to a small Australian explorer (release areas S02-4 and S02-5) is under consideration.

Between 1996 and 1998, a total of nine deepwater exploration permits were awarded in the Carnarvon, Browse and Roebuck Basins. Minimum guaranteed work programs (first three years of the work programs) associated with seven of these permits (78%) included at least one exploration well. In 2001 and 2002, however, of the 19 deepwater release areas either awarded as permits or under consideration for award, only four (22%) included an exploration well in the minimum guaranteed work program (Table 1.7). This recent reluctance of explorers to include a commitment well in work programs associated with deepwater immature to frontier acreage in recent releases of vacant offshore acreage is reflected in declining indicative expenditures committed to guaranteed work programs in these permits over the period 1996 to 2002.

Deepwater exploration permits either awarded or under consideration for award from the 2001 and 2002 Acreage Release Programs are shown in Table 1.7. The location of deepwater exploration acreage currently under permit is shown in Figure 1.6.

Table 1.7 Deepwater exploration permits either awarded or under consideration for award in 2001 and 2002

Release Area / Permit	Basin / Sub-basin	Water Depth Range (m)	Operator	Indicative Expenditure in Permit Years 1 to 3 (\$A)
2001				
T32-P	Sorell	<200–3000	Santos	\$2 800 000
T33-P	Sorell	<200–3000	Santos	\$2 900 000
WA-339-P	Perth / Houtman	300–3000	Santos	\$2 600 000
WA-337-P	Perth / Houtman	200–3000	Kerr McGee	\$2 400 000
WA-336-P	Perth / Houtman	500–3000	Petroz	\$2 400 000
WA-326-P	Perth / Houtman	<200–3000	AGIP	\$1 700 000
WA-328-P	Perth / Houtman	200–3000	AGIP	\$9 370 000
VIC/P50	Otway	1000–3000	Essential	\$8 070 000
VIC/P52	Otway	600–3000	Santos	\$28 600 000
EPP 31	Duntroon	<200–3000	Woodside	\$6 600 000
EPP 32	Duntroon	<200–3500	Santos	\$2 200 000
2002				
T02-1	Otway	500–3000	To be announced	
T02-2	Otway	500–3000	To be announced	
W02-7	Carnarvon / Exmouth Plateau	1200–2000	To be announced	
W02-8	Carnarvon / Exmouth Plateau	1200–1800	To be announced	
W02-10	Carnarvon / Exmouth Plateau	800–1500	To be announced	
S02-4	Bight / Ceduna	<200–1200	To be announced	
S02-5	Bight / Ceduna	<200–1200	To be announced	
WA-335-P	Carnarvon / Exmouth	600–1800	Apache	\$26 500 000

Deepwater drilling to June 2003

During the period 1991 through to June 2003, 45 deepwater exploration wells were drilled offshore Australia (Figure 1.7). These wells identified significant gas resources on the Exmouth Plateau (Chrysaor, Orthrus, Geryon, Urania, Maenad, Jansz and Io gas discoveries), a commercial oil discovery on the Sahul Platform (Corallina/Laminaria), gas discoveries in the Browse Basin (Argus and Brecknock South) and both commercial and sub-commercial oil discoveries in the Exmouth Sub-basin (Enfield, Laverda, and Stybarrow).

Over half of the deepwater exploration wells and all of the deepwater appraisal and development wells drilled offshore Australia during 2002 and the first two quarters of 2003 were located either in the Exmouth Sub-basin or on the Exmouth Plateau (Figure 1.6, Figure 1.8).

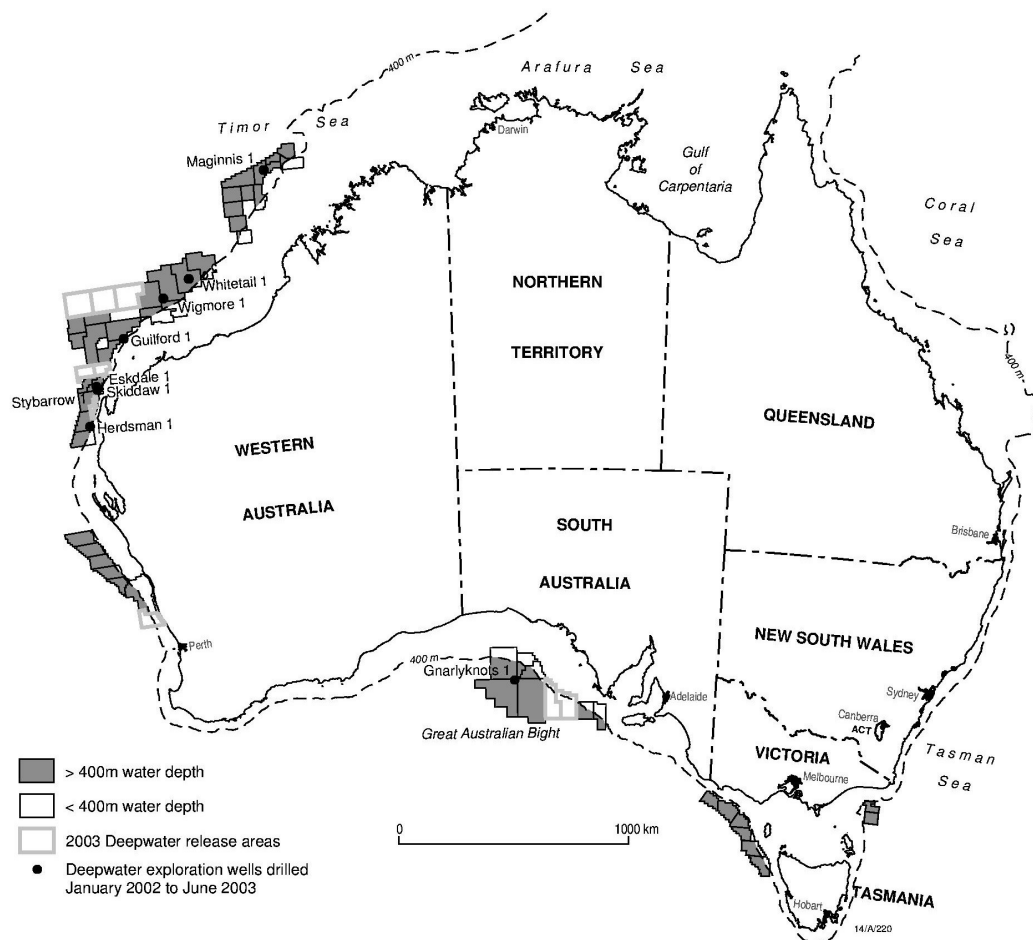


Figure 1.6 Deepwater exploration permits either awarded or under consideration for award, deepwater release areas currently on offer, and deepwater exploration wells drilled January 2002 to June 2003

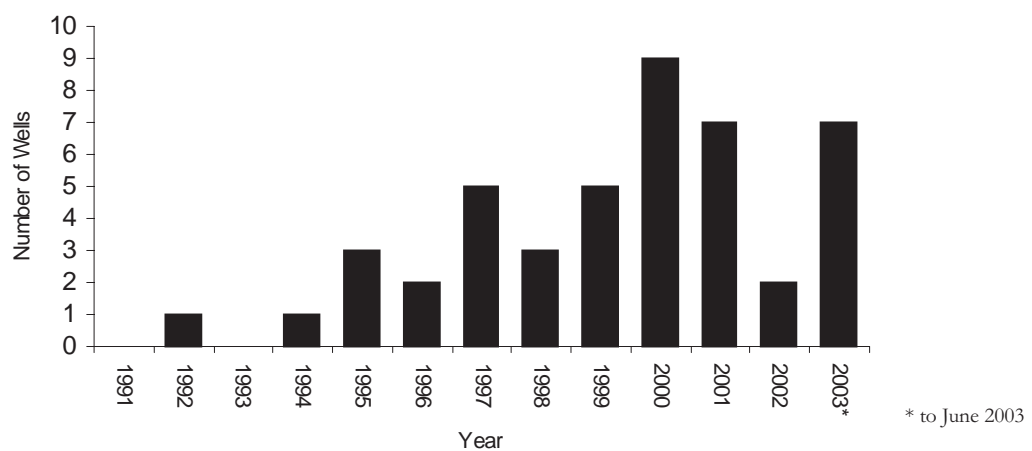


Figure 1.7 Deepwater (>400 m) exploration wells drilled offshore Australia, 1991 to June 2003

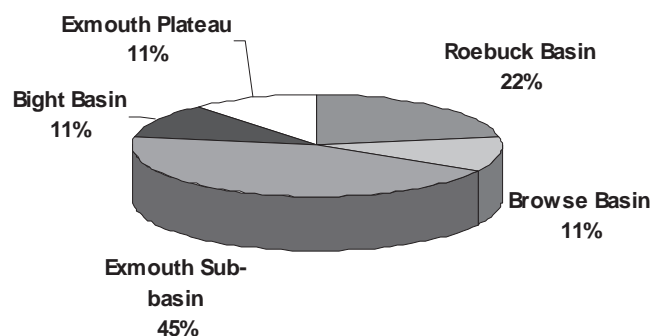


Figure 1.8 Location of deepwater (>400 m) exploration drilling, January 2002 to June 2003

The overall success rate for deepwater exploration wells drilled offshore Australia to June 2003 is around 38%. This compares favourably with the current global deepwater exploration success rate of around 30% (Pettingill & Weimer, 2001).

The high deepwater exploration success rates observed offshore Australia in 1999 and 2000 (Figure 1.9) resulted largely from successful exploration drilling undertaken by Woodside Oil Ltd, ChevronTexaco Australia Pty Ltd and Mobil Exploration and Producing Australia Pty Ltd in permits overlying the Exmouth Plateau and Exmouth Sub-basin (WA-267-P, WA-268-P and WA-271-P).

During 2002 and early 2003, however, only one deepwater exploration well was drilled on the Exmouth Plateau (Guilford 1, exploration permit WA-269-P). At time of writing, limited information is available on Guilford 1. Although petroleum does not appear to have been recovered on test from this well, a media release by the operator (Woodside Energy Ltd) inferred the presence of a 25 m gross gas column from wireline logs.

Deepwater exploration drilling in the Exmouth Sub-basin continued during 2002 and 2003 (exploration permits WA-255-P and WA-299-P) but resulted in only one further oil discovery (Stybarrow 1). The absence of further large significant discoveries in these two, predominantly deepwater sub-basins during 2002 and early 2003 has depressed exploration drilling success rates in these two years (Figure 1.9).

Deepwater appraisal and development drilling in the Exmouth Sub-basin and on the Exmouth Plateau continued during 2002 and 2003 (Table 1.8). Enfield 4 and Enfield 5 were drilled in exploration permit WA-271-P by Woodside Oil Ltd as part of a proposed commercial development of the Enfield oil field. An appraisal well (Laverda 2) was also drilled on the nearby Laverda oil discovery.

Development drilling also continued on the Laminaria oil field during this period (Laminaria 7, Laminaria 8 and Laminaria North 1). Although Laminaria lies in water depths of less than 400 m, the field is in commercial production as a joint development with the nearby Corallina oil field, which lies in water depths of around 400 m. Commercial oil

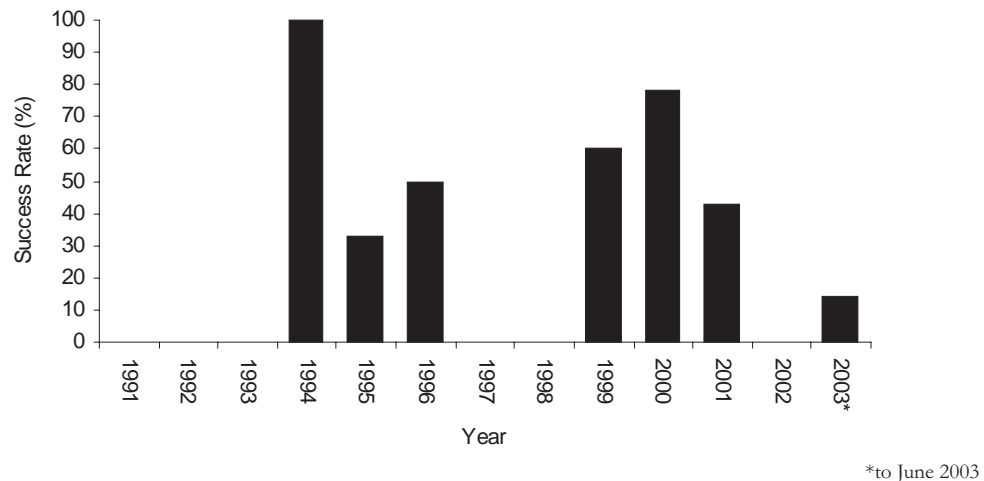


Figure 1.9 Success rates, deepwater (>400 m) exploration wells drilled offshore Australia, 1991 to June 2003

production from the joint development commenced in 1999 via sub-sea wellheads linked to flowlines and risers connected to a common FPSO facility. The FPSO is moored in water depths of around 385 m, making it Australia's deepest water oil production facility.

In October/November 2002, the drill ship *Jack Ryan* commenced a four well, deepwater drilling program offshore Australia. The first well in the program (Jansz 2) appraised the giant gas field, Jansz, which was discovered in 2000 on the Exmouth Plateau by ExxonMobil. This well was followed by Maginnis 1, which was drilled by BHP Billiton in the deepwater, outboard portion of the Browse Basin. Maginnis 1 was plugged and abandoned as a dry hole.

The *Jack Ryan* subsequently moved to the Bight Basin where the rig drilled the Gnarlyknots 1 commitment well for a Joint Venture led by Woodside Oil Ltd in exploration permit EPP 29. Gnarlyknots 1 was drilled to a depth of 4736 mRT and plugged and abandoned as a dry hole. (The Joint Venture elected not to deepen the well to the planned total depth of 5600 mRT due to deteriorating weather conditions.)

On completion of Gnarlyknots 1, the *Jack Ryan* returned to the North West Shelf to drill a further appraisal well on the Jansz gas discovery (Jansz 3). Jansz 3 flowed gas on test at a rate of 72 mmcf per day. Latest reserve estimates by Joint Venture partner ChevronTexaco indicate 20 Tcf of gas reserves may be present in the combined Io-Jansz structure.

Table 1.8 Deepwater (>400 m) wells drilled offshore Australia, 2002 to June 2003

Well Name	Operator	Title	Basin / Sub-basin	Water Depth (m)	Drilling Rig
Appraisal & Development Drilling:					
Enfield 4	Woodside	WA-271-P	Carnarvon / Exmouth	-456	Ocean Bounty
Enfield 5	Woodside	WA-271-P	Carnarvon / Exmouth	-566	Sedco 703
Laverda 2	Woodside	WA-271-P	Carnarvon / Exmouth	-807	Atwood Falcon
Stybarrow 2*	BHPBilliton	WA-255-P	Carnarvon / Exmouth	~820	Atwood Falcon
Jansz 2	ExxonMobil	WA-268-P	Carnarvon / Exmouth Plateau	-1347	Jack Ryan
Jansz 3*	ExxonMobil	WA-268-P	Carnarvon / Exmouth Plateau	-1340	Jack Ryan
Exploration Drilling:					
Wigmore 1	Kerr McGee	WA-295-P	Roebuck	-1175	Jack Ryan
Whitetail 1	Woodside	WA-296-P	Roebuck	-953	Atwood Falcon
Herdsmen 1*	Woodside	WA-299-P	Carnarvon / Exmouth	-557	Atwood Falcon
Eskdale 1*	BHPBilliton	WA-255-P	Carnarvon / Exmouth	-822	Atwood Falcon
Stybarrow 1*	BHPBilliton	WA-255-P	Carnarvon / Exmouth	-825	Atwood Falcon
Guilford 1*	Woodside	WA-269-P	Carnarvon / Exmouth Plateau	-1032	Atwood Falcon
Maginnis 1*	BHPBilliton	WA-302-P	Browse	-1304	Jack Ryan
Gnarlyknots 1*	Woodside	EPP 29	Bight	~1300	Jack Ryan
Skiddaw 1* ¹	Woodside	WA-255-P	Carnarvon / Exmouth	-780	Atwood Falcon

* Drilled during 2003.

¹ Although Skiddaw 1 was drilled as an exploration well, it is thought the well may have appraised an extension of the Laverda oil field in exploration permit WA-255-P.

References

Pettingill, H. S. and Weimer, P., 2001. Global deep water exploration: past, present and future frontiers. *21st GCSSEPM Research Conference*, pp. 1–22.

2: Identified Resources

2.1 Basin geology and petroleum potential

Sedimentary rocks ranging in age from Proterozoic to Tertiary underlie approximately 4.3 million km² of Australia's land area and 2 million km² of Australia's continental shelf. Forty-eight sedimentary basins are now recognised, 20 of which lie partly or wholly offshore (Figure 2.1).

Petroleum systems active in Australian sedimentary basins and the history of Australian petroleum discovery to date have recently been reviewed by Bradshaw and others (1999) and Longley and others (2002).

Australia's petroleum reservoirs range in age from Proterozoic to Early Tertiary. Locally, the relationship between basins can be complex (e.g. the Galilee Basin overlies the Adavale Basin and underlies the Eromanga Basin). Regions denoted as 'basement' mainly comprise areas underlain by crystalline or tightly folded and/or metamorphosed rocks which are generally unprospective for petroleum.

Most of the oil discovered in Australia to date has been found in Tertiary siliclastic sequences within the offshore Gippsland Basin. Significant oil and gas reserves have also been identified on the North West Shelf (offshore Carnarvon, Browse and Bonaparte Basins) and onshore, in the Cooper and Eromanga Basins.

Australian sedimentary basins from which petroleum has been recovered are shown in Table 2.1.

Table 2.1 Australia's petroleum reservoirs

Sedimentary Basin	Onshore / Offshore	Age of Petroleum Reservoir
Adavale	Onshore	Devonian
Amadeus	Onshore	Precambrian and Ordovician
Bass	Offshore	Tertiary
Bonaparte	Offshore	Mesozoic and Permian
Bonaparte	Onshore	Carboniferous and Devonian
Bowen	Onshore	Permian & Triassic
Browse	Offshore	Mesozoic
Canning	Onshore	Permian & Devonian
Carnarvon	Offshore	Mesozoic
Clarence-Moreton	Onshore	Jurassic
Cooper	Onshore	Permian & Triassic
Eromanga	Onshore	Cretaceous & Jurassic
Georgina	Onshore	Ordovician
Gippsland	Offshore	Tertiary
Gunnedah	Onshore	Permian & Triassic
McArthur	Onshore	Proterozoic
Otway	Offshore & Onshore	Mesozoic
Perth	Onshore	Jurassic, Triassic & Permian
Perth	Offshore	Cretaceous & Permian
Surat	Onshore	Jurassic
Sydney	Onshore	Permian & Triassic

2.2 Significant oil and gas discoveries made during 2002

Oil

Exeter

In April 2002, a joint venture led by Santos Ltd in exploration permit WA-191-P(R3) drilled Exeter 1 on the northern margin of the Dampier Sub-basin (Carnarvon Basin). The well intersected an 18 m net oil column between 3110 and 3133 mRT in the Angel Formation. (The Wanaea, Cossack and Lambert oil fields are located 15 to 35 km to the south-east and produce oil from same Angel formation reservoirs.)

In May 2002, an appraisal well (Exeter 2) was drilled 1.9 km north of the discovery well. Exeter 2 intersected the top of the reservoir approximately 40 m deeper than at Exeter 1 and encountered 9 m of net oil pay over the interval 3151–3162 mRT in good quality Angel Formation sandstones.

A further appraisal well (Exeter 3) was drilled approximately 1.6 km to the south of Exeter 1 in November/December 2002 but was plugged and abandoned after encountering oil shows.

The Exeter oil field is located in 147 m of water, 150 km north of the town of Dampier and approximately 7 km to the south-west of the Mutineer complex. (The Mutineer complex was first tested in 1997 by the Pitcairn 1 well which encountered oil in Angel Formation reservoirs. Since that time, several exploration and appraisal wells have been drilled on the Mutineer complex. These include Mutineer 1B, Mutineer 2, Mutineer 3, Norfolk 1 and Norfolk 2.)

At time of writing, combined reserves for the Exeter and Mutineer oil fields are estimated by Santos Ltd to be in the range 50 to 130 mmbbl. A joint commercial development of the Exeter and Mutineer oil fields is currently planned.

Double Island, Little Sandy, Pedirka, Hoover & Victoria

Exploration drilling in Western Australian State Waters by Apache Northwest Pty Ltd (Apache) continued during 2002. In exploration permit TP/8, located east of Barrow Island in the Carnarvon Basin, batch drilling using the *Ensco 56* jack-up rig resulted in several small commercial oil discoveries within the Flag Sandstone. These include Double Island, Little Sandy, Pedirka, Victoria and Hoover.

Gas

Casino

The most significant gas discovery in 2002 was made by Casino 1, drilled in exploration permit VIC/P44 in the offshore Otway Basin. The Casino feature and its environs are covered by the Casino 3D seismic survey which was acquired in 2001 on behalf of joint venture partners Strike Oil NL and Santos Ltd. The Casino 1 well was drilled in September 2002 by the semi-submersible drilling rig *Ocean Bounty* to test a well developed 'bright spot' identified on the 3D seismic data. Casino 1 intersected a 47 m gas column within the Waarre Formation.

In October 2002, a successful appraisal well (Casino 2) intersected a 38 m gas-filled sand in the Waarre Formation, downdip from the discovery well. A further appraisal well (Casino 3) has been proposed.

Latest reserve estimates by Strike Oil NL for Casino are in the order of 140 BCF of sales gas. At time of writing, development options for the Casino gas discovery are under consideration by the permittees of VIC/P44.

The Casino gas discovery has confirmed the presence of an active petroleum system in this part of the offshore Otway Basin and has enhanced the prospectivity of a number of additional prospects which have a seismic response similar to that present over the Casino gas field and which were delineated by the Casino 3D seismic survey.

2.3 Identified resources

Australia's identified resources are compiled from Geoscience Australia's in-house data and data provided by companies and State and Northern Territory mines departments. Information on individual accumulations is provided in the Geoscience Australia series *Australian Petroleum Accumulations*. The reserves estimates at 1 January 2002 and 1 January 2003 are presented in Tables 2.2a and 2.2b, respectively, categorised by basin. The corresponding estimates according to the McKelvey reporting system are listed in Tables 2.3a and 2.3b. Bonaparte Basin estimates include the total reserves in the JPDA with East Timor.

Initial and remaining crude oil, condensate and gas reserves, together with production, for the period 1960–2002 are shown in Figure 2.2. The overall shapes of the curves for earlier years of estimate have changed due to a review of the data for those years. Remaining

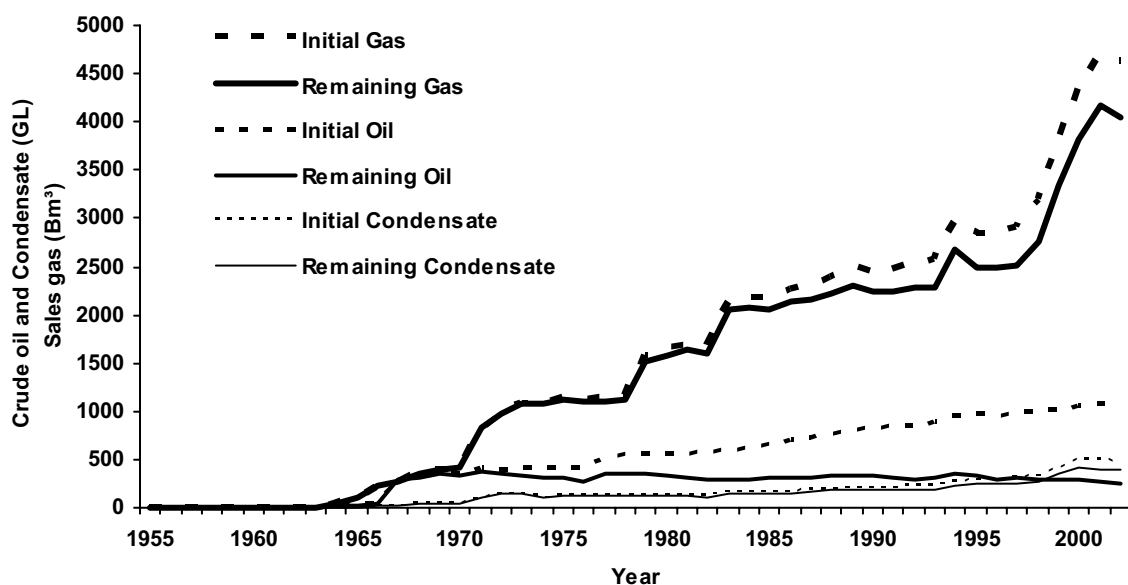


Figure 2.2 Australia's initial and remaining commercial plus non-commercial reserves of crude oil, condensate and sales gas

Table 2.2a: Petroleum reserves estimates by basin as at 1 January 2002

Category Basin	Crude oil		Condensate		LPG		Sales gas	
	GL	million barrels	GL	million barrels	GL	million barrels	Bcm	Tcf
Category 1								
Adavale	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.01
Amadeus	0.76	4.80	0.26	1.65	0.22	1.38	4.96	0.18
Bonaparte	24.96	157.01	0.00	0.00	0.00	0.00	0.17	0.01
Bowen	0.03	0.19	0.09	0.56	0.10	0.60	1.88	0.07
Canning	0.02	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Carnarvon	74.81	470.54	95.31	599.45	93.62	588.85	619.58	21.88
Cooper	1.18	7.41	5.00	31.45	7.37	46.37	63.63	2.25
Eromanga	5.59	35.19	0.11	0.70	0.02	0.10	1.06	0.04
Gippsland	53.87	338.80	16.20	101.85	28.70	180.52	150.96	5.33
Otway	0.00	0.00	0.06	0.37	0.00	0.00	1.38	0.05
Perth	0.18	1.14	0.01	0.07	0.00	0.00	2.75	0.10
Surat	0.19	1.19	0.02	0.13	0.03	0.16	0.83	0.03
TOTAL	161.60	1,016.41	117.00	736.27	130.05	817.98	847.56	29.93
PREVIOUS	171.71	1,080.40	120.82	759.97	134.47	845.80	894.15	31.58
Category 2								
Amadeus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bass	2.45	15.41	5.51	34.66	8.14	51.20	9.70	0.34
Bonaparte	13.46	84.65	94.42	593.88	66.04	415.38	701.42	24.77
Bowen	0.00	0.00	0.01	0.03	0.01	0.07	5.21	0.18
Browse	0.29	1.79	93.60	588.73	70.60	444.03	722.06	25.50
Canning	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.01
Carnarvon	74.39	467.89	86.59	544.65	96.30	605.71	1,751.08	61.84
Cooper	0.18	1.10	1.21	7.58	1.31	8.21	13.37	0.47
Eromanga	0.24	1.52	0.00	0.00	0.00	0.00	0.04	0.00
Gippsland	14.75	92.77	4.42	27.77	0.10	0.63	56.85	2.01
Gunnedah	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.01
Otway	0.00	0.00	1.64	10.32	0.00	0.00	35.87	1.27
Perth	6.36	40.00	0.00	0.00	0.00	0.00	22.50	0.79
Surat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	112.1	705.15	287.39	1,807.61	242.49	1,525.22	3,318.61	117.20
PREVIOUS	109.22	686.97	298.54	1,877.78	243.10	1,529.02	2,926.48	103.35
GRAND TOTAL	273.71	1,721.57	404.45	2,543.88	372.54	2,343.21	4,166.17	147.13
PREVIOUS TOTAL	280.99	1,767.36	419.37	2,637.75	377.57	2,374.82	3,820.65	134.93

NOTES

Category 1 comprises current reserves of those fields which have been declared commercial. It includes both proved and probable reserves.

Category 2 comprises estimates of recoverable reserves which have not yet been declared commercially viable; they may be either geologically proved or are awaiting further appraisal.

For McKelvey resource classification see Tables 2.3a and 2.3b.

"Previous" totals refer to revised estimates of remaining reserves for the previous year.

Table 2.2b: Petroleum reserves estimates by basin as at 1 January 2003

Category	Crude oil		Condensate		LPG		Sales gas	
Basin	GL	million barrels	GL	million barrels	GL	million barrels	Bcm	Tcf
Category 1								
Adavale	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.01
Amadeus	0.70	4.40	0.25	1.55	0.22	1.38	4.54	0.16
Bonaparte	13.34	83.89	0.00	0.00	0.00	0.00	0.08	0.00
Bowen	0.03	0.19	0.07	0.44	0.08	0.48	6.04	0.21
Canning	0.02	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Carnarvon	63.11	396.93	87.34	549.38	89.75	564.52	612.63	21.64
Cooper	1.00	6.30	4.05	25.49	6.44	40.50	57.02	2.01
Eromanga	5.11	32.12	0.08	0.50	0.08	0.50	0.62	0.02
Gippsland	45.12	283.80	15.00	94.35	26.80	168.57	145.86	5.15
Otway	0.00	0.00	0.03	0.16	0.00	0.00	1.08	0.04
Perth	1.68	10.54	0.00	0.02	0.00	0.00	2.64	0.09
Surat	0.15	0.94	0.02	0.09	0.02	0.12	0.71	0.03
TOTAL	130.25	819.24	106.84	671.98	123.35	776.08	831.58	29.37
PREVIOUS	161.60	1,016.41	117.00	736.27	130.05	817.98	847.56	29.93
Category 2								
Amadeus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bass	2.11	13.28	6.88	43.26	9.31	58.55	14.78	0.52
Bonaparte	13.46	84.65	94.62	595.14	62.38	392.33	683.99	24.16
Bowen	0.00	0.00	0.02	0.13	0.03	0.17	0.53	0.02
Browse	0.29	1.79	86.44	543.72	70.60	444.03	740.65	26.16
Canning	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.01
Carnarvon	76.54	481.43	83.92	527.86	86.66	545.08	1,644.46	58.07
Cooper	0.10	0.60	0.77	4.87	1.13	7.09	8.66	0.31
Eromanga	0.29	1.81	0.00	0.00	0.00	0.00	0.01	0.00
Gippsland	14.75	92.77	4.22	26.51	0.10	0.63	59.79	2.11
Gunnedah	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.01
Otway	0.00	0.00	2.06	12.93	0.00	0.00	38.83	1.37
Perth	6.36	40.00	0.00	0.00	0.00	0.00	22.50	0.79
Surat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	113.85	716.35	278.93	1,754.41	230.20	1,447.85	3,214.72	113.51
PREVIOUS	112.1	705.15	287.39	1,807.61	242.49	1,525.22	3,318.61	117.20
GRAND TOTAL	244.14	1,535.58	385.77	2,426.40	353.58	2,223.97	4,046.32	142.90
PREVIOUS TOTAL	273.71	1,721.57	404.45	2,543.88	372.54	2,343.21	4,166.17	147.13

NOTES

Category 1 comprises current reserves of those fields which have been declared commercial. It includes both proved and probable reserves.

Category 2 comprises estimates of recoverable reserves which have not yet been declared commercially viable; they may be either geologically proved or are awaiting further appraisal.

For McKelvey resource classification see Tables 2.3a and 2.3b.

"Previous" totals refer to revised estimates of remaining reserves for the previous year.

Table 2.3a: McKelvey classification estimates by basin as at 1 January 2002

Category Basin	Crude oil		Condensate		LPG		Sales gas	
	GL	million barrels	GL	million barrels	GL	million barrels	Bcm	Tcf
Economic Demonstrated Resources								
Adavale	0	0	0	0	0	0	0	0
Amadeus	1	5	0	2	0	1	5	0
Bass	2	9	1	5	1	5	3	0
Bonaparte	27	170	84	529	66	415	339	12
Bowen	0	0	0	1	0	1	2	0
Canning	0	0	0	0	0	0	0	0
Carnarvon	109	683	180	1135	190	1194	2040	72
Cooper	1	8	5	32	7	47	64	2
Eromanga	6	35	0	1	0	0	1	0
Gippsland	61	382	17	107	29	181	177	6
Otway	0	0	2	10	0	0	33	1
Perth	0	1	0	0	0	0	3	0
Surat	0	1	0	0	0	0	1	0
TOTAL	206	1295	289	1821	293	1845	2667	94
PREVIOUS	194	1222	300	1885	292	1835	2203	78
Subeconomic Demonstrated Resources								
Amadeus	0	0	0	0	0	0	0	0
Bass	1	6	5	30	7	47	7	0
Bonaparte	11	72	10	65	0	0	363	13
Bowen	0	0	0	0	0	0	5	0
Browse	0	2	94	589	71	444	722	25
Canning	0	0	0	0	0	0	0	0
Carnarvon	41	255	1	9	0	0	331	12
Cooper	0	1	1	8	1	8	13	0
Eromanga	0	2	0	0	0	0	0	0
Gippsland	8	50	4	23	0	0	30	1
Gunnedah	0	0	0	0	0	0	0	0
Otway	0	0	0	1	0	0	4	0
Perth	6	40	0	0	0	0	23	1
Surat	0	0	0	0	0	0	0	0
TOTAL	68	427	115	724	79	499	1495	53
PREVIOUS	87	546	115	749	86	540	1618	57
GRAND TOTAL	274	1722	404	2544	373	2344	4166	147
PREVIOUS TOTAL	281	1768	419	2638	378	2375	3821	135

NOTES

Economic Demonstrated Resources are resources judged to be economically extractable and for which the quantity and quality are computed partly from specific measurements, and partly from extrapolation for a reasonable distance on geological evidence.

Subeconomic Demonstrated Resources are similar to Economic Demonstrated Resources in terms of certainty of occurrence and, although considered to be potentially economic in the foreseeable future, these resources are judged to be subeconomic at present.

For traditional petroleum industry classification see Tables 2.2a and 2.2b.

"Previous" totals refer to revised estimates of resources for the previous year.

Table 2.3b: McKelvey classification estimates by basin as at 1 January 2003

Category Basin	Crude oil		Condensate		LPG		Sales gas	
	GL	million barrels	GL	million barrels	GL	million barrels	Bcm	Tcf
Economic Demonstrated Resources								
Adavale	0	0	0	0	0	0	0	0
Amadeus	1	4	0	2	0	1	5	0
Bass	1	7	2	14	2	12	8	0
Bonaparte	15	97	84	530	62	392	317	11
Bowen	0	0	0	0	0	0	6	0
Canning	0	0	0	0	0	0	0	0
Carnarvon	99	622	169	1061	176	1109	1920	68
Cooper	1	7	4	25	6	41	57	2
Eromanga	5	32	0	1	0	1	1	0
Gippsland	52	327	16	99	27	169	176	6
Otway	0	0	2	12	0	0	36	1
Perth	2	11	0	0	0	0	3	0
Surat	0	1	0	0	0	0	1	0
TOTAL	176	1108	277	1742	274	1726	2528	89
PREVIOUS	206	1295	289	1821	293	1845	2667	94
Subeconomic Demonstrated Resources								
Amadeus	0	0	0	0	0	0	0	0
Bass	1	6	5	30	7	47	7	0
Bonaparte	11	72	10	65	0	0	367	13
Bowen	0	0	0	0	0	0	1	0
Browse	0	2	86	544	71	444	741	26
Canning	0	0	0	0	0	0	0	0
Carnarvon	41	257	3	16	0	0	337	12
Cooper	0	1	1	5	1	7	9	0
Eromanga	0	2	0	0	0	0	0	0
Gippsland	8	50	4	22	0	0	30	1
Gunnedah	0	0	0	0	0	0	0	0
Otway	0	0	0	1	0	0	4	0
Perth	6	40	0	0	0	0	23	1
Surat	0	0	0	0	0	0	0	0
TOTAL	68	428	105	683	79	498	1518	54
PREVIOUS	68	427	115	724	79	499	1495	53
GRAND TOTAL	244	1536	386	2426	354	2224	4046	143
PREVIOUS TOTAL	274	1722	404	2544	373	2344	4166	147

NOTES

Economic Demonstrated Resources are resources judged to be economically extractable and for which the quantity and quality are computed partly from specific measurements, and partly from extrapolation for a reasonable distance on geological evidence.

Subeconomic Demonstrated Resources are similar to Economic Demonstrated Resources in terms of certainty of occurrence and, although considered to be potentially economic in the foreseeable future, these resources are judged to be subeconomic at present.

For traditional petroleum industry classification see Tables 2.2a and 2.2b.

"Previous" totals refer to revised estimates of resources for the previous year.

crude oil reserves are continuing to show signs of a slow decline, having remained approximately unchanged since 1970. Increases in reserves through field growth continue to dominate additions to liquid reserves. More recently, reassessment of older gas discoveries has added a significant growth component to gas reserves. These issues have been the focus of an in-house study, the preliminary results of which can be found in section 2.4.

There has been an overall reduction in both crude oil and condensate reserves for identified fields in the year to 1 January 2003. Production has been the main contributor to the decline in oil reserves while revision of recent gas discoveries has led to a small downward movement in gas and condensate reserves.

2.4 Reserves Growth

Background

It is well known that oil and gas reserves tend to increase over the life of a field. This phenomenon is known as ‘reserves growth’. It is thought to be a common source of uncertainty in production forecast estimates (Figure 2.3).

In order to quantify the reserves growth effect on US fields, in 1992 the US Geological Survey (USGS) conducted a study of US lower 48 oil and gas fields using reserves estimates from 1977 to 1991 (Attanasi and Root, 1993). In recent years, the majority of additions to Australia’s reserves have come from growth in existing fields, rather than new discoveries (Figures 2.4a and 2.4b). Geoscience Australia has applied the USGS methodology to a preliminary study of data from Australian fields in an attempt to quantify reserves growth for Australia.

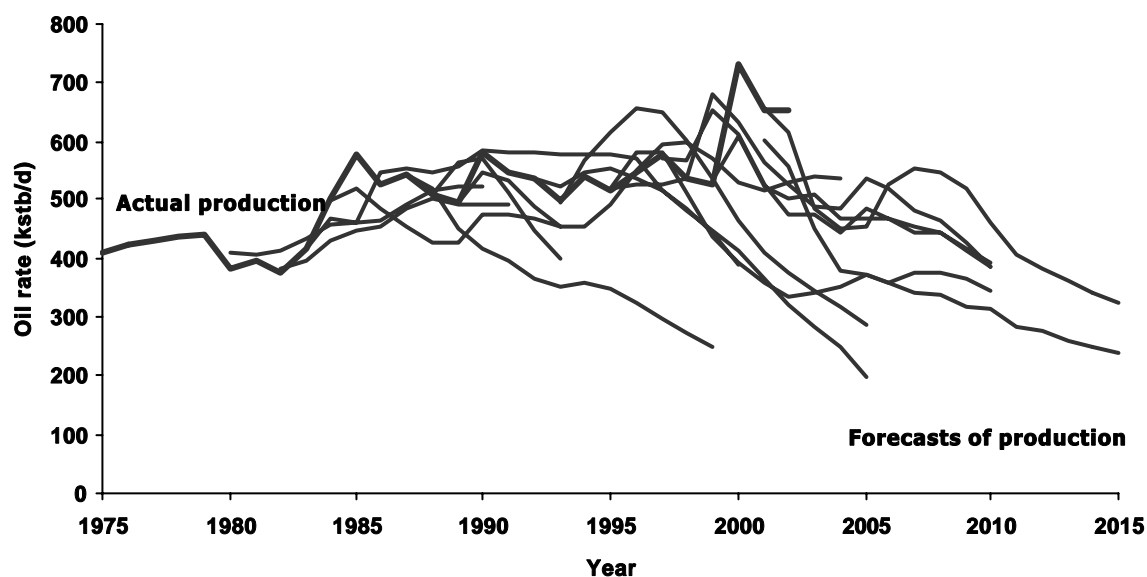
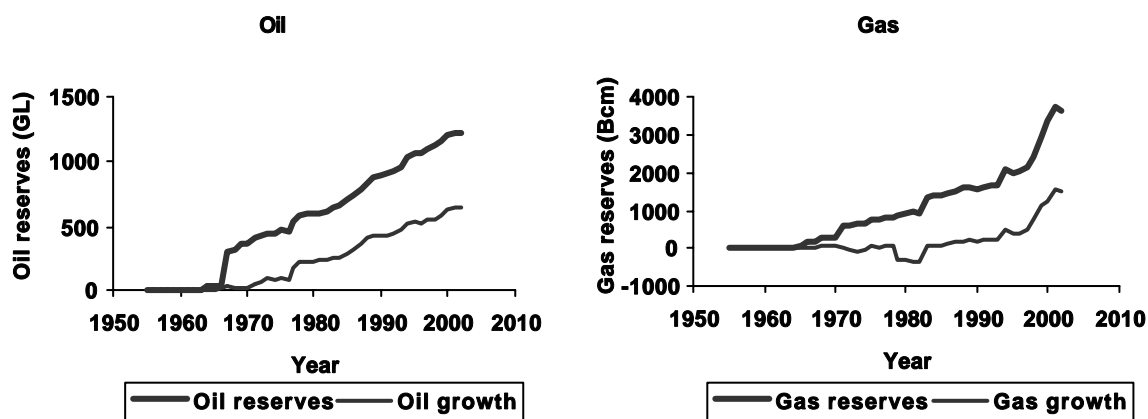


Figure 2.3 Historical average and P(50) Australian production forecasts and actual production



Figures 2.4a and 2.4b Contributions to Australian oil and gas reserves totals

Methods

The USGS methods initially divided the data into ‘oil’ and ‘gas’ fields. These were defined as those fields with a gas–oil ratio of less than, or greater than, twenty thousand cubic feet per barrel of oil plus condensate, respectively. The assumption here was that the ‘gas’ fields would contain non-associated gas. The data were further divided into ‘common’ and ‘outlier’ groups where the outlier data included those fields showing disproportionately large reserves changes. This set comprised some 10% of the total reserves. The two datasets were analysed separately. Growth functions (G) were estimated from the data with the value of the G-factor for a given year chosen by minimising the sum of squares error (Figures 2.5 and 2.6).

Irregular growth curve behaviour was observed for later years and was removed by assuming that annual percentage reserves growth would decline monotonically with time. These data were then used to ‘hindcast’ the common dataset 1991 reserves from the 1977 estimates. The errors in predictions were 2% for oil and 8% for gas. The curves were then used to estimate future reserves growth.

The USGS identified the following reasons for reserves growth associated with normal field development:

- operational experience,
- boundaries of proved areas are extended by drilling,
- new pay zones, pools, or reservoirs are found and confirmed by drilling,
- new infill wells, re-completions to other zones or well stimulation procedures contact previously inaccessible hydrocarbons, and
- introduction of a water-flood or other fluid injection programs.

The assumptions made in these reasons are that

- only reserves demonstrated by drilling are booked,
- the field comes under production,
- infill drilling occurs, and
- secondary (and/or tertiary) recovery processes are used.

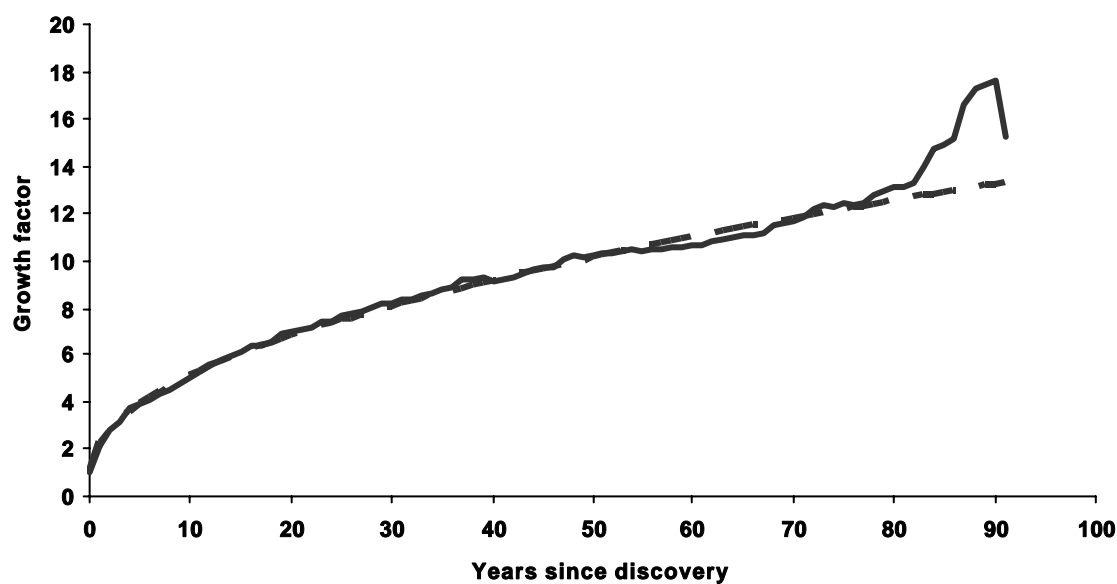


Figure 2.5 USGS G-curve for oil fields and parabolic fit

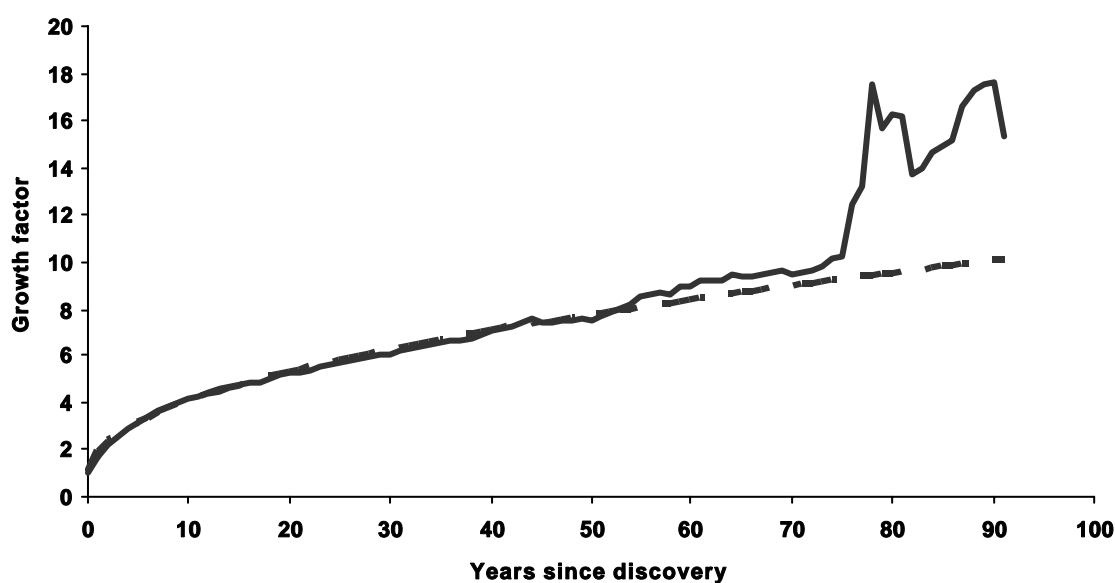


Figure 2.6 USGS G-curve for gas fields and parabolic fit

Application to Australian data

The US data covered onshore and state offshore (near-shore) lower 48 oil (26 021) and gas (19 635) fields, a total of 45 656 accumulations. In contrast, the Australian dataset is dominated by large offshore fields and totals only some 730 accumulations. Consequently, the above assumptions do not generally apply to Australian circumstances.

The US booked reserves are in the 'proven' category and must be demonstrated by drilling. This leads to a smooth progression of reserves increases as a field is delineated. In contrast, Australian data are 'proven plus probable' and can include reasonable estimates of

undrilled extensions to fields. This has led to large, step-wise increases (or decreases) in reserves estimates as geological knowledge changes or production commences. This, incidentally, has led Geoscience Australia to prefer growth estimates since startup rather than growth estimates since discovery, on the basis that they are a more accurate indicator of Australian conditions (Wright and le Poidevin, 1992) and can be the focus of further studies. Most of the US lower 48 fields are under production and the information gained from production history can be used to firm up reserves estimates. Many of the large gas fields and some oil fields discovered offshore Australia are yet to enter production, so the reserves are unconfirmed by production data. As the accumulations are offshore, well densities are typically low and there is a perception of limited economic opportunities for infill drilling. Secondary processes are uncommon as the majority of reserves are offshore and natural reservoir pressure support is good. From the outset some challenges were expected in interpreting any results for Australian data.

In the Australian context, reserves growth can occur for other reasons;

- reservoir performance is better than anticipated, and
- adjacent pools are identified.

These caveats notwithstanding, estimates were made as follows.

The Australian dataset was divided into either ‘oil’ or ‘gas’ categories, as per the USGS methodology. ‘Common’ and ‘outlier’ groups were not identified, as some of the largest fields showed step-wise growth and their removal seriously distorted the already limited dataset. Some of this step-wise growth was caused by reserves increases due to addition of large new pools to existing discoveries; it could be addressed in the estimates by considering growth by formation or pool. Otherwise the step-wise growth was due to reassessment of earlier discoveries that were previously considered to be of little interest; it seems intractable for purposes of estimate.

A G-curve was estimated for each category and the results were plotted. As these curves contain step-wise changes, their predictive power is limited, so curves of best fit were applied. To do this, a parabolic curve was fitted to the USGS data and the following equations were obtained:

$$y = 1 + \sqrt{(x / 0.6)} \quad \text{and} \quad y = 1 + \sqrt{(x / 1.1)}$$

for oil and gas, respectively, where x is the number of years since discovery and y is the growth factor for fields of that age. For the Australian dataset the parabolic curves of best fit were

$$y = 1 + \sqrt{(x / 40)} \quad \text{and} \quad y = 1 + \sqrt{(x / 14)}$$

for oil and gas (Figures 2.7 and 2.8). The fall off in G-factor in later years is due to fields progressively dropping out of the dataset rather than a reversal in reserves growth.

The difference between the US and Australian curves may be due to a property of the US dataset. Estimates were not available for US fields before 1977 so the data for the later part of the G-curve include a high proportion of large fields at high depletion. The data for the early part of the curve includes discoveries made between 1977 and 1991 totalling only 3% of the oil and 10% of the gas reserves in 1991, with no contribution from the fields producing the later part of the curve. The curve is thus made of two different datasets.



Figure 2.7 Reserves growth for Australian oil fields

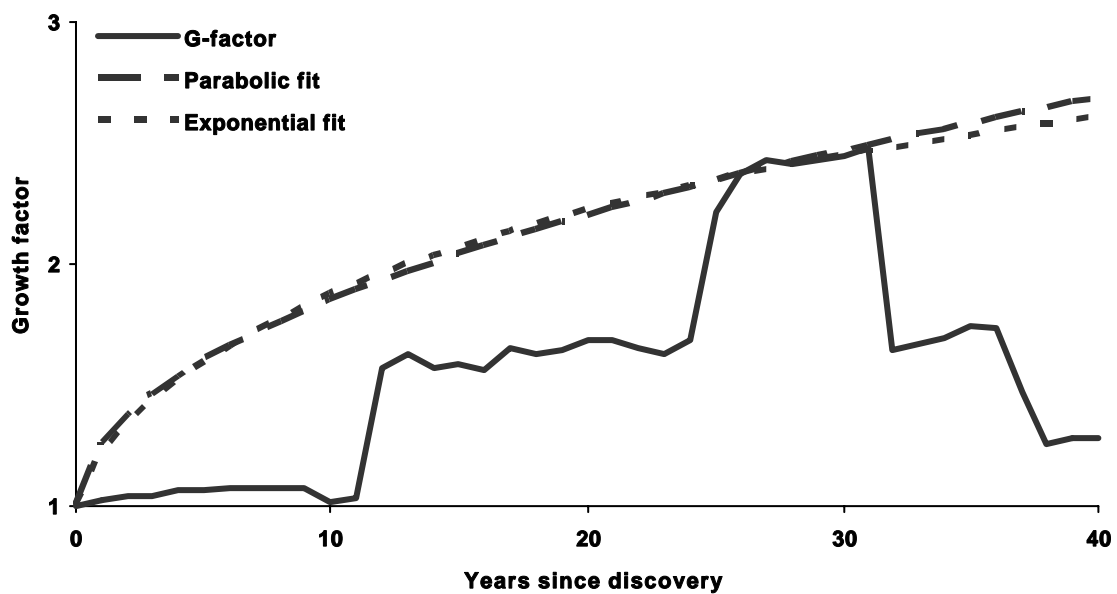


Figure 2.8 Reserves growth for Australian gas fields

One of the more obvious problems with this method is the choice of a parabolic growth function, as it does not converge to a finite limit while oil and gas fields contain finite resources. Further investigation revealed a set of growth data produced by the US Minerals Management Service (MMS) and used by the USGS in their world-wide assessment of reserves (Schmoker and Klett, 2000). In that assessment it is the MMS data that were used for Australian fields. An exponential curve was found to be a good fit to their G-curve data

and the following equation was derived for both oil and gas fields:

$$y = 1 + 3.677 (1 - e^{-0.059x}) .$$

This equation describes an exponential which reaches 90% of the final G-value of 4.677 after 35 years. Equivalent curves were generated for Australian fields, with the oil fields reaching 90% of their final G-value of 2.004 at 26 years and gas fields at 95 years for a final G-value of 3.393. In the case of gas fields, the longer period may be due to the lack of development of gas reserves and the long lead time before production of offshore gas fields (Figures 2.7 and 2.8). The Australian fitted curves are as follows:

$$y = 1 + 1.004 (1 - e^{-0.064x}) \quad \text{for oil,}$$

$$y = 1 + 2.393 (1 - e^{-0.100x^{0.654}}) \quad \text{for gas.}$$

Note that an exponent was required in the exponential term to obtain a more acceptable fit for the early years of the gas data. The Australian G-curves were then used to ‘hindcast’ to the most current reserves estimate at year’s end 2002 (Figures 2.9 and 2.10). The final year of estimate is the actual (current) reserves.

Both sets of curves have an obvious tendency to underestimate reserves in early years and inevitably converge on the current reserves (as the growth factor approaches 1 for the current year). Attempts to adjust the exponential parameters to fit the estimated growth curve to the actual growth data produced very poor fits to the G-factor curve.

Preliminary results

Finally, in order to test the predictive power of these curves, estimates of reserves growth in current fields were produced for a range of years.

Due to the open-ended nature of the parabolic curve, it is only applicable for short range estimates. In contrast, the exponential curve converges to a limit and is a more realistic description of reserves growth processes.

Further studies

As noted earlier most of the US fields are onshore and tend to enter production soon after discovery. This is not necessarily the case for Australian fields. One possible resolution to this difference in reserves history would be to estimate growth for both the pre-production period using the post-discovery data and the post-production period using post-startup data. As fields produce at different rates, a further refinement of the post-startup data would be to assess reserves growth by percentage field depletion.

It is intended that future work will include

- reserves growth from production startup,
- reserves growth by field depletion,
- growth by pool and formation, and
- application to estimates of production from undiscovered resources.

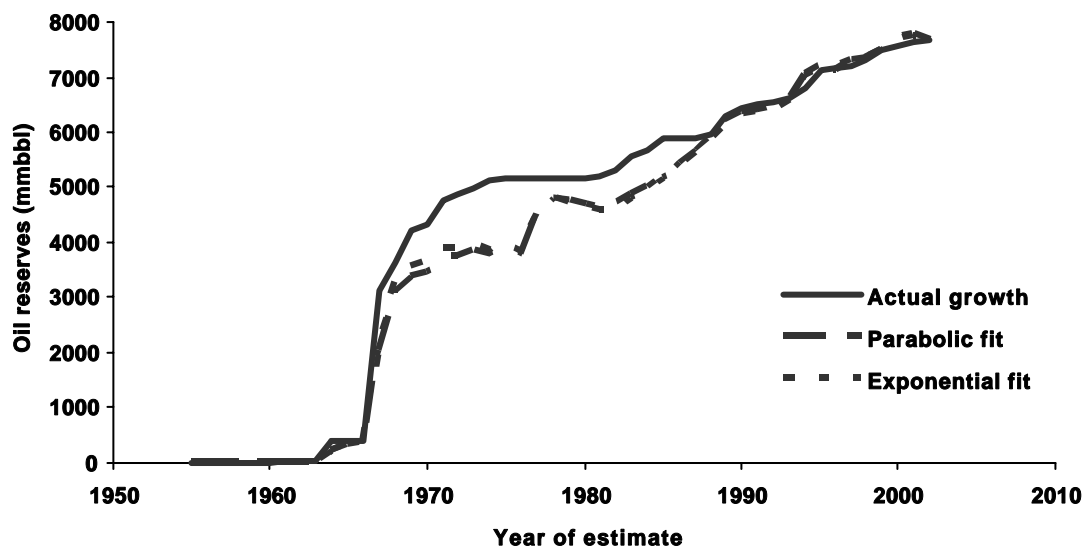


Figure 2.9 Estimates of oil reserves in 2002 — parabolic and exponential fit

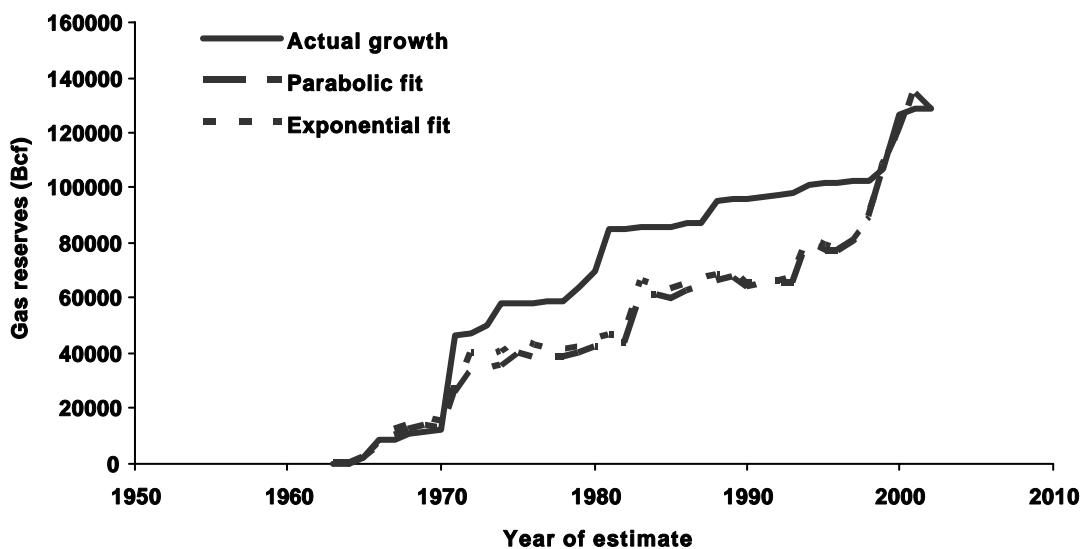


Figure 2.10 Estimates of gas reserves in 2002 — parabolic and exponential fit

Table 2.4 Reserves growth projections - parabolic and exponential fit

Year	Parabolic fit		Exponential fit	
	Oil (mmbbl)	Gas (Tcf)	Oil (mmbbl)	Gas (Tcf)
2002	7664	129	7664	129
2010	8253	140	8182	147
2020	8848	151	8551	161
2030	9364	161	8749	171
2040	9828	170	8854	178
2050	10254	178	8911	184

Geoscience Australia thanks Eve Crozier and Ian Meynink for their substantial contributions to this study. Comments on this or other reserves growth methods would be appreciated and should be directed to denis.wright@ga.gov.au.

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3: Undiscovered resources

3.1 Medium term potential of the Browse Basin

During 2002–2003, an updated assessment of the undiscovered resources of the Browse Basin has been undertaken. The results reveal that there is a medium term mean expectation for

- 46 mmbbl of oil,
- 7.6 Tcf of gas, and
- 180 mmbbl of condensate

to be discovered in the next ten to fifteen years.

The last assessment of the Browse Basin was undertaken in 1998 where the result was 391 mmbbl of oil and 3.3 Tcf of gas. There is a very significant difference between the two assessments with oil showing a reduction by about 88% and gas increasing by 130%. This variation will be discussed later.

Table 3.1 shows in more detail the results of the Browse Basin assessment.

Table 3.1 Assessment of undiscovered hydrocarbon resources in the Browse Basin

		P ₉₀	Mean	P ₁₀
Oil	Million barrels	0	46.0	150.0
	Gigalitres	0	7.3	23.9
Gas	Trillion cubic feet	0.1	7.6	19.2
	Billion cubic metres	3.8	216.1	543.3
Condensate	Million barrels	0	180.4	449.4
	Gigalitres	0	28.7	71.4

Figures 3.1 and 3.2 show the cumulative distribution plots for the oil and gas assessments respectively.

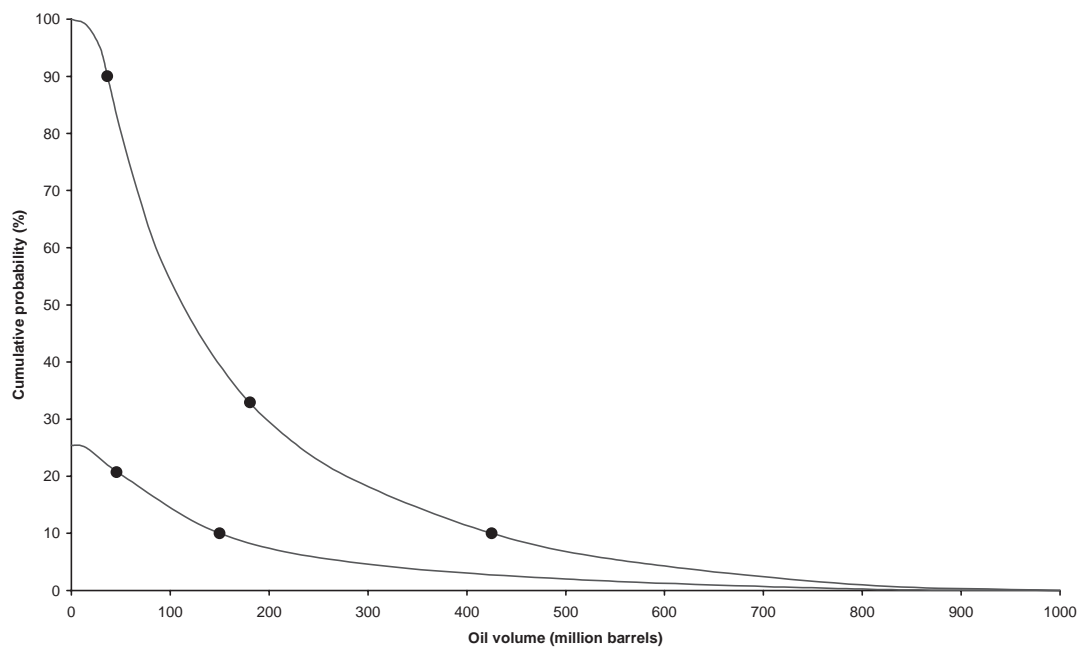


Figure 3.1 Browse Basin undiscovered oil resources

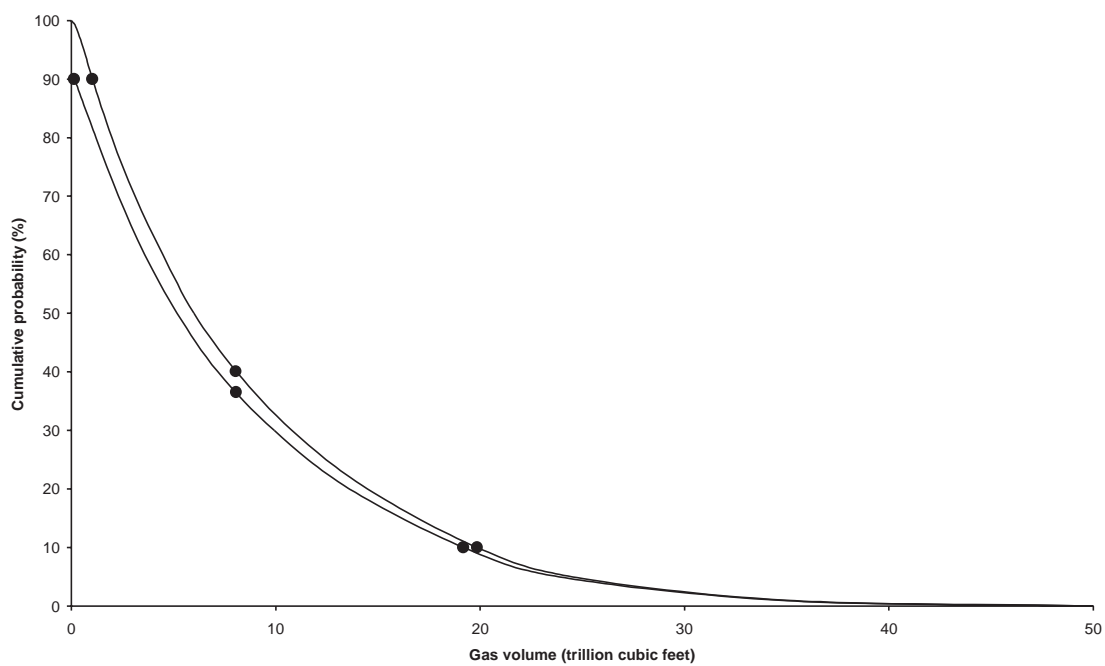


Figure 3.2 Browse Basin undiscovered gas resources

3.2 Discussion

This year's assessment has followed the AUSTPLAY methodology outlined in OGRA 2001 (Petrie and others, 2002). A total of three petroleum systems were defined: two Jurassic gas petroleum systems and a Cretaceous oil system.

The new oil assessment is significantly lower than the 1998 assessment. The older assessment was constructed during a period when there was still optimism following the discovery of oil in the Cornea field, but subsequent exploration soon downgraded this discovery. This is reflected in the latest assessment.

The gas mean expectation for the 1998 Browse Basin assessment has already been exceeded by new discoveries such as Brecknock South and Argus. For assessment purposes, the Dinichthys-1, Gorgonichthys-1 and Titanichthys-1 wells are considered to be appraisals of the Brewster gas discovery with discovered volumes attributed back to the time of the drilling of Brewster-1A.

For one of the gas petroleum systems, an alternative drilling model has also been tested. AUSTPLAY drilling models are based on historic drilling rates, but it was thought that the drilling model based on historical rates predicted too many wells to be drilled for a mature exploration play. The reduced well model resulted in no change in the oil assessment but reduced the mean expectation for gas to 4.2 Tcf and the condensate outcome to 115 mmbbl.

3.3 Ultimate Potential of the Browse Basin

In OGRA 2000 (Petrie and others, 2001), a detailed discussion was presented of the USGS World Petroleum Assessment results for the four basins assessed (USGS, 2000). The mean USGS expectation for the Browse Basin was:

- 1055 mmbbl of oil,
- 20.1 Tcf of gas,
- 934 mmbbl of condensate.

These volumes are significantly higher than the assessment conducted by Geoscience Australia but it is important to understand the reasons. The AUSTPLAY assessment is attempting to model what will be discovered in the next ten to fifteen years whereas the USGS assessment is attempting this for a thirty year period. The USGS assessment is thus aimed more at estimating an ultimate resource potential.

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4: Developments

4.1 Major new developments

Offshore

The Woollybutt oil field was put in production in March 2003 by the operator Eni Australia Limited. The floating production storage and offloading unit (FPSO) *Four Vanguard* was moored on location at the Woollybutt field on 26 April 2003. The first well, Woollybutt-2AST3, was opened for production on 29 April 2003, while the other production well in this field, Woollybutt-1ST1, was opened for production a few days later. The field's plateau production rate is expected to be 40 000 bbl/d.

The field consists of two horizontal development wells located along the crest of the anticline. Development wells were sidetracked from the suspended Woollybutt 1 and 2AST exploration wells. The wells are produced through subsea well heads and flexible flow lines to the leased FPSO *Four Vanguard*.

Expected abandonment date is between 32 and 36 months after initial production. Oil reserves are estimated to be 19.9 mmbbl at P50 level. Project cost is estimated to be US\$185 million and not to exceed US\$200 million for the life of the field.

The Woollybutt field is located approximately 80 km offshore in the Barrow Sub-basin in 100 m water depth. Nearby producing fields include East Spar, Griffin and Barrow Island. The field was discovered by Woollybutt 1, drilled in April 1997, 2 km south-west of West Barrow 1A. Woollybutt 1 intersected a 16 m oil column in Top Barrow Group sands. Woollybutt 2AST was drilled in December 1997 and encountered 9 m of hydrocarbons in the Mardie Greensand reservoir section directly above Top Barrow. Woollybutt 3A was drilled in November 1999 and encountered a 9 m column comprising both Mardie and Barrow sections at Top Barrow level and a second 7 m column about 41 m deeper.

ROC Oil is working towards the development of the Cliff Head oil field. The Cliff Head oil field was discovered at the end of 2001 in the offshore Perth Basin permit WA-286-P. The field is situated approximately 11 km off the Western Australian coastline in 16 m of water. The Cliff Head-1 well commenced drilling on 25 December 2001 and discovered a 5 m oil column in the primary objective Permian reservoir. The field was successfully appraised by three wells. On two appraisal wells the reservoir was cored and on one well a production test was conducted that flowed at stabilised rates up to 3000 BOPD using electrical submersible pump. Pre-development studies are currently underway. If the results are positive, engineering and design studies will be initiated immediately thereafter with a target date for first oil production in 2005. The envisaged development concept consists of horizontal and deviated production wells, and a shallow-water unmanned production platform connected by 15 km pipeline and power cable to onshore processing, storage and loading facilities. The reserves are estimated at 20 to 30 mmbbl.

In March 2003, Woodside Energy Ltd submitted the preliminary field development plan to the Government as a precursor to an application for a Production Licence over the Enfield oil field. The Enfield oil field is located approximately 16 km north of the Ningaloo Reef in exploration permit WA-271-P in offshore Carnarvon Basin.

Five wells have appraised the Enfield accumulation. All except Enfield 2 tested heavily biodegraded oil with an API of 22°, while a gas cap was encountered in Enfield 5. The preferred development option is via subsea wells tied back with flowlines to an FPSO with disconnectable mooring. The FPSO is planned to be positioned west of Enfield in a water depth of 550 m. Due to the proximity of the development to the Ningaloo Reef, both produced water and surplus gas will be reinjected back into the reservoir unit. Five production wells (four horizontal, one vertical), two gas injection wells, six water injection wells and provision for additional infill wells have been planned. Start up is planned for late 2006.

The P50 reserves have been assessed at 23.9 GL (150 million stb). The peak daily oil production of 12 800 kL/d (80.5 kbbbl/d) is expected in 2007. Gas production is expected to peak at 1.086 Mm³/d (38.35 million scf/d) with gas injection reaching 0.980 Mm³/d (34.6 million scf/d) which will be recycled and used as artificial lift with an estimated gas lift rate of around 0.770 Mm³/d (27.2 million scf/d) for the field life. Average water injection ranges from 13 200 kL/d (83.0 kbbbl/d) in 2007 to 13 500 kL/d (84.9 kbbbl/d) in 2020.

In June 2003, Santos Ltd submitted the preliminary field development plan to the Government as a precursor to an application for a Production Licence over the Mutineer and Exeter oil fields. The fields are located in the northern part of the Dampier Sub-basin of the Carnarvon Basin in Western Australia, within Exploration Permit WA-191-P, in water depths ranging from 140 to 160 m. The fields are approximately 150 km north of the Dampier township and 40 km north of the *Cossack Pioneer* FPSO.

The Mutineer field was appraised by seven wells (Mutineer 1B, 2 & 3, Norfolk 1 & 2, Pitcairn1 and Bounty 1) of which all except Mutineer 2 and Bounty 1 intersected oil within the J40 sandstone of the Late Jurassic Angel Formation. The Exeter field was appraised by three wells (Exeter 1, 2 & 3) of which Exeter 1 and 2 intersected oil within the J40 sandstone.

The preferred development option is via an FPSO moored between the two fields, horizontal production wells equipped with down-hole electrical pumps to provide artificial lift, and seabed multi-phase pumps at production and pumping manifolds. One production and pumping manifold will be positioned at each field. Provision is also included for water injection if necessary. Eight development wells are planned, with provision to cater for a total of up to 15 wells. All wells will be completed subsea, with production co-mingled at subsea production and pumping manifolds. Subsea flowlines will connect each of the Mutineer and Exeter production manifolds to the FPSO. The FPSO will be a disconnectable, turret-moored unit with product offloading to trading tankers via a floating hose and provision for 95 to 159 ML (600 000 to 1 000 000 bbl) of processed crude oil storage. All process separation and treatment of the Mutineer and Exeter fluids will occur onboard the FPSO. The production capacity for the FPSO will be 22 ML/d (140 000 bbl/d), with a design oil throughput of 15.9 ML/d (100 000 bbl/d).

The field life is estimated at 7 to 12 years. It is forecast that the two fields will come off the plateau production rate of 15.9 ML/d (100 000 bbl/d) after two years of production. The P50 reserves have been assessed at 18.6 GL (117 million stb).

In July 2003, OMV Australia submitted to the Government the preliminary field development plan for the Sole gas field, as a precursor to an application for a Production Licence. The Sole field is located in Retention Lease VIC/RL3 in the offshore Gippsland Basin, Victoria. The field is approximately 35 km offshore and 65 km from the existing Patricia Baleen Gas Plant. The Sole-1 discovery well was drilled in 1973. The Sole-2 appraisal well was drilled in July 2002.

The proposed development of the Sole field consists of two subsea production wells and a new connecting pipeline and umbilical control line between the wells and the existing Patricia Baleen Gas Plant. The existing Patricia Baleen Gas Plant will be extended to accommodate additional Sole gas production. A Sole field production rate up to 110 million scf/d is planned. Sole has an expected gas reserve of 227 billion scf. The production life is expected to be around 8 years. First Gas is targeted for early 2005.

Onshore

In Perth Basin, activity was concentrated on the delineation and development of the Hovea oilfield. The field was discovered by the Hovea 1 well in October 2001. The well was subsequently placed on test production, and encouraging results of this test led to the drilling of a series of appraisal and development wells. The acquisition of the Hovea 3D seismic survey was completed in 2002 to better delineate the field and the surrounding area. Four appraisal/development wells were drilled on the basis of this survey in 2002.

The development of the Hovea field facilities has proceeded in parallel with the appraisal and development drilling program. The development concept of Hovea field utilises centralised directional/horizontal production wells at the Hovea production facility to the extent operationally practicable. Produced water will be reinjected to maximise oil recovery. The production facilities have a capacity of 795 kL/d (5 kbbbl/d).

4.2 Overview of present and past offshore developments

Offshore production facilities in Australia consist of conventional fixed steel jacket production platforms, concrete gravity platforms, various types of fixed mini-platforms, floating production facilities and subsea completions. Conventional steel jacketed platforms are generally large complex structures weighing up to 50 000 t, installed in water depths of between 45 m and 125 m, with four or more 'legs' fixed to the seabed by piles and catering for wellheads. The platforms accommodate a drilling rig when necessary, processing and transportation equipment, utilities, a helipad and living quarters and, sometimes, storage facilities.

Conventional platforms operating in Australia can be conveniently divided into two generations depending on their type of construction. The first-generation platforms were constructed between 1967 and 1969 on the earliest discovered fields in Bass Strait, and consisted of tubular steel jackets with steel superstructures built onto them. Later

platforms in Bass Strait and those on the North West Shelf were constructed with modular decks, integral modular support frames, and drilled and grouted pile foundations. Remotely operated satellite platforms, generally of a different construction (e.g. single leg monotowers or mini-platforms), FPSOs and, more recently, subsea completions have resulted from the need to economically develop smaller offshore fields.

A description of current and planned offshore production facilities in Australia is given below. Locations are given in Figure 4.1.

4.2.1 Bonaparte Basin

Buffalo

The Buffalo oil field was discovered in 1996 in the Bonaparte Basin, 7 km south-east of the Laminaria East 1 well in permit WA-260-P. Field production commenced in December 1999, with peak production rates between 6360 and 7950 kL/d (40 and 50 kbbl/d). The Buffalo field is estimated to have reserves of 3.5 GL (22 mmbbl). The field development consists of an unmanned wellhead platform supporting three vertical wells producing to a nearby FPSO.

Challis and Cassini

The Challis and Cassini oil fields are located on the Australian continental shelf in 106 m water depth, approximately 280 km from the nearest mainland and 600 km west of Darwin. The field was discovered in October 1984 and production started in December 1989. The production facilities at the Challis field consist of an FPSO, a single anchor leg rigid arm mooring (SALRAM) system comprising a mooring base on the sea floor and a mooring column which is connected to the FPSO by a steel yoke, a total of 80 km of flowlines and control umbilicals connecting to the subsea wells, and eleven subsea wells (including three currently suspended wells). The FPSO is a permanently moored barge, purpose-built as floating oil production storage and offloading facility for the Challis field, and it does not have seagoing capabilities.

The mooring column is a cylindrical, welded steel structure reinforced with internal stiffeners. Its weight is 2850 t and it is ballasted with 2500 t of iron ore. It is 10.5 m in diameter and 121 m long. It has an upper, watertight section comprising nine separate compartments, and a lower section which is flooded and ballasted with iron ore. None of the compartments in the column has ever contained hydrocarbons or any liquids other than water.

The gravity base is an all-welded steel fabricated structure ballasted with iron ore and designed to penetrate the seabed to prevent any lateral movement of the mooring column. With ballast, the base weighs more than 15 000 t; it has outside dimensions of 33 m x 33 m, and a height of 24 m.

Elang/Kakatua

The Elang/Kakatua oil fields started production in July 1998. The fields are located in the Bonaparte Basin, approximately 450 km north-west of Darwin in the JPDA in the Timor

Sea. The development is by subsea completion of the existing vertical Elang 1 and 2 and Kakatua 1 wells connected to an FPSO vessel *Modoc Venture 1* (formerly the *Skua Venture*) moored over the Elang field. Export of crude is via shuttle tankers. The reserves are estimated at 2.7 GL (17 mmbbl), while peak production is expected to reach 5250 kL/d (33 kbbbl/d). The Kakatua North development involved subsea completion of the Kakatua North 1 discovery well and tie-in to the Elang/Kakatua development through a 12 km pipeline. The Kakatua North field reserves have been estimated at 1.9 MCM (12 mmbbl). Production from the Kakatua North field started in December 1998.

Jabiru

The Jabiru oil field was brought on stream in August 1986 following installation of the FPSO using a converted tanker, the *Jabiru Venture*, of approximately 140 000 t moored on a single point system of catenary design. Oil and associated gas are produced from subsea completed wells via flowlines to the mooring system and thence to the tanker where the oil is stabilised and stored. A connect/disconnect system is incorporated into the facility to allow the tanker, and elements of the mooring system, to disengage in the event that the system loads exceed preset criteria, or upon warning of an approaching cyclone. Rapid reconnection is possible. The FPSO is located in approximately 119 m of water and 900 m from the Jabiru 1A subsea wellhead. Crude oil is transferred from the FPSO to a shuttle tanker moored in tandem.

Laminaria/Corallina

The Laminaria oil field is located offshore in permit AC/P8, in the Territory of Ashmore and Cartier Islands area, in the Timor Sea just outside the JPDA, approximately 550 km west-north-west of Darwin. The field was discovered in October 1994 when the Laminaria 1 exploration well encountered a 52 m hydrocarbon column in a water depth of 361 m. Further drilling and wireline logging extended the depth of the oil column to 102 m.

The Corallina oil field is located offshore 10 km north-west of Laminaria 1 within permit AC/P8. The field was discovered in December 1995 when the Corallina 1 exploration well encountered a 77 m oil column.

Due to the close proximity of the Laminaria and Corallina fields, the operator undertook a joint development of the fields using a system of subsea wellheads linked through flowlines and risers to a common FPSO facility, permanently moored to an internal turret mooring system. Production from the Laminaria field and the adjacent Corallina field commenced in November 1999. The FPSO, *Northern Endeavour*, is moored in a water depth of about 385 m, making it Australia's deepest offshore site for an oil production facility. This water depth required the development of diverless subsea systems. The internal turret system includes provision for future risers and riser tubes, as well as future piping arrangements, thereby allowing other fields to be linked to the development at a later stage. The FPSO has a production capacity of 27 000 kL/d (170 kbbbl/d) and a storage capacity of 0.22 GL (1.4 mmbbl).

The combined reserves have been estimated at 39.7 GL (250 mmbbl). The peak production rate from the two fields is expected to be up to 27 000 kL/d (170 kbbbl/d). A production life of about 14 years is expected. The combined development is estimated to cost between A\$1.275 billion and A\$1.325 billion.

Skua

Skua oil and gas field, located in the Vulcan Sub-basin of the Timor Sea, was discovered in 1985. The field was developed by the FPSO facility. Oil production commenced in December 1991 and continued for a little over five years until production ceased in January 1997 after recovering 3.2 GL (20.2 mmbbl) of oil from the three producing wells. The field was still producing at 300 kL/d (1.9 kbbbl/d) when production was shut-in on 30 January 1997.

4.2.2 Carnarvon Basin

Agincourt

The Agincourt oil field is within the Harriet production licence area, 10 km south-west of the Harriet field and 4 km west of Rosette field. The field was developed by one subsea completed horizontal well and an unmanned offshore monopod which is tied back to the existing processing facilities on Varanus Island through a 150 mm diameter 6.5 km long pipeline.

Bambra

The Bambra gas and oil field is in close proximity to Varanus Island. A seapole has been installed at the Bambra 3 gas well, but this has not yet been connected for production because sufficient gas reserves were available from the Sinbad, Rosette and Campbell gas fields.

Campbell

The Campbell gas field is situated 40 km north-east of Barrow Island in water 39 m deep. The field is produced via a monopod facility to the Harriet gas-gathering facilities on Varanus Island, and from there the gas goes to the Dampier–Perth gas pipeline.

Chervil

The Chervil oil field is in close proximity to Airlie Island (7 km) and was developed by using the existing North Herald/South Pepper storage and loading facilities on the island and setting a small caisson-type platform next to the existing Chervil 4 well. The platform supports two production wells, header manifolds, remotely operated well control equipment, gas lift lines, flowline risers and helideck. The produced fluids from the wells are commingled on the platform and shipped to the Airlie Island processing facilities through a 200 mm diameter pipeline.

Cowle

The Cowle oil field is situated 70 km south-west of Barrow Island in 12 m water depth. The Cowle accumulation was developed by two production wells and a monopod

unmanned offshore structure for well support and protection. The discovery well, Cowle 1, was re-entered and completed as a vertical production well. The production well, Cowle 2, was drilled 1054 m horizontally into the reservoir in a south-west direction. The installation method for the structure was similar to that used for the Yammaderry monopod. Cowle wells are producing directly to the Thevenard Island processing facilities through a single 203 mm diameter product line.

East Spar

The East Spar gas condensate field is located 40 km west-north-west of Barrow Island in 98 m of water. The field was discovered on 7 April 1993 and commenced production in November 1996.

The East Spar development comprises Australia's first fully-automated subsea gas-gathering system operated via an unmanned navigation control and communication (NCC) buoy. The concept of controlling an entire subsea facility via an unmanned buoy is a world first. The buoy controls the operation of the subsea facility via electrohydraulic umbilicals which connect it to all control and monitoring devices on the subsea components. The buoy also provides:

- electrical and hydraulic power to activate the control devices;
- a telemetry communication system allowing remote control of the offshore facilities from a computerised master control system on Varanus Island via radio and satellite links; and
- chemical storage for corrosion and hydrate inhibitors which are injected via subsea umbilicals into the wellheads.

The submerged main body of the buoy is a 7.5 m diameter tube split into five deck levels:

- Level 1 (uppermost) contains control system electronics and communications equipment;
- Level 2 contains diesel power generation;
- Level 3 contains a battery system and hydraulic power units for subsea control;
- Level 4 is entirely sealed as chemical and diesel storage tanks; and
- Level 5 contains a pump room for chemical injection.

The buoy is attached to a gravity base on the seabed by tensioned tethers and is secured using a fabricated steel box filled with 2220 t of iron ore ballast. Gas and condensate from the East Spar field are produced from two subsea wells (East Spar 1 and 3) and conveyed to a subsea manifold through 1.8 km of 150 mm flexible flowlines after cooling in subsea heat exchangers. Provision for the tie-in of up to two further East Spar subsea wells and a future pipeline from another field is included in the manifold design. The combined wet gas production fluid is transported from the subsea manifold through a 356 mm, 62.5 km carbon steel pipeline to new processing facilities on Varanus Island.

In November 1996, two 3.14 MCM/d (110 million scf/d) gas processing trains were commissioned immediately adjacent to the two existing 1.57 MCM/d (55 million scf/d) trains used by the Harriet Joint Venture on Varanus Island. The two trains provide significant back-up capabilities for gas supply contracts held by the two joint ventures. The

processing trains remove condensate, water and other minor impurities from the East Spar gas, conditioning it to Alinta Gas transmission pipeline specifications. The treated gas is then transported to the mainland through the existing 324 mm, 100 km sales gas pipeline and sold to customers on both the Dampier to Bunbury pipeline and the Goldfields Gas Transmission pipeline. The condensate is exported from Varanus Island by tanker.

Goodwyn

The Goodwyn gas field is situated 145 km north-west of Dampier and 23 km south-west of the North Rankin platform in 126 m water depth. The Goodwyn field is being developed by a conventional fixed steel offshore platform and production wells drilled directionally into the reservoir from the platform. The platform has been built with a capacity for 26 wells. The Goodwyn A platform is connected by a subsea pipeline with the North Rankin A platform. The produced gas and condensate are shipped from the Goodwyn A platform to the onshore processing and storage facilities at Burrup Peninsula, via the North Rankin A platform.

The 18 000 t, eight-leg platform jacket was launched in October 1992. The Goodwyn A platform installation and commissioning were completed on 4 February 1995.

Griffin/Chinook/Scindian

Griffin and Chinook/Scindian oil and gas fields are located about 68 km north-west of Onslow. The Chinook/Scindian field was discovered in August 1989, while the Griffin field was discovered in March 1990.

The development of the Griffin area fields uses a 100 000 t double-hulled FPSO — *Griffin Venture* — and a disconnectable mooring and production system. The *Griffin Venture* and its mooring riser are configured to accommodate a total of 11 wells. The field development features subsea completions for horizontally drilled wells, designed to achieve improved reservoir drainage, and permanent downhole pressure gauges to monitor reservoir pressure during production. All production from the Griffin area fields utilises subsea well completions at the seabed, linked back by flowlines to the centrally located FPSO facility. The FPSO vessel and its mooring riser are configured to accommodate a total of 11 wells with initial production from nine wells. Oil from the FPSO vessel is pumped to moored offtake tankers through a floating hose system. Associated gas is exported via a subsea pipeline to the Griffin gas plant.

First oil production from the Griffin field commenced on 16 January 1994, with production from Scindian commencing in March 1994 and Chinook coming on-stream in January 1995. Peak oil production capacity is 12 700 kL/d (80 kbbl/d).

The Griffin area fields contain an estimated 2.14 BCM (76 BCF) of natural gas reserves, associated with the oil. This gas is either sold into the domestic gas pipeline system, injected into the Tubridgi field, or used as fuel on the *Griffin Venture*, except when safety dictates that flaring is necessary.

The *Griffin Venture* was the first FPSO vessel in Australia to export gas to shore, via a pipeline to onshore processing facilities. Located about 30 km south-west of Onslow, the

Griffin Gas Plant commenced full processing operations in November 1994. Up to 1 MCM (37 million scf) of gas per day is produced from the *Griffin Venture*. This gas is transported to shore through a 200 mm 68 km pipeline and is processed at the plant to meet sales gas specification standards. Unwanted inert gases such as nitrogen and carbon dioxide and other contaminants are removed and the LPG component of up to 68 t/d (824 bbl/d) is separated and piped 24 km to a loading terminal. The LPG is sold into the domestic market. Sales gas is metered and sold to the Tubridgi joint venture participants, who deliver it into the Dampier to Bunbury natural gas pipeline, through a 250 mm diameter feed pipeline that is approximately 90 km long. In 1997, the Griffin gas plant began processing third-party gas sourced from the Thevenard and Tubridgi permit areas.

Harriet

The Harriet oil and gas field is situated 20 km north-east of Barrow Island and 120 km west of Dampier in 23 m water depth. The Harriet field was developed by one conventional eight-leg platform with the processing plant on deck (Harriet A) and two satellite monopods (Harriet B and C) feeding back via the A platform to storage facilities on nearby Varanus Island. The Harriet A platform is totally self-contained, with all power generation, production facilities, oil shipping facilities, helideck and emergency personnel amenities on board. The production facilities on the Harriet A platform consist of well manifolds, a three-stage production separation train and a three-phase test separator.

While the Harriet A platform and Varanus Island facilities were under construction, further drilling proved a northern extension to the field. Two satellite unmanned monopods (B and C), supporting three production wells each, were subsequently constructed and installed. The monopods were originally equipped with two-phase separation facilities. Separated liquid and gas are transported through separate lines to the Harriet A platform. Each monopod is also connected to the Harriet A platform with a 168 mm line in gas lift service. In 1991 the separator on Harriet B platform was converted to three-phase service and a hydrocyclone was installed to increase water handling capacity. Produced water from Harriet B is released into the ocean after processing.

Lambert/Hermes

Production from the Lambert/Hermes oil field commenced in October 1997. The field was discovered in November 1973 at Lambert 1 well, but was considered uneconomic at that time. In 1994 a 3D seismic survey was carried out over the Lambert discovery and it identified that the field has two culminations separated by a saddle. Lambert 1 well is located on the southern lobe. The existence of oil in the northern lobe, which was later named Hermes, had to be proved by drilling. The Lambert 2 well, which was spudded in January 1996, confirmed the existence of oil in the northern lobe and, consequently, sufficient reserves to make development economic. The development consists of three subsea wells tied back to the *Cossack Pioneer* FPSO via the subsea manifold and a 15 km flexible flowline.

North Herald/South Pepper

The North Herald and South Pepper fields are situated 53 km north of Onslow and 30 km south of Barrow Island. The fields were abandoned in November 1997.

The North Herald field is in 16 m water depth. The field was developed by a single well monopod and one production well drilled horizontally into the reservoir. The well was connected by a 150 mm diameter flowline and 75 mm diameter gas lift line via the South Pepper platform to the production facility on board the jack-up rig *Vicksburg* located over the South Pepper structure. The drilling rig *Vicksburg* is a slotted type jack-up, which was able to be positioned above the North Herald and South Pepper jacket structures, as these structures were specifically designed to accommodate the rig slot configuration. The rig was used to install the North Herald monopod and to drill the production well. The North Herald structure supported only one conductor and wellhead. The 80 t jacket supported the 5 m x 4 m wellhead access deck. The upper level of the deck structure allowed wireline equipment to be delivered by helicopter sling drop.

The South Pepper field is in 17 m water depth. The field was developed jointly with North Herald as a single project. The development concept was similar to that of North Herald, using a small unmanned offshore structure which supported four production wells and four subsea completed wells, producing to facilities on board the jack-up rig *Vicksburg*. The 115 t South Pepper jacket consisted of a tripod structure containing a central column which extended below the mudline to act as a pile.

Three external pin piles were attached to the jacket through grouted sleeve connections. One conductor and all pipeline risers were contained within the central pile. A deck structure provided access to the wellheads from the *Vicksburg*. South Pepper crude oil was commingled on the platform with North Herald crude oil and was then piped to the processing facilities on the *Vicksburg* for separation and shipment to Airlie Island for storage and distribution to refineries.

North Rankin

The North Rankin gas field is situated 134 km north-west of Dampier in 125 m of water. The North Rankin field was developed by a conventional fixed steel offshore platform and production wells drilled directionally into the reservoir from the platform. On the platform, streams from the producing wells are gathered, condensate and gas are separated, gas is dehydrated and both phases are shipped to shore in a two-phase 1016 mm diameter 134 km long pipeline. Further processing and distribution of sales products take place in the onshore gas plant and shipping facilities at Burrup Peninsula, 30 km from the town of Karratha. Produced gas was formerly partly reinjected into the reservoir for accelerated condensate recovery.

The North Rankin A platform jacket has an eight-leg, 32-pile design, with a separate three-leg, six-pile flare support jacket, and a bridge between platform and flare. The platform weight, including piles, is 54 000 t. The flare support weighs 3130 t. Piles are driven 120 m into the sea bed. Twenty modules were installed on the platform. The average weight of each module is 800 t. The platform is equipped with a drilling rig which allows concurrent production and drilling or workover. The top of the derrick is 90 m above sea level. The platform dimensions are 83 m x 67 m at the sea bed and 60 m x 38 m at the top. The

accommodation has capacity for 118 permanent and 96 temporary personnel. The two-phase pipeline to shore has a maximum capacity of 46.7 MCM/d (1.65 billion scf/d). The pipeline maximum design pressure is 13 100 kPa (1900 psi).

Roller/Skate

The Roller/Skate oil development incorporates six horizontal production wells linked to three unmanned steel monopods over the Roller field, and two horizontal wells producing through a single unmanned steel monopod at Skate. A gas injection well is also operated from the Skate monopod.

The Roller field is located offshore 20 km north-west of Onslow and 20 km south-west of Thevenard Island. The field was discovered in January 1990. In May 1994, first oil production commenced from the Roller C monopod, while the Roller A and B monopods commenced production in June 1994. The Skate field is located 2 km north-east of the Roller field and 13 km south of Thevenard Island. The field was discovered in October 1991 and commenced oil production in July 1994.

A 508 mm, 27 km three-phase production pipeline transports commingled oil from the Roller and Skate fields, together with associated gas and water, to existing separation, storage and load-out facilities located on Thevenard Island, where it is blended with oil from the Saladin/Yammaderry, Crest and Cowle fields.

The existing facilities on Thevenard Island were originally capable of processing up to 14 300 kL/d (90 000 bbl/d) of fluid. To handle the increased production from the Roller/Skate fields, a third gas turbine generator, a gas treatment plant, a 55 kL (346 bbl) capacity slug catcher/separator vessel and two additional gas compression units were integrated with existing facilities. The upgraded Thevenard facilities are capable of handling up to 19 078 kL/d (120 000 bbl/d) of mixed oil/water fluid production.

Associated gas from the Roller/Skate fields is conditioned and compressed at Thevenard Island. The Roller/Skate associated gas reserves were sufficient to justify development of a gas-gathering project involving associated gas from the Saladin, Crest, Yammaderry and Cowle oil fields. Gas from the six fields is transported through a 150 mm, 44 km gas export line extending from Thevenard Island to the mainland via each of the Roller and Skate monopods, and then overland to the Tubridgi gas field facilities.

Commissioning of the gas-gathering system was completed in November 1994 and gas from Thevenard Island is being delivered into Tubridgi at a maximum rate of 0.52 MCM/d (18.5 million scf/d). The bulk of the gas is transported via the onshore Tubridgi pipeline lateral and the Dampier–Bunbury pipeline to the Dongara and Mondarra fields in the Perth Basin. The gas is then transferred into the Parmelia pipeline for direct sale or injection into the Dongara and Mondarra reservoirs for storage.

Saladin/Yammaderry

The Saladin/Yammaderry oil field is situated 70 km south-west of Barrow Island in 16 m water depth. The Saladin area has been developed by three unmanned platforms: A, B and C. Each of the platforms is a three-leg, three-well-slots steel structure with a double deck topside. Bi-level boat landings and a helicopter deck are installed on each platform. The

platforms were positioned over the Saladin 1, 2 and 7 wells that had been drilled previously. In addition, one directional well, Saladin 8, was drilled from the Saladin A platform. Three wells, Saladin 4, 5 and 6, were drilled from Thevenard Island and deviated into the reservoir area drilled. In addition, one directional well, Saladin 8, was drilled from the Saladin A platform. Three wells, Saladin 4, 5 and 6, were also drilled from Thevenard Island and deviated into the reservoir area that lay beneath the environmentally sensitive Thevenard Island shoal. Production from each offshore platform and onshore well is transported by pipeline to separation and stabilisation facilities on Thevenard Island.

The Yammaderry area was developed by a single horizontal well (Yammaderry 2) drilled to a horizontal length of 704 m to the south-west. The well was completed with a wellhead above the water level by an unmanned offshore monopod which protects and supports the well. A jack-up drilling rig was used to drill the caisson hole, lift the monopod substructure from the transportation vessel and grout the monopod substructure in place. The production well was then drilled and completed through the substructure. The monopod topside was then installed over the completed well. Yammaderry well is producing through a 2 km, 152 mm line to Saladin C platform, where the product is mixed with that of the Saladin 7 well and fed into the 203 mm diameter product line running to the Thevenard Island processing facility.

Sinbad

The Sinbad gas field is situated 30 km north-east of Barrow Island in 37 m water depth. The Sinbad field is produced via monopod facility to the Harriet gas-gathering facilities on Varanus Island.

Stag

The Stag field is located in 46 m of water, 30 km north-west of Dampier. The field's oil reserves have been estimated at 7 GL (44 mmbbl). The field was developed by a fixed production platform consisting of a six-leg piled jacket, topsides and full production facilities. Oil is exported from the production platform through a subsea flow line connected via a mooring buoy to a dedicated storage tanker about 2 km away and offloaded to export tankers. The platform oil-processing capacity is 7950 kL/d (50 kbbl/d). The platform is equipped with a workover rig and has accommodation for 50 people. The reservoir was developed by eight horizontal production wells and four water injection wells. The production wells are equipped with subsurface electric pumps.

Talisman

The Talisman oil field is situated 127 km north of Dampier in 89 m water depth. Initially the Talisman field was developed by one subsea well (the discovery well Talisman 1) producing into an FPSO. In 1990, a second well, Talisman 7, was connected and put into production. Bluewater Offshore Production Systems NV was contracted to provide the FPSO, the Acqua Blu, a 70 000 t tanker which had been converted to FPSO service in 1985. A 152 mm diameter flexible flowline and an eight-path hydraulic control umbilical were laid from the buoy across a buoyancy tank/clump weight arrangement to the

Talisman wellheads. Production was terminated in August 1992 and the facilities were later decommissioned.

Wanaea/Cossack

The Wanaea/Cossack oil discoveries lie in 80 m of water, approximately 130 km north of Dampier. They were discovered in June 1989 and January 1990, respectively. The two fields have a production life of about 25 years based on combined oil ultimate recovery of 39.7 GL (250 mmbbl) of which 29.2 GL (184 mmbbl) is at Wanaea and 10.5 GL (66 mmbbl) at Cossack.

First oil production from the Wanaea/Cossack development commenced on 17 November 1995, and was the first oil production from the North West Shelf Project. The two fields reached full production capacity of 18 280 kL/d (115 kbbbl/d) a week after start-up.

Development of Wanaea/Cossack uses the 150 000 t *Cossack Pioneer*, a former crude oil tanker converted for use as an FPSO facility. The conversion involved a total overhaul of all onboard systems, installation of both steam-driven and gas-fired turbine generators to a total of 28 MW, a helideck, flare tower, rigid arm for connection to the mooring system, central control room, refurbishment of the accommodation area and repainting of the ship. In addition, six process modules, and two structural support modules, weighing 1600 t, were installed on the upper deck of the FPSO vessel. The process facilities separate the produced fluids from Wanaea/Cossack into oil, water and gas, and the stabilised oil is stored in the FPSO vessel's tanks, which are capable of holding up to 183 000 kL (1.15 million bbl) of oil. The oil is then offloaded by a flexible hose to shuttle tankers moored astern of the FPSO vessel. The *Cossack Pioneer* is moored over Wanaea field by its bow to a disconnectable riser turret mooring (RTM). The RTM consists of a 1900 t riser column which is held in position by eight 108 mm chain anchors connected to a gravity box. In the event of a cyclone or severe storm, production is closed in and the FPSO vessel disconnects and leaves the area, reconnecting when the storm has passed. Five subsea completion production wells on Wanaea and one horizontal production well on Cossack are connected through 40 km of flexible flowlines to four subsea manifolds from which the crude oil flows to the RTM for processing onboard the *Cossack Pioneer*. At a later stage, additional Wanaea and/or Cossack wells may be added to increase production. In August 1997 the Lambert 3 well in the Lambert/Hermes oil field was tied back to the FPSO through a 15 km flowline connected to the Wanaea 3 manifold. Production commenced at a rate of 1270 kL/d (8 kbbbl/d), and has since been increased to around 2540 kL/d (16 kbbbl/d). Further development of neighbouring fields would extend the life of the FPSO and/or delay the natural decline in production levels as the Wanaea/Cossack reserves are drained.

Wandoo

The Wandoo oil field is located 75 km offshore northwest of Karratha. The field was discovered in June 1991 and commenced production under an extended production test from Wandoo A platform on 17 October 1993 at initial rates of up to 1270 m³/d (8 kbbbl/d) from one well. First oil from the Wandoo B platform flowed on 10 March 1997.

The Wandoo A platform now makes up part of the Wandoo full field development. The platform consists of a single column monopod wellhead platform supporting a deck and five production wells.

The Wandoo B platform was installed to the north-east of the Wandoo A platform. A concrete gravity structure (CGS), capable of holding 63 600 m³ (400 kbbl) of crude oil, was positioned on the seabed in October 1996. The Wandoo B platform is the first seabed-based oil storage system to be used in Australia. The platform consists of 10 horizontal oil production wells, and one gas injection well and processing facilities. The processing facilities are capable of handling up to 19 000 m³/d (120 kbbl/d) of total fluid. This fluid handling capacity is required as it is expected that a significant amount of water will be produced from the field.

The fluid produced from the Wandoo A monopod platform is piped to the topside processing facilities where it is processed along with the fluid produced from the Wandoo B platform. The oil is stored in the CGS and then offloaded through two 348 mm flexible pipelines to a loading buoy located 1.2 km north of Wandoo B. A floating hose is used in transferring the oil from the loading buoy to export tankers at a mooring facility.

Wonnich

The Wonnich gas and oil field, discovered in August 1995, started production on 3 July 1999. The field is located 25 km north-west of Varanus Island in 30 m water depth. The field was developed with a simple tripod structure from which the untreated well stream is transferred to Varanus island via twin 200 mm pipelines. The pipelines and new facilities on the island were completed in February 1999.

4.2.3 Gippsland Basin

Early platforms in the Gippsland Basin were conventional fixed steel jackets as described above. The later platforms of Mackerel through to Whiting were constructed using modular decks, module support frames and grouted pile foundations. All the modules were constructed onshore, and transported to the platforms on crane barges. Total weights range from 3387 t for Whiting to 7919 t for Mackerel. Whiting was the first unmanned platform installed in Bass Strait, standing in 54 m water depth, halfway between Barracouta and Snapper, and housing only basic production equipment and a helideck. Operations were remotely controlled from the Snapper platform. Two subsea completions, Tarwhine and Seahorse are produced via the Barracouta platform. The Blackback subsea production facility is produced via the Mackerel platform.

Dolphin and Perch were Australia's first steel gravity-based monotowers. They were installed in 1989. Each monotower supports a deck that accommodates a single well, a separator with minimal control facilities and a helideck. Each weighs 2160 t. They stand on 1500 mm diameter steel columns, and the bulk of the weight is made up of iron ore and cement ballast fed into three feet on the tripod base section.

Two concrete gravity-based platforms, Bream B and West Tuna were installed in late 1996. The total weight of the Bream B facility is estimated at 45 000 t, and West Tuna at 95 000 t.

Barracouta

Barracouta oil and gas field was discovered in January 1965 and production started in March 1969. The field was developed by one manned jacket steel platform, 24.1 km from shore, piled into the seabed in 46 m of water depth. Sixteen piles were used and maximum pile penetration is 44 m. Platform main deck dimensions are 37 m x 20 m and the deck is 20 m above sea level. The total weight of platform structural steel is 2042 t. The platform has 10 well conductors and accommodation for 28 people. Production is exported through one 450 mm nominal diameter pipeline, 49 km long, in gas service and one 150 mm nominal diameter pipeline, 54.2 km long, in oil service to onshore plant at Longford.

Blackback

The Blackback oil field is located about 18 km south-east of the Mackerel platform and 90 km offshore in the Gippsland Basin. Water depth over the field varies from approximately 300 m to 600 m. Because of significant reserve uncertainty, a phased field development was planned, where the extent of Phase 2 development would be determined on the basis of data gathered from the Phase 1 development. The completed Phase 1 production facilities consist of three subsea completed wells (two conventional and one horizontal) connected using a single-well daisy chain configuration and a 23.2 km pipeline to production facilities on the Mackerel platform. Export to shore and onshore processing use the existing infrastructure. Phase 1 production commenced on 12 June 1999 at a combined oil rate of 1590 kL/d (10 kbbbl/d).

Bream

The Bream oil and gas field was discovered in April 1969 and production started in May 1988. The field was developed by one manned jacket steel platform, 45 km from shore, piled into the seabed in 59 m of water depth. Twelve piles were used and maximum pile penetration is 107 m. Platform main deck dimensions are 65 m x 44 m and the deck is 25 m above sea level. The total weight of platform structural steel is 7074 t. The platform has 27 well conductors and accommodation for 84 people. Production is exported through one 400 mm nominal diameter pipeline, 30 km long, in oil service to West Kingfish A platform.

Production from the Bream B platform started in December 1996. The field was developed by one remote-controlled concrete gravity platform, 51 km from shore, in 61 m water depth. Dimensions of the concrete base are 55 m x 55 m x 15 m and the concrete volume is 12 000 m³. The total structure weighs 45 000 t. The weight of steel reinforcement is 4000 t, and the solid ballast weighs 10 000 t. The platform has one leg and three buoyancy tanks. The diameter of the leg and buoyancy tanks is 12 m. Topsides weight is 800 t. The platform main deck dimensions are 17 m x 16.5 m and the deck is 24 m above sea level. Production is exported through one 6-km-long pipeline in oil service to the Bream platform.

Cobia

Production from the Cobia platform started in April 1983. The field was developed by one manned jacket steel platform, 66 km from shore, piled into the seabed in 78 m water depth. Sixteen piles were used and maximum pile penetration is 102 m. The platform main deck dimensions are 29 m x 58 m and the deck is 24 m above sea level. The total weight of platform structural steel is 8178 t. The platform has 21 well conductors and accommodation for 70 people. Production is exported through one 300 mm nominal diameter pipeline in oil service to Halibut platform.

Dolphin

The Dolphin oil field was discovered in October 1967 and production started in January 1990. Dolphin oil accumulation was developed by a single-well uncrewed monotower producing to the onshore plant at Longford. The platform main deck dimensions are 10 m x 10 m and the deck is 17 m above sea level. The total weight of platform structural steel is 2187 t. The platform has two well conductors. Production is exported through one 300 mm nominal diameter pipeline.

Flounder

The Flounder oil and gas field was discovered in August 1968 and production started in late 1984. The field was developed by one manned jacket steel platform, 58 km from shore, piled into the seabed in 93 m water depth. Sixteen piles were used and maximum pile penetration is 122 m. The platform main deck dimensions are 58 m x 29 m and the deck is 25 m above sea level. The total weight of platform structural steel is 8000 t. The platform has 27 well conductors and accommodation for 70 people. Production is exported through one 250 mm nominal diameter pipeline, 16 km long, in oil service and one 250 mm nominal diameter pipeline, 16 km long, in gas service to Tuna platform.

Halibut

Halibut oil field was discovered in August 1967 and production started in March 1970. The Halibut oil accumulation was developed by one manned jacket steel platform, 64.4 km from shore, piled into the seabed in 72.5 m of water depth. Twenty-four piles were used and maximum pile penetration is 145 m. Platform main deck dimensions are 43 m x 36 m and the deck is 21 m above sea level. The total weight of platform structural steel is 4761 t. The platform has 24 well conductors and accommodation for 40 people. Production is exported through 600 mm nominal diameter pipeline oil service to onshore plant at Longford.

The Fortescue oil pool was discovered on the western flank of Halibut in September 1978 and production commenced in September 1983. Fortescue was developed by one manned jacket steel platform, 65 km from shore, piled into the seabed in 69 m water depth. Sixteen piles were used and maximum pile penetration is 102 m. The platform main deck dimensions are 58 m x 29 m and the deck is 24 m above sea level. The total weight of platform structural steel is 6334 t. The platform has 21 well conductors and accommodation for 70 people. Production is exported through one 300 mm nominal diameter pipeline in oil service to Halibut platform.

Kingfish

The Kingfish oil field was discovered in May 1967 and production started in April 1971. The Kingfish A area was developed by one manned jacket steel platform, 75.6 km from shore, piled into the seabed in 77.1 m water depth. Twelve piles were used and maximum pile penetration is 155.5 m. The platform main deck dimensions are 52 m x 20 m and the deck is 22 m above sea level. The total weight of platform structural steel is 4309 t. The platform has 21 well conductors and accommodation for 40 people. A 300 mm nominal diameter pipeline, 4 km long, connects West Kingfish to Kingfish A platform, and a 400 mm nominal diameter pipeline, 3.9 km long, connects Kingfish A and Kingfish B platform. Commingled Kingfish A, Kingfish B, West Kingfish and Bream production is transported through a 500 mm nominal diameter pipeline, 25.3 km long, to Halibut platform.

Kingfish B oil production started in November 1971. The Kingfish B area was developed by one manned jacket-steel platform, 77.2 km from shore, piled into the seabed in 77.7 m water depth. Twelve piles were used and maximum pile penetration is 155.5 m. The platform main deck dimensions are 52 m x 20 m and the deck is 22 m above sea level. The total weight of platform structural steel is 4309 t. The platform has 21 well conductors and accommodation for 40 people.

West Kingfish oil production started in December 1982. The area was developed by one manned jacket-steel platform, 73 km from shore, piled into the seabed in 76.2 m water depth. Sixteen piles were used and maximum pile penetration is 103 m. The platform main deck dimensions are 29 m x 58 m and the deck is 24 m above sea level. The total weight of platform structural steel is 8371 t. The platform has 31 well conductors and accommodation for 60 people.

Mackerel

The Mackerel oil field was discovered in April 1969 and production started in December 1977. The field was developed by one manned jacket-steel platform, 72.4 km from shore, piled into the seabed in 92.7 m water depth. Sixteen piles were used and maximum pile penetration is 102 m. The platform main deck dimensions are 59 m x 29 m and the deck is 24 m above sea level. The total weight of platform structural steel is 7917 t. The platform has 25 well conductors and accommodation for 54 people. Production is exported through one 300 mm nominal diameter pipeline, 8 km long, in oil service to the Halibut platform.

Marlin

The Marlin gas and oil field was discovered in February 1966 and production started in late 1969. The field was developed by one manned jacket-steel platform, 52.5 km from shore, piled into the seabed in 58.5 m water depth. Thirty-two piles were used and maximum pile penetration is 60 m. Platform main deck dimensions are 43 m x 36 m and the deck is 20 m above sea level. The total weight of platform structural steel is 4127 t. The platform has 24 well conductors and accommodation for 56 people. Production is exported through one 500 mm nominal diameter pipeline, 108.3 km long, in gas service to onshore plant at Longford. A 300 mm nominal diameter pipeline, 1 km long, in oil service, carries Marlin, Tuna, Flounder and Snapper oil to join the Halibut-to-shore 600 mm pipeline.

Moonfish

The Moonfish oil field was put in production in 1997. The field is located about 4 km north of the Snapper field in the Gippsland Basin. The field was developed by two directional long reach wells drilled from the Snapper platform. The Moonfish oil field reserves are estimated at 1.99 GL (12.5 mmbbl). Peak production rates reached 795 kL/d (5 kbbbl/d).

Perch

The Perch oil field was discovered in March 1968 and production started in January 1990. Perch oil accumulation was developed by a single-well uncrewed monotower producing to shore plant at Longford. The platform main deck dimensions are 10 m x 10 m (33 ft x 33 ft) and the deck is 17 m (56 ft) above the sea level. The total weight of platform structural steel is 2204 t (4.8 million lb). The platform has 2 well conductors. The platform is currently shut in. Production export was via one 300 mm nominal diameter pipeline to Dolphin platform.

Seahorse

The Seahorse oil field was discovered in August 1978 and production started in September 1990. The field is located 15 km from shore in 42 m water depth. The Seahorse oil accumulations were developed by a single well subsea completion producing to Longford plant via the Barracouta platform.

Snapper

The Snapper gas and oil field was discovered in June 1968 and production started in July 1981. Snapper gas and oil accumulation was developed by one manned jacket steel platform, 32 km from shore, piled into the seabed in 54.96 m water depth. Twelve piles were used and maximum pile penetration is 103 m. Platform main deck dimensions are 29 m x 59 m and the deck is 24 m above sea level. The total weight of platform structural steel is 6783 t. The platform has 27 well conductors and accommodation for 55 people. Production is exported through one 250 mm nominal diameter pipeline, 15 km long, to Marlin platform in oil service and one 600 mm nominal diameter pipeline, 38.8 km long, in gas service to onshore gas pipeline and plant at Longford.

Tarwhine

The Tarwhine oil field was discovered in December 1981 and production started in May 1990. The field is located 23 km from shore in 43 m water depth. The field was developed by a single well subsea completion producing to Longford plant via the Barracouta platform. The export pipeline to Barracouta is 200 mm nominal diameter, 17 km long.

Tuna

The Tuna oil and gas field was discovered in June 1968 and production started in May 1979. The field was developed by one manned jacket steel platform, 56.3 km from shore,

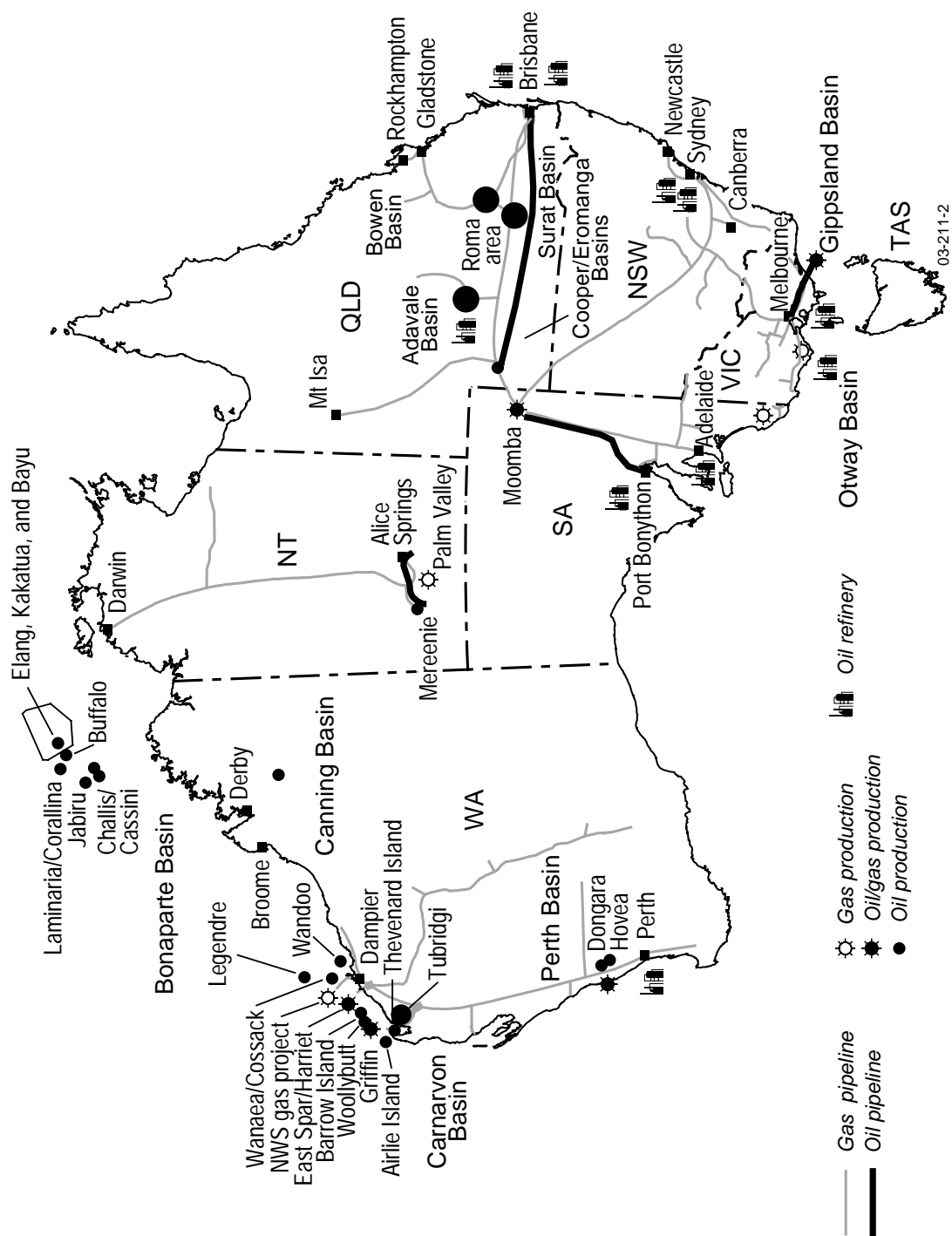


Figure 4.1 Locations of oil and gas production and pipelines

piled into the seabed in 58.5 m water depth. Twelve piles were used and maximum pile penetration is 105 m. The platform main deck dimensions are 59 m x 20 m and the deck is 24 m above sea level. The total weight of platform structural steel is 6245 t. The platform has 30 well conductors and accommodation for 55 people. Production is exported through one 300 mm nominal diameter pipeline, 19.3 km long, to Marlin platform in gas service and one 200 mm nominal diameter pipeline, 19.3 km long, to Marlin platform in oil service.

West Tuna oil production started in January 1996. The area was developed by one manned concrete gravity platform, 56 km from shore, in 61 m water depth. The dimensions of concrete base are 92 m x 76 m x 15 m and the total structure weighs 80 000 t. The weight of steel reinforcement is 9000 t and solid ballast is 17 000 t. The platform has three legs and four buoyancy tanks. Diameter of legs and buoyancy tanks is 16 m. Topsides weight is 7000 t and there is accommodation for 84 people. The platform main deck dimensions are 80 m x 69 m and the deck is 27 m above sea level. Production is exported through two 3 km long pipelines (250 mm nominal diameter in oil service and 100 mm nominal diameter in gas service) to Tuna platform.

Whiting

The Whiting oil and gas field was developed by one unmanned jacket steel platform, 34 km from shore, piled into the seabed in 54 m water depth. The field was discovered in March 1983, and production started in October 1989. The platform main deck dimensions are 33 m x 26 m and the deck is 25 m above sea level. The total weight of platform structural steel is 3387 t. The platform has six well conductors. Production was exported through one 250 mm nominal diameter pipeline in oil service and one 200 mm nominal diameter pipeline in gas service to Snapper platform. The platform is currently shut in.

4.3 Pipelines

A list of Australia's major petroleum pipelines is included as Appendix J. The pipelines listed are high pressure, large diameter (>100 mm) natural gas and crude oil pipelines that have been constructed since the mid 1960s. Pipelines transporting refined and partly refined products have been excluded, except major lines transporting LPG (propane and butane), ethane and fuel gas in Victoria. The map of Australia's petroleum exploration and development titles (included with this publication) shows the major pipelines (see also Figure 4.1).

The three basic functions of pipelines in the Australian oil and gas industry are to:

- (i) transport crude oil from onshore and offshore fields to stabilisation plants, refineries and export terminals;
- (ii) transport natural gas from onshore and offshore fields to processing plants, distribution centres or consumers; and
- (iii) carry refined products from refineries or tanker terminals to local distribution centres or consumers.

From 1964 to 1970 there were significant discoveries of oil and gas in Queensland, Victoria, South Australia and Western Australia. This led to the supply of oil and natural gas to refineries and consumers in the capital cities, industrial centres and certain country areas.

Major liquids pipelines

Australia's first long distance crude oil pipeline was constructed in 1964 between Moonie in the Bowen/Surat Basin and Brisbane (306 km). By the end of the decade an oil pipeline was constructed from the offshore Bass Strait to Westernport (185 km), later extended to Melbourne and Geelong (135 km). In 1984 the Jackson to Moonie pipeline (800 km) was linked to the Moonie to Brisbane pipeline, and in 1985 the Mereenie to Alice Springs pipeline (270 km) was completed. The Moomba to Stony Point liquids pipeline (659 km) was completed in 1982. This transports Cooper Basin natural gas liquids and crude oil to a fractionation plant on the Spencer Gulf.

Major gas pipelines

Queensland

The first major gas pipeline (397 km) connected Roma (Bowen/Surat Basin) fields and Brisbane in 1969. It was connected from Roma to Silver Springs (102 km) in 1978. In 1990, the Queensland State Gas Pipeline Unit completed the Wallumbilla to Gladstone gas pipeline through the Denison Trough gas fields (530 km). An extension to Rockhampton (100 km) was completed in 1991.

In 1993 the south-west Queensland gas/condensate pipeline from the Queensland Gas Centre (near the Ballera field) to Moomba in South Australia (180 km) was completed, linking the Queensland Cooper/Eromanga gas fields to South Australia. The natural gas pipeline from Ballera to Wallumbilla (750 km) was completed in 1996 providing a continuous link between the Cooper/Eromanga and Bowen/Surat basins and the Brisbane gas market. A second natural gas pipeline link (480 km) from north of Roma to the northern outskirts of Brisbane was completed in 1999. The Ballera to Mt Isa (841 km) pipeline, supplying the Mica Creek Power Station and a major fertiliser project planned for Phosphate Hill located about 150 km south of Mt Isa, was completed in 1997. A lateral pipeline linking the Cannington mine and the Bunya/Vernon/Cocos gas fields were connected to the main line via the Cental Treatment Plant at Ballera in 1998.

In 1994, a pipeline (247 km) from the Gilmore Gas field in the Adavale Basin to Barcaldine was completed. This was connected to the Ballera to Wallumbilla pipeline in 1997, thus connecting the Adavale basin fields to the pipeline network. A pipeline project connecting coal seam methane in the Fairview area of the Bowen Basin, 150 km north of Roma, to the Queensland Gas Pipeline was completed in 1998. This methane development is a small but important alternative energy source in supply diversity and competition. A pipeline to connect gas reserves from the central highlands of Papua New Guinea with markets in Queensland is under consideration for possible commencement of construction in the near future.

Projects recently completed include the conversion to gas of the Jackson to Moonie oil pipeline, the connection of a number of new gas fields in the Ballera–Jackson region, gas pipelines from Injune to Petrie north of Brisbane and from Gladstone to Bundaberg. Also a new gas-fired power station at Roma has been connected to the Ballera–Brisbane gas pipeline. A 392 km pipeline is planned between Moranbah and Townsville to supply coal seam methane to the Yabulu power station by late 2004.

South Australia

A gas pipeline was completed between the Moomba gas fields and Adelaide (781 km) in 1969, and was later connected to other centres including Angaston, Port Pirie and Whyalla. A liquids pipeline (659 km) from Moomba to Stony Point was completed in 1982. A gas pipeline linking Katnook gas field to Salfries and a separate line to Mount Gambier and Snuggery were completed in the early 1990s. A gas pipeline from Angaston to Murray Bridge, including laterals to Berri in South Australia (231 km), was constructed in 1994 and an extension from Berri to Mildura in Victoria was completed in 1999.

Victoria

An LPG pipeline was built from Longford to Westernport (185 km) in 1968. An ethane pipeline was built from Westernport to Altona (78 km) in 1970. The 174 km gas pipeline from the Gippsland gas plant at Longford to Melbourne (1971) was later extended to Geelong, Ballarat, Bendigo, Shepparton, Kyabram and Albury. A 181 km pipeline from Carisbrook to Ararat, Stawell and Horsham was completed in 1997. The onshore Otway Basin field North Paaratte was connected by pipeline to Warrnambool in 1986 and later to Portland (1992). A gas pipeline linking the depleted Iona gas field (developed as a major underground storage facility) to Geelong was constructed in 2000.

In September 2002 work was completed on the 735-km-long Tasmanian Gas Pipeline (TGP). The TGP starts at Longford gas facility in Victoria, crosses Bass Strait and comes ashore at Five Mile Bluff, north-east of George Town on the north coast of Tasmania. Two onshore Tasmanian sections travel from Bell Bay to Port Latta in the north-west and from Bell Bay to Bridgewater in the south of the State.

The 680 km sea gas pipeline between Port Campbell and Adelaide is due for completion in late 2003. The pipeline will link Adelaide, Melbourne and Sydney. The pipeline will supply gas from the Minerva gas field located 15 km offshore from Port Campbell and from Yalla gas field in Bass Strait. Gas from the Thylacine and Geographe fields will also be transported in this pipeline.

New South Wales

Since the construction of the natural gas pipeline linking the Moomba gas fields to Wilton near Sydney in 1976, laterals have been constructed linking Wagga Wagga, Canberra, Lithgow, Oberon, Orange, Bathurst, Griffith, Leeton, Wollongong, Plumbton, Hexham and Walsh Point. In 1998 a 255 km natural gas pipeline was completed from Marsden near West Wyalong to Dubbo, including an extension to Wellington. This pipeline will be

extended to Tamworth, Mudgee, Muswellbrook and Gunnedah. An ethane pipeline following the same easement as the main natural gas pipeline from Moomba to Sydney was completed in 1996. The 157 km gas pipeline link between Barnawatha in Victoria and Wagga Wagga in NSW was completed in 1998 and it supplied gas to Melbourne during the emergency shortage of 1998.

The construction of the 457 mm diameter, 795 km long Eastern Gas Pipeline from Longford to Sydney started in August 1999. The pipeline passes through the towns and regions of Bairnsdale, Orbost, Cann River, Bombala, Cooma, Nowra, Port Kembla, Wollongong and Wilton. The pipeline final capacity is 110 PJ gas/y and it has cost \$495 million. The pipeline was completed in August 2000 and delivered gas to Sydney and the Olympic facility in September 2000. A lateral from Hoskinstown to Queanbeyan and Canberra was completed during 2001.

Construction of a 200 mm pipeline linking Illabo (near Junee), Tumut and Wagga Wagga in the southern part of New South Wales was completed during 2001.

Western Australia

The Dongara to Perth pipeline (445 km) established the Perth Basin natural gas market in 1972. The Carnarvon Basin gas fields were first developed by the North Rankin–Withnell Bay (Dampier) gas/condensate pipeline (134 km) and the Dampier–Wagerup pipeline (1482 km) gas pipeline which connected the North Rankin gas field to Perth, Wagerup and Bunbury in 1984. Enhancement of the pipeline was completed in December 1997, increasing capacity through additional compression. In 1995 the Wanaea/Cossack FPSO was connected by gas pipeline to the North Rankin platform. During 1994 the Karratha to Port Hedland (213 km) natural gas pipeline began supplying a 105 MW gas-fired power station. Since 1992, natural gas pipelines linking Varanus Island to shore, Griffin FPSO to Tubridgi (onshore) and the Roller oil platform to shore have been completed. These offshore facilities serve as focal points for shorter pipelines from a number of offshore producing fields. A second parallel gas pipeline (100 km) was commissioned in 1999 linking Varanus Island and Compressor Station 1 to cater for increasing gas production in adjoining fields.

In 1996 the Yaraloola–Kalgoorlie (1400 km) natural gas pipeline was completed. This pipeline carries Carnarvon Basin natural gas to the iron ore fields in the Pilbara area, various mine sites and the goldfields of Kalgoorlie and Boulder. A 353 km long pipeline to deliver gas from the main Dampier–Bunbury gas pipeline to the Windimurra Vanadium Project was completed in 2000. The gas is used directly and fires a 12 MW power station at the mine.

A 350 km gas pipeline is planned to link Kambalda to Esperance and is due for completion by late 2004. On the North West Shelf, work commenced in May 2003 on a second trunkline (134 km) from North Rankin to the Burrup Peninsula to transport gas and liquids to new production and liquefaction facilities on the Burrup Peninsula.

Northern Territory

The Palm Valley–Alice Springs gas pipeline (145 km) developed the Amadeus Basin gas fields and connected to the Amadeus Basin–Darwin gas link (1512 km) in 1986. The connection to the Macarthur River Mine (333 km) was completed in 1995. A gas pipeline has been proposed to link the Undan/Bayu gas field in the Timor Sea with Darwin, and feasibility studies have been completed for alternative gas supply to Eastern Australian markets.

5: Coalbed methane

5.1 Coalbed methane and coalmine methane

Coalbed methane (CBM) is a naturally occurring methane gas in coal seams, also known as coal seam methane or coal seam gas. It was generated within coal seams and adsorbed onto the grain faces and micro-pores of the coal during the geological thermal maturation process of coalification.

In recent years, coalbed methane has become the subject of stand-alone energy resource development enterprises. The coalbed methane industry is yet in its infancy but is becoming a substantial part of the Australian gas industry. Coalbed methane resources are located fairly close to large potential markets in eastern Australia. The successful development of coalbed methane fields now contributes to the diversification of gas supply sources, particularly in Queensland. Coalbed methane is poised to continue as an important energy source.

The coalbed methane that is associated with coalmining operations is traditionally called coalmine methane. Its concentration generally increases with coal seam depth. Thus, the amount of coalmine methane released from coal mining would increase as underground mines get deeper. Without the use of an appropriate methane drainage system, many underground mines would become unsafe.

Drained coalmine methane is sometimes utilised as either pipeline gas or fuel for on-site electric power generation, and surplus electricity is supplied to regional distributors. These practices help to reduce greenhouse gas emissions from collieries and may in future be eligible to gain greenhouse gas emission carbon credits.

The coalmine methane that is emitted through mine ventilation systems is called ventilation air methane. Although the exhausted ventilation air contains low concentrations of methane (generally less than 1%, with an average of 0.4%), ventilation air methane is the largest source of coalmine methane emissions. Ventilation air methane emissions from Australia's underground coal mining were 27 PJ (25 BCF or 0.7 BCM) per year (75 TJ, 68 mmcf or 1.9 Mm³ per day) in 2002, according to statistics available at the website of Environmental Protection Agency of the United States. This amount equals about 80% of coalbed methane production in Australia in 2002 (Table 5.2) or about 2% of Australia's total domestic natural gas consumption.

Ventilation air methane is a significant source of methane emissions. However, it is also an untapped potential energy resource. The potential utilisation of mine ventilation air is largely restricted to on-site power generation, as its methane content is not high enough for pipeline transmission. If its concentration is more than 0.2%, an oxidiser or reactor will produce useable heat that can be captured and utilised to produce electricity. It can also be used as a supplemental lean fuel. CSIRO and its research partners have designed and demonstrated a hybrid coal and gas turbine system that co-fires ventilation air methane and unmarketable off-specification waste coal in a rotary kiln.

5.2 Coalbed methane policy development

Coalmine methane drainage and coalbed methane resources are separately administered: the former by mineral resources legislation and the latter by petroleum resources legislation in Queensland and New South Wales. In Victoria, however, coalbed methane resources are administered under the legislation for mineral resources development. As coalbed methane is contained within coal seams, the potential for conflict between the production of coal and coalmine methane and the production of coalbed methane can occur in an area where the coalbed methane resource is located within a potentially economically mineable coal deposit.

The Queensland Government released in November 2002 a new coalbed methane regime to address the issues that arise where coalbed methane and coal exploration and production activities may occur under different tenures granted over the same area. The new regime intends to optimise the extraction of both resources in an efficient manner and to ensure that coalbed methane activities do not compromise the safety of existing and future coal mining.

To implement the coalbed methane regime in Queensland, a new *Petroleum and Gas (Production and Safety) Bill* is currently being drafted to replace the *Petroleum Act 1923*. The *Mineral Resources Act 1989* and *Coal Mining Health and Safety Act 1999* will also be amended to reflect the new regime. All commercial coalbed methane production will be authorised by a Petroleum Lease under the new petroleum legislation. Overlapping production leases for both resources will be permitted only where they are held by the same party or where two separate parties have voluntarily entered into a commercial agreement.

In a separate but related policy development in Queensland, a new gas scheme will be introduced in January 2005. Designed to encourage the development of new gas supply sources such as coalbed methane, the scheme requires electricity retailers to source at least 13% of their electricity sold in Queensland from gas-fired generation or renewable resources. The scheme will be implemented through an amendment to the *Electricity Act 1994*, but has already acted as a catalyst for active exploration and development programs for coalbed methane.

The greenhouse gas abatement program (GGAP) is an Australian Government initiative to assist Australia in meeting its Kyoto Protocol target. Its objective is to reduce Australia's net greenhouse gas emissions by supporting activities that are likely to result in substantial emission reductions. This program is targeting opportunities for large-scale, cost-effective and sustained abatement. Several projects of power generation from waste coalmine methane have been awarded for financial assistance from GGAP since May 1999 when this environmental initiative was announced. Round 3 of GGAP was announced in May 2003.

5.3 Coalbed methane drilling activity

The capital cost of drilling coalbed methane wells has decreased significantly in the last decade with fit-for-purpose drilling technologies tried and developed on site in Australia. Coalbed methane drilling activity for exploration and development doubled in a two-year period from 2000 to 2002 in terms of the number of wells and metres drilled; more than 100 wells were drilled in 2002. In Queensland and New South Wales, the number of

Table 5.1 Coalbed methane drilling in 2000, 2001 and 2002

Year	State	Basin	Coal type	No. of CBM wells	Metres drilled depth (m)	Average total
2000				52*	38 987*	750
	Qld			39*	28 956*	742
		Bowen	high rank	29*	22 805*	786
		Clarence-Moreton	low rank	2	456	228
		Galilee	high rank	4	4 536	1 134
		Surat	low rank	4	1 159	290
	NSW			13	10 031	772
		Gunnedah	high rank	4	3 574	894
		Sydney	high rank	9	6 456	717
2001				87*	53 683*	617
	Qld			76*	46 265*	609
		Bowen	high rank	46*	33 431*	727
		Surat	low rank	30	12 835	428
	NSW			7	6 343	906
		Clarence-Moreton	low rank	5	4 725	945
		Sydney	high rank	2	1 618	809
	Vic			4	1 075	269
		Otway	lignite	4	1 075	269
2002				106*	78 317*	739
	Qld			88*	65 126*	740
		Bowen	high rank	57*	48 522*	851
		Clarence-Moreton	low rank	2	944	472
		Cooper	high rank	1	1 537	1 537
		Surat	low rank	28	14 123	504
	NSW			16	12 978	811
		Gunnedah	high rank	2	673	337
		Sydney	high rank	14	12 305	879
	Vic			2	213	107
		Otway	lignite	2	213	107

Coalmine methane drainage wells that are administered under coal mining legislations are not included.

* Minimum estimates only. Wells drilled in PL 191 or ATP 364P in the Bowen Basin in Queensland are not counted for this statistical summary. A total of 26 wells were drilled in PL 191 from 2001 to early 2003. Some data entries are provisional. Some figures are different from those in last year's survey results. The data have been compiled from information provided by State governments or available at the websites of various companies.

coalbed methane drilling rigs exceeds the number of rigs drilling conventional petroleum wells. Coalbed methane drilling rigs are usually truck-mounted.

The Bowen Basin in Queensland remained the most actively explored and developed basin in years 2000, 2001 and 2002. The basin shares more than 50% of coalbed methane drilling activity in Australia. Coal seams in the Baralaba Coal Measures of Late Permian age are the primary target, and wells are typically about 800 m deep in this basin (Table 5.1).

A well (Dartmoor-1) was drilled in the Queensland part of the Cooper Basin in 2002 for exploring the coalbed methane potential of the Epsilon Formation of Early Permian age. While the well intersected a thick coal seam as prognosed, subsequent testing and fracture stimulation of the coal was unsuccessful, demonstrating low permeability.

Coal seams in the Illawarra Coal Measures of Late Permian age are the principal target of coal mining and coalbed methane development in the Southern Coalfield of the Sydney Basin. Much of the coalbed methane drilling activity in this region in 2002 was carried out for the first phase of the commercial development of the Camden project. In addition, two exploration wells were drilled into coal seams of the Wollombi or Wittingham Coal Measures of Late Permian age in the Hunter region of the Sydney Basin in 2002.

In the Gunnedah Basin in New South Wales, coalbed methane is explored within coal seams of Permian age. Three operators explore the coalbed methane potential of the basin. One of them drilled two exploration wells in 2002. However, the drilling result indicates low methane but high carbon dioxide contents.

A recent trend in coalbed methane exploration is to target resources at fairly shallow depths in low-rank (low thermal maturity) coal seams of Jurassic age in the Surat Basin in Queensland and in the Clarence–Moreton Basin in Queensland and New South Wales. Lignite (brown coal) of Tertiary age has also become the target for coalbed methane exploration in the Otway Basin in Victoria. This new trend is based on the theory that, in spite of a smaller amount of coalbed methane in place per unit volume of coal, low-rank coal at shallow depths (less than 100 to 500 m) is more permeable than high-rank coal of Permian age at intermediate depths. Thus, coalbed methane could be more easily desorbed from the low-rank coal than from the high-rank coal, resulting in a higher recovery factor.

Drilling activity in the Surat Basin in Queensland remained buoyant in 2002. Target coal seams are of low rank and occur at shallow depth within the Walloon Coal Measures of Middle Jurassic age. The Walloon Coal Measures fairway, which is a prospective region delineated geologically for coalbed methane exploration, occurs near existing gas pipelines. Wells are typically about 450 m deep in the Surat Basin.

Two coalbed methane exploration wells were drilled near a gas-fired power station at Ipswich about 40 km south-west of Brisbane in 2002. Low-rank coal seams occur within the Walloon Coal Measures of Middle Jurassic age in the Clarence–Moreton Basin and within the Ipswich Coal Measures of Late Triassic age in the underlying Ipswich Basin.

Coalbed methane is also explored in several other sedimentary basins in Queensland, New South Wales and Victoria, but no wells were drilled there in 2002. In South Australia, 14 Petroleum Exploration Licence Applications (PELAs) are under consideration for exploration rights for coalbed methane or *in-situ* gasification over coal deposits (as of May 2003). Grants of these licences are delayed pending resolution of issues of conflicting

Table 5.2 Coalbed methane production

Year	Queensland				New South Wales				Total (Australia)			
	PJ/y	BCF/y	TJ/d	mmcf/d	PJ/y	BCF/y	TJ/d	mmcf/d	PJ/y	BCF/y	TJ/d	mmcf/d
1995	0	0	0	0	0	0	0	0	0	0	0	0
1996	2	2	5	5	0	0	0	0	2	2	5	5
1997	2	2	5	5	3	3	8	7	5	5	14	12
1998	3	3	8	7	6	5	15	14	9	8	23	21
1999	5	5	14	12	6	5	16	15	11	10	30	27
2000	6	5	16	15	7	6	18	16	13	11	34	31
2001	13	12	36	32	8	7	21	19	21	19	57	51
2002	25	23	68	62	9	8	24	22	34	31	93	84
	PJ	BCF			PJ	BCF			PJ	BCF		
Total	56	51			38	34			94	85		

PJ/y = PJ per year; BCF/y = billion cubic feet of methane equivalent per year; TJ/d = TJ per day; mmcf/d = million cubic feet of methane equivalent per day; BCF = billion cubic feet of methane equivalent. Coalmine methane utilisation is included. The Queensland figures are estimated from information available at the website of Origin Energy (Oil Company of Australia). The NSW figures are rough estimates only.

rights with coal leases. Coal deposits in South Australia range in age from Tertiary to Permian and contain low to high-rank coals.

In Western Australia, two petroleum exploration areas (L03-2 & L03-3) in the Perth Basin were released primarily for coalbed methane exploration. Target coal seams exist within the Sue Coal Measures of Permian age in the Vasse region, 280 km south-west of Perth. Application for grant of petroleum exploration permits closed in September 2003.

5.4 Coalbed methane production

Gas produced from stand-alone coalbed methane wells drilled in Australia is highly pure in general (>95% methane) and requires minimal processing. However, as coalbed methane wells are less productive than conventional gas wells, a large number of wells are required to develop a coalbed methane field. The production wells are inflexible, and the gas flow rate cannot be controlled as easily as it can on conventional gas wells. Coalbed methane wells require continuous dewatering to release gas. Production is as much a water management exercise as it is a coalbed methane production exercise. In addition, gas compression to pipeline specifications adds significantly to operating costs.

The commercial production of coalbed methane (including coalmine methane utilisation) was zero in 1995 but has substantially increased in recent years. Production is estimated to have reached 93 TJ (84 mmcf of methane equivalent) per day (34 PJ or 31 BCF of methane equivalent per year) in 2002. Coalbed methane now contributes about 3% of Australia's total domestic natural gas consumption. Cumulative coalbed methane production totals about 94 PJ (85 BCF of methane equivalent) in Australia for the seven

years since 1996 when commercial production began in the Moura colliery in Queensland (Table 5.2).

Queensland

Coalbed methane exploration and development is becoming a significant part of the petroleum upstream industry in Queensland. Coalbed methane is produced commercially at several collieries and coalbed methane fields in the Bowen and Surat Basins. The produced gas is connected to the State-wide pipeline network. Production is from high-rank coal seams in the Baralaba Coal Measures of Late Permian age in the Bowen Basin and from low-rank coal seams in the Walloon Coal Measures of Jurassic age in the Surat Basin. In 2002, coalbed methane production, including coalmine methane utilisation, in Queensland was about 25 PJ (23 BCF of methane equivalent) per year. This amount represents about 25% of Queensland's total gas demand.

There follow brief descriptions of individual coalbed methane production projects that include coalmine methane utilisation activities at collieries. These projects are arranged in historical order.

Moura colliery

The Moura colliery is operated by Anglo Coal. A 21 km lateral pipeline from the colliery to the Wallumbilla–Gladstone pipeline was commissioned in December 1995, and the commercial production of coalmine methane started in February 1996. The coal of Permian age in the Bowen Basin contains gas at 6 to 12 m³/t, and the gas is 98–99% methane. The coalmine methane is drained from exposed highwalls with a series of horizontal wells into both highwall and underground seams several years in advance of coal mining. Each well is about 1000 m in length, and some wells are up to 1500 m in length.

Approximately 3 PJ of coalmine methane per year (8.2 TJ or 7.5 mmcf/d, as of early 2003) are supplied from this colliery to the regional transmission line. A gas processing plant located on site dehydrates and compresses the gas before delivering it to the pipeline. The operator is in the process of increasing production up to 19 TJ (about 17 mmcf) of gas per day in the near future. The infrastructure of the colliery has at present a capacity to process 27 TJ (about 25 mmcf) of gas per day.

Dawson Valley (Moura A, Moura C, Nipan and Dawson River)

The first stand-alone commercial production of coalbed methane in Australia was commenced by Conoco in November 1996 at the Dawson Valley project sites, which adjoin the Moura coalmine area. This project is now operated by the Oil Company of Australia in Petroleum Lease (PL) 94. The produced coalbed methane is connected with the Wallumbilla–Gladstone pipeline through a 47 km lateral pipeline. Targeting Permian coal seams of the Bowen Basin, this project consists of the Moura A, Moura C, Nipan and Dawson River coalbed methane fields. Nearly 100 coalbed methane production wells have been drilled at these fields. This project produces 3 PJ of gas per year (8 TJ or 7 mmcf/d; as of late 2002). The Moura coalmine methane and Dawson Valley coalbed methane projects are separately operated for different objectives by different operators under different legislative regimes.

Comet Ridge (Fairview and Durham)

Since February 1998, gas has been supplied to the Wallumbilla–Gladstone pipeline from the Fairview coalbed methane field, north of Roma, through a 26 km lateral pipeline. This field produces coalbed methane from Permian coal seams of the Bowen Basin at a rate of 25 mmcf (28 TJ) per day from about 50 active production wells (as of early 2003), giving an average of about 0.5 mmcf/d per well. The Durham coalbed methane project area, near the Fairview field, will be linked to the existing infrastructure facilities.

Collectively known as the Comet Ridge project, the Fairview and Durham fields are located in PLs 90, 91, 92, 99, 100 and 195, and in Authority to Prospect (ATP) 584P, 592P, 623P and 701P. The former is operated by Tipperary, and the latter is operated by the Oil Company of Australia. A 12-well drilling campaign was completed in 2002 and 2003, and 40 production wells will have been drilled by the end of 2004 in the Durham project area. A long-term supply and indirect transportation arrangement with Australian Gas Light was exchanged in December 2002. Under the contract term, 195 PJ of coalbed methane and up to 15 PJ per year will be supplied from 2007 to 2020.

Peat

The Peat coalbed methane field, 15 km east of Wandoan, is operated by the Oil Company of Australia in PL 101. The 115 km Peat/Scotia lateral pipeline was constructed in 2000 to link the field to the Roma–Brisbane transmission line. The development of the field was based on Australia's first major long-term (20 years) coalbed methane sales agreement for the supply to the BP Bulwer Island Clean Fuels Project in Brisbane. Gas production from Permian coal seams of the Bowen Basin commenced in February 2001, and this field produces 6 PJ of gas per year (16 TJ or 15 mmcf/d; as of early 2003).

Scotia

Santos made its first venture into coalbed methane production, as a project operator, with the commissioning of the Scotia field in May 2002. This field is located in PL 176 in the northern part of the Burunga anticline in the Bowen Basin about 25 km north of the Peat field, between Taroom and Wandoan in south-eastern Queensland.

Capable of delivering 26.5 TJ of coalbed methane a day through the Peat/Scotia pipeline to the Roma–Brisbane transmission line, the Scotia gas treatment plant is supplying 120 PJ of methane under contract since September 2002 for up to 15 years (8 PJ/y) to the 385-MW Swanbank power station, near Ipswich. The gas will be used to drive the two newly installed combined-cycle gas-fired turbines at the station, making it Queensland's largest gas-fired power station. A new drilling program will begin in 2004.

Mungi

The Mungi coalbed methane field in the Bowen Basin is situated near the township of Moura in PL 94, in which the Dawson Valley coalbed methane fields are also located. The field is operated by the Oil Company of Australia. A seasonal gas sales agreement was exchanged in August 2002. A portion of the gas will be used as a fuel stock for cotton drying facilities near the field.

A pilot production program comprising an in-seam three-lateral well and an intersecting vertical production well has been under way since March 2003. Targeting three coal seams, the multi-lateral well with extensively exposed coal seam areas provides a means of maximising the connectivity between the coal seams and the producing vertical well. Water and gas are pumped from the vertical well.

Drilling commercial development wells and fracture stimulation commenced in June 2003. Connecting two existing wells and new nine wells to new gas treatment facilities will be part of the first phase of the production program. The wells are being progressively brought on stream in 2003. The installation of an 8 km pipeline was completed in October 2003 between Mungi and the existing Dawson Valley processing facilities at Moura.

Moranbah (or Grosvenor)

CH4 Gas, a company established in 2000, acquired the exclusive coalbed methane exploration rights to ATP 364P from BHP Billiton which is the coal mining operator of the area. Situated near the township of Moranbah in the northern Bowen Basin, this region includes the collieries of North Goonyella, Goonyella Riverside, Moranbah North, Peak Downs, Saraji, Norwich Park and German Creek. CH4 Gas was granted PL 191 in March 2002 over the undeveloped Moranbah (or Grosvenor) coalbed methane project area, located just north of Moranbah, on ATP 364P.

The operator of the Moranbah coalbed methane project drilled 33 exploration wells and 6 production wells within PL 191 between January 2001 and September 2003. These wells include three pairs of horizontal in-seam wells and connecting vertical production wells. In total, more than 130 coal or coalbed methane exploration wells have been drilled in the area now covered by PL 191. However, as drilling statistical data for PL 191 or ATP 364P are not available, a statistical summary, as shown on Table 5.1, does not count any wells drilled in these areas.

The three pairs of horizontal drainage and vertical pilot production wells have been producing coalbed methane since April 2001. The horizontal wells are about 1000 m long, and the vertical wells are about 330 m deep. Initial dewatering phase continued for about 80 days, ending in June 2001. After attaining a peak production phase with an average of 0.53 mmcf/d per production well for about 230 days from November 2001 to June 2002, the wells are in a hyperbolic decline phase with an average of 0.27 mmcf/d per production well (as of July 2003). The gas extracted from the coal seams is almost pure methane and requires only minimal processing to remove water and coal fines.

The Queensland Government announced in June 2002 that the liquid-fuelled 160-MW Yabulu power station, near Townsville, would be converted to a 220-MW combined-cycle base-load gas-fired power station. This project will have coalbed methane demand in the order of 20 PJ/y (55 TJ or 50 mmcf/d) from February 2005. A new 391 km pipeline will connect the power station with the Grosvenor coalbed methane project area. The pipeline will initially be configured for 20 PJ/y but can be expanded through further gas compression to approximately 50 PJ/y. Initially the converted Yabulu power station will consume between 11 and 14 PJ of gas per year. Construction of the pipeline is scheduled to commence in late 2003 with the first gas delivery due in October 2004 to enable the commissioning of the re-fitted power station by February 2005. The power station is

operated by Transfield, and new gas treatment and compression facilities, as well as the pipeline, will be operated by Enertrade.

Berwyndale South (pilot production)

The Berwyndale South coalbed methane pilot development site is located in Petroleum Lease Application (PLA) 201 within ATP 632P near Condamine in south-eastern Queensland, within 35 km of the Roma–Brisbane pipeline. A conditional gas supply contract of 4–6 PJ/y for 15 years was exchanged in December 2002 for a tie-in to the Roma–Brisbane pipeline in early 2005. An application was lodged in June 2003 for a petroleum lease over part of the exploration permit.

Operated by Queensland Gas, this project targets coal seams within the Walloon Coal Measures of Middle Jurassic age in the Surat Basin. The original intention was to test potential for naturally enhanced permeability resulting from an underlying geological structure, the Undalla Nose. The top of the coal seams is 300 m below surface, and the seams are highly permeable, ranging from 60 to 550 millidarcies.

The original pilot phase comprised five wells with associated gas gathering and water handling facilities. Spaced 500 m apart, these wells were put on production test in September 2002. Initially, gas production rates were too low to be measured. After the installation of high capacity pumps in February 2003, aggregate flows of between 0.06 and 0.1 mmcf/d were measured. Aggregate water production is about 8600 bbl (1400 kL) per day (as of March 2003). Additionally, three new pilot production wells were drilled in early 2003, resulting higher gas flow rates of 0.13 mmcf/d from six operational wells (as of May 2003). A study is underway to treat the produced water for agricultural use.

Aberdeen (pilot production)

Targeting the Walloon Coal Measures in the Surat Basin, the Aberdeen coalbed methane pilot development project is operated by Queensland Gas on ATP 621P near Condamine in southern Queensland. The top of the coal seams is 480 m below surface. In contrast to the geological concept applied to the Berwyndale South pilot project, the Aberdeen pilot development site was selected to test the concept that permeability of coal seams in the Walloon Coal Measures is sufficient to allow development without relying on any particular structural enhancement or sweet spot. Five wells were spaced 500 m apart. Dewatering operations commenced in June 2002 and continued over a period of eight months to February 2003. During this period of testing, the aggregate gas production from five wells fluctuated from an initial rate of 0.025 mmcf (0.026 TJ) per day to a high of 0.25 mmcf (0.26 TJ) per day. Production has been suspended for further evaluation.

Argyle (pilot production)

The Argyle coalbed methane pilot development project is located in ATP 620P and adjoins the Berwyndale South project. The Argyle project was the first pilot development project operated by Queensland Gas. High gas flow rates of up to 1 mmcf/d were measured. This project was suspended until March 2003 when litigation was settled among the joint venture partners.

Kogan North (pilot production)

The Kogan North coalbed methane pilot production is operated by Arrow Energy in Petroleum Lease Application (PLA) 194, located near Darby and 5 km north of the Roma–Brisbane gas pipeline in south-eastern Queensland. This five-well project targets the Walloon Coal Measures in the Surat Basin. The pilot production commenced in January 2003. Gas flows at 0.3 mmcf/d (as of early 2003). The operator intends to use the results of the pilot production to establish commercial feasibility for a full-scale production of up to 12 PJ/y for 15 years for a conditional gas supply agreement with the pipeline operator.

Talinga (pilot production)

The Talinga coalbed methane pilot production site is located within the Walloon Coal Measures fairway of the Surat Basin in south-eastern Queensland. A four-well pilot project was carried out by the Oil Company of Australia in ATP 692P in 2002.

Harcourt (pilot production)

The Harcourt coalbed methane pilot production area is situated in ATP 564P and 10 km to the north of the Mungi Field, and is within 2 km of the Wallumbilla–Gladstone gas pipeline. Three wells were drilled in the Bowen Basin by the Oil Company of Australia in 2001 and 2002. Two of the wells are a pair of an in-seam dual lateral well and a connecting vertical production well. A long-term production test started in late 2003.

Timmy (pilot production)

Three wells were drilled in the Timmy coalbed methane pilot production area in ATP 602 in the Bowen Basin in 2002 by the Oil Company of Australia. This area was delineated on the basis of a low-stress geological model applied to the Baralaba Coal Measures. Production testing is underway in 2003.

Tipton West (pilot production)

The Tipton West coalbed methane pilot production is another project operated by Arrow Energy. The site in PLA 198 is also located near Dalby. A conditional agreement of 4 PJ of gas per year for 15 years has been exchanged with the Roma–Brisbane pipeline operator. Pilot production commenced in June 2003.

Grasstree (German Creek) colliery

In June 2003, it was announced that a 32-MW waste coalmine methane power plant would be built at the Grasstree (German Creek) colliery. The colliery is operated by Anglo Coal, and the power plant will be operated by Energy Developments. The power plant will be partly funded under the Australian Government's Greenhouse Gas Abatement Programme. Full commercial operation is scheduled for late 2004. This project will use 2.5 PJ of waste coalmine methane a year (6.8 TJ or 6.2 mmcf of methane equivalent per day).

North Goonyella colliery

Ten 1-MW reciprocating gas engines will be installed and operated by Envirogen at the North Goonyella colliery in the Bowen Basin. Methane gas that would otherwise be vented to the atmosphere during the coalmining process will be drained from the coal before it is mined, and used to generate electricity. This project is expected to start in June 2004.

New South Wales

Coalbed methane production in New South Wales was about 9 PJ (8 BCF of methane equivalent) per year in 2002. Much of this came from coalmine methane utilisation at the Appin and Tower collieries. Two production licences, which were granted in 2002 for the Camden coalbed methane project, are the only petroleum production leases that have ever been granted in New South Wales.

Appin, Tower and Westcliff collieries

The Appin, Tower and Westcliff collieries are operated by BHP Billiton in the Southern Coalfield of the Sydney Basin. These collieries have been using coalmine methane on a commercial basis since 1997. The gas is drained from coal seams in the Illawarra Coal Measures of Late Permian age by horizontal wells at the mine workings, prior to coal mining.

The in-seam drainage gas from the three collieries is piped to Appin and Tower power stations; they have a combined capacity of 97 MW to generate electricity, which is sold into the State-wide electricity grid. The coalmine methane power stations are operated by Energy Developments. Gas with variable methane contents (40 to 100%) is used as a fuel source at these power plants. Some 20 mmcf of methane equivalent per day is required for the generation capacity. A total of 7.5 PJ of coalmine methane is used per year (21 TJ or 19 mmcf of methane equivalent per day) at these collieries as of early 2003. This portion represents 68% of Australia's total commercial utilisation of coalmine methane (about 11 PJ/y, 30 TJ or 27 mmcf of methane equivalent per day) as of early 2003. The 97-MW project is the largest coalmine methane power generation project in the world. The operator of this power generation project has estimated that coalmining-related greenhouse gas emissions can be reduced by 50%.

In addition to these projects, a pilot reactor plant was installed at the Appin colliery as a demonstration trial to burn mine ventilation air, which contains 0.3 to 0.8% methane, as combustion air. This plant utilises fumigant methane before it is emitted to the atmosphere while simultaneously capturing its energy value. Operated by BHP Billiton, this pilot project will be scaled up at the West Cliff colliery with the use of low quality (<1% methane) mine ventilation air as primary fuel source. The project should be fully operational by August 2005.

Tahmoor colliery

A 5-MW coalmine methane power plant was commissioned in February 2001 at the Tahmoor colliery near Picton in the Southern Coalfield. The colliery is operated by Austral

Coal, and the power plant by Envirogen. The plant uses the waste coalmine methane directly from the existing colliery's extraction plant. After minimal treatment involving compression and cleaning, the plant feeds the gas into the engine generator sets. The plant uses waste coalmine methane that is released during the mining process, and generates approximately 40 GWh (0.14 PJ) of electricity each year. The present utilisation of gas for power generation is at a rate of about 0.5 PJ/y (1.4 TJ or 1.3 mmcf of methane equivalent per day) as of early 2003. Construction commenced in 2002 to increase capacity with the addition of two new 1-MW units.

Camden

The first well was drilled in early 1999 for the Johndilo coalbed methane pilot project, which was the initial phase of the Camden coalbed methane project operated by Sydney Gas. The project area is located 50 km south-west of Sydney. Petroleum Production Leases (PPLs) 1 and 2 were granted for parts of the Camden project area in September and October 2002, representing the first petroleum production project approved under the petroleum legislation in New South Wales. A gas sales agreement was signed in December 2002 for up to 10 PJ (about 9 BCF) of gas per year for 10 years. This amount will account for up to 7% of total primary gas consumption in New South Wales in 2004.

Coalbed methane is produced from coal seams in the Illawarra Coal Measures of Late Permian age in the Sydney Basin. The produced gas has been piped through a 5 km lateral to a regional distribution network since May 2001. The coalbed methane reservoirs in the producing wells were artificially fractured to initiate flow. The gas composition is 95 to 98% methane. Camden wells are generally dewatered in two months; water production is less intense here than in typical wells in Queensland. A total of 25 wells had been drilled by June 2003 during the first stage of the development. Gas sales volume is about 2.5 TJ (about 2.3 mmcf) per day (as of June 2003). Most of the gas is produced from seven better-performing wells. The Ray Beddoe treatment plant is currently operating at 99% of maximum running time capacity. The second treatment plant and a new pipeline to the Moomba-Sydney trunkline are under construction. The operator intends to complete a new 100-well drilling program as part of the second phase of the development by the end of 2003.

Hunter (pilot production)

The Hunter coalbed methane pilot project is located in Petroleum Exploration Licences (PELs) 4 and 267 in the Hunter Valley, 100 km north of Sydney, and operated by Sydney Gas. A memorandum of understanding was exchanged in April 2002 to extract methane from the Bulga and other collieries in the region. Target coal seams exist in the Wollombi and Wittingham Coal Measures of Late Permian age in the Sydney Basin. The operator plans to commence five-well pilot production operations by the end of 2003 as the first phase of the 300-well Hunter gas project.

Teralba colliery

The waste coalmine methane project at the Teralba colliery on the Central Coast will see the installation of gas engines that burn methane contained in waste coalmine gas to produce electricity, reducing methane emissions and displacing coal fired electricity generation. Envirogen will install and operate ten 1-MW reciprocating gas engines. Initial activity on this project has now commenced, and the project should be fully operational by June 2004.

Bellambi colliery

Gas engine power generators will be installed and operated by Envirogen at the Bellambi colliery on the South Coast. Methane recovered from pre-drainage wells will be used to fuel the generators. The project should be fully operational by March 2006.

Endeavour and Munmorah collieries

Centennial Coal's coalmine methane abatement project will link the air intake of the Vales Point power station to the mine ventilation systems of the Endeavour and Munmorah collieries, south of Newcastle on the Central Coast. Methane contained in mine ventilation air is currently vented to the atmosphere but will be captured through the interlinking of the collieries. The ventilation air methane will then be burnt to generate electricity at the power station. Project starting date has not been announced yet.

Victoria

Oak Park (pilot production)

The Oak Park coalbed methane pilot production in Exploration Licence (EL) 4507 is operated by Eastern Star Gas. In close proximity to existing gas pipeline infrastructure, the pilot site is located 18 km south of Bacchus Marsh and 45 km west of Melbourne. Unlike all other commercial or pilot productions in Queensland or New South Wales, this project is aiming at lignite (brown coal) seams at very shallow depths (less than 100 m below the surface). Also unlike other States, coalbed methane exploration and production is administered under the mineral resources development legislation in Victoria.

The Oak Park pilot project comprises five wells into the Maddingly brown coal seam of Tertiary age in the Melbourne Trough in the Otway Basin, with four wells 300 m apart surrounding a central well. These wells were drilled in 2002 and 2003, ranging in total depth from 105 to 111 m. Long-term production testing was scheduled for a six-month period in late 2003. The aim of the pilot production is to establish the viability of natural gas production from the extensive brown coals of Tertiary age that occur at shallow depths.

6: Current production

6.1 Crude oil and condensate production in 2001 and 2002

Crude oil and condensate production in 2001 totalled 38.2 GL or 104.7 ML/d (658 000 bbl/d) and 37.8 GL or 103.8 ML/d (652 000 bbl/d) in 2002. Crude oil production data include all production from the JPDA with East Timor in the Bonaparte Basin, of which Australia's share is 10% of production. The 2001 production shows a decline of 10.1% compared with the figure of 42.5 GL or 116.4 ML/d (732 000 bbl/d) in 2000 while the 2002 production decreased by 1.0% compared with the 2001 production.

Crude oil production by basin up to 2001 is listed in Appendix I. Production relative to reserves is shown in Figure 2.2.

6.2 Gas production in 2001 and 2002

Gas production in 2001 and 2002, inclusive of on-site fuel use and flaring, was 35.0 BCM or 95.8 MCM/d (3.4 BCF/d) and 36.7 BCM or 100.6 MCM/d (3.6 BCF/d) respectively. Annual gas production by basin up to 2001 is listed in Appendix I.

7: Crude oil and condensate forecasts

7.1 Crude oil and condensate forecast for 2003–2020

The forecast of production given in this chapter is based on current estimates of production from identified and undiscovered resources. Geoscience Australia estimates are provided at various probability levels to reflect the uncertainty surrounding the development of discovered accumulations (e.g. a production estimate at the 90% probability level means that there is a 90% chance of production being at least as high as the figure shown).

The figures for production from identified resources incorporate estimates of production from individual developed fields as well as estimates of reserves and timing of development of identified but undeveloped fields. The major factors affecting the accuracy of oil production estimates for identified fields are reserves growth in offshore fields and delays in the startup and interruptions to production from offshore fields. As a result the lower probability levels reflect the scope for increases in the reserves estimates on which the forecasts are based.

The accuracy of the production estimates is also dependent on the timing of future gas developments with their associated condensate production. In some cases, the cycling of dry gas allows accelerated production of condensate.

Figure 7.1 shows the production of crude oil and condensate from 1975 to 2002 and Figure 7.1 and Table 7.1 show forecast production from 2003 to 2020. The forecast includes production of crude oil and condensate from accumulations that had been discovered by the end of June 2003, plus production of crude oil and condensate from undiscovered accumulations. The 2003 forecast includes 10% of production from the Joint Petroleum Development Area (JPDA).

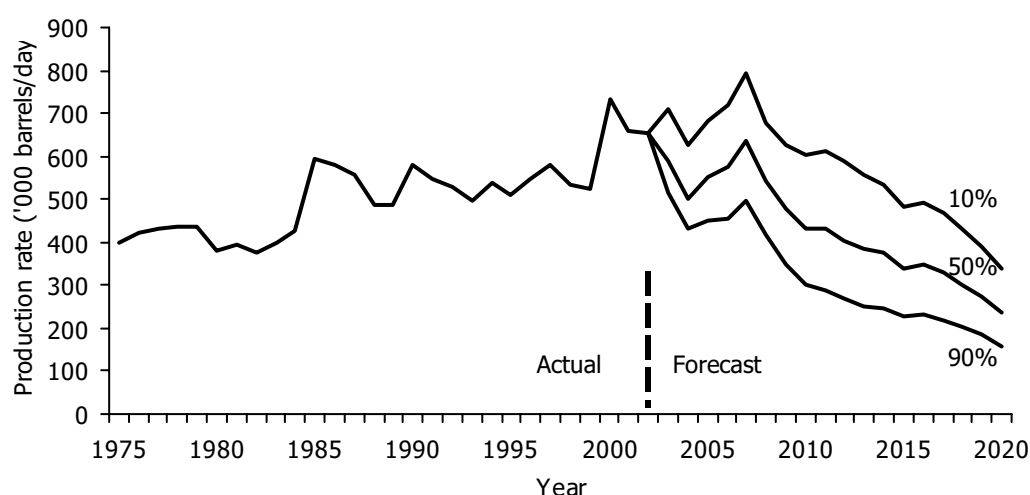


Figure 7.1 Australia's annual production of crude oil and condensate 1975–2002 and forecast annual production at 90%, 50% and 10% cumulative probability 2003–2020

Table 7.1 Forecast for 2003–2020 of crude oil and condensate production from Australia's identified accumulations, and crude oil production from undiscovered accumulations, in the Bonaparte, Carnarvon, Eromanga, Cooper, Gippsland, Browse, Bass, offshore Otway and offshore Perth Basins, as at July 2002 (thousands of barrels per day)

Year	Identified			Undiscovered			Both		
	P90	P50	P10	P90	P50	P10	P90	P50	P10
2002	653	653	653				653	653	653
2003	517	588	705	0	1	2	517	590	709
2004	426	497	621	0	1	9	431	503	629
2005	445	536	670	1	4	31	451	550	682
2006	440	555	694	2	13	57	455	574	719
2007	463	601	752	6	28	88	496	638	795
2008	368	488	610	12	45	122	415	544	675
2009	290	407	543	20	63	150	348	478	624
2010	231	344	497	28	76	169	301	432	602
2011	207	325	499	37	90	190	289	430	613
2012	176	288	457	43	99	203	267	405	588
2013	160	264	427	49	105	206	253	384	556
2014	147	241	393	54	113	214	246	374	535
2015	129	211	343	57	114	211	229	337	482
2016	133	218	354	57	114	207	231	347	493
2017	125	205	333	57	111	197	220	328	466
2018	115	188	306	53	105	189	202	300	430
2019	105	171	279	48	94	168	186	275	390
2020	88	144	235	40	83	150	159	237	337

7.2 Crude oil forecast for 2003–2020

Figure 7.2 shows crude oil production from 1975 to 2002 and Figure 7.2 and Table 7.2 show a forecast of crude oil production from 2003 to 2020. The forecast is based partly on Geoscience Australia and company estimates of crude oil production from accumulations that had been discovered by end of June 2003 (identified accumulations), and partly on estimates of crude oil production from undiscovered accumulations. The forecast includes 10% of production from the JPDA.

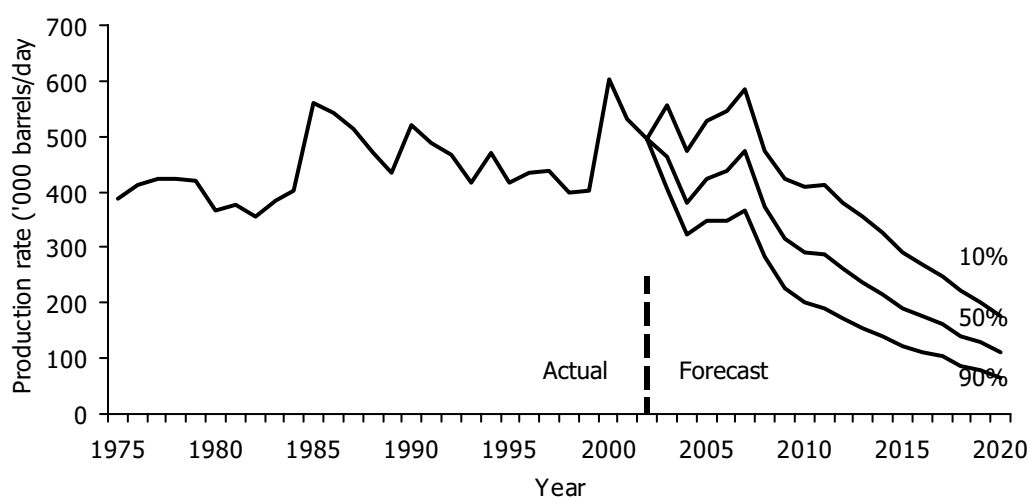


Figure 7.2 Australia's annual production of crude oil 1975–2002 and forecast annual production at 90%, 50% and 10% cumulative probability 2003–2020

Table 7.2 Forecast for 2003–2020 of crude oil production from Australia's identified accumulations, and from undiscovered accumulations, in the Bonaparte, Carnarvon, Eromanga, Cooper, Gippsland, Browse, Bass, offshore Otway and offshore Perth Basins, as at July 2002 (thousands of barrels per day)

Year	Identified			Undiscovered			Both		
	P90	P50	P10	P90	P50	P10	P90	P50	P10
2002	497	497	497				497	497	497
2003	405	461	553	0	1	2	406	462	556
2004	322	376	470	0	1	9	325	381	475
2005	340	411	513	1	4	31	347	423	528
2006	330	417	521	2	13	57	347	438	546
2007	335	436	545	6	28	88	365	473	585
2008	242	321	402	12	45	122	284	374	473
2009	174	244	326	20	63	150	226	315	425
2010	137	204	295	28	76	169	201	292	409
2011	118	185	284	37	90	190	191	286	412
2012	92	150	238	43	99	203	171	261	380
2013	73	120	195	49	105	206	155	238	355
2014	59	96	157	54	113	214	139	216	328
2015	43	70	114	57	114	211	121	190	292
2016	35	57	93	57	114	207	112	174	268
2017	30	48	79	57	111	197	103	163	248
2018	21	34	56	53	105	189	86	141	222
2019	19	31	51	48	94	168	79	128	202
2020	15	24	39	40	83	150	66	110	175

7.3 Condensate forecast for 2003–2020

Figure 7.3 shows production of condensate from 1975 to 2002 and Figure 7.3 and Table 7.3 show a forecast of condensate production from 2003 to 2020. The forecast is based on company and Geoscience Australia estimates of production from accumulations that had been discovered by June 2003 and for which some production planning has been carried out. The forecast includes 10% of production from the JPDA.

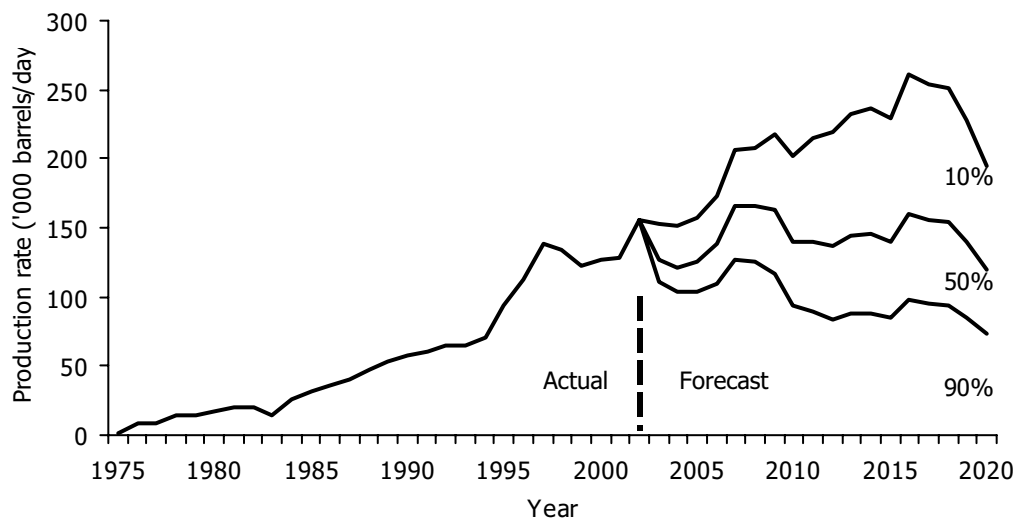


Figure 7.3 Australia's annual production of condensate 1975–2002 and forecast annual production at 90%, 50% and 10% cumulative probability 2003–2020

Table 7.3 Forecast for 2003–2020 of condensate production from Australia's identified accumulations, as at July 2002 (thousands of barrels per day)

Year	Identified		
	P90	P50	P10
2002	156	156	156
2003	112	127	152
2004	104	121	151
2005	104	126	157
2006	110	138	173
2007	127	166	207
2008	126	166	208
2009	116	163	217
2010	94	140	203
2011	89	140	215
2012	84	138	219
2013	87	144	233
2014	89	145	236
2015	86	141	229
2016	98	160	261
2017	95	156	254
2018	94	154	250
2019	86	140	228
2020	73	120	195

8: Sufficiency of crude oil and condensate resources

8.1 Introduction

This chapter discusses the quantity of Australia's petroleum resources, the amounts that have already been produced and the sufficiency of the amounts that remain for future consumption. Sufficiency refers to the amounts of discovered and undiscovered resources relative to current and future extraction rates. The word 'sufficiency' is used rather than 'sustainability', since petroleum resources are consumed much faster than they are generated, and the production of petroleum is not strictly sustainable.

Since the 1960s, when oil and gas were first produced, petroleum has played an increasingly important part in Australia's economy. Nevertheless, Australia's resources of crude oil are limited and there is concern about how much longer they can last.

Australian production of natural gas meets domestic consumption. Significant additional amounts are exported. There are prospects for significantly increased production for both domestic and export markets. Condensate resources are substantial but cannot be brought into production rapidly.

8.2 Ratio of economic demonstrated resources to annual production

Australia's remaining economic demonstrated resources of petroleum, as estimated at the end of each year, and the production for that year, are set out in Table 8.1. The ratios of economic demonstrated resources to production are shown in Figure 8.1.

The resources to production (R/P) ratio indicates how many years of production the resource would support assuming present production rates could be maintained (Figure 8.1). For example, the ratio for crude oil indicates an estimated 'life' which has remained fairly steady at about 10 years since 1982 but is currently six years. This has decreased rapidly since 1998. Natural gas has a current 'life' estimated at 69 years, but past estimates have been as low as 39 years (in 1993) and as high as 76 years (in 2001). These estimates include all resources and production in the JPDA with East Timor.

The fairly constant R/P ratio of about 10 years for crude oil over 1983–1999 shows that economic demonstrated resource to production ratios cannot be relied on as an indicator of resource life. The estimated life did not reduce year by year (despite considerable production), because estimates of remaining economic demonstrated resources stayed at a near constant level, mainly as a result of revisions (additions) to the estimates of the demonstrated resources within the producing fields, and partly as a result of new discoveries (while the rate of production remained steady). The rapid decrease in R/P ratio recently is due to record production levels while resource additions have been small.

Table 8.1 Australia's economic demonstrated resources and production of crude oil, condensate, naturally-occurring LPG and natural gas 1982 to 2002 (gigalitres and billions of cubic metres).

End of Year	Crude oil			Condensate			LPG			Gas		
	EDR	Annual Production	R/P	EDR	Annual Production	R/P	EDR	Annual Production	R/P	EDR	Annual Production	R/P
1982	260	20.6	13	83	1.2	69	123	2.8	44	641	11.8	54
1983	235	22.3	11	74	0.8	93	87	3.3	26	629	9.0	70
1984	240	23.3	10	81	1.5	54	86	4.3	20	689	12.1	57
1985	217	32.5	7	86	1.8	48	88	4.9	18	709	13.3	53
1986	242	31.5	8	116	2.1	55	99	3.8	26	902	16.2	56
1987	246	29.8	8	119	2.9	41	97	4.7	21	1069	14.4	74
1988	255	27.4	9	122	2.8	44	130	4.5	29	1033	16.9	61
1989	260	25.1	10	119	3.1	38	114	3.7	31	955	18.9	51
1990	270	30.3	9	118	3.3	36	114	4.8	24	927	21.3	44
1991	258	28.3	9	124	3.5	35	131	4.3	30	950	22.1	43
1992	244	27.1	9	133	3.7	36	135	4.9	28	1006	24.1	42
1993	249	25.1	10	136	3.7	37	133	5.1	26	992	25.5	39
1994	297	27.2	11	156	4.1	38	154	5.3	29	1292	31.4	41
1995	277	24.1	11	183	5.5	33	144	5.7	25	1264	29.6	43
1996	240	25.3	9	193	6.5	30	174	4.9	36	1360	30.1	45
1997	266	25.5	10	192	8.1	24	184	5.1	36	1494	32.2	46
1998	243	23.2	10	273	7.8	35	243	7.1	34	1989	40.3	49
1999	215	23.3	9	277	7.1	39	262	5.8	45	1989	33.0	60
2000	194	35.1	6	300	7.4	41	292	5.6	52	2203	34.3	64
2001	206	30.7	7	289	7.5	39	293	5.6	52	2667	35.0	76
2002	176	28.8	6	277	9.0	31	274	6.1	45	2528	36.7	69

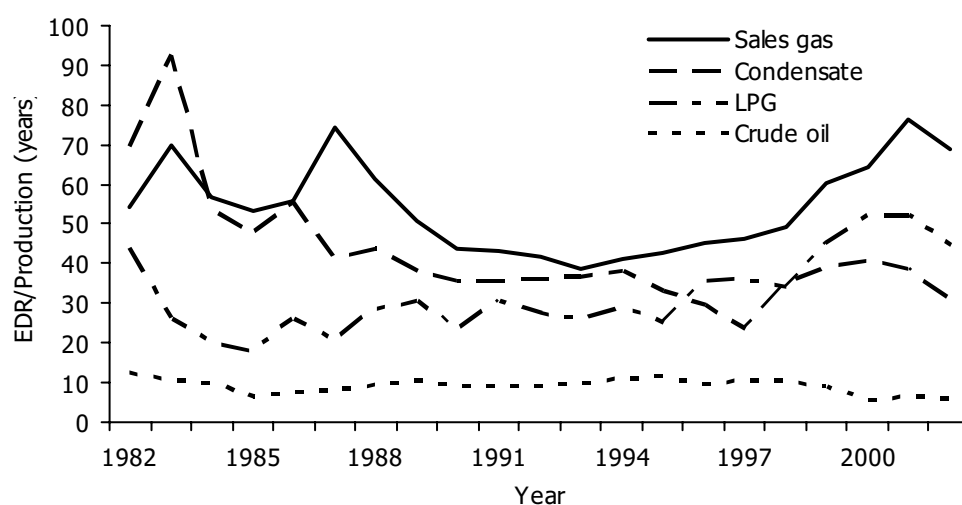


Figure 8.1 Annual R/P ratios for crude oil, condensate, LPG and sales gas

Table 8.2 Australia's production and demand for crude oil and condensate (thousands of barrels per day)

Year	Production	Consumption	Ratio
2003	590	689	86%
2004	503	703	72%
2005	550	730	75%
2006	574	742	77%
2007	638	754	85%

The average crude oil and condensate production from 1993 to 2002 was 26.8 GL/y, while remaining economic demonstrated resources in 2002 were 453 GL. This means that in 2002 average crude oil and condensate production could be sustained for 16.9 years.

A better indicator of sustainability might be the ratio of crude oil and condensate production to consumption. The consumption figures are projected by ABARE (2003). The ratios of forecast crude oil and condensate production to consumption from 2003 to 2007 are given in Table 8.2. It can be seen that the capability of domestic crude oil and condensate production at the median probability level to sustain consumption decreases from 86% in 2003 to 72% in 2004 and then increases to 85% in 2007. The consumption rate of crude oil and condensate in 2003 (40 GL/y) could be sustained for only 11.3 years using the economic demonstrated resources remaining at the end of 2002 (453 GL).

8.3 Trends in crude oil production

Clearly the resource about which there is most concern is crude oil. Production profiles and the longevity of fields vary widely with the size of the field, the quality of the host reservoir and the means of development. The Barrow Island field is a giant field hosted in a poor quality reservoir with low recovery rates, but is accessible from land. It has produced consistently over a long period of time because of the ability to implement improved recovery practices relatively easily and economically. However, maintenance of and/or additional production depends on profitability, which in turn is related to the price of oil and the capacity for technological innovation.

In the past, the giant fields in the Gippsland Basin have underpinned Australian oil production. These fields have high-performing reservoirs and associated fixed infrastructure. Growth in reserves in these fields, plus the ability to economically tie-in small fields to the infrastructure, has meant that these assets have sustained production for a long period of time. Similarly, production of condensate from the large gas developments on the North West Shelf and Timor Sea is expected to have a relatively long life, but with very even production profiles reflecting constraints on the associated gas production. In the very long term, they will underpin the Australian production that the Bass Strait fields have traditionally supplied, but obviously not at the same level.

Production of oil from the Gippsland fields peaked in 1985 and has subsequently declined steadily. The industry has been successful in replacing this production by the development of the gas/condensate fields on the North West Shelf and in the discovery and development of many smaller oilfields on the north-west margin. In contrast to the Gippsland Basin oilfields, the remote and relatively small oilfields of the North West Shelf and Timor Sea have much shorter lives. They have been discovered and developed in a period of very uncertain oil prices and their location and size have required physical facilities with lower capital costs, constraining their flexibility for secondary developments in some cases. The year-by-year production performance of these developments has been harder to predict. However, it is evident that the recent spurt in oil production is superimposed on a decline from a peak in production in the mid-1980s. While overall liquids production has increased due to the contribution from condensate, production in the longer term can only be sustained at current levels from new reserves in new oil fields.

8.4 Estimated self-sufficiency

An indicator of resource sufficiency is percentage self-sufficiency, last published by the Department of Primary Industries and Energy (DPIE 1987). Self-sufficiency was defined as:

$$\text{Self - sufficiency} = \frac{\text{Crude oil and condensate production} + \text{domestic demand for naturally occurring LPG}}{\text{Net domestic demand for petroleum products}}$$

Since 1970, self-sufficiency has fluctuated between 60% and 90%, with levels above 70% since mid-1984. The indicator shows how well domestic production meets demand and is simple to understand. The 2000–2001 figure was 84%. Heavy crude oil suitable for fuel oil, lubricant and bitumen production is imported and light crude oil is exported.

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9: Shale oil development

9.1 Shale oil

Shale oil comes from oil shale. Oil shale is organic-rich shale that yields substantial quantities of oil by heating and distillation. One tonne of oil shale may contain over 200 L of oil. The organic material in oil shale is kerogen, which can be a precursor to conventional oil reservoirs given appropriate conditions in the crust. Australian oil shale deposits of commercial interest are predominantly in a series of narrow and deep extensional-basins near Gladstone and Mackay in central Queensland. These are thick Tertiary lacustrine (lake-formed) deposits that are relatively easy to mine. They contrast with generally harder carbonate-bearing oil shales (marls) found elsewhere in the world that are more difficult to mine and process.

9.2 Resources

All ten of the central Queensland oil shale deposits are held by Southern Pacific Petroleum (SPP), either solely or with joint venture partners. In 2000 SPP systematically reviewed the in-situ mineralisation for these 10 oil shale deposits to accord with the JORC Code. The 2002 reserve and resource estimates reported by SPP remain little changed from those reported in 2000 and the results are incorporated in this assessment.

Australia has 4.6 GL (29 mmbbl) of shale oil economic demonstrated resources. However, this could increase significantly if the research and development demonstration-scale processing of shale oil advances to a proposed commercial plant at SPP's Stuart deposit near Gladstone. Paramarginal and submarginal demonstrated resources are 202.1 GL (1.3 BNbbl) and 3719 GL (23.4 BNbbl) respectively. Almost one million barrels of shale oil have now been produced at Stuart. However, the shale tonnage processed is small in comparison to the overall resource, so there is no change in the reserves estimate at the reported level of precision.

9.3 Production

Oil production at the Stuart demonstration plant for the 2002 calendar year was up 39% to 51.5 ML (324 000 bbl). By mid-2003 total production since the start of operations had reached to 153.4 ML (965 000 bbl) of oil from 1.556 Mt of oil shale during 406 operating days since operations began. A new monthly production record of 85 000 bbl was set in June 2003 as part of the longest continuous production run of 96 days.

The Stage 1 design ore grade is 172 L/t at zero moisture (LT0M). The retorting has now been tested with a range of input grades from 152 LT0M in July and August 2002 to 189 LT0M more recently. Recovery rates have been improved from 70% to a current recovery of 87%.

The oil products are Ultra Low Sulphur Naphtha (ULSN) 55–60% and Light Fuel Oil (LFO) 40–45%. The ULSN, which can be used to make petrol, diesel and jet fuel, has a

sulphur content of less than 1 ppm. To put this into perspective, petrol in Australia currently contains about 500 ppm sulphur. Regulatory guidelines are in place to reduce this to 150 ppm for petrol by 2005 and to 50 ppm for diesel by 2006.

In July 2002 SPP secured a long term sales contract with Mobil Oil Australia Pty Ltd for all naphtha produced at its Stuart Project, through to 2005.

9.4 World resources and production

The 2001 survey of energy resources by the World Energy Council reported that Jordan, Australia and Morocco have the largest estimates of 'proved oil shale in place'. The same survey also reported that production of oil from shale for 1999 was recorded in Brazil (239 ML), Estonia (185 ML) and Australia (6 ML).

9.5 Industry developments

Production has progressively increased at the \$350 million Stuart demonstration plant (Stage 1) since trials commenced in August 1999. Production for calendar year 2003 is expected to attain 600 000 bbl (95 ML), an increase of 85% over 2002 production.

Results from research and development at the Stage 1 plant are being incorporated into the design for a 4:1 commercial scale-up (Stage 2). If Stage 2 proceeds it is expected to cost \$600 million and SPP are actively seeking joint venture partners.

SPP has committed itself to restricting net greenhouse gas emissions to lower than the emissions produced by conventional oil extraction methods over the full cycle of production and end use. SPP's long-term goal is to achieve, through progressive plant expansion, production of 200 000 bbl/d. This would be greater than Bass Strait's current oil production (now in decline) and would deliver a balance of payments benefit to Australia of about \$4 billion annually at current oil prices. Federal Industry Minister, Ian Macfarlane advised, on 1 July 2002:

This method of extracting oil has the potential to significantly boost Australia's ability to remain self-sufficient for liquid fuels. The Queensland deposits hold about 20 billion barrels of oil equivalent resources while Australia's total known liquid petroleum reserves are less than 4 billion barrels.

Table 9.1 Australian shale oil resources as at 31 Dec 2002

State	Demonstrated Economic		Demonstrated Subeconomic			
Deposit	GL	million barrels	GL	million barrels	GL	million barrels
Queensland						
Alpha	0	0	0	0	14	90
Condor	0	0	0	0	1 908	12 000
Duaringa	0	0	0	0	477	3 000
Julia Creek	0	0	0	0	238	1 500
Lowmead	0	0	0	0	32	200
Nagoorin	0	0	0	0	191	1 200
Nagoorin Sth	0	0	0	0	16	100
Rundle	0	0	0	0	413	2 600
Stuart	5	29	202	1 271	64	400
Yaamba	0	0	0	0	270	1 700
Block Creek	0	0	0	0	32	200
Boundary Flat	0	0	0	0	48	300
Queensland Total	5	29	202	1 271	3 703	23 290
New South Wales						
Baerami	0	0	0	0	3	19
Newnes	0	0	0	0	4	25
New South Wales Total	0	0	0	0	7	44
Tasmania						
Beulah	0	0	0	0	1	3
Chudleigh	0	0	0	0	1	6
Railton	0	0	0	0	6	38
Nook	0	0	0	0	1	3
Quamby Bluff	0	0	0	0	1	6
Tasmanian Total	0	0	0	0	9	57
AUSTRALIA	5	29	202	1 271	3 719	23 390

Categories of resources based on economic considerations

Economic: this term implies that, at the time of determination, profitable extraction or production under defined investment assumptions has been established, analytically demonstrated, or assumed with reasonable certainty.

Subeconomic: this term refers to those resources which do not meet the criteria of economic.

Subeconomic resources include paramarginal and submarginal categories.

Paramarginal: that part of subeconomic resources which, at the time of determination, almost satisfies the criteria for economic. The main characteristics of this category are economic uncertainty and/or failure (albeit just) to meet the criteria which define economic. Included are resources which would be producible given postulated changes in economic or technologic factors.

Submarginal: that part of subeconomic resources that would require a substantially higher commodity price or some major cost-reducing advance in technology to render them economic.

10: A review of geological sequestration of carbon dioxide in Australia

In 1997, international negotiations resulted in the Kyoto Protocol. Under the Protocol, Australia has a target that would limit its growth in net emissions of greenhouse gases to a level of 8% above 1990 emissions over the period 2008–2012. Even though Australia has stated that it does not intend to ratify the protocol, the Government will attempt to meet this target. Despite this being an increase on current emissions, it represents a considerable challenge, and will require Australia to reduce emissions from existing operations and restrain those likely to result from planned developments. The Australian Government aims to meet this target without damaging the economy, or driving industry offshore.

Geological sequestration is technology that is being researched and evaluated both internationally and in Australia under the auspices of the GEODISC project (Geological storage program in the Australian Petroleum Cooperative Research Centre (APCRC), finished 15 August 2003) and now the CO₂CRC (Cooperative Research Centre for Greenhouse Gas Technologies, commenced 1 July 2003). Sequestration includes both the capture and storage of CO₂. Geological sequestration refers to the storage of CO₂ in geological formations, specifically those with good reservoir and sealing properties.

Underground storage will not solve the global greenhouse problems, but is likely to make a significant contribution to an overall reduction strategy. This kind of technology is one of many options that can meet both environmental and economic benchmarks (Bradshaw and coworkers 2002a,b; Bradshaw 2003; Allinson and coworkers 2003). By capturing CO₂ emissions and storing them in suitable formations deep underground, Australia has the opportunity to significantly reduce CO₂ from stationary sources that would otherwise be released into the atmosphere. In addition, CO₂ storage opens up opportunities for development of unproduced gas fields on the North West Shelf that have high levels of CO₂, and it has application for enhanced oil recovery (EOR) and enhanced coal bed methane recovery (ECBM).

10.1 International programs

Assessment studies relating to geological storage potential of CO₂ are underway in several regions of the world, namely USA, Canada, Europe and Japan, and are well advanced in Australia. Storage capacity estimates for geological reservoirs such as saline aquifers, oil and gas fields and coal seams show that there is potential to significantly reduce global CO₂ emissions through geological sequestration. The methodologies and assumptions used to estimate CO₂ storage capacities are evolving such that comparisons of storage assessments need to be judiciously examined before conclusions are reached. However, global levels of CO₂ from stationary sources are well documented, and over 14 600 emission point sources have been identified.

Large industry and power plants are recognised as the principal emitters of CO₂ worldwide. North America has the largest number of stationary CO₂ sources (37%) followed by OECD Europe (14 %) and China (10%) (Gale 2002).

Currently, there are at least three international pilot projects directly involved in injecting and monitoring CO₂:

- 1) injection into saline formations of the Sleipner field in the Norwegian sector of the North Sea;
- 2) enhanced oil recovery in the Weyburn Field in Saskatchewan, Canada; and
- 3) enhanced coal bed methane recovery in Recopol, Poland.

Further activities in geological sequestration include acid gas injection projects in Canada; planned tests of geological storage in Japan; and a BP project re-injecting captured CO₂ into natural gas reservoirs in Algeria (Bradshaw and coworkers 2002b).

The most significant in terms of relevance to current Australian research is the injection into the Statoil operated Sleipner field. The GEODISC project has enabled Australia to form links with the Sleipner project research and operations staff and gain practical experience in monitoring, in particular, 4D-seismic monitoring. When the Sleipner West offshore gas-condensate field came on-stream in October of 1996, field refinery infrastructure included the Sleipner treatment platform, and the world's first offshore CO₂ stripping plant. The CO₂ is captured and compressed at the treatment platform, before being injected into the Utsira Formation about 1200 m below the sea floor. The Utsira Formation is a very permeable sandstone between 200 and 250 m thick that is overlain by mudstone. At present, about 1 Mt of CO₂ per year is injected and, to date, this is the only commercial-scale CO₂ storage site employing sub-surface injection technology anywhere in the world (Kårstad 2002).

10.2 GEODISC project 1999–2003

The GEODISC project, under the umbrella of the APCRC program, has finalised its geological sequestration research outputs and outcomes. This research was conducted by CSIRO (Petroleum), Curtin University, Geoscience Australia, the University of Adelaide NCPGG (National Centre for Petroleum Geology and Geophysics — now ASP (Australian School of Petroleum)), and the University of New South Wales. The work was supported by the Australian Greenhouse Office (AGO), BHP Billiton, BP, Chevron, Gorgon JV, Shell, TotalFinaElf and Woodside.

Wide-ranging studies included assessment of the regional storage potential in 300 sedimentary basins, revision of greenhouse gas emissions in Australia, matching of CO₂ sources and sinks, completing economic modelling of the viability of the source-to-sink match and capturing all data and results into an Oracle relational database. In addition to the basin overview research, four basins were the subject of detailed site-specific studies on geological modelling and storage potential. The methodology and risking were uniquely developed by the GEODISC researchers. Furthermore, the methodology underwent constant revision, a reflection of the rapidly evolving science of geological sequestration. The GEODISC project also undertook:

- experimental studies on the CO₂-water/brine-rock systems
- petrophysical studies
- development of a coupled chemical-dynamic-kinetic model
- monitoring of CO₂ injection

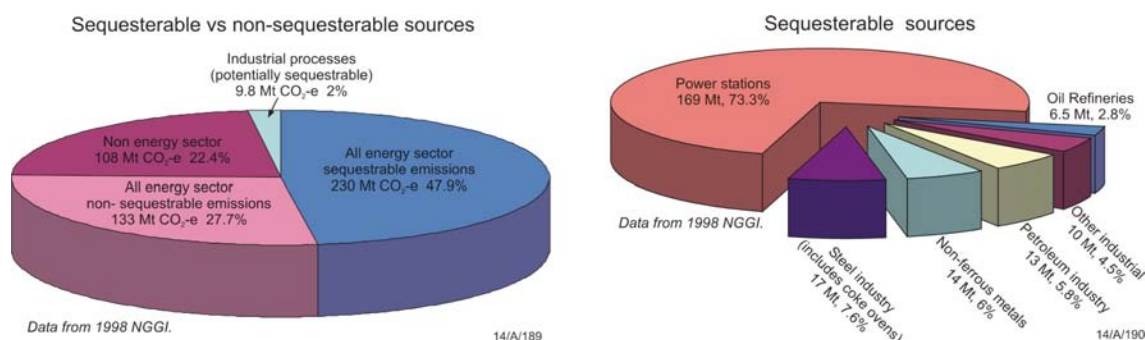


Figure 10.1 Sequesterable vs non-sequesterable sources of CO₂, and a further breakdown of the sequesterable sources by industry (Bradshaw et al. 2002a).

- risk assessment
- economic modelling
- international cooperation
- natural analogues
- education & training (Bradshaw and Rigg 2001).

Emissions mapping

The 1998 National Greenhouse Gas Inventory (NGGI) produced by the Australian Greenhouse Office estimated that Australia emitted 455.9 Mt or 8.5 Tcf of CO₂ per annum (503.3 Mt CO₂-e in 1999, and 535.3 Mt CO₂-e in 2000). In addition, the AGO identified the origin of CO₂ emissions. Emissions that originate from point sources such as power stations are large, and can potentially be sequestered. Emissions from random or non-point sources such as cars are considered non-sequesterable at this point in time. Currently in Australia, 50% of total CO₂ emissions (239.8 Mt) come from stationary point-sources that have the potential to be sequestered. These point-sources can be further divided into various industry sectors, refineries, and power stations, with the latter proving to be the largest emitters of CO₂ (Figure 10.1).

Emissions mapping (Figure 10.2) has shown that the top 50 point sources around Australia represent about 96% of the potential sequesterable emissions. Based on proximity to one another, these sources have been further grouped into major CO₂ emission nodes, allowing a possible reduction of infrastructure costs associated with sequestration.

Identification and Assessment of Storage Sites

Three hundred sedimentary basins in Australia were analysed by GEODISC researchers to determine their viability for CO₂ storage (Bradshaw 2003). In particular, basins near to known emission sites and possible future emission sites were included in the study.

Of the basins that were examined, 48 were then selected based on initially suitable geological characteristics (such as thickness, depth, stratigraphy, lithology and structural

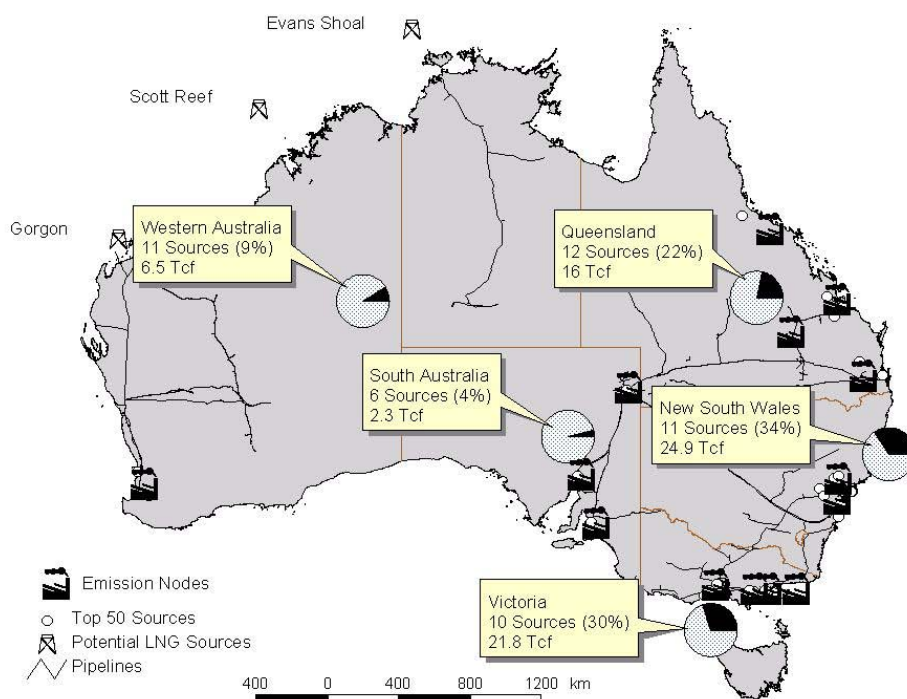


Figure 10.2 Australia’s point-source CO₂ emissions (20-year projected). Clusters of the top 50 sources are grouped into emission nodes. The percentage of national, stationary (sequesterable) emissions is calculated for each state, with the highest emitters being in the east.

complexity) to assess the potential injection and storage of CO₂. Within these 48 sites, 65 potential ESSCIs (Environmentally Sustainable Sites for CO₂ Injection) and 22 ISOs (Implausible Sequestration Options) were identified and ranked according to five *risking factors*:

1. *storage capacity* — the chance that the reservoir will meet the volume requirements of neighbouring, currently identified CO₂ sources.
2. *injectivity potential* — the chance that the reservoir conditions will be viable for injection.
3. *site details* — the chance that the site is economically and technically viable.
4. *containment* — the chance that the seal and trap will be effective for storing CO₂.
5. *existing natural resources* — the chance that there are no viable natural resources in the ESSCI that may be compromised.

Sites that failed one or more of the risk factors, or had insufficient and poor quality data were deemed to be ISO (unsuitable for use in sequestration). Figure 10.3 shows the location of all the ESSCIs and ISOs examined by the study (Bradshaw et al. 2002a,b; Bradshaw 2003).

Following the allocation of risking factors, an ‘ESSCI chance’ was calculated by multiplying

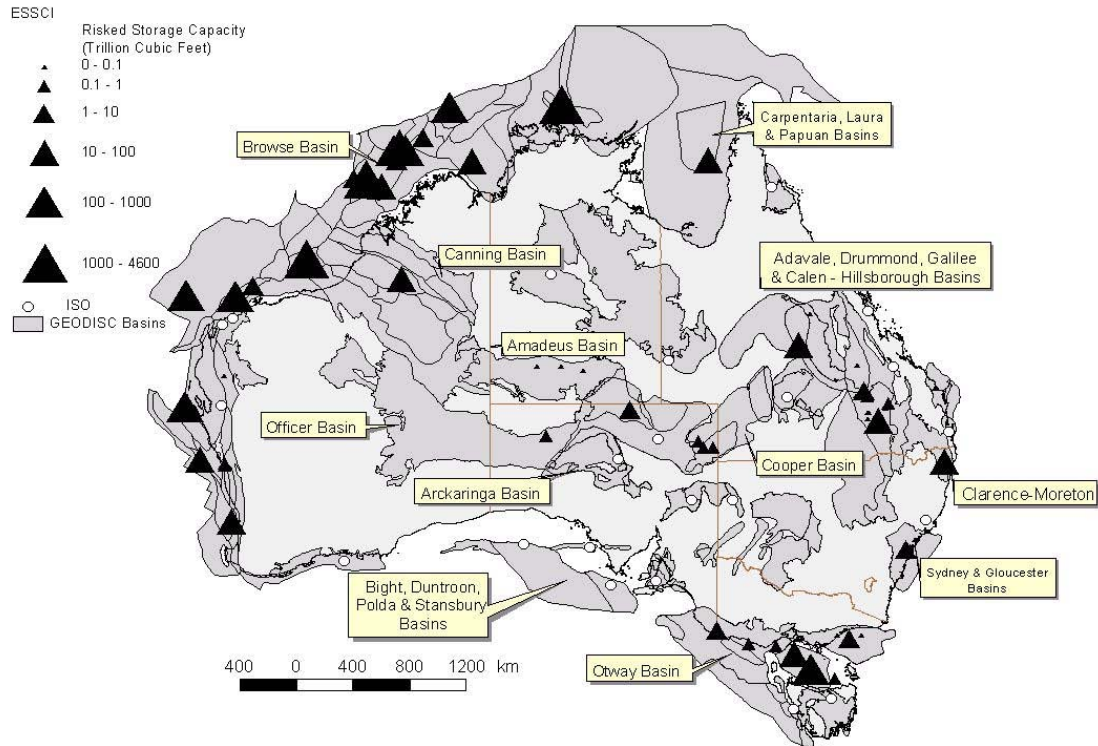


Figure 10.3 Location of the sedimentary basins assessed as part of the GEODISC project, the Environmentally Sustainable Sites for CO₂ Injection (ESSCIs), and the Implausible Sequestration Options (ISOs). ESSCI symbols are scaled according to risked storage capacities, the largest being located on the Northwest shelf.

the five risk factors for each site. The resultant risk was rated between 0 (fail) and 1 (complete success). The ESSCI chance allowed for comparisons between sites to be made and the most viable ones to be identified based on geotechnical, environmental and economic risk factors. Additional risk calculations were used to compare sites and to create an Australia-wide listing of potential storage sites. These calculations included: *risked capacity* (i.e. ESSCI chance \times total estimated storage capacity of CO₂), and *ESSCI rating* (i.e. ESSCI chance/radius of 1 Tcf CO₂ at the site) (Bradshaw et al. 2002a).

Site-specific studies involved comprehensive modelling and geological interpretation of sites in the Petrel Sub-basin, northern Perth Basin, Barrow Sub-basin and Gippsland Basin.

Modelling included geomechanical modelling and reservoir simulation modelling thus providing scientific understanding of how the CO₂ reacts when injected into various geological formations (Bradshaw et al. 2002b; Streit and Hillis 2002). Each site study presented different challenges when modelling the response of CO₂ injection in the various trap types.

Each trap type had unique characteristics, thereby influencing the risk assigned to the ESSCI. For example, ESSCIs associated with hydrodynamic traps were initially rated low, mostly due to the perceived higher risk for containment (i.e. CO₂ migrating to the edge of

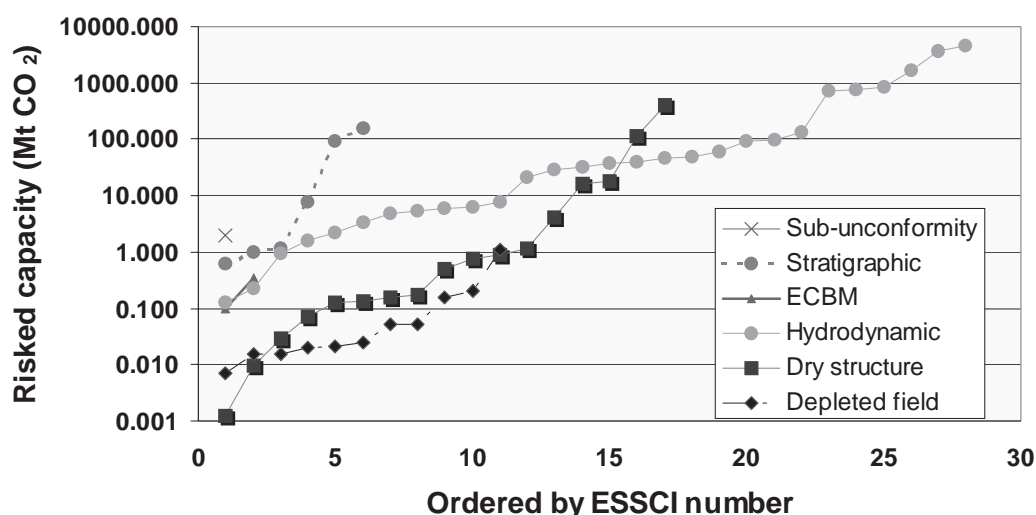


Figure 10.4 ESSCI capacity (ESSCI chance x total pore volume) plotted against the number of ESSCIs for different ESSCI types (Bradshaw et al. 2002b)

the basin has a higher chance of escaping). However, in the case of the Petrel Sub-basin, reservoir modelling results indicate that over a period of 10 000 years there would be complete dissolution of the CO₂ into the formation water. The CO₂ would move only tens of kilometres from the injection site and in that time not migrate anywhere near the edges of the basin located some 120 km away. In contrast, depleted fields have more certainty associated with them because they have stored hydrocarbons for thousands to millions of years. The ESSCI chance for dry structures (non-petroleum bearing) is wide-ranging, reflecting the variety of geological settings that were being examined.

Storage capacity

The potential storage capacity of the different ESSCI trap types is highly variable. For example, about 43% of the sites studied were hydrodynamic traps, which actually represent about 94% of the risked storage capacity of all sites. Hydrodynamic traps have large storage potential relative to other ESSCI types. Figure 10.4 shows the distribution of ESSCIs plotted against risked capacity (Bradshaw et al. 2002b). On a national scale, the total risked capacity for the 65 ESSCIs studied is 740 000 Mt of CO₂. This amounts to a potential to store 1600 years of CO₂ emissions based on Australia's total net emissions for 1998 (Bradshaw 2003).

Storage costs

Following on from geological risk assessment and storage capacity, project costs for each source-to-sink match were also assessed so as to consider the relative costs for each ESSCI. Whether or not a site would be commercially viable would depend on project specific economics such as the cost associated with compression of CO₂, transport via pipelines and injection. Capital costs of the portfolio of 65 ESSCIs examined ranged from \$US13 million to \$US1300 million. Sites examined with small CO₂ sources adjacent to a depleted gas field with existing infrastructure facilities ended up being more cost effective

than large sources more than 1000 km from an injection site (Bradshaw 2003). However, significant benefits occur from having large flow rates in terms of a cost per tonne. Thus large separations between sources and sinks should not be immediately dismissed, until the project-specific costs have been estimated.

Source to sink

Source to sink matching is an estimation that any given ESSCI site will have the storage capacity to sequester the CO₂ from a nearby source over a 20 year period. This ratio is calculated by dividing the risked storage capacity with the 20 year emissions volume of a source. Results from this show that there is enormous potential for storage on the North West Shelf, whilst the potential in eastern Australia is not as good due to poor reservoir characteristics and high source volumes of CO₂ (Bradshaw et al. 2002a). A comparison of Figures 10.2 and 10.3 reveals the dichotomy observed between north Western Australia (i.e. low source volumes and high storage capacity) and eastern Australia (i.e. high source volumes and low storage capacity) (Bradshaw et al. 2002b).

From the preliminary work completed in the GEODISC project, a realistic estimate of the likely volumes of CO₂ that could be stored in Australia on a yearly basis was attempted. This estimate was based on matching sources with the best nearby sinks, making some assumptions as to which might become commercially viable. Subsequent to this estimate, a more refined approach was adopted, whereby the storage potential was estimated based on an increasing credit for the storage of CO₂. This method suggested that 50–180 Mt of CO₂ could be potentially stored given a credit for CO₂ that ranged from US\$20/t to US\$40/t (Bradshaw et al. 2002a). Using this method, the storage potential of CO₂ for identified ESSCIs is estimated at 100 to 115 Mt/year, or up to 25% of the 1998 total net emissions.

10.3 CO2CRC 2003–2010

Building on the success and partnerships established in the GEODISC project, the CO2CRC is undertaking research into both CO₂ capture and CO₂ storage technologies. Aside from a reduction of greenhouse gas emissions, there are other benefits to be gained through the successful injection and storage of CO₂. Commercial benefits can also be obtained, such as EOR or ECBM. The CO2CRC will undertake research into all these options. Effectively using CO₂ as a commodity, and identifying a successful capture and storage process, may create new investment opportunities in Australia with the added benefit of decreasing CO₂ emissions (e.g. the potential development of the high CO₂ gas fields on the North West Shelf).

Key research within the CO2CRC will be identifying sites for long-term geological storage, and starting a demonstration site where the migration and storage of CO₂ in the sub-surface will be tested and monitored. Future work by the CRC will involve refinement of the research thus far, by advancing the probabilistic analysis of potential ESSCIs. A comprehensive assessment of community risk will be carried out in order to provide the public with factual information and reassurance regarding the processes involved. An outcome of the work is to enhance public confidence in the contribution that development of capture and storage technologies will make to decreasing CO₂ emissions in Australia, and also globally.

One of the major challenges for the CO₂CRC will be to assess sites more comprehensively and develop geological sequestration as a sustainable, cost effective and socially acceptable tool for lowering emission rates. The CO₂CRC will address the mandate on carbon emission levels for Australia by providing a technical framework for geological sequestration. The resulting increased knowledge-base on greenhouse gas technologies has, and will continue to advance Australia globally in sequestration research. The CRC will ultimately provide greenhouse gas mitigation options for industry and government that are cost-effective, thereby helping to provide a sustainable future for Australian fossil fuels and energy-intensive products, while producing real reductions in CO₂ emissions in Australia.

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11: Petroleum data and information

Public access to existing petroleum exploration data reduces financial and exploration risks for explorers, particularly when exploring frontier areas. Australian Commonwealth and State Governments have a long-standing policy requiring exploration data to be lodged and released publicly after a confidentiality period, to encourage further exploration.

The *Petroleum Search Subsidy Acts 1957* (PSSA) was enacted at a time when Australia was considered to be poorly prospective for oil and gas. Exploration was subsidised under the PSSA on condition that data were made available to assist future exploration. During the term of the PSSA significant discoveries were made in the Gippsland, Cooper, Bowen/Surat and Amadeus Basins, and on the North West Shelf.

As Australia's petroleum exploration and production industry became established the subsidy was removed with the introduction of the *Petroleum Submerged Lands Act 1967* (P(SL)A). The P(SL)A which governs petroleum exploration and production in Australia's offshore area beyond three nautical miles from the coast, retained the requirement to lodge exploration data and to make those data available for subsequent exploration. The arrangement continues to this day.

The Australian Government makes these exploration data available to industry to promote and facilitate oil and gas exploration. The data are also used by government agencies, including Geoscience Australia, to support technical advice to Government and to promote acreage release.

Geoscience Australia is custodian of Australia's largest collection of petroleum data, including data lodged with the Government under the PSSA and P(SL)A. The collection also includes data collected by Geoscience Australia's Continental Margins Program and other research programs. It contains seismic data, well log data, cores and cuttings from exploration wells, well completion reports, seismic survey reports, and reports from the analysis of core samples.

11.1 Lodgement of data

The P(SL)A is administered in each State on behalf of the Australian Government by a Designated Authority (DA) in each State. The DA has the responsibility under the Act for determination of matters relating to the operation of the Act in offshore areas of the State. All lodgements and access to data formally involve the office of the DA in each State, but direct access to the Geoscience Australia repositories is also possible.

Under the P(SL)A, petroleum exploration and production data are made publicly available after specified times. Basic data are normally available after two years and most interpretative data are available after five years. Basic data comprise the field and processed data normally available to the explorationist for interpretation (e.g. seismic reflection and other geophysical data in both field and processed form; well stratigraphy; well logs; well test data and cores and cuttings). Interpretative data refer to professional assessments in

terms of potential for discovery and production of hydrocarbons, and may arise from studies of basic data.

11.2 Data Availability

Digital seismic tape Remastering Project

The Australian Government Budget of May 2003 has allocated resources to be used for the copying and concatenation onto high density media, of older technology tapes (9 and 21 track) held in the Geoscience Australia repository.

As part of the Budget process, the Minister ‘announced the new funding which will be used over four years to provide vital geological and seismic data to companies considering oil exploration in Australian waters’. In part, the Ministerial statement said: ‘It will also enable the copying of more than half a million tapes held by Geoscience Australia onto modern storage media. This preservation is necessary to ensure valuable seismic data is not lost because of the deterioration of old technology tapes.’

The copying and concatenation of the seismic data will result in more efficient access and lower costs for petroleum companies wanting to use these seismic data for processing and interpretation. After copying and concatenation some of the older surveys can be contained completely on a few tape cartridges. Currently companies are required to borrow the large number of older media associated with a seismic survey and return copies to Geoscience Australia.

Industry access

In the past twelve months, digital data from over 250 seismic surveys and 160 offshore wells have been borrowed by local and overseas petroleum companies. These data loans have amounted to 5 terabytes (5 000 gigabytes) of data. Over the past three years there has been an average of 5 terabytes, accessed by industry, every year.

Digital seismic exploration and well log data

Geoscience Australia’s collection is made up of over 570 000 digital magnetic tapes, some analogue data, and associated paper data from over 700 seismic surveys. The digital magnetic tapes contain field seismic survey data and well log, processed seismic and navigation data. The tape media include 21 track tapes, 9 track tapes, 3480 tapes, 3590 tapes, 8 mm and DAT tapes.

Drilling and geophysical survey reports

Geoscience Australia's repository houses more than 3500 drilling reports, geophysical reports and support data and includes:

- operations, positioning, processing and acquisition reports, shotpoint location and water depth maps, velocity data and seismic sections;
- interpretative data comprising various reports and maps;
- drilling data comprising well completion reports, logs, maps, and other data generated during operations; and
- prints and transparencies for logs, maps and seismic sections.

While most of the reports are printed documents, more recent reports have been submitted on CD, with processed seismic data being lodged on tapes. Data on open file can be viewed at the Symonston repository or can be scanned to CD on request.

Cores, cuttings and fluid samples

The following physical data are available:

- samples from over 5700 petroleum wells and stratigraphic holes;
- over 150 000 m of down-hole core samples;
- over 3 000 000 m of down-hole drill cuttings;
- over 3000 onshore sidewall cores;
- 14 000 thin sections and 9000 reservoir plugs;
- assorted prepared samples from previous analyses;
- over 1200 open file destructive analyses reports, and
- documented duplicate and unwashed samples.

11.3 Metadata databases

The Petroleum Exploration Data Index (PEDIN) contains data for over 10 000 wells and 4500 geophysical surveys. Basic drilling data are recorded for all wells drilled in Australia. More detailed data, such as formation tops, down-hole temperature and seismic horizon intersections, are recorded for PSSA and P(SL)A wells. Index data are recorded for onshore and offshore geophysical surveys including operator, titles, basins and survey specifications. Surveys conducted under the PSSA and P(SL)A have more details, such as summaries from data acquisition, navigation and interpretation reports, line numbers and other line information. PEDIN interfaces with other Geoscience Australia databases.

The Petroleum Information Management System (PIMS) manages data lodged under the Australian Government legislation. This database is accessible through the Geoscience Australia website.

11.4 Contacts

All Geoscience Australia's data collections are located in the Geoscience Australia Data Repository at Symonston, ACT, Australia. Inquiries regarding lodgement of and access to data in the repositories, including charges for access, may be made through the Designated Authorities or directly with Geoscience Australia Data Repositories, or through the Geoscience Australia web page;

Geoscience Australia Data Repository

Postal Address: GPO Box 378 Canberra, ACT 2601, Australia

Street Address: Cnr Jerrabomberra Ave and Hindmarsh Drive, Symonston ACT 2609

Phone: +61 2 6249 9222

Fax: +61 2 6249 9903

Email: ausgeodata@ga.gov.au

Web page: www.ga.gov.au

Appendices

Appendix A 2002

Wells drilled for petroleum exploration, development and production by State, 2002

APPENDIX A: WELLS DRILLED FOR EXPLORATION, DEVELOPMENT AND PRODUCTION BY STATE, 2002

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
QUEENSLAND							
BEACH Bodalla South 14 PL31	Eromanga	-26° 27' 34" 143° 25' 36"	RT 157.7 GL 153.8	22-Oct-02 02-Nov-02	1 610 1 610	Completed as a Jurassic Hutton Sst oil producer.	DEV DEV
BEACH Kenmore 27 PL32	Cooper/Eromanga	-26° 38' 44" 143° 26' 24"	RT 175.1 GL 171.2	27-Sep-02 14-Oct-02	1 441 1 441	Completed as a Hutton Sst oil producer.	DEV DEV
MOSAIC Barker 1 ATP471P	Surat	-27° 39' 3" 149° 15' 19"	RT 285 GL 280.75	07-Apr-02 26-Apr-02	2 231 2 231	Plugged and abandoned, dry.	NFW NFW
MOSAIC Churchie 1A ATP471P	Surat	-27° 5' 48" 149° 12' 51"	RT 258 GL 253	11-Dec-02 22-Dec-02	2 134 2 134	Cased and suspended pending completion as a future Tinowon Sandstone gas producer.	EXT EXT
MOSAIC Churchie 3 ATP471P	Surat	-27° 5' 23" 149° 11' 32"	RT 248.2 GL 244	31-May-02 17-Jun-02	2 124 2 124	Cased and suspended as a future gas producer.	EXT EXT
MOSAIC Downlands 3 PL119	Surat	-27° 7' 11" 149° 2' 57"	RT 244 GL 239.75	14-May-02 23-May-02	1 948 1 948	Cased and suspended pending completion as a Permian oil producer.	DEV DEV
MOSAIC Downlands East 2 PL119	Bowen/Surat	-27° 7' 27" 149° 4' 48"	RT 244 GL 239.75	30-Apr-02 09-May-02	1 950 1 950	Plugged and abandoned, dry.	EXT EXT
MOSAIC Norkam 1 ATP471P	Bowen/Surat	-27° 8' 35" 149° 11' 22"	RT 250 GL 245	19-Aug-02 02-Sep-02	2 220 2 220	Cased and suspended as a potential future gas producer from the Rewan Fm.	NFW NFD
MOSAIC Tinker 5 PL16	Bowen/Surat	-27° 27' 21" 149° 18' 19"	RT 5 GL 345	06-Sep-02 15-Sep-02	2 232 2 232	Plugged and abandoned with non-commercial gas shows.	EXT EXT
OCA Glentulloch 6 PL45	Bowen/Surat	-25° 47' 18" 148° 22' 49"	RT 477 GL 472	04-Dec-02 10-Dec-02	935 935	Cased and suspended pending completion as a Permian Aldebaran sandstone gas producer.	DEV DEV
OCA Horseshoe 2 ATP375P	Surat	-27° 0' 41" 149° 11' 27"	RT 247 GL 242	13-Oct-02 26-Oct-02	1 969 1 969	Completed as a gas producer.	EXT EXT
OCA Myall Creek 3 PL174	Bowen/Surat	-27° 4' 17" 149° 12' 54"	RT 247 GL 242	22-Sep-02 02-Oct-02	2 140 2 140	Cased and suspended as a future gas producer.	DEV DEV
OCA Myall Creek 4 PL174	Surat	-27° 4' 49" 149° 13' 1"	RT 250 GL 245	20-Nov-02 28-Nov-02	2 164 2 164	Cased and suspended as gas producer.	DEV DEV
OCA New Royal 8 PL22	Bowen	-27° 6' 2" 148° 52' 9"	RT 272.5 GL 268	16-Feb-02 21-Feb-02	1 531 1 531	Cased and suspended pending completions as a future Triassic oil producer.	DEV DEV
OCA Riverside South 1 PL174	Surat	-27° 4' 27" 149° 11' 9"	RT 245.5 GL 240	01-Nov-02 13-Nov-02	2 124 2 124	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
QUEENSLAND							
SANTOS Acrus 1 PL131	Cooper/Eromanga	-27° 43' 21" 141° 50' 21"	RT 73.7 GL 68.7	22-Apr-02 11-May-02	2 789 2 789	Cased and suspended as a Permian gas producer.	NFW NFD
SANTOS Ballera West 3 PL61	Cooper/Eromanga	-27° 23' 24" 141° 46' 32"	RT 105.5 GL 100	12-Feb-02 12-Feb-02	2 573 2 573	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Barrolka 8 PL112	Cooper/Eromanga	-26° 53' 18" 141° 41' 44"	RT 109 GL 104	16-Dec-01 03-Jan-02	2 630 2 630	Cased and suspended as a future gas producer.	EXT EXT
SANTOS Cook 9 PL97	Cooper/Eromanga	-26° 40' 47" 141° 17' 32"	RT 130 GL 145	11-Jan-02 17-Jan-02	2 067 2 067	Cased and suspended as a Jurassic oil producer.	EXT EXT
SANTOS Juno 5 PL131	Cooper/Eromanga	-27° 41' 49" 141° 49' 44"	RT 73 GL 68	16-May-02 08-Jun-02	2 780 2 780	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Karmona 3 PL81	Cooper/Eromanga	-27° 18' 14" 141° 52' 60"	RT 115.2 GL 110	18-Jun-02 30-Jun-02	2 553 2 553	Cased and suspended as a future Permian gas producer.	EXT EXT
SANTOS Munkah 9 PL60	Cooper/Eromanga	-27° 25' 4" 141° 54' 49"	RT 96 GL 90	11-Mar-02 18-Mar-02	2 356 2 356	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Munkah 10 PL60	Cooper/Eromanga	-27° 25' 34" 141° 54' 22"	RT 93 GL 88	08-Apr-02 16-Apr-02	2 396 2 396	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Munkah 11 PL60	Cooper/Eromanga	-27° 26' 36" 141° 53' 38"	RT 79 GL 74	24-Mar-02 03-Apr-02	2 361 2 361	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Sardine Creek 1 ATP337P	Bowen	-25° 16' 29" 148° 23' 18"	RT 656.5 GL 652	16-Nov-02 27-Nov-02	1 526 1 526	Cased and suspended as a future gas producer.	NFW NFD
SANTOS Stokes 11 PL84	Cooper/Eromanga	-28° 20' 16" 141° 2' 32"	RT 93 GL 88	02-Mar-02 15-Mar-02	2 510 2 510	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Stokes 12 PL84	Cooper/Eromanga	-28° 20' 53" 141° 3' 0"	RT 97 GL 92	18-Jan-02 30-Jan-02	2 520 2 520	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Stokes Central 1 ATP259P	Cooper/Eromanga	-28° 19' 7" 141° 2' 40"	RT 91.7 GL 86	05-Feb-02 19-Feb-02	2 606 2 606	Cased and suspended as a future Permian gas producer.	NFW NFD
SANTOS Tellus South 1 ATP259P	Cooper/Eromanga	-28° 22' 37" 141° 3' 36"	RT 98.5 GL 93	25-Dec-01 11-Jan-02	2 611 2 611	Cased and suspended as a future Permian gas producer.	NFW NFD
SANTOS Thungo 7 PL51	Cooper/Eromanga	-26° 16' 41" 142° 34' 57"	RT 111.6 GL 106.5	09-Jul-02 15-Jul-02	1 096 1 096	Cased and suspended as a future oil producer.	DEV DEV
SANTOS Wackett 12 PL86	Cooper/Eromanga	-27° 31' 1" 141° 59' 52"	RT 77 GL 72	28-Jan-02 06-Feb-02	1 978 1 978	Cased and suspended as a Permian gas producer.	DEV DEV

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
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QUEENSLAND

METRES DRILLED - QUEENSLAND

Wells	Onshore	Offshore	Total
Exploration	33 766	-	33 766
Development	32 339	-	32 339
Total	66 105	-	66 105

VICTORIA

BHP BILLITON Minerva 3 VIC/L22	Otway	-38° 42' 28" 142° 57' 28"	RT 26 WD -59.25	24-Nov-02 04-Dec-02	1 760 1 760	Cased and suspended as a future gas producer.	EXT EXT
ESSO Beardie 1 VIC/L 2	Gippsland	-38° 15' 12" 147° 48' 24"	RT 25 WD -50	27-Jul-02 04-Aug-02	1 905 1 905	Plugged and abandoned, dry.	NFW NFW
ESSO Tuna A 5A VIC/L 4	Gippsland	-38° 10' 16" 148° 25' 7"	KB 32.9 WD -59.4	10-Dec-02 26-Dec-02	3 257 3 046	Cased and suspended as a future oil and gas producer.	DEV DEV
ESSO Tuna A 10A VIC/L 9 R1	Gippsland	-38° 10' 25" 148° 25' 3"	KB 32.9 WD -59.4	16-Oct-02 17-Oct-02	2 243 267	Completed as a future oil producer.	DEV DEV
ESSO Tuna A 11B VIC/L 9 R1	Gippsland	-38° 10' 16" 148° 25' 6"	KB 32.9 WD -59.4	15-Nov-02 17-Nov-02	3 041 523	Completed as an oil producer.	DEV DEV
ESSO Tuna A 29 VIC/L 9	Gippsland	-38° 10' 25" 148° 25' 3"	RT 32.9 WD -59.4	27-Jul-02 12-Aug-02	3 075 3 075	Completed as an oil producer.	DEV DEV
ESSO Tuna A 30 VIC/L9	Gippsland	-38° 10' 25" 148° 25' 3"	RT 32.9 WD -59.4	23-Aug-02 03-Sep-02	2 862 2 862	Completed as an oil producer.	DEV DEV
ESSO Tuna A 31 VIC/L 9	Gippsland	-38° 10' 16" 148° 25' 5"	RT 32.9 WD -59.4	30-Jun-02 17-Jul-02	3 220 3 220	Completed as an oil producer.	DEV DEV
ESSO West Tuna W 8A VIC/L 4	Gippsland	-38° 11' 36" 148° 23' 14"	RT 34.69 WD -61.1	25-Feb-02 25-Mar-02	3 590 2 895	Completed as an oil producer.	DEV DEV
ESSO West Tuna W 33A VIC/L 4	Gippsland	-38° 10' 25" 148° 25' 3"	RT 38.9 WD -61.1	24-Apr-02 25-Apr-02	2 460 488	Completed as an oil producer.	DEV DEV
ESSO West Tuna W 38A VIC/L 4	Gippsland	-38° 10' 25" 148° 25' 3"	RT 38.9 WD -61.1	19-May-02 22-May-02	1 730 990	Completed as an oil producer.	DEV DEV
ESSO West Tuna W 48A VIC/L 4	Gippsland	-38° 10' 25" 148° 25' 3"	NA -	21-Jan-02 24-Jan-02	2 268 1 621	Completed as an oil producer.	DEV DEV
LAKES York 1 (Lakes Oil Ltd) PEP158	Gippsland	-38° 34' 58" 146° 51' 37"	RT* 14 GL 12	28-Feb-02 15-Mar-02	1 200 1 200	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
VICTORIA							
OMV Baleen 3 VIC/RL 5	Gippsland	-38° 0' 24" 148° 26' 36"	RT 25 WD -52.5	24-May-02 04-Jun-02	1 555 1 770	Completed as a future Tertiary age Gunard Fm gas producer.	DEV DEV
OMV Patricia 2 VIC/RL 5	Gippsland	-38° 1' 36" 148° 26' 54"	RT 25 WD -52.5	20-Jun-02 28-Jun-02	1 385 1 385	Cased and suspended as a future gas producer.	DEV DEV
OMV Sole 2 VIC/RL3	Gippsland	-38° 6' 13" 149° 0' 33"	RT 25 WD -124.5	11-Jul-02 16-Jul-02	1 005 1 005	Cased and suspended as a future gas producer.	EXT EXT
ORIGIN Port Fairy 1 PEP152	Otway	-38° 21' 39" 142° 12' 49"	NA -	09-Jan-02 21-Jan-02	1 550 1 550	Plugged and abandoned.	NFW NFD
SANTOS Buttress 1 PEP154	Otway	-38° 30' 59" 142° 48' 31"	RT 50.7 GL 46	07-Jan-02 17-Jan-02	1 710 1 710	Cased and suspended as a future Permian gas producer.	NFW NFD
SANTOS Casino 1 VIC/P44	Otway	-38° 57' 19" 142° 42' 0"	RT 25 WD -70.5	25-Aug-02 14-Sep-02	2 118 2 118	Plugged and abandoned.	NFW NFD
SANTOS Casino 2 VIC/P44	Otway	-38° 47' 44" 142° 44' 51"	KB 25 WD -67.8	24-Sep-02 03-Oct-02	2 112 2 112	Plugged and abandoned, dry.	EXT EXT
SANTOS Minerva 4 VIC/L22	Otway	-38° 43' 13" 142° 57' 39"	RT 26 WD -59.25	19-Dec-02 -	- -	Drilling ahead.	DEV -
SANTOS Naringal 1 PEP154	Otway	-38° 27' 18" 142° 44' 22"	RT 53.7 GL 49	23-Jan-02 31-Jan-02	1 710 1 710	Plugged and abandoned, dry.	NFW NFW
SANTOS Seamer 1 PEP153	Otway	-38° 33' 26" 143° 1' 14"	RT 63.7 GL 58.51	18-Dec-02 27-Dec-02	1 360 1 360	Cased and suspended as a future Waarre Sandstone gas producer.	NFW NFD

METRES DRILLED - VICTORIA

Wells	Onshore	Offshore	Total
Exploration	7 530	8 900	16 430
Development	-	22 142	22 142
Total	7 530	31 042	38 572

SOUTH AUSTRALIA

BEACH Aldinga 1 PEL 95	Cooper/Eromanga	-28° 44' 16" 140° 21' 12"	RT 35 GL 30.3	25-Aug-02 02-Sep-02	1 619 1 619	Cased and suspended as a future oil producer.	NFW NFD
BEACH Henley 1 PEL95	Cooper/Eromanga	-28° 35' 22" 140° 52' 12"	RT 90 GL 85	09-Sep-02 17-Sep-02	1 673 1 673	Plugged and abandoned.	NFW NFD
BEACH Maslins 1 PEL 94	Cooper/Eromanga	-28° 52' 57" 140° 0' 58"	RT 24 GL 19.3	10-Aug-02 19-Aug-02	1 358 1 358	Plugged and abandoned.	NFW NFD

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
SOUTH AUSTRALIA							
BEACH Selicks 1 PEL92	Cooper/Eromanga	-26° 4' 12" 139° 28' 35"	RT 23.1 GL 18.4	16-Jul-02 30-Jul-02	2 242 2 242	Cased and suspended as a future oil producer.	NFW NFD
COOPER Karbine 1 PEL 93	Cooper	-28° 25' 56" 139° 47' 7"	RT 28.5 GL 23	12-Dec-02 27-Dec-02	1 900 1 900	Plugged and abandoned, dry.	NFW NFW
INPEX Marabooka 6 PPL22	Cooper/Eromanga	-28° 11' 20" 140° 36' 26"	RT 62.7 GL 59.6	13-Oct-02 23-Oct-02	2 040 2 040	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Barina 6 PPL84	Cooper/Eromanga	-28° 17' 57" 139° 54' 9"	RT 32.5 GL 26.5	02-May-02 08-May-02	2 322 2 322	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Barina 7 PPL84	Cooper/Eromanga	-28° 19' 9" 139° 54' 4"	RT 29.8 GL 24	13-May-02 19-May-02	2 323 2 323	Plugged and abandoned, dry.	DEV DEV
SANTOS Biala 8 PPL30	Cooper/Eromanga	-28° 31' 18" 140° 22' 49"	RT 49 GL 44	30-Apr-02 05-May-02	1 554 1 554	Cased and suspended as an oil producer.	DEV DEV
SANTOS Biala 9 PPL30	Cooper/Eromanga	-28° 32' 38" 140° 21' 1"	RT 47 GL 42	19-May-02 23-May-02	1 535 1 535	Cased and suspended as an Early Cretaceous oil producer.	DEV DEV
SANTOS Big Lake 73 PPL11	Cooper/Eromanga	-28° 13' 32" 140° 17' 38"	RT 37.8 GL 32	30-Oct-02 14-Nov-02	1 970 1 970	Cased and suspended as a future oil producer.	DEV DEV
SANTOS Big Lake 74 PPL11	Cooper/Eromanga	-28° 8' 5" 140° 17' 36"	RT 36 GL 32	16-Nov-02 02-Dec-02	2 021 3 730	Cased and suspended as a gas producer.	DEV DEV
SANTOS Coopers Creek 3 PPL68	Cooper/Eromanga	-27° 48' 17" 140° 1' 12"	RT 35 GL 30	30-Jan-02 12-Feb-02	2 925 2 925	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Cowralli 4 PPL140	Cooper/Eromanga	-27° 53' 44" 139° 59' 33"	RT 40.2 GL 34.4	26-Aug-02 12-Sep-02	3 255 3 255	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Cowralli 5 PPL140	Cooper/Eromanga	-27° 54' 32" 139° 59' 13"	RT 35.7 GL 30	26-Oct-02 06-Nov-02	3 320 3 320	Plugged and abandoned, dry.	EXT EXT
SANTOS Crowsnest 2 PPL141	Cooper/Eromanga	-28° 0' 45" 140° 56' 18"	RT 91.4 GL 85.6	27-Aug-02 18-Sep-02	2 962 2 962	Cased and suspended as a future Permian Gas Producer.	EXT EXT
SANTOS Crowsnest 3 PPL141	Cooper/Eromanga	-28° 1' 22" 140° 54' 28"	RT 92 GL 86.1	29-Dec-02 -	- -	Drilling ahead.	EXT -
SANTOS Dullingari 55 PPL112	Cooper/Eromanga	-28° 7' 55" 140° 51' 35"	RT 82 GL 76	10-Apr-02 23-Apr-02	2 711 2 711	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Dullingari North 14 PPL112	Cooper/Eromanga	-28° 3' 43" 140° 52' 50"	RT 86 GL 80	16-Jan-02 30-Jan-02	2 719 2 719	Cased and suspended as a Permian gas producer.	DEV DEV

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
SOUTH AUSTRALIA							
SANTOS Dullingari North 15 PPL112	Cooper/Eromanga	-28° 3' 2" 140° 53' 14"	RT 89 GL 83	07-Feb-02 22-Feb-02	2 798 2 798	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Dullingari North 16 PPL12	Cooper/Eromanga	-28° 3' 11" 140° 52' 13"	RT 92 GL 86	04-Mar-02 12-Mar-02	2 825 2 825	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Dullingari North 17 PPL112	Cooper/Eromanga	-28° 4' 47" 140° 50' 58"	RT 84 GL 78	24-Mar-02 04-Apr-02	2 928 2 928	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Dullingari North 18 PPL141	Cooper/Eromanga	-27° 58' 11" 140° 54' 49"	RT 93 GL 87	03-Aug-02 22-Aug-02	2 784 2 784	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Fly Lake 11 PPL18	Cooper/Eromanga	-27° 36' 18" 140° 0' 0"	RT 35 GL 29.6	12-Jan-02 26-Jan-02	2 952 2 952	Cased and suspended as a future Permian oil and gas producer.	DEV DEV
SANTOS Gidgealpa 57 PPL 6	Cooper/Eromanga	-28° 1' 45" 139° 57' 57"	RT 44.5 GL 38.7	13-Apr-02 21-Apr-02	2 256 2 256	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Jena 14 PPL30	Cooper/Eromanga	-28° 30' 39" 140° 17' 2"	RT 36 GL 31	29-May-02 02-Jun-02	1 524 1 524	Cased and suspended as an Early Cretaceous oil producer.	DEV DEV
SANTOS Limestone Creek 10 PPL30	Cooper/Eromanga	-28° 31' 26" 140° 24' 9"	RT 45 GL 40	09-May-02 14-May-02	1 308 1 308	Cased and suspended as an Early Cretaceous oil producer.	DEV DEV
SANTOS Marabooka 7 PPL22	Cooper/Eromanga	-28° 11' 0" 140° 37' 11"	RT 59.7 GL 54	26-Sep-02 09-Oct-02	2 037 2 037	Cased and suspended as a future Jurassic and Permian gas producer.	DEV DEV
SANTOS Meranji North 1 PPL35	Cooper/Eromanga	-27° 50' 11" 140° 4' 58"	RT 38.4 GL 33	14-Dec-01 06-Jan-02	2 893 2 978	Plugged and abandoned, dry.	EXT EXT
SANTOS Meranji North 2 PPL35	Cooper/Eromanga	-27° 50' 4" 140° 4' 2"	RT 45.1 GL 39.2	18-Nov-02 01-Dec-02	3 012 3 012	Cased and suspended as a future gas producer.	EXT EXT
SANTOS Moomba 150 PPL 7	Cooper/Eromanga	-28° 6' 24" 140° 18' 53"	RT 40.8 GL 35	10-May-02 25-May-02	2 778 2 778	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Moomba 152 PPL 7	Cooper/Eromanga	-28° 6' 22" 140° 19' 27"	RT 41 GL 35	31-May-02 14-Jun-02	2 802 2 802	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Moomba 154 PPL 7	Cooper/Eromanga	-28° 3' 18" 140° 11' 18"	RT 36.4 GL 28.9	14-Feb-02 25-Feb-02	2 598 2 598	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Moomba 155 PPL 7	Cooper/Eromanga	-28° 5' 3" 140° 18' 25"	RT 45.4 GL 39.6	15-Jun-02 24-Jun-02	2 783 2 783	Cased and suspended as a future gas producer.	DEV DEV
SANTOS Moomba 156 PPL 7	Cooper/Eromanga	-28° 3' 11" 140° 11' 33"	RT 36.2 GL 30.4	06-Jan-02 24-Jan-02	2 612 2 763	Cased and suspended as Permian gas producer.	DEV DEV

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
SOUTH AUSTRALIA							
SANTOS Moomba 157 PPL 7	Cooper/Eromanga	-28° 3' 16" 140° 11' 59"	RT 41.8 GL 36	28-Jan-02 09-Feb-02	2 626 2 626	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Moomba 158 PPL 7	Cooper/Eromanga	-28° 2' 41" 140° 13' 11"	RT 49.7 GL 44	21-Mar-02 30-Mar-02	2 611 2 611	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Moomba 159 PPL 7	Cooper/Eromanga	-28° 3' 51" 140° 11' 16"	RT 35 GL 30	05-Mar-02 17-Mar-02	2 608 2 608	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Moomba 160 PPL 8	Cooper/Eromanga	-28° 10' 8" 140° 11' 24"	RT 37.8 GL 32.1	25-Apr-02 05-May-02	1 844 1 844	Cased and suspended as a Jurassic oil producer.	DEV DEV
SANTOS Moomba 161 PPL 9	Cooper/Eromanga	-28° 9' 54" 140° 11' 15"	RT 37 GL 31	05-Apr-02 19-Apr-02	2 483 2 483	Cased and suspended as a future oil producer.	DEV DEV
SANTOS Moomba 162 PPL 7	Cooper/Eromanga	-28° 5' 32" 140° 17' 16"	RT 41 GL 35	30-Jun-02 14-Jul-02	2 800 2 800	Cased and suspended as a future Permian gas producer.	DEV DEV
SANTOS Moomba 163 PPL 7	Cooper/Eromanga	-28° 5' 55" 140° 17' 55"	RT 41 GL 36	20-Jul-02 01-Aug-02	2 803 2 803	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Moomba 164 PPL 7	Cooper/Eromanga	-28° 6' 12" 140° 18' 13"	RT 41 GL 36	07-Aug-02 22-Aug-02	2 801 2 801	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Moomba 165 PPL 9	Cooper/Eromanga	-28° 14' 29" 140° 12' 59"	RT 34.3 GL 28.4	13-Dec-02 25-Dec-02	2 073 2 073	Cased and suspended as an Early Cretaceous Namur Sandstone oil producer.	DEV DEV
SANTOS Moomba 168 PPL 9	Cooper/Eromanga	-28° 10' 59" 140° 13' 40"	RT 35 GL 29.7	03-Jan-02 11-Jan-02	2 262 2 262	Cased and suspended as an oil producer.	DEV DEV
SANTOS Nephrite South 3 PPL140	Cooper/Eromanga	-27° 54' 25" 139° 53' 11"	RT 40.2 GL 34.4	04-Oct-02 17-Oct-02	3 251 3 251	Cased and suspended as a future Permian gas producer.	EXT EXT
SANTOS Swan Lake 6 PPL84	Cooper/Eromanga	-27° 50' 51" 140° 8' 27"	RT 40.8 GL 34	27-May-02 04-Jun-02	3 072 3 072	Cased and suspended as a Permian gas producer.	DEV DEV
SANTOS Tindilpie 3 PPL140	Cooper/Eromanga	-27° 54' 56" 139° 55' 19"	RT 37.4 GL 31.7	16-Sep-02 02-Oct-02	3 274 3 274	Cased and suspended as a Permian Gas Producer.	EXT EXT
SANTOS Tindilpie 4 PPL140	Cooper/Eromanga	-27° 53' 3" 139° 55' 37"	RT 36.5 GL 30.6	05-Dec-02 20-Dec-02	3 247 3 247	Cased and suspended as future Permian Aldebaran Sandstone gas producer.	EXT EXT
SANTOS Tirrawarra 72 PPL20	Cooper/Eromanga	-27° 41' 56" 140° 4' 37"	RT 36.7 GL 31.7	23-Mar-02 04-Apr-02	3 092 3 092	Cased and suspended as a future Permian oil and gas producer.	EXT EXT
SANTOS Tirrawarra South 1 PPL20	Cooper/Eromanga	-27° 42' 51" 140° 5' 37"	RT 46 GL 41	22-Feb-02 18-Mar-02	3 099 3 099	Cased and suspended as a future Permian gas producer.	EXT EXT

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
SOUTH AUSTRALIA							
SANTOS Ulandi 6 PPL36	Cooper/Eromanga	-28° 32' 31" 140° 18' 51"	RT 40 GL 35	06-Jun-02 10-Jun-02	1 311 1 311	Cased and suspended as an Early Cretaceous oil producer.	DEV DEV
SANTOS Verona 3 PPL158	Cooper/Eromanga	-27° 11' 56" 140° 26' 50"	RT 42.7 GL 30.6	25-Dec-02 -	- -	Drilling ahead.	DEV -
STUART PET. Acrasia 1 PEL90	Cooper/Eromanga	-27° 13' 59" 140° 59' 48"	RT 136.4 GL 131.7	29-Mar-02 23-Apr-02	2 360 2 360	Cased and suspended as a Tinchoo Fm and/or Hutton Sst oil producer.	NFW NFD
STUART PET. Acrasia 2 PEL90	Cooper/Eromanga	-27° 13' 59" 140° 59' 3"	RT 130 GL 125	20-Jun-02 07-Jul-02	2 323 2 323	Cased and suspended as a new pool discovery.	EXT NPD
STUART PET. Acrasia 3 PEL 90	Cooper/Eromanga	-27° 13' 55" 140° 59' 33"	RT 131 GL 126	29-Oct-02 26-Nov-02	2 343 2 343	Completed as an oil production well.	EXT EXT

METRES DRILLED - SOUTH AUSTRALIA

Wells	Onshore	Offshore	Total
Exploration	44 053	-	44 053
Development	91 514	-	91 514
Total	135 567	-	135 567

WESTERN AUSTRALIA

AGIP Woollybutt 1H WA-234-P	Carnarvon	-20° 54' 16" 114° 54' 31"	RT 26 WD -100	14-Sep-02 29-Sep-02	3 178 1 394	Completed as an oil producer.	DEV DEV
AGIP Woollybutt 2A ST2 WA-234-P	Carnarvon	-20° 54' 16" 114° 54' 31"	RT 26 WD -100	01-Aug-02 24-Aug-02	3 260 1 988	Completed as an oil producer.	DEV DEV
APACHE Argos 1 WA-254-P PARTS 1,3 & 4	Carnarvon	-19° 45' 17" 116° 40' 49"	RT 34 WD -59	15-Nov-02 18-Nov-02	2 052 2 052	Plugged and abandoned, dry.	NFW NFW
APACHE Ceres 1 WA-261-P	Carnarvon	-20° 21' 21" 116° 5' 4"	RT 32.1 WD -46	21-Nov-02 24-Nov-02	1 012 1 012	Plugged and abandoned with minor oil shows at TD.	NFW NFW
APACHE Dawn 1 TL/1	Carnarvon	-20° 31' 15" 115° 43' 23"	RT 31.4 WD -38.6	20-Dec-02 -	- -	Drilling ahead.	NFW -
APACHE Double Island 1 TP/8	Carnarvon	-20° 45' 26" 115° 30' 15"	RT 25 WD -8	14-Jan-02 20-Jan-02	2 716 2 716	Plugged and abandoned.	NFW NFD
APACHE Double Island 1H TP/ 8 R2	Carnarvon	-20° 45' 26" 115° 30' 15"	RT 25 WD -8	27-Jan-02 04-Feb-02	2 529 2 529	Completed as an oil producer.	DEV DEV
APACHE East Spar 5 WA-13-L	Carnarvon	-20° 40' 34" 114° 59' 20"	RT 26 WD -95	20-Feb-02 26-Feb-02	2 621 2 621	Plugged and abandoned, dry.	EXT EXT

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
WESTERN AUSTRALIA							
APACHE Endymion 1 TL/1	Carnarvon	-20° 30' 17" 115° 42' 31"	RT 39 WD -41	04-Oct-02 11-Oct-02	3 565 3 565	Completed as a gas producer.	NFW NFD
APACHE Hoover 1 TL/1	Carnarvon	-20° 44' 45" 115° 35' 48"	RT 34.2 WD -11	01-Apr-02 03-Apr-02	1 817 1 817	Plugged and abandoned.	NFW NFD
APACHE Immortelle 1 TP/ 7 R2	Carnarvon	-21° 11' 10" 115° 26' 43"	RT 29 WD -15	30-Nov-02 02-Dec-02	1 258 1 258	Plugged and abandoned.	NFW NFD
APACHE Little Sandy 1 TL/6	Carnarvon	-20° 44' 22" 115° 34' 18"	RT 25 WD -7.5	27-Feb-02 17-Mar-02	2 900 2 900	Cased and suspended as a future oil producer.	NFW NFD
APACHE Pedirka 1 TL/6	Carnarvon	-20° 44' 22" 115° 34' 18"	RT 25 WD -7.5	13-Feb-02 24-Feb-02	2 238 2 238	Cased and suspended as a future oil producer.	NFW NFD
APACHE Selene 1 (Apache) TL/1	Carnarvon	-20° 29' 40" 115° 44' 11"	RT 39 WD -41	17-Oct-02 27-Oct-02	3 900 3 900	Plugged and abandoned, dry.	NFW NFD
APACHE Simpson 4 TL/1	Carnarvon	-20° 40' 24" 115° 35' 6"	RT 26 WD -7	31-Jul-02 12-Aug-02	2 433 4 866	Completed as an oil producer.	EXT EXT
APACHE South Simpson 1 TL/1	Carnarvon	-20° 40' 24" 115° 35' 6"	RT 29 WD -8	18-Aug-02 25-Aug-02	3 050 3 050	Completed as an oil well.	NFW EXT
APACHE Stag 10H L 1 WA-15-L	Carnarvon	-20° 17' 24" 116° 17' 25"	RT 38 WD -49	09-Nov-02 10-Nov-02	2 409 2 409	Completed as an horizontal oil producer.	DEV DEV
APACHE Stag 24H WA-15-L	Carnarvon	-20° 17' 22" 116° 15' 40"	RT 49 WD -49	09-Apr-02 13-Apr-02	1 873 1 873	Completed as a horizontal Stag Sand oil producer.	DEV DEV
APACHE Tanami 6 TL/1	Carnarvon	-20° 40' 24" 115° 35' 6"	RT 28 WD -8	17-Aug-02 01-Sep-02	2 735 2 735	Completed as an oil producer.	DEV DEV
APACHE Taunton 2 TL/2	Carnarvon	-21° 19' 37" 115° 6' 0"	RT 30 WD -15	06-Dec-02 16-Dec-02	1 432 2 864	Plugged and abandoned.	NFW NFW
APACHE Tirari 1 TL/1	Carnarvon	-20° 41' 46" 116° 36' 4"	RT 32.1 WD -9.2	26-Nov-02 29-Nov-02	1 875 1 875	Plugged and abandoned, dry.	NFW NFW
APACHE Victoria 1 TL/6	Carnarvon	-20° 44' 22" 115° 34' 18"	RT 24.7 WD -7.7	12-Feb-02 24-Mar-02	2 958 2 958	Completed as an oil and gas well.	NFW NFD
APACHE Victoria 2 TL/6	Carnarvon	-20° 44' 22" 115° 34' 18"	RT 24.7 WD -7.7	16-Sep-02 21-Sep-02	2 429 2 429	Plugged and abandoned, dry.	EXT EXT
ARC ENERGY Hovea 2 L 1	Perth	-29° 18' 49" 115° 2' 41"	RT 80.8 GL 72.9	23-Jun-02 20-Jul-02	2 687 2 687	Cased and suspended as a future gas producer.	EXT EXT

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
WESTERN AUSTRALIA							
ARC ENERGY Hovea 3 L 1	Perth	-29° 19' 7" 115° 2' 25"	RT 69 GL 61	03-Aug-02 16-Sep-02	2 500 3 357	Completed over the Dongara Sandstone oil reservoir.	EXT EXT
ARC ENERGY Hovea 4 L 1 R1	Perth	-29° 19' 13" 115° 2' 23"	RT 66.9 GL 59	20-Nov-02 -	- -	Drilling ahead.	DEV -
EMPIRE Carlston 1 EP 410	Carnarvon	-23° 49' 51" 114° 11' 49"	KB 38.2 GL 35.3	30-Dec-01 11-Feb-02	1 003 1 003	Plugged and abandoned, dry.	NFW NFW
EMPIRE Eclipse 1 (Empire) EP 389 R1	Perth	-30° 25' 57" 115° 52' 34"	RT 77.9 GL 70	03-Jul-02 -	- -	Drilling ahead.	NFW -
HARDMAN Woodada 17 L 5	Perth	-29° 51' 43" 115° 8' 48"	RT 44.05 GL 35.95	27-Dec-01 10-Jan-02	2 024 2 484	Plugged and abandoned, dry.	DEV DEV
HARDMAN Woodada 19 L 5	Perth	-29° 51' 56" 115° 8' 22"	RT 44.8 GL 37	11-Apr-02 16-May-02	2 841 2 841	Cased and suspended as a future gas producer.	EXT EXT
IB RES. Huascaran 1 WA-292-P	Carnarvon	-18° 46' 56" 117° 48' 6"	RT 24.98 WD -178.62	18-Feb-02 04-Mar-02	2 970 2 970	Plugged and abandoned, dry.	NFW NFW
KERR-MCGEE Wigmore 1 WA-295-P	Carnarvon	-18° 17' 42" 117° 6' 41"	RT 25.1 WD -1175	28-Nov-02 -	- -	Drilling ahead.	NFW -
MOBIL Bloodwood 1 (Apache) WA-202-P	Carnarvon	-20° 1' 34" 116° 40' 32"	RT 33 WD -62	25-Apr-02 28-Apr-02	834 834	Plugged and abandoned, dry.	NFW NFW
MOBIL Jansz 2 WA-268-P	Carnarvon	-19° 43' 12" 114° 22' 51"	RT 25.8 WD -1347.2	03-Nov-02 17-Nov-02	3 285 3 285	Plugged and abandoned, dry.	EXT EXT
MOBIL Quandong 1 WA-202-P	Carnarvon	-19° 59' 12" 116° 31' 12"	RT 31 WD -62	18-Apr-02 22-Apr-02	2 265 2 265	Plugged and abandoned, dry.	NFW NFW
NEXEN Buffalo 7 WA-19-L	Bonaparte	-10° 40' 20" 126° 6' 9"	RT 31.08 WD -29.22	12-Mar-02 05-Apr-02	3 452 3 452	Completed as an oil producer.	DEV DEV
NEXEN Buffalo 8 WA-19-L	Bonaparte	-10° 40' 20" 126° 6' 9"	RT 31.08 WD -29.2	18-Apr-02 08-May-02	3 793 3 793	Plugged and abandoned, dry.	DEV DEV
NEXEN Buffalo 9 WA-19-L	Bonaparte	-10° 40' 20" 126° 6' 9"	RT 31.08 WD -29.2	16-May-02 31-May-02	3 749 2 957	Completed as an oil producer.	DEV DEV
ORIGIN Jingemia 1 EP 413 R1	Perth	-29° 20' 27" 114° 59' 22"	RT 16 GL 8	06-Oct-02 03-Nov-02	2 950 2 950	Completed as an oil producer.	NFW NFD
ORIGIN Morangie 1 WA-226-P R1	Perth	-27° 22' 29" 112° 55' 30"	RT 26 WD -213	16-Oct-02 23-Oct-02	2 188 2 188	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
WESTERN AUSTRALIA							
ROC Cliff Head 2 WA-286-P	Perth	-29° 27' 53" 114° 52' 11"	RT 25.21 WD -16.39	31-Dec-01 03-Jan-02	2 020 1 591	Plugged and abandoned.	EXT EXT
SANTOS Bligh 1 WA-191-P R3	Carnarvon	-19° 13' 60" 116° 40' 0"	RT 26.4 WD -164	26-Sep-02 11-Oct-02	3 205 3 205	Plugged and abandoned, dry.	NFW NFW
SANTOS Corowa Flank 1 WA-264-P	Carnarvon	-21° 28' 25" 114° 33' 33"	RT 26 WD -95.7	01-Feb-02 11-Feb-02	1 670 1 670	Plugged and abandoned, dry.	NFW NFW
SANTOS Exeter 1 WA-191-P	Carnarvon	-19° 18' 16" 116° 33' 59"	RT 26 WD -147	05-Apr-02 14-Apr-02	3 212 3 212	Plugged and abandoned.	NFW NFD
SANTOS Exeter 2 WA-191-P	Carnarvon	-19° 17' 21" 116° 34' 29"	RT 26 WD -151	05-May-02 17-May-02	3 245 3 245	Plugged and abandoned.	EXT EXT
SANTOS Exeter 3 WA-191-P R2	Carnarvon	-19° 19' 6" 116° 34' 0"	RT 169 WD -143	16-Nov-02 09-Dec-02	3 995 3 995	Plugged and abandoned with sub-commercial shows.	EXT EXT
SANTOS Mutineer 2 WA-191-P	Carnarvon	-19° 13' 53" 116° 38' 8"	RT 26 WD -173.2	20-Apr-02 20-Apr-02	3 250 3 250	Plugged and abandoned, dry.	EXT EXT
SANTOS Mutineer 3 WA-191-P R3	Carnarvon	-19° 15' 45" 116° 37' 41"	RT 26.4 WD -160	16-Oct-02 30-Oct-02	3 320 3 320	Plugged and abandoned.	EXT EXT
SANTOS Norfolk 1 WA-191-P	Carnarvon	-19° 14' 55" 116° 39' 13"	RT 26 WD -165	07-Mar-02 19-Mar-02	3 274 3 274	Plugged and abandoned.	NFW NFW
SANTOS Norfolk 2 WA-191-P	Carnarvon	-19° 14' 55" 116° 39' 13"	RT 26 WD -165	24-Mar-02 01-Apr-02	3 350 1 008	Plugged and abandoned.	EXT EXT
WOODSIDE Enfield 4 WA-271-P	Carnarvon	-21° 28' 40" 113° 59' 34"	NA WD -456	14-Jan-02 21-Jan-02	2 240 2 240	Plugged and abandoned.	EXT EXT
WOODSIDE Enfield 5 WA-271-P	Carnarvon	-21° 30' 29" 113° 57' 25"	RT 26 WD -568	10-Sep-02 18-Sep-02	2 150 2 150	Plugged and abandoned.	EXT EXT
WOODSIDE Firetail 1 WA-33-P R3	Browse	-14° 21' 7" 122° 14' 58"	RT 26 WD -318	05-Aug-02 20-Aug-02	3 355 3 355	Plugged and abandoned, dry.	NFW NFW
WOODSIDE Laverda 2 WA-271-P	Carnarvon	-21° 30' 29" 113° 51' 19"	RT 22.3 WD -807	28-Nov-02 27-Dec-02	2 264 2 264	Plugged and abandoned, dry.	EXT EXT
WOODSIDE Whitetail 1 WA-296-P	Carnarvon	-17° 39' 13" 118° 15' 1"	RT 23 WD -953	31-Dec-02 -	- -	Drilling ahead.	NFW -

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
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WESTERN AUSTRALIA

METRES DRILLED - WESTERN AUSTRALIA

Wells	Onshore	Offshore	Total
Exploration	12 838	91 442	104 280
Development	2 484	23 130	25 614
Total	15 322	114 572	129 894

NORTHERN TERRITORY

ANADARKO Anson North 1 AC/P26	Bonaparte	-12° 28' 32" 124° 49' 43"	RT 22 WD -115.4	15-Feb-02 22-Feb-02	1 950 1 950	Plugged and abandoned, dry.	NFW NFW
ANADARKO Sebring 1 AC/P25	Bonaparte	-12° 22' 2" 124° 58' 18"	RT 22 WD -98.8	06-Feb-02 12-Feb-02	1 575 1 575	Plugged and abandoned, dry.	NFW NFW
ANADARKO Sleeper 1 AC/P27	Bonaparte	-12° 37' 37" 124° 56' 31"	NA WD -104	19-Jan-02 30-Jan-02	1 540 1 540	Plugged and abandoned, dry.	NFW NFW
COASTAL Cash 1 AC/P20	Bonaparte	-11° 58' 24" 124° 35' 6"	KB 26 WD -127	05-Jun-02 23-Jul-02	3 929 4 145	Plugged and abandoned.	NFW NFW
NEWFIELD Montara 3 AC/RL3	Bonaparte	-12° 40' 40" 124° 32' 33"	NA WD -73	14-Mar-02 28-Mar-02	2 825 2 825	Cased and suspended as a future oil producer.	EXT EXT
OMV Bodacious 1A AC/P17	Bonaparte	-11° 51' 48" 124° 54' 30"	RT 22 WD -159	18-Dec-01 11-Jan-02	3 255 3 255	Plugged and abandoned, dry.	NFW NFW
SANTOS Mallonee 1 AC/P15	Bonaparte	-11° 21' 16" 125° 20' 60"	NA WD -142	27-Feb-02 07-Mar-02	2 345 2 345	Plugged and abandoned, dry.	NFW NFW
WOODSIDE Laminaria 7 AC/L5	Bonaparte	-10° 37' 37" 126° 1' 42"	RT 30 WD -361	21-Jan-02 26-Mar-02	3 415 3 415	Completed as an oil producer.	DEV DEV
WOODSIDE Laminaria 8 AC/L5	Bonaparte	-10° 37' 36" 126° 1' 43"	RT 30.5 WD -361	24-Jan-02 20-Apr-02	3 574 7 861	Completed as an oil producer.	DEV DEV
WOODSIDE Laminaria North 1 AC/L5	Bonaparte	-10° 35' 58" 126° 1' 27"	RT 30.5 WD -373	20-May-02 28-May-02	3 420 3 420	Plugged and abandoned, dry.	DEV DEV
WOODSIDE Lantana 1 AC/P4	Bonaparte	-11° 46' 0" 125° 1' 60"	RT 26 WD -170.6	28-May-02 10-Jun-02	2 290 2 290	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD Metres drilled	Well remark	Classi- fication
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NORTHERN TERRITORY

METRES DRILLED - NORTHERN TERRITORY

Wells	Onshore	Offshore	Total
Exploration	-	19 925	19 925
Development	-	14 696	14 696
Total	-	34 621	34 621

JOINT PETROLEUM DEVELOPMENT AREA

PHILLIPS Bayu Undan W01 JPDA 91-13	Bonaparte	-11° 4' 30" 126° 40' 50"	RT 45.7 WD -78.3	22-May-02 29-Sep-02	3 924 3 924	Completed for future production.	DEV DEV
PHILLIPS Bayu Undan W02 JPDA 91-13	Bonaparte	-11° 4' 30" 126° 40' 50"	RT 45.7 WD -78.3	25-May-02 28-Dec-02	4 986 6 943	Cased and completed for future production.	DEV DEV
PHILLIPS Bayu Undan W04 JPDA 91-13	Bonaparte	-11° 4' 30" 126° 40' 50"	RT 45.7 WD -78.3	21-May-02 -	- -	Drilling ahead.	DEV DEV
PHILLIPS Bayu Undan W05 JPDA 91-13	Bonaparte	-11° 4' 30" 126° 40' 50"	RT 45.7 WD -78.3	20-May-02 -	- -	Drilling ahead.	DEV -
PHILLIPS Bayu Undan W08 JPDA 91-13	Bonaparte	-11° 4' 30" 126° 40' 50"	RT 45.7 WD -78.3	17-May-02 -	- -	Drilling ahead.	DEV DEV
PHILLIPS Bayu Undan W11 JPDA 91-13	Bonaparte	-11° 4' 30" 126° 40' 50"	RT 45.7 WD -78.3	24-May-02 -	- -	Drilling ahead.	DEV -

METRES DRILLED - JOINT PETROLEUM DEVELOPMENT AREA

Wells	Onshore	Offshore	Total
Exploration	-	-	-
Development	-	10 867	10 867
Total	-	10 867	10 867

* Assumed reference point

Abbreviations (Amercian Petroleum Institute standard definitions for petroleum statistics)

DEV	Development	NPD	New-pool discovery
DF	Drill floor	SPD	Shallower pool discovery
DRY	Not completed	RT	Rotary table
EXT	Extension	STR	Stratigraphic
GL	Ground level	SRV	Service
KB	Kelly bushing	TD	Total depth
NFD	New-field discovery	WD	Water depth
NFW	New-field wildcat		

Appendix B 2002

Seismic survey activity by State, 2002

APPENDIX B: SEISMIC SURVEY ACTIVITY BY STATE, 2002

Operator	Contractor	Basin	Survey name	Type	Title	Km shot (sq. km)	Status
OFFSHORE							
VICTORIA							
BHP	WesternGeco	Gippsland	VIC P 45 MSS	3D	VIC/P45	Completed (563)	
Essential Petroleum Resources Ltd	Multiwave Geophysical Company AS	Otway	OEP02	2D	VIC/P46	780	Completed
Essential Petroleum Resources Ltd	Multiwave Geophysical Company AS	Otway	VIC P 46	2D	VIC/P46	729	Completed
Esso Australia Resources Ltd	WesternGeco	Gippsland	NORTHERN FIELDS 3D (G01A)	3D	VIC/L 9 R1, VIC/L10, VIC/L11, VIC/L15, VIC/L16, VIC/L17, VIC/L18, VIC/L19, VIC/L20, VIC/RL2, VIC/RL4, VIC/RL5, VIC/P36, VIC/P40	(2 562)	Completed
Pan Canadian Petroleum Ltd	Fugro Geoteam	Gippsland	2001 MIDAS 2D	2D	VIC/P48, VIC/P49	238	Completed
Santos Ltd	Multiwave Geophysical Company AS	Bass	GBS02 2D SEISMIC SURVEY	2D	VIC/P41	203	Continuing
Santos Ltd	Multiwave Geophysical Company AS	Bass	GS02 SD SEISMIC SURVEY	2D	VIC/RL3	194	Continuing
Santos Ltd	Multiwave Geophysical Company AS	Otway	OS 02 2D	2D	VIC/P52	1 142	Completed
Santos Ltd	WesternGeco	Otway	OS 02 3D	3D	VIC/P52, VIC/P51	Completed (760)	
TASMANIA							
Santos Ltd	Multiwave Geophysical Company AS	Sorell	SS 02 2D	2D	T/32P, T/33P	1 142	Completed
SOUTH AUSTRALIA							
Woodside Energy Ltd	WesternGeco	Otway	CARPENTER	3D	EPP27	Completed (300)	
WESTERN AUSTRALIA							
AGIP Australia Ltd	Veritas DGC Australia Pacific Pty Ltd	Carnarvon	MOON PART 1	2D	WA-326-P, WA-328-P	4 800	Continuing
Chevron Asiatic Ltd	Veritas DGC Australia Pacific Pty Ltd	Carnarvon	WA 205 P 2D	2D	WA-205-P R1	150	Completed
Chevron Australia Pty Ltd	Veritas DGC Australia Pacific Pty Ltd	Carnarvon	ACME 3D	3D	WA-205-P R2	Completed (250)	

APPENDIX B (cont'd)

Operator	Contractor	Basin	Survey name	Type	Title	Km shot (sq. km)	Status
Drillsearch Energy NL	Veritas DGC Australia Pacific Pty Ltd	Bonaparte	VERITAS MC2D MSS	2D	WA-317-P, WA-318-P, WA-319-P, WA-313-P, WA-18-P R5, WA-279-P	2 383	Completed
Magellan Petroleum (WA) Pty Ltd	Veritas DGC Australia Pacific Pty Ltd	Browse	STRUMBO-MUNYANG 2D	2D	WA-288-P, WA-311-P	640	Completed
Petroleum Geoservices Asia Pacific Pte Ltd	Petroleum Geoservices Asia Pacific Pte Ltd	Carnarvon	PANAEUS 2001 EAST MC3D	3D	SPA 8SL/01-2	(1 421)	Completed
ROC Oil Company Ltd	Veritas DGC Australia Pacific Pty Ltd	Perth	JEAN	2D	WA-325-P, WA-327-P, WA-286-P	47	Completed
ROC Oil Company Ltd	Veritas DGC Australia Pacific Pty Ltd	Perth	RITA	2D	WA-325-P	2 111	Completed
ROC Oil WA Pty Ltd	Veritas DGC Australia Pacific Pty Ltd	Perth	CHERYL	2D	WA-327-P	569	Completed
Santos Ltd	Veritas DGC Australia Pacific Pty Ltd	Bonaparte	2002 TERN FRIGATE MSS	2D	WA-18-P R5	589	Completed
Shell Company of Australia Ltd	WesternGeco	Carnarvon	COVERACK 3D	3D	WA-299-P, WA-300-P	(307)	Completed
Veritas DGC Australia Pacific Pty Ltd	Swire Pacific Offshore	Browse	BROWSE 2001	2D	SPA 4SL/01-2	322	Completed
Veritas DGC Australia Pacific Pty Ltd	Veritas DGC Australia Pacific Pty Ltd	Carnarvon	TP 2 3D	3D	WA-215/309-P, TP/2 R2	(132)	Completed
WesternGeco (A) Pty Ltd	WesternGeco (A) Pty Ltd	Carnarvon	SKORPION/COVERACK WG2D	2D	WA-271-P, WA-299-P, WA-300-P, SPA 7SL/01-2, SPA6SL/01-2	1 583	Completed
Woodside Energy Ltd	Veritas DGC Australia Pacific Pty Ltd	Bonaparte	POLKADOT 279 2D MSS	2D	WA-279-P	240	Completed
Woodside Energy Ltd	Veritas DGC Australia Pacific Pty Ltd	Bonaparte	POLKADOT 313 2D MSS	2D	WA-313-P	1 433	Completed
NORTHERN TERRITORY							
Indo-Pacific Energy Ltd	(unknown)	Browse	URSA	2D	AC/P18	171	Completed
Veritas DGC Australia Pacific Pty Ltd	Veritas DGC Australia Pacific Pty Ltd	Arafura	ARAFURA 2002 MSS	2D	N'T-02	6 000	Completed
West Oil NL	Veritas DGC Australia Pacific Pty Ltd	Timor Gap	ARISTARCHUS WEST	2D	AC/P28	314	Completed

APPENDIX B (cont'd)

Operator	Contractor	Basin	Survey name	Type	Title	Km shot (sq. km)	Status
ONSHORE							
QUEENSLAND							
Beach Petroleum	Trace Energy	Cooper	NAUTILUS EXTENSION	2D	PEL 92	310	Completed
Beach Petroleum NL	Trace Energy	Cooper/ Eromanga	BODALLA SOUTH 3D	3D	PL31	(45)	Completed
Beach Petroleum NL	Trace Energy	Surat	KENMORE 3D	3D	PL32	(42)	Completed
Cooper Energy NL	Trace Energy	Cooper	COOPER ENERGY 2002	2D	PEL 88	45	Completed
Mosaic Oil NL	Velseis Pty Ltd	Surat	BB02	2D	ATP471P, PPL119	137	Completed
Oil Company of Australia Ltd	Trace Terracorp	Bowen	OB 01	2D	ATP564P	25	Completed
Oil Company of Australia Ltd	Trace Terracorp	Surat	OS 01	2D	ATP692P	22	Completed
Santos Ltd	WesternGeco	Eromanga	AROS	2D	ATP299P	111	Completed
Santos Ltd	WesternGeco	Cooper/ Eromanga	SE02	2D	EPP299, PL39, PL169, PL170	136	Completed
Santos Ltd	WesternGeco	Cooper/ Eromanga	SE02 3D	3D	EPP299	(553)	Completed
Santos Ltd	WesternGeco	Cooper/ Eromanga	SQ02 3D	3D	ATP259P, PL63, PL88	(99)	Completed
Santos Ltd	Trace Energy	Eromanga	TINTABURRA	2D	ATP299P	134	Completed
Santos Ltd	WesternGeco	Cooper/ Eromanga	WOLGOLLA 3D	3D	PL88	(99)	Completed
Stuart Petroleum NL	Trace Energy	Cooper	2002 PANDO MARIBU	2D	PEL 90, PEL 92, PEL 93, PEL 91	754	Completed
Victoria Petroleum NL	Trace Energy	Surat	GILIGULGUL	2D	ATP574P	14	Completed
NEW SOUTH WALES							
Eastern Star Gas Ltd	Trace Terracorp	Gunnedah	PILLIGA EAST	2D	PEL238	38	Completed
Eastern Star Gas Ltd	Trace Energy	Gunnedah	PILLIGA EAST EXTENSION	2D	PEL238	56	Completed
Eastern Star Gas Ltd	Trace Terracorp	Surat	WHALAN CREEK PHASE 1	2D	PEL6	94	Completed
Eastern Star Gas Ltd	Trace Energy	Surat	WHALAN CREEK PHASE 2	2D	PEL6	123	Completed
VICTORIA							
Santos Ltd	WesternGeco	Otway	COBDEN 2D	2D	PEP153	295	Completed
Santos Ltd	WesternGeco	Otway	WEST CASTERTON	2D	PEP160	210	Completed

APPENDIX B (cont'd)

Operator	Contractor	Basin	Survey name	Type	Title	Km shot (sq. km)	Status
Santos Ltd	WesternGeco	Otway	WEST CURDIE	2D	PEP154	57	Completed
SOUTH AUSTRALIA							
Beach Petroleum NL	Trace Energy	Cooper/ Eromanga	NAUTILUS	2D	PEL 92, PEL 94, PEL 95	752	Completed
Origin Energy Resources Ltd	Trace Energy	Otway	HONANS SCRUB	2D	PEL 57	74	Completed
Santos Ltd	WesternGeco	Cooper	GIDGEALPA	3D	Various	(199)	Completed
Santos Ltd	WesternGeco	Cooper/ Eromanga	RAVEN MOONANGA	3D	PPL150, PPL137	(80)	Completed
Santos Ltd	WesternGeco	Cooper/ Eromanga	VERONA 3D	3D	PPL158	(63)	Completed
WESTERN AUSTRALIA							
Arc Energy NL	WesternGeco	Perth	HIBBERTIA	3D	L 1 R1	(57)	Completed

APPENDIX B (cont'd)

SEISMIC SURVEY ACTIVITY 1999–2002

	Onshore		Offshore		2D Total	3D Total
	2D (line km)	3D (sq km)	2D (line km)	3D (sq km)		
1999						
Queensland	2 903	548	-	-	2 903	548
New South Wales	476	-	-	-	476	-
Victoria	40	-	960	579	1 000	579
Tasmania	-	-	-	38	-	38
South Australia	216	30	3 688	-	3 904	30
Western Australia	365	212	58 976	7 539	59 341	7 751
Northern Territory	99	-	18 201	-	18 300	-
JPDA	-	-	2 904	-	2 904	-
Total	4 098	790	84 729	8 156	88 827	8 946
2000						
Queensland	1 759	619	-	-	1 759	619
Victoria	202	84	-	845	202	929
Tasmania	-	-	-	562	-	562
South Australia	188	878	2 142	-	2 330	878
Western Australia	142	-	21 272	9 359	21 414	9 359
Northern Territory	-	-	1 771	2 621	1 771	2 621
JPDA	-	-	-	1 836	-	1 836
Total	2 291	1 581	25 185	15 223	27 477	16 805
2001						
Queensland	171	811	-	-	171	811
New South Wales	176	-	-	-	176	-
Victoria	131	195	1 409	2 463	1 540	2 658
Tasmania	659	-	3 576	-	4 235	-
South Australia	100	2 064	14 058	-	14 157	2 064
Western Australia	60	180	37 547	15 903	37 607	16 083
Northern Territory	-	-	5 489	171	5 489	171
Total	1 298	3 250	62 079	18 537	63 377	21 787
2002						
Queensland	1 688	838	-	-	1 688	838
New South Wales	311	-	-	-	311	-
Victoria	562	-	3 286	3 885	3 848	3 885
Tasmania	-	-	1 142	-	1 142	-
South Australia	826	342	-	300	826	642
Western Australia	-	57	14 867	2 110	14 867	2 167
Northern Territory	-	-	6 485	-	6 485	-
Total	3 387	1 237	25 780	6 294	29 167	7 532

Appendix C 2002

Discoveries of petroleum in 2002

APPENDIX C: DISCOVERIES OF PETROLEUM IN 2002

Basin and well name	Operator	State	Producing formation	Discovery	Classification
	Recovery			Remarks	
OFFSHORE					
BONAPARTE					
CASH 1 ST1A	Coastal	NT		Oil	NFD
	Recovered 8 litres of 31.7 degree API, very waxy oil.			Plugged and abandoned.	
CARNARVON					
DOUBLE ISLAND 1*	Apache	WA		Oil	NFD
	Logs indicate 15.5m net oil column in Flag Sst.			Plugged and abandoned.	
ENDYMION 1*	Apache	WA		Gas	NFD
	Logs indicate a 14 m gas column (20 m gross).			Completed as a gas producer.	
EXETER 1*	Santos	WA		Oil	NFD
	Wireline log interpretation indicates 18m net oil column (3110 - 3133m) in Angel Fm.			Plugged and abandoned.	
HOOVER 1*	Apache	WA	Flag Sst.	Oil	NFD
	Logs indicate a 6m oil column in Flag Sst at 1770m.			Plugged and abandoned.	
IMMORTELLE 1*	Apache	WA		Oil and Gas	NFD
	Logs indicate sub-commercial oil and gas shows.			Plugged and abandoned.	
LITTLE SANDY 1*	Apache	WA		Oil	NFD
	Pressure data indicate 10.7m net oil column (at 1770m) with no oil/water contact at top of Flag Sst, primary objective. Two gross oil columns within Jurassic Dupuy Sst of 42m (at 2572m) and 6m.			Cased and suspended as a future oil producer.	
PEDIRKA 1*	Apache	WA	Flag Sst	Oil	NFD
	Logs indicated a 7m oil column.			Cased and suspended as a future oil producer.	
TAUNTON 2 ST1	Apache	WA	Birdong sandstone	minor oil and minor gas	NFD
	Flowed oil at 2 895 bbl/d on 3/4" choke.			Plugged and abandoned.	
VICTORIA 1	Apache	WA	Flag Sst	Oil and Gas	NFD
	Tests indicate 6m of net 46.2° API oil in three separate sandstone intervals. These are overlain by a separate 1m sandstone interval containing gas. No oil water contact was intersected, with the oil lying directly on sealing shale.			Completed as an oil and gas well.	
OTWAY					
CASINO 1*	Santos	Vic		Gas	NFD
	Logs confirmed the presence of gas from over a 14m interval 1,729-1,743m.			Plugged and abandoned.	

APPENDIX C (cont'd)

Basin and well name	Operator Recovery	State	Producing formation	Discovery Remarks	Classification
ONSHORE					
BOWEN					
SARDINE CREEK 1	Santos	Qld	Aldebaran Sst	Gas	NFD
	Flowed 19 540 cu m/d (0.69 million cfd) gas through a 1/4" surface choke.			Cased and suspended as a future gas producer.	
BOWEN/SURAT					
NORKAM 1*	Mosaic	Qld		Gas	NFD
	Wireline logs indicate net gas pay at 2022 - 2023m and 2056 - 2058m			Cased and suspended as a potential future gas producer from the Rewan Fm.	
COOPER/EROMANGA					
ACRASIA 1	Stuart Pet.	SA	Tinchoo/Hutton Fm	Oil	NFD
	Flowed 2200 bbl/d of 43 degrees API oil through a 12.7mm (1/2") choke.			Cased and suspended as a Tinchoo Fm and/or Hutton Sst oil producer.	
ACRASIA 2	Stuart Pet.	SA	Tinchoo Fm	Oil	NPD
	Flowed 90 bbl/d oil with 200 bbl/d water. Interpreted as a new pool discovery.			Cased and suspended as a new pool discovery.	
ALDINGA 1*	Beach	SA		Oil	NFD
	Wireline log data indicates up to 2m of oil bearing net porous sandstone in the Cadna-owie Fm.			Cased and suspended as a future oil producer.	
HENLEY 1	Beach	SA	Patchawarra Fm	Oil	NFD
	Recovered 1.5bbbls mud and 0.5bbbls oil (46 degree API).			Plugged and abandoned.	
SELLICKS 1	Beach	SA	Patchawarra	Oil	NFD
	Flowed 1 780 bbl/d of oil through a (12.7mm)1/2" choke.			Cased and suspended as a future oil producer.	
OTWAY					
PORT FAIRY 1	Origin	Vic	Flaxman/Warre	Oil and Gas	NFD
	Flowed 4- 5 million cfd gas through a 50.8mm (2") choke.			Plugged and abandoned.	
PERTH					
JINGEMIA 1	Origin	WA	Dongara Sst	Oil	NFD
	Production test flowed 382 cu m(2 400 bbl/d) oil through a 1" choke.			Completed as an oil producer.	

* Accumulation inferred from logs.

Appendix D 2002

Summary of wells drilled

WELL
SUMMARIES

APPENDIX D : SUMMARY OF WELLS DRILLED

SUMMARY OF ONSHORE AND OFFSHORE WELLS DRILLED IN 2002

Status at 31 December 2002

State or Territory	Spudded		Completed or C&S					Abandoned or Secured				DA	
	*	**	Oil	Gas	O&G	Unsp	Serv	Dry	Oil	Gas	O&G	Unsp	
Exploration													
Queensland	2	12	1	9	-	-	-	4	-	-	-	-	-
Victoria	-	10	-	4	-	-	-	3	-	2	1	-	-
South Australia	1	17	6	6	1	-	-	3	1	-	-	-	1
Western Australia	2	41	6	3	1	-	-	16	10	1	2	-	4
Northern Territory	1	7	1	-	-	-	-	6	1	-	-	-	-
TOTAL	6	87	14	22	2	-	-	32	12	3	3	-	5
Development													
Queensland	-	17	5	12	-	-	-	-	-	-	-	-	-
Victoria	-	13	9	2	1	-	-	-	-	-	-	-	1
South Australia	-	38	9	26	1	-	-	1	-	-	-	-	1
Western Australia	2	11	8	1	1	-	-	2	-	-	-	-	1
Northern Territory	-	3	2	-	-	-	-	1	-	-	-	-	-
Joint Petroleum Development Area	-	6	2	-	-	-	-	-	-	-	-	-	4
TOTAL	2	88	35	41	3	-	-	4	-	-	-	-	7

* Other than this period

** This period

C&S Cased and Suspended

Serv Service well, classification applicable only to development wells

Unsp Unspecified

DA Drilling ahead

Sus Suspended temporarily; to resume drilling at a future date

APPENDIX D (cont'd)

SUMMARY OF ONSHORE WELLS DRILLED 2002

Status at 31 December 2002

State or Territory	Spudded		Completed or C&S					Abandoned or Secured				DA	
	*	**	Oil	Gas	O&G	Unsp	Serv	Dry	Oil	Gas	O&G	Unsp	
Exploration													
Queensland	2	12	1	9	-	-	-	4	-	-	-	-	-
Victoria	-	5	-	2	-	-	-	2	-	-	1	-	-
South Australia	1	17	6	6	1	-	-	3	1	-	-	-	1
Western Australia	1	4	1	2	-	-	-	1	-	-	-	-	1
TOTAL	4	38	8	19	1	-	-	10	1	-	1	-	2
Development													
Queensland	-	17	5	12	-	-	-	-	-	-	-	-	-
South Australia	-	38	9	26	1	-	-	1	-	-	-	-	1
Western Australia	1	2	-	1	-	-	-	1	-	-	-	-	1
TOTAL	1	57	14	39	1	-	-	2	-	-	-	-	2

*	Other than this period
**	This period
C&S	Cased and Suspended
Serv	Service well, classification applicable only to development wells
Unsp	Unspecified
DA	Drilling ahead
Sus	Suspended temporarily; to resume drilling at a future date

APPENDIX D (cont'd)

SUMMARY OF OFFSHORE WELLS DRILLED 2002

Status at 31 December 2002

State or Territory	Spudded		Completed or C&S					Abandoned or Secured				DA	
	*	**	Oil	Gas	O&G	Unsp	Serv	Dry	Oil	Gas	O&G	Unsp	
Exploration													
Victoria	-	5	-	2	-	-	-	1	-	2	-	-	-
Western Australia	1	37	5	1	1	-	-	15	10	1	2	-	3
Northern Territory	1	7	1	-	-	-	-	6	1	-	-	-	-
TOTAL	2	49	6	3	1	-	-	22	11	3	2	-	3
Development													
Victoria	-	13	9	2	1	-	-	-	-	-	-	-	1
Western Australia	1	9	8	-	1	-	-	1	-	-	-	-	-
Northern Territory	-	3	2	-	-	-	-	1	-	-	-	-	-
Joint Petroleum Development Area	-	6	2	-	-	-	-	-	-	-	-	-	4
TOTAL	1	31	21	2	2	-	-	2	-	-	-	-	5

*	Other than this period
**	This period
C&S	Cased and Suspended
Serv	Service well, classification applicable only to development wells
Unsp	Unspecified
DA	Drilling ahead
Sus	Suspended temporarily; to resume drilling at a future date

Appendix E 2002

Petroleum expenditure and activity

EXPENDITURE

APPENDIX E: PETROLEUM EXPENDITURE AND ACTIVITY

PETROLEUM EXPLORATION EXPENDITURE (SA) – OPERATORS, 2002

State	Exploration Drilling	Geological	Seismic			Total
			Regional	2D	3D	
Onshore						
New South Wales	5,300,000	0	0	0	0	5,300,000
Northern Territory	407,000	155,000	0	0	0	562,000
Queensland	81,745,000	6,009,000	0	1,397,000	3,390,000	94,114,000
South Australia	44,028,000	3,230,000	0	431,000	3,834,000	52,951,000
Tasmania	0	0	0	0	0	-
Victoria	3,599,000	3,039,000	0	3,945,000	0	10,641,000
Western Australia	4,094,000	2,564,000	0	5,674,000	4,100,000	19,765,000
TOTAL	139,173,000	14,997,000	0	11,447,000	11,324,000	183,333,000
Offshore						
Joint Petroleum Development	0	431,000	0	0	0	431,000
New South Wales	0	0	0	0	0	-
Northern Territory	32,203,000	6,564,000	-	-	508,000	39,275,000
Queensland	0	0	0	0	0	-
South Australia	2,178,000	6,413,000	0	1,321,000	7,741,000	17,653,000
Tasmania	1,800,000	0	0	1,550,000	0	3,350,000
Victoria	114,112,000	5,000,000	0	1,694,000	43,692,000	167,598,000
Western Australia	335,136,000	25,061,000	0	3,543,000	4,332,000	377,892,000
TOTAL	485,429,000	43,469,000	0	8,108,000	55,765,000	606,199,000
TOTAL EXPLORATION						
	624,602,000	58,466,000	0	19,555,000	67,089,000	789,532,000

Northern Territory includes Territory of Ashmore and Cartier Islands
 JPDA is the Joint Petroleum Development Area (formerly Zone of Cooperation Area A)
 Some company expenditure data is estimated

APPENDIX E (cont'd)

PETROLEUM EXPLORATION, DEVELOPMENT AND PRODUCTION EXPENDITURE (\$A) – OPERATORS, 2002

State	Drilling		Production	Geological	Seismic			Other	Total
	Exploration	Development			Regional	2D	3D		
Joint Petroleum Devel	0	0	0	431,000	0	0	0	-	431,000
New South Wales	5,300,000	0	0	0	0	0	0	-	5,300,000
Northern Territory	32,610,000	820,000	13,928,000	6,719,000	0	0	0	2,473,000	56,550,000
Queensland	81,745,000	48,351,000	144,935,000	6,009,000	0	1,397,000	3,390,000	7,268,000	293,095,000
South Australia	46,206,000	85,198,000	160,029,000	9,643,000	0	1,752,000	11,575,000	3,377,000	317,780,000
Tasmania	1,800,000	0	0	0	0	1,550,000	0	58,253,000	61,603,000
Victoria	117,711,000	100,304,000	849,240,000	8,039,000	0	5,639,000	43,692,000	3,917,000	1,128,542,000
Western Australia	339,230,000	81,415,000	138,697,000	27,625,000	0	9,217,000	8,432,000	47,473,000	652,089,000
TOTAL	624,602,000	316,088,000	1,306,829,000	58,466,000	0	19,555,000	67,089,000	122,761,000	2,515,390,000

Northern Territory includes Territory of Ashmore and Cartier Islands

JPDA is the Joint Petroleum Development Area (formerly Zone of Cooperation Area A)

ORIGIN OF PRIVATE ENTERPRISE EXPENDITURE ON EXPLORATION, DEVELOPMENT AND PRODUCTION, 2002 (\$A)

	Onshore operations		Offshore operations	Total
Australian funds	1,084,422,000		1,141,876,000	2,226,298,000
Reinvestment	13,361,000		165,169,000	178,530,000
North American funds	375,668,000		0	375,668,000
Other	18,991,000		117,214,000	136,205,000
TOTAL	1,492,442,000		1,424,259,000	2,916,701,000

APPENDIX E (cont'd)

PETROLEUM DEVELOPMENT AND PRODUCTION EXPENDITURE (\$A) – OPERATORS, 2002

State	Development Drilling	Production	Other	Total
Onshore				
New South Wales	-	-	-	-
Northern Territory	820,000	13,928,000	262,000	15,010,000
Queensland	48,351,000	144,935,000	5,695,000	198,981,000
South Australia	85,198,000	160,029,000	1,949,000	247,176,000
Tasmania	-	-	-	-
Victoria	2,218,000	21,944,000	-	24,162,000
Western Australia	7,106,000	20,112,000	-	27,218,000
TOTAL	143,693,000	360,948,000	7,906,000	512,547,000
Offshore				
Joint Petroleum Development	-	-	-	-
New South Wales	-	-	-	-
Northern Territory	-	-	1,703,000	1,703,000
Queensland	-	-	-	-
South Australia	-	-	-	-
Tasmania	-	-	58,253,000	58,253,000
Victoria	98,086,000	827,296,000	759,000	926,141,000
Western Australia	74,309,000	118,585,000	34,320,000	227,214,000
TOTAL	172,395,000	945,881,000	95,035,000	1,213,311,000
TOTAL DEVELOPMENT AND PRODUCTION	316,088,000	1,306,829,000	102,941,000	1,725,858,000

Northern Territory includes Territory of Ashmore and Cartier Islands

JPDA is the Joint Petroleum Development Area (formerly Zone of Cooperation Area A)

APPENDIX E (cont'd)

SUMMARY OF PRIVATE ENTERPRISE PETROLEUM EXPLORATION AND DEVELOPMENT EXPENDITURE AND ACTIVITY 1979-2002

Year	Exploration Expenditure (\$ million)	Development Expenditure (\$ million)	Seismic Surveys (line km)	Seismic Surveys (square km)	Exploration wells drilled	Development wells drilled
1979	223	236	41,539		52	57
1980	290	358	55,445		94	33
1981	459	944	74,438		158	55
1982	948	1,263	95,253		221	107
1983	723	1,022	38,761		211	64
1984	740	734	61,941		264	109
1985	774	1,065	90,169		270	94
1986	424	936	47,353		138	37
1987	346	2,068	42,527		225	57
1988	503	1,049	51,492		237	54
1989	521	1,378	70,750		148	76
1990	589	1,467	89,933		177	75
1991	424	776	163,642		154	86
1992	430	947	359,523		120	51
1993	441	1,207	174,469		122	55
1994	650	1,437	161,352		128	44
1995	782	1,464	161,174		148	65
1996	758	2,262	389,163		143	89
1997	772	2,063	529,529		176	155
1998	1,008	1,926	1,062,810		168	95
1999	699	2,245	523,410		94	81
2000	874	1,813	135,828	15,178	99	103
2001	1,050	1,614	65,024	21,779	127	87
2002	790	1,726	15,442	15,643	83	84

APPENDIX E (cont'd)

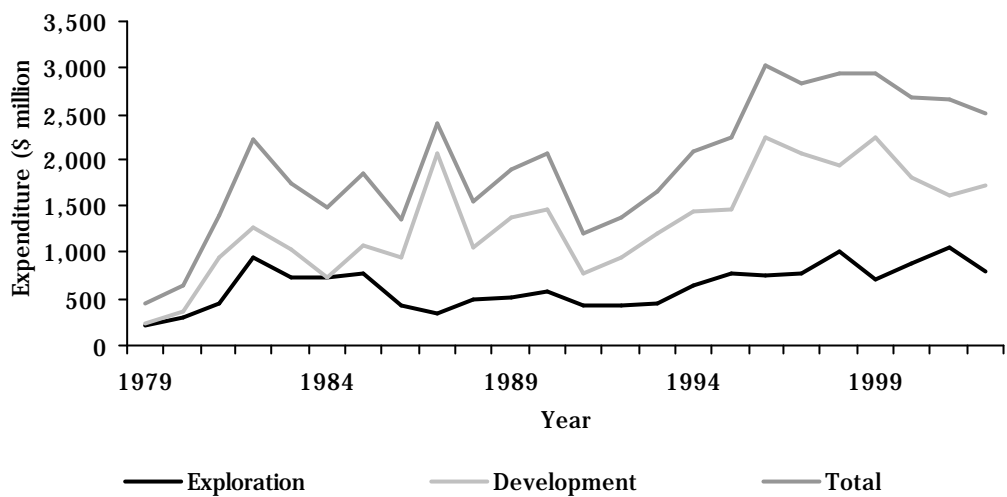


Figure E.1 Total petroleum expenditure by private enterprise, 1979–2002

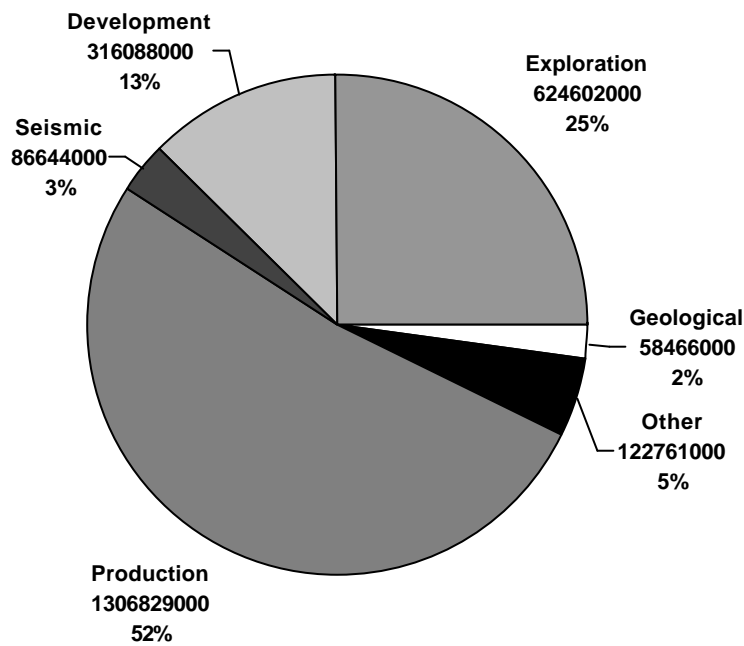


Figure E.2 Total petroleum expenditure by industry in 2002 (\$)

Appendix F 2002

Wells and metres drilled, 1983–2002

APPENDIX F: WELLS AND METRES DRILLED 1983 - 2002

WELLS DRILLED

Year	Exploration		Development		Total		Total
	Onshore	Offshore	Onshore	Offshore	Exploration	Development	
1983	127	49	49	26	176	75	251
1984	192	42	80	42	234	122	356
1985	227	41	75	20	268	95	363
1986	110	28	17	21	138	38	176
1987	210	15	37	20	225	57	282
1988	201	35	32	15	236	47	283
1989	120	41	33	25	161	58	219
1990	105	67	57	16	172	73	245
1991	110	41	65	18	151	83	234
1992	76	42	39	12	118	51	169
1993	75	49	34	21	124	55	179
1994	83	46	18	24	129	42	171
1995	93	56	31	35	149	66	215
1996	97	48	65	18	145	83	228
1997	120	58	80	75	178	155	333
1998	90	73	48	46	163	94	257
1999	43	51	40	40	94	80	174
2000	37	62	79	24	99	103	202
2001	67	59	68	20	126	88	214
2002	40	48	56	26	88	82	170

METRES DRILLED

Year	Exploration		Development		Total		Total
	Onshore	Offshore	Onshore	Offshore	Exploration	Development	
1983	234 463	146 801	95 196	70 262	381 264	165 458	546 722
1984	370 628	111 896	160 800	129 432	482 524	290 232	772 757
1985	405 693	101 783	121 559	66 908	507 476	188 467	695 943
1986	208 444	63 987	31 162	73 809	272 431	104 971	377 402
1987	396 354	34 233	65 491	56 909	430 587	122 400	552 987
1988	380 479	105 520	59 576	40 848	485 999	100 424	586 423
1989	229 034	130 403	60 189	67 256	359 437	127 445	486 883
1990	211 578	176 389	91 060	49 031	387 967	140 091	528 058
1991	213 967	100 645	99 927	54 587	314 612	154 514	469 126
1992	153 269	107 331	72 773	35 659	260 600	108 432	369 031
1993	135 537	112 649	56 349	59 238	248 185	115 586	363 772
1994	187 077	115 699	33 091	74 760	302 776	107 851	410 627
1995	187 383	145 371	46 293	116 731	332 754	163 024	495 778
1996	208 479	131 264	93 673	58 997	339 743	152 670	492 413
1997	242 457	135 999	143 109	210 707	378 456	353 816	732 272
1998	215 560	190 551	99 143	123 315	406 111	222 458	628 569
1999	93 832	112 975	83 468	135 135	206 807	218 603	425 410
2000	76 449	164 610	179 732	57 247	241 059	236 979	478 037
2001	153 825	149 805	152 959	67 067	303 630	220 026	523 655
2002	92 038	120 267	132 486	70 834	212 305	203 320	415 625

Appendix G 2002

Offshore and onshore drilling activity by State, 1992–2002

APPENDIX G: OFFSHORE AND ONSHORE DRILLING ACTIVITY BY STATE, 1992-2002

OFFSHORE

New-Field Wildcat wells drilled

State	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Qld	-	-	-	-	-	-	-	-	-	-	-
Vic	3	5	-	6	-	2	1	2	-	4	2
Tas	2	-	-	-	-	-	1	1	-	1	-
SA	-	4	-	1	-	-	2	-	-	-	-
WA	17	19	11	20	26	24	40	35	48	34	22
NT	5	5	5	4	2	3	9	5	7	9	7
JPDA	1	3	10	3	2	4	3	1	1	1	-
TOTAL	28	36	26	34	30	33	56	44	56	49	31

Extension/Appraisal wells drilled

State	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Vic	4	2	2	3	-	-	-	1	-	1	3
Tas	-	-	-	-	-	-	1	-	-	1	-
WA	10	11	17	9	11	19	12	6	6	6	13
NT	-	-	-	4	1	1	3	-	-	2	1
JPDA	-	-	1	6	6	5	1	-	-	-	-
TOTAL	14	13	20	22	18	25	17	7	6	10	17

Development wells drilled

State	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Vic	10	11	9	20	11	50	33	25	6	9	12
WA	1	10	12	15	7	22	9	14	14	11	9
NT	1	-	3	-	-	2	4	1	3	-	3
JPDA	-	-	-	-	-	1	-	-	1	-	2
TOTAL	12	21	24	35	18	75	46	40	24	20	26

APPENDIX G (cont'd)

ONSHORE

New-Field Wildcat wells drilled

State	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Qld	27	29	27	41	32	41	29	13	12	21	9
NSW	1	2	-	-	1	1	-	1	1	-	-
Vic	2	1	5	3	3	7	2	3	2	8	5
Tas	-	-	-	-	-	5	-	-	-	-	-
SA	16	8	11	14	30	27	34	9	5	11	9
WA	5	6	17	5	6	4	7	2	6	9	2
NT	2	3	-	-	1	-	1	-	-	-	-
TOTAL	53	49	60	63	73	85	73	28	26	49	25

Extension/Appraisal wells drilled

State	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Qld	11	12	9	19	11	25	8	10	6	6	5
NSW	-	-	-	1	-	-	-	-	-	-	-
Vic	-	-	-	1	-	-	-	-	1	2	-
SA	9	11	10	7	9	8	9	5	4	9	8
WA	2	3	2	2	4	1	-	-	-	1	2
NT	1	-	2	-	-	1	-	-	-	-	-
TOTAL	23	26	23	30	24	35	17	15	11	18	15

Development wells drilled

State	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Qld	19	12	7	9	28	28	18	18	22	23	17
NSW	-	-	-	-	-	-	-	-	-	2	-
Vic	-	-	1	-	-	-	-	2	-	-	-
SA	16	6	4	4	12	29	23	10	48	35	37
WA	2	8	5	14	22	20	7	8	6	8	2
NT	2	8	1	4	3	3	-	2	3	-	-
TOTAL	39	34	18	31	65	80	48	40	79	68	56

Appendix H 2002

Australia's offshore production facilities

Appendix H: AUSTRALIA'S OFFSHORE PRODUCTION FACILITIES

Basin/Facility	Accumulation(s)	Operator	Platform type	Product	Producing to	Start-up date
BONAPARTE						
Challis Venture	Challis*, Cassini*	Newfield	Floating facility	Oil	Offtake tanker	December-89
Jabiru Venture	Jabiru	Newfield	Floating facility	Oil	Offtake tanker	August-86
Modec Venture 1	Elang*, Kakatua*	BHP	Floating facility	Oil	Offtake tanker	July-98
Northern Endeavour	Corallina*, Laminaria*	Woodside	Floating facility	Oil	Offtake tanker	November-99
Skua Venture (ab. Jan-97)	Skua	BHP	Floating facility	Oil	Offtake tanker	December-91
Buffalo WHP	Buffalo	BHP	Mini-platform	Oil	Buffalo Venture	December-99
Buffalo Venture		BHP	Floating facility	Oil	Offtake tanker	December-99
CARNARVON						
Acqua Blu (ab. Jul-92)	Talisman	Marathon	Floating facility	Oil	Offtake tanker	January-89
Four Vanguard	Woollybutt	Eni Australia	Floating facility	Oil	Offtake tanker	April-03
Griffin Venture	Griffin*, Chinook/Scindian*	BHP	Floating facility	Oil and Gas	Offtake tanker (oil); Onslow plant (gas)	January-94
South Plato	South Plato	Apache	Minipod	Oil	Varanus Island	June-02
Stag	Stag	Apache	Conventional steel	Oil	Storage tanker	May-98
North Herald (ab. Nov-97)	North Herald	WMC	Monopod	Oil	South Pepper	December-87
South Pepper (ab. Nov-97)	South Pepper	WMC	Tripod	Oil	Vicksburg jackup rig to Airlie Island	January-88
Chervil	Chervil	Apache	Monopod	Oil	Airlie Island	August-89
Ocean Legend	Legendre	Woodside	Conventional steel	Oil	Karratha Spirit	May-01
Karratha Spirit		Woodside	FSO	Oil	Offtake tanker	May-01
Cossack Pioneer	Wanaea*, Lambert*, Cossack*	Woodside	Floating facility	Oil	Offtake tanker (oil); North Rankin (solution gas)	November-95
Goodwyn A	Rankin*, Goodwyn	Woodside	Conventional steel	Gas	North Rankin	February-95
North Rankin A	North Rankin	Woodside	Conventional steel	Gas	Withnell Bay	July-84
Cowle A	Cowle	Chevron	Monopod	Oil	Thevenard Island	April-91
Roller A	Roller	Chevron	Monopod	Oil	Roller B	March-94
Roller B	Roller	Chevron	Monopod	Oil	Roller C	March-94
Roller C	Roller	Chevron	Monopod	Oil	Skate	March-94
Skate	Skate	Chevron	Monopod	Oil	Thevenard Island	March-94
Saladin A	Saladin	Chevron	Mini-platform	Oil	Thevenard Island	November-89
Saladin B	Saladin	Chevron	Mini-platform	Oil	Thevenard Island	November-89
Yammaderry A	Saladin	Chevron	Monopod	Oil	Saladin C	April-91
Saladin C	Saladin	Chevron	Mini-platform	Oil	Thevenard Island	November-89
Agincourt	Agincourt	Apache	Minipod	Oil and Gas	Varanus Island	August-97
Campbell A	Campbell	Apache	Monopod	Gas	Sinbad A	October-92
Sinbad A	Sinbad	Apache	Monopod	Gas	Varanus Island	October-92
Harriet B	Harriet	Apache	Monopod	Oil	Harriet C	January-86
Harriet C	Harriet	Apache	Monopod	Oil	Harriet A	January-86
Harriet A	Harriet	Apache	Conventional steel	Oil and Gas	Varanus Island	January-86
Simpson A	Simpson	Apache	Minipod	Gas	Varanus Island	December-01
Simpson B	Simpson	Apache	Minipod	Gas	Varanus Island	December-01
Wonnich	Wonnich	Apache	Tripod	Oil and Gas	Varanus Island	July-99

* = Subsea wells

APPENDIX H (cont'd)

Basin/Facility	Accumulation(s)	Operator	Platform type	Product	Producing to	Start-up date
Wandoo A	Wandoo	Mobil	Monopod	Oil	Initially Hakuryu VII jackup rig; now Wandoo B	October-93
Wandoo B	Wandoo	Mobil	Concrete gravity	Oil	Offtake tanker	March-97
GIPPSLAND						
Bream B	Bream	Esso	Concrete gravity	Oil and Gas	Bream	January-97
Bream	Bream	Esso	Conventional steel	Oil and Gas	West Kingfish (oil), Longford (gas)	March-88
West Kingfish	Kingfish	Esso	Conventional steel	Oil	Kingfish A	December-82
Kingfish A	Kingfish	Esso	Conventional steel	Oil	Kingfish B	April-71
Kingfish B	Kingfish	Esso	Conventional steel	Oil	Halibut	November-71
Cobia	Halibut	Esso	Conventional steel	Oil	Halibut	April-83
Fortescue	Halibut	Esso	Conventional steel	Oil	Halibut	September-83
Mackerel	Mackerel, Blackback*	Esso	Conventional steel	Oil	Halibut	December-77
Whiting	Whiting	Esso	Mini-platform	Oil and Gas	Snapper	October-89
Snapper	Snapper, Moonfish	Esso	Conventional steel	Oil and Gas	Longford (gas); Marlin (oil)	July-81
Flounder	Flounder	Esso	Conventional steel	Oil and Gas	Tuna	December-84
West Tuna	Tuna	Esso	Concrete gravity	Oil and Gas	Tuna	December-96
Tuna	Tuna	Esso	Conventional steel	Oil and Gas	Marlin	May-79
Marlin	Marlin	Esso	Conventional steel	Oil and Gas	Longford (gas); Halibut (oil)	November-69
Halibut	Halibut	Esso	Conventional steel	Oil	Longford	March-70
Perch	Perch	Esso	Monotower	Oil	Dolphin	January-90
Dolphin	Dolphin	Esso	Monotower	Oil	Longford	January-90
Barracouta	Barracouta, Seahorse*, Tarwhine*	Esso	Conventional steel	Oil and Gas	Longford	March-69

* = Subsea wells

Appendix I 2002

Crude oil and gas production by basin, pre-1993 and 1993 to 2002

APPENDIX I: CRUDE OIL AND GAS PRODUCTION BY BASIN, pre-1993 and 1993 to 2002 (GL and BCM)

Basin	pre-1993	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
CRUDE OIL												
Adavale	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Amadeus	1.001	0.096	0.143	0.143	0.143	0.141	0.145	0.080	0.079	0.080	0.064	2.115
Bass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bonaparte	18.091	2.348	1.835	1.486	1.165	0.988	1.256	3.018	11.648	8.359	6.678	56.872
Bowen/Surat	4.555	0.059	0.053	0.071	0.032	0.095	0.085	0.050	0.024	0.037	0.019	5.080
Browse	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Canning	0.325	0.021	0.049	0.001	0.005	0.005	0.005	0.008	0.004	0.007	0.003	0.433
Canarvon	56.494	4.001	8.722	8.656	11.246	10.136	11.116	8.263	12.892	13.382	14.320	159.228
Cooper/Eromanga	24.544	2.044	1.597	1.382	1.796	1.489	1.205	1.116	0.915	1.059	0.821	37.968
Gippsland	455.300	16.500	14.800	12.300	10.900	12.600	9.400	10.800	9.500	7.800	6.900	566.800
Gunnedah	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Otway	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Perth	0.339	0.045	0.035	0.025	0.021	0.016	0.010	0.008	0.003	0.008	0.034	0.544
Total	560.649	25.114	27.234	24.064	25.308	25.470	23.222	23.343	35.065	30.732	28.839	829.040
GAS												
Adavale	0.000	0.000	0.000	0.044	0.053	0.052	0.034	0.023	0.013	0.004	0.002	0.225
Amadeus	2.005	0.721	0.427	0.400	0.456	0.502	0.484	0.478	0.458	0.592	0.639	7.162
Bass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bonaparte	1.362	0.245	0.191	0.149	0.096	0.067	0.095	0.180	0.143	0.105	0.100	2.733
Bowen/Surat	10.265	1.026	1.090	1.193	1.058	0.855	0.672	0.642	0.620	0.605	0.798	18.824
Browse	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Canning	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Canarvon	50.390	12.365	15.020	15.919	16.862	18.371	21.422	18.783	18.846	18.353	19.821	226.152
Cooper/Eromanga	74.041	4.876	7.123	4.809	5.201	5.787	11.065	6.888	7.521	7.962	8.420	143.693
Gippsland	102.400	5.900	7.000	6.600	5.800	6.300	5.900	5.500	6.000	6.700	6.200	164.300
Gunnedah	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Otway	0.110	0.069	0.117	0.131	0.138	0.141	0.155	0.232	0.408	0.420	0.568	2.489
Perth	13.669	0.345	0.422	0.317	0.390	0.152	0.487	0.258	0.264	0.237	0.189	16.730
Total	254.242	25.547	31.390	29.562	30.054	32.227	40.314	32.984	34.273	34.978	36.737	582.308

APPENDIX I (cont'd)

(million barrels and billion cubic feet)

Basin	pre-1993	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
CRUDE OIL												
Adavale	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Amadeus	6.296	0.604	0.899	0.899	0.899	0.887	0.912	0.503	0.497	0.503	0.403	13.303
Bass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bonaparte	113.789	14.768	11.542	9.347	7.328	6.214	7.900	18.983	73.264	52.576	42.003	357.714
Bowen/Surat	28.650	0.371	0.333	0.447	0.201	0.598	0.535	0.317	0.151	0.233	0.120	31.955
Browse	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Canning	2.044	0.132	0.308	0.006	0.031	0.031	0.031	0.050	0.025	0.044	0.019	2.723
Canarvon	355.336	25.165	54.860	54.445	70.735	63.753	69.917	51.973	81.088	84.170	90.070	1,001.512
Cooper/Eromanga	154.377	12.856	10.045	8.693	11.296	9.366	7.579	7.019	5.755	6.661	5.164	238.811
Gippsland	2,863.746	103.782	93.089	77.365	68.559	79.251	59.124	67.930	59.753	49.060	43.400	3,565.059
Gunnedah	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Otway	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Perth	2.132	0.283	0.220	0.157	0.132	0.101	0.063	0.050	0.019	0.050	0.214	3.422
Total	3,526.370	157.962	171.296	151.358	159.182	160.201	146.062	146.825	220.552	193.298	181.392	5,214.498
GAS												
Adavale	0.000	0.000	0.000	1.554	1.872	1.836	1.201	0.812	0.459	0.141	0.071	7.946
Amadeus	70.807	25.462	15.080	14.126	16.104	17.728	17.092	16.881	16.174	20.906	22.566	252.926
Bass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bonaparte	48.099	8.652	6.745	5.262	3.390	2.366	3.355	6.357	5.050	3.708	3.532	96.516
Bowen/Surat	362.508	36.233	38.493	42.131	37.363	30.194	23.732	22.667	21.895	21.366	28.181	664.765
Browse	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Canning	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Canarvon	1,779.523	436.670	530.431	562.179	595.482	648.772	756.518	663.322	665.546	648.136	699.979	7,986.558
Cooper/Eromanga	2,614.758	172.196	251.549	169.830	183.673	204.368	390.760	243.250	265.604	281.178	297.352	5,074.518
Gippsland	3,616.256	208.359	247.205	233.079	204.827	222.485	208.359	194.232	211.890	236.610	218.953	5,802.255
Gunnedah	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Otway	3.885	2.437	4.132	4.626	4.873	4.979	5.474	8.193	14.409	14.832	20.059	87.899
Perth	482.721	12.184	14.903	11.195	13.773	5.368	17.198	9.111	9.323	8.370	6.675	590.820
Total	8,978.556	902.192	1,108.538	1,043.982	1,061.357	1,138.097	1,423.689	1,164.825	1,210.351	1,235.248	1,297.367	20,564.202

Appendix J 2002

Australian petroleum pipelines, 2002

APPENDIX J: AUSTRALIAN PETROLEUM PIPELINES, 2002

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
QUEENSLAND						
ONSHORE						
1	Moonie to Brisbane	Moonie Pipeline Co Pty Ltd	Oil	306	273	1964
2	Wallumbilla (Roma) to Brisbane	APT Petroleum Pipelines Ltd	Gas	397, 37	273, 324	1969
3	Kincora to Wallumbilla	Oil Co of Aust Ltd	Gas	53	219	1977
4	Silver Springs to Wallumbilla	Santos (BOL) Pty Ltd	Gas	102	219	1978
6	Jackson to Moonie	Santos Ltd	Oil	800	324	1983-84
7	MLIA to Wallumbilla	Elgas Ltd	Propane and Butane	14	60	1984
8	Tickalara to Cooroo	Santos Ltd	Oil	115	114	1989
9	Kenmore to Eromanga	Inland Oil Refiners Qld P/L	Oil	18	89	1989
10	Arcturus Separation Plant to PPL30	Oil Co of Aust Ltd	Gas	107	168	1990
11	Central Treatment Plant to PPL30	Oil Co of Aust Ltd	Gas	41	168	1989
12	Epsilon to SA Border	Santos Ltd	Gas	18	273	1992
13	Qld. Gas Centre (Ballera) to Moomba (See PL5 South Australia)	Santos Ltd	Gas and Condensate	90	400	1993
14	Patroclus to Tickalara/Cooroo Line	Santos Ltd	Oil	15	80	1993
15	PPL24 to Barcaldine	Australian Gasfields Ltd	Gas	420	168	1994-97
16	Judga to Munkah	Santos Ltd	Gas	13	219	1993
17	Munkah to QGC	Santos Ltd	Gas	13.5	356	1993
18	Yanda to QGC	Santos Ltd	Gas	8	324	1993
19	Dinmore lateral	Gas Corp of Qld	Gas	1.2	168	1993
20	Namarah to Yarrabend	Oil Co of Aust	Gas	45	168	1994
21	SA border to NSW border	East Australian Pipeline Ltd	Gas	56	864	1974
22	Major to Boxleigh	Angari Pty Ltd	Gas	16	89	1994
23	SA border to NSW border	Gorodok Pty Ltd	Ethane	38	219	1974-76
24	Ballera to Wallumbilla	Tenneco Energy Queensland Pty Ltd	Gas	750	406	1996
30	Gladstone to Rockhampton	Duke Queensland Pipeline Pty Ltd	Gas	100	219	1991
30	Wallumbilla to Gladstone	Duke Queensland Pipeline Pty Ltd	Gas	530	324	1989-90
31	Roti to Judga	Santos Ltd	Gas	-	-	1996
32	Gatton to Gympie	Allgas Pipeline Operations Pty Ltd	Gas	239	150	Under construct.
34	Stokes to SA Border	Santos Ltd	Gas	7	300	1996
35	Challum to Ballera Gas Centre	Santos Ltd	Gas	15	400	1996
36	Karmona to Ballera Gas Centre	Santos Ltd	Gas	15	300	1996
37	Wackett to Ballera Gas Centre	Santos Ltd	Gas	15	200	1996
38	Okotoko to Karmona	Santos Ltd	Gas	10	200	1996
39	Wippo to Okotoko	Santos Ltd	Gas	10	200	1996
40	Yawa to Munkah	Santos Ltd	Gas	5	150	1996
41	Ballera to Mt Isa	Roverton Pty Ltd	Gas	841	324	1997

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
42	PPL41 to Carrington	AGL Pipelines (Qld) Pty Ltd	Gas	100	100, 150	1998
45	Bunya/Vernon/Cocos to Central Treatment Plant	Australian Gasfields Ltd	Gas	130	–	1998
47	Mt Howitt to Wippo	Santos Limited	Gas	75	200	Under Construct.
48	Wolgolla to Epsilon	Santos Limited	Gas	16	250	Under Construct.
49	Mica Creek Meter Station to Power Station	Mount Isa Mines Ltd	Gas	1	508, 114	1998
50	Mica Creek Meter Station	Roverton Pty Ltd	Gas	–	324	1998
51	Mica Creek to Mt Isa	Roverton Pty Ltd	Gas	6.2	168, 89	1998
53	Central Treatment Plant to PPL41	Australian Gasfields Ltd	Gas	42.6	168	Under construction
54	PPL41 to Phosphate Hill	WMC Fertilisers	Gas	4.5	323	Operational
55	PPL24 to Roma Power Station	Boral Energy Electric Ltd	Gas	14.1	114.3	Operational
58	Downlands to PPL 4	Mosaic Oil NL	Gas	8.5	114.3	Operational
62	Karri to Wackett	Santos Ltd	Gas	17.3	150	Operational
68	Wackett South manifold to Wackett pipeline riser	Santos Ltd	Gas	7.9	150 to 200	Under Construct
69	Okotoko East No. 1 wellhead to Okotoko pipeline riser	Santos Ltd	Gas	3.3	100 to 150	Under Construct
70	Wippo South No. 1 wellhead to Judga North No. 1 wellhead	Santos Ltd	Gas	6.5	100 to 200	Under Construct
71	Chiron Field manifold to Stokes Field manifold	Santos Ltd	Gas	10.5	150 to 250	Under Construct

NEW SOUTH WALES

ONSHORE

na	Moomba to MW10 (loopline)	East Australian Pipeline Ltd	Gas	10	660	1984
1	Wilton to Horsley Park	The Australian Gas Light Co Ltd	Gas	52	864	1976
2	Wilton to Wollongong	The Australian Gas Light Co Ltd	Gas	32	508	1978
3	Horsley Park to Plumpton	AGL Gas Networks Ltd	Gas	10	168	1976
4, 5, 6	Botany Bay to Rosehill	Shell Oil Australia, SMP Company	Petroleum	28	na	1977
7	Plumpton to Killingworth	The Australian Gas Light Co Ltd	Gas	141	508	1982
8	Killingworth to Walsh Point	Newcastle Gas Co Pty Ltd (AGL)	Gas	32.9	508, 355	1982
15	Moomba to Wilton	East Australian Pipeline Ltd	Ethane	1 375	219	1997
16	Moomba (Qld border) to Wilton (Sydney)	East Australian Pipeline Ltd	Gas	1 142	864	1974-76
17	Young to Lithgow	East Australian Pipeline Ltd	Gas	212	168	1986-87
17	Young to Bathurst Spur	East Australian Pipeline Ltd	Gas	2	114	1986-87
18	Young to Oberon Spur	East Australian Pipeline Ltd	Gas	21	168	1987-88
19	Young to Wagga Wagga	East Australian Pipeline Ltd	Gas	131	324, 89	1980-81
20	Junee to Griffith/Leeton	East Australian Pipeline Ltd	Gas	180	168, 114	1993
21	Dalton to Canberra	East Australian Pipeline Ltd	Gas	52	273	1981
22	Young to Orange Spur	East Australian Pipeline Ltd	Gas	24	114	1986-87
23	Culcairn to Wagga Wagga	East Australian Pipeline Ltd	Gas	88	457	1998

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
24	Vic/NSW border to Culcairn (from Barnawatha)	Transmission Pipelines Australia	Gas	57	457	Under construction
25	Marsden to Dubbo	AGL Pipelines (NSW) Pty Ltd	Gas	255	168, 219	Under construction
26	Vic/NSW to Wilton	Duke Energy	Gas	467	450	Under construction
VICTORIA						
OFFSHORE						
PL 4	Barracouta to Shore	Esso Aust Resources Ltd	Oil	18.9	150	1969
PL 1	Barracouta A to Gippsland gas processing plant	Esso Australia Resources Ltd	Oil and Gas	18.5	450	1967
PL 2	Marlin A to shore (Vic/PL and Vic/PL(V))	Esso Australia Resources Ltd	Gas	47.	500	1967
PL 5	Halibut to shore (Vic/PL and Vic/PL(V))	Esso Australia Resources Ltd	Oil	71.	600	1969
PL 6	Kingfish A to Kingfish B	Esso Australia Resources Ltd	Oil	4.5	400	1969
PL 7	Kingfish B to Halibut A	Esso Australia Resources Ltd	Oil	26.9	500	1969
PL 8	Mackerel A to Halibut A	Esso Australia Resources Ltd	Oil	9.2	300	1975
PL 9	Tuna A to Marlin A	Esso Australia Resources Ltd	Oil	18.	300	1975
PL10	Tuna A to Marlin A	Esso Australia Resources Ltd	Gas	18.7	200	1975
PL11	Marlin to Halibut to shore pipeline (Vic/PL5)	Esso Australia Resources Ltd	Liquid and Hydrocarbon s	1.6	300	1975
PL13	Snapper A to shore (Vic/PL and Vic/PL(V))	Esso Australia Resources Ltd	Oil and Gas	31	600	1979
PL14	West Kingfish to Kingfish A	Esso Australia Resources Ltd	Oil	3.5	300	1981
PL15	Cobia to Halibut A	Esso Australia Resources Ltd	Oil	5.5	300	1982
PL16	Fortescue to Halibut A	Esso Australia Resources Ltd	Oil	4.1	300	1982
PL17	Flounder to Tuna A	Esso Australia Resources Ltd	Oil and Gas	16.7	250	1983
PL18	Flounder to Tuna A	Esso Australia Resources Ltd	Oil and Gas	16.7	250	1983
PL19	Snapper A to Marlin A	Esso Australia Resources Ltd	Oil	17.8	250	1983
PL20	Bream to West Kingfish	Esso Australia Resources Ltd	Oil	32	400	1987
PL21	Perch Monotower to shore (Vic/PL and Vic/PL(V))	Esso Australia Resources Ltd	Oil	26.4	300	1989
PL22	Seahorse subsea well to Barracouta A	Esso Australia Resources Ltd	Oil	11.3	150	1989
PL23	Tarwhine to Barracouta A	Esso Australia Resources Ltd	Oil	17.4	200	1989
PL24	Whiting to Snapper A	Esso Australia Resources Ltd	Oil	14.6	250	1989
PL25	Whiting to Snapper A	Esso Australia Resources Ltd	Gas and Oil	14.6	200	1989
PL26	Bream B to Bream A	Esso Australia Resources Ltd	Oil and Gas	6.2	250	1996
PL27	West Tuna to Tuna A	Esso Australia Resources Ltd	Oil and Gas	3.5	100	1996
PL28	West Tuna to Tuna A	Esso Australia Resources Ltd	Oil	3.6	250	1996
SL 1	Cobia Sub-sea to Mackerel A	Esso Australia Resources Ltd	Oil	-	-	Revoked Sep 1984
SL 2	Marlin A to Halibut A to Mackerel A	Esso Australia Resources Ltd	Fuel gas	31.5	100	1990
SL 5	Perch to Dolphin to shore	Esso Australia Resources Ltd	Fuel gas	26.4	100	1989
SL 3	Cobia to Halibut A	Esso Australia Resources Ltd	Fuel gas	5.5	100	1990

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
SL 4	Fortescue to Halibut A	Esso Australia Resources Ltd	Fuel gas	4.1	100	1990
SL 5 & SL 5(v)	Perch to Dolphin to shore	Esso Australia Resources Ltd	Gas	32.6	100	1989
SL 6	Seahorse to Barracouta A	Esso Australia Resources Ltd	Gas	11.3	65	1989
SL 7	Tarwhine to Barracouta A	Esso Australia Resources Ltd	Fuel gas	17.4	65	1989
SL 8	Blackback Termination to Mackerel	Esso Australia Resources Ltd	Fuel gas	22.7	65	1998
SL 9	Marlin to West Kingfish and Kigfish A & B	Esso Australia Resources Ltd	Fuel gas	53	150	1998
PL29	Blackback wells to Mackerel Platform	Esso Aust Resources Ltd	Oil	22.7	200	1998
PL30	Vic/Tas sea boundary to 3 mile zone	DEI Tasmania Holdings P/L	Gas	93.0	350	2001
PL31	Patricia-Baleen subsea wells to 3 mile	Trinity Gas Resources Pty Ltd	Gas and liquid	19.7	324	2002
PL32	Bream A to 3 mile	Esso Australia Resources Ltd	Gas	41.5	350	2001
PL33	Minerva to 3 mile	BHP Billiton Petroleum (Victoria) Pty Ltd	Gas and liquid	15	250	2002
ONSHORE						
73	Williamstown dock to Altona	Mobil Refining Australia Pty Ltd	Liquids	7	450	1972
70,71	Altona	Mobil Refining Australia P/L	Liquids	0.73	300	1971
1	Mean low water level (Barracou) to Gippsland gas processing plant	Esso Australia Resources Ltd	Liquids or Gas	24.67	450	1969
2	Mean low water level (Marlin) to Gippsland Gas Processing Plant	Esso Australia Resources Ltd	Liquids or Gas	55.1	500	1969-70
3	Crib Point to Dandenong	Crib Point Terminal Pty Ltd	Liquids	36.59	200	1968
5	Shell Newport to South Dynon Railway Yards	Shell Company of Australia Ltd	Liquids	7.4	100	1968
6	Shell Geelong to Lara Gas Plant	Shell Company of Australia Ltd	LPG	3.54	100	1968
7	Shell Geelong to Shell Newport	Shell Company of Australia Ltd	Liquids (White Oil)	53.13	200	1968
8	Shell Geelong to Shell Newport	Shell Company of Australia Ltd	Liquids (Black Oil)	56.35	200	1968
9	Newport to Coode Island Terminal	BP Australia Pty Ltd	Liquids	4.99	150	1968
10	Shell Geelong to Corio Quay	Shell Company of Australia Ltd	Liquids	3.98	200	1968
11	BP Western Port to Dandenong	Vic Gas Distribution Pty Ltd	Gas	39.1	300	1969
13	Dandenong to Highett	United Energy & Multinet Gas DB1 & DB2	Gas	17.9	300	1969
14	Highett to Spencer St Bridge	United Energy	Gas	19.7	300	1969
16	Altona to Derrimut	TXU Networks (Gas) Pty Ltd	Gas	6.4	100	1969
17	Derrimut to West Melbourne	TXU Networks (Gas) Pty Ltd	Gas	15.7	150	1969
18	Footscray to Sunshine	TXU Networks (Gas) Pty Ltd	Gas	12.03	200, 300, 400	1968
19	West Footscray to Williamstown	TXU Networks (Gas) Pty Ltd	Gas	8.8	400, 300, 200	1968
22	Port Melbourne to Newport	BP Australia Ltd	Liquids	6.1	200	1968
23	Spotswood to Newport	Caltex Oil (Australia) Pty Ltd	Liquids	0.48	300	1969
25	Spotswood to Newport	Caltex Oil (Australia) Pty Ltd	Liquids	0.44	150	1968
26	Spotswood to Newport	Caltex Oil (Australia) Pty Ltd	Liquids	0.44	150	1968

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
27	Gippsland gas processing plant to Cranbourne/Hastings	Esso Australia Resources Ltd	LPG	173.08	250	1968
28	Ringwood to Vermont	United Energy	Gas	3.5	200	1968
33	Dandenong to Edithvale	United Energy	Gas	11.6	150	1968
34	Cranbourne/Hastings to Long Island Point	Esso Australia Resources Ltd & BHP Billiton Petroleum (Bass Strait) Pty Ltd	Liquids	12.4	250	1968
35	Dutson to Hastings	Esso Australia Resources Ltd	Liquids	185.2	700	1969
36	Dandenong to West Melbourne	GasNet Australia (Operations) P/L	Gas	37.	200, 750	1969
37,38	Altona, Yarraville, Spotswood	Mobil Refining (Aust) Pty Ltd	Liquids	8.1	150	1969
39	Termination Halibut submarine to Gippsland gas processing plant	Esso Australia Resources Ltd	Oil	55.2	650	1969
40	Dandenong to Templestowe	United Energy	Gas	37	450	1969
42	Termination Barracouta subm. To Gippsland gas processing plant	Esso Australia Resources Ltd	Liquids and Gas	32	150	1969
43	Longford to Sale	Vic Gas Distribution Pty Ltd	Gas	15	100	1969
44	Sale to Maffra	Vic Gas Distribution Pty Ltd	Gas	16.5	100	1969
46	Long Island Point to Crib Point	Esso Australia Resources Ltd	Liquids	10.8	1050	1969
47	Dandenong Terminal to Industrial Plants	United Energy	Gas	3.06	150, 80	1969
49	Dandenong to Frankston	Vic Gas Distribution P/L	Gas	24	200	1970
50	Dandenong to Morwell with branch lines	GasNet Australia (Operations) P/L	Gas	127.2	450, 100, 75	1970
51	Ringwood to Croydon	United Energy	Gas	6.5	250	1970
53	Hastings to Altona	Esso Australia Resources Ltd	Ethane	78.3	250	1970
54	Fawkner to Coburg	TXU Networks (Gas) P/L	LPG	4.5	150,250	1970
55	Altona to Spotswood	Mobil Refining (Aust) Pty Ltd	Liquids	6.9	250, 150	1970
56	Dandenong to West Melbourne with branch lines	United Energy	Gas	43.7	450, 300, 200, 150	1970
57	Corio/Belmont/Point Henry	TXU Networks (Gas) P/L	Gas	24.5	350, 250, 200	1970
58, 59, 60	Yarraville to Spotswood	BP Australia Ltd	Liquids	1.58	300, 200	1970
61	Hastings to Tyabb	Vic Gas Distribution Pty Ltd	Gas	3.44	250,80	1970
62	Tyabb to Mornington	Vic Gas Distribution Pty Ltd	Gas	12.6	150	1970
63	Golden Beach to Longford (Loopline)	Esso Australia Resources Ltd	Liquids or Gas	28.5	750	1971
64	Fawkner to Craigieburn	TXU Networks (Gas) P/L	Gas	10.5	150,200,250	1971
65	Tyabb/Altona/Corio	WAG Pipeline Pty Ltd	Liquids	135.9	600, 450	1971
66	North Melbourne to Fairfield	Vic Gas Distribution Pty Ltd	Gas	11.6	250	1971
67	Tyers to Maryvale	GasNet Australia (Operations) P/L	Gas	5.4	150	1971
68	Pakenham	GasNet Australia (Operations) P/L	Gas	1.2	80	1971
69,72	Altona	Mobil Refining (Aust) Pty Ltd	Liquids	11.24	150, 200, 250, 300, 450	1972

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
75	Longford to Dandenong	GasNet Australia (Operations) P/L	Gas	174.2	750	1971
76	Maidstone to Braybrook	TXU Networks (Gas) Pty Ltd	Gas	4.1	300	1971
77	Croydon to Mooroolbark	United Energy	Gas	3.4	250	1972
78	Brooklyn/Ballarat/Bendigo	GasNet Australia (Operations) P/L	Gas	180.1	200, 150	1972
80	North Geelong to Fyansford	TXU Networks (Gas) Pty Ltd	Gas	4.93	350	1972
81	Brooklyn to Corio	GasNet Australia (Operations) P/L	Gas	50.7	350, 400	1972
82	Sunshine to Sunshine North	TXU Networks (Gas) Pty Ltd	Gas	1.2	300	1972
84	Yarraville	TXU Networks (Gas) Pty Ltd	Gas	2.78	100, 150, 200	1973
85	Bangholme	Vic Gas Distribution Pty Ltd	Gas	2.1	150	1973
87	Along Bayview Rd, Hastings	BOC Gases Australia Ltd	Compressed air	1.1	50,150,200	1975
90	Exford to Melton	TXU Networks (Gas) Pty Ltd	Gas	8	150	1974
91	Lardner to Warragul	GasNet Australia (Operations) P/L	Gas	4.8	100	1974
92 - 94	Yarraville to Spotswood	Mobil Oil Australia Ltd	Liquids	1.25	250, 150	1974
96	Longford	Esso Australia Resources Ltd	Gas	1.4	600	1975
97	Corio	TXU Networks (Gas) Pty Ltd	Gas	0.57	200	1975
98	Lake Reeve	Esso Australia Resources Ltd	Gas	26.6	750	1975
99	Fyansford to Waurin Ponds	TXU Networks (Gas) Pty Ltd	Gas	12.6	250	1975
100	Mooroolbark to Lilydale	United Energy	Gas	4.8	250	1975
101	Keon Park/Wodonga/Shepparton	GasNet Australia (Operations) P/L	Gas	318	300, 200, 600	1975
102	Wodonga	Vic Gas Distribution P/L	Gas	5.05	200	1975
103	Shepparton	Vic Gas Distribution P/L	Gas	10.28	200	1975
104	Lascelles Wharf to PCC Geelong	Pivot Ltd	Sulphuric acid	.38	300	1975
107	Clyde North	GasNet Australia (Operations) P/L	Gas	2	100	1975
108	South Melbourne to Brooklyn	GasNet Australia (Operations) P/L	Gas	12.8	750	1976
109	Altona to West Footscray	BOC Gases Australia Ltd	Nitrogen	6.7	90	1976
110	Altona to Footscray	BOC Gases Australia Ltd	Hydrogen	6.7	50	1976
111	Altona to Footscray	BOC Gases Australia Ltd	Propylene	6.7	50	1976
112	Altona to West Footscray	Huntsman Chemical Company Australia Ltd	Ethane	6.5	250	1976
113	Brooklyn to Altona	TXU Networks (Gas) P/L	Gas	4.9	500, 300	1976
115	John Lysaght Hastings	Vic Gas Distribution Pty Ltd	Gas	1.58	250	1977
116	Termination submarine to Valve Site 1	Esso Australia Resources Ltd	Gas	1.3	600	1977
117	Rosedale to Tyers	GasNet Australia (Operations) P/L	Gas	34.3	750	1978
118	Altona to Somerton	Mobil Oil Australia Ltd	Liquids	34	350	1978
119	Somerton to Tullamarine	Mobil Oil Australia Ltd	Liquids	11	150	1978
120	Longford to Rosedale	GasNet Australia (Operations) P/L	Gas	30.5	750	1978

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
121	Tyers to Morwell	GasNet Australia (Operations) P/L	Gas	15.7	500	1978
122	Derrimut to Sunbury	GasNet Australia (Operations) P/L	Gas	24	150	1979
124	Newport	GasNet Australia (Operations) P/L	Gas	1	450	1979
125	Guildford to Maryborough	GasNet Australia (Operations) P/L	Gas	31.4	150	1980
126	Longford to Westbury	BHP Billiton Petroleum (Bass Strait) Pty Ltd	Liquids	87	700	1980
128	Mt Franklin to Kyneton	GasNet Australia (Operations) P/L	Gas	24	300	1980
129	Dandenong to Princes Highway	GasNet Australia (Operations) P/L	Gas	5	750, 500	1980
130	Altona	Quenos Olefins P/L	Gas	3.74	200,250	1980
131	Mt Franklin to Bendigo	GasNet Australia (Operations) P/L	Gas	50.8	300	1980
132	Shepparton to Tatura	GasNet Australia (Operations) P/L	Gas	16.2	200	1981
133	Longford Plant to Metering Station	Esso Australia Resources Ltd	Gas	1.14	600, 350	1981
134	Ballan to Ballarat	GasNet Australia (Operations) P/L	Gas	22.8	300	1981
135	Bunyip to Pakenham	GasNet Australia (Operations) P/L	Gas	18.7	750	1981
136	Tatura to Kyabram	GasNet Australia (Operations) P/L	Gas	21.3	200	1982
137	Bittern to Dromana	Stratus Pty Ltd	Gas	19	200	1982
138	Altona	Petro Altona P/L	LPG	2.3	150	1981
139	Langwarrin to Frankston	Vic Gas Distribution P/L	Gas	8	200	1982
141	Pakenham to Woolert	GasNet Australia (Operations) P/L	Gas	93.1	750	1982
142	Knox to Shire of Sherbrooke	United Energy	Gas	6	150	1983
143	Wandong to Kyneton	GasNet Australia (Operations) P/L	Gas	59	300	1984
144	Altona	Quenos Olefins P/L	LPG	3.	80	1985
145	Paaratte to Allansford	GasNet Australia (Operations) P/L	Gas	34	150	1985-86
149	Seaspray to Longford (Perch/Dolphin)	Esso Australia Resources Ltd	Oil and Gas	19.4	300	1989
150	Longford to Seaspray (Perch/Dolphin)	Esso Australia Resources Ltd	Oil and Gas	17.8	100	1989
151	Altona	Cabot Australia P/L	LPG	1.35	300	1989
152	Kyabram to Echuca	GasNet Australia (Operations) P/L	Gas	30.7	150	1990
153	Crib Pt to Hastings	Trafigura terminals Australia P/L	Liquids	9.4	300	1990
154	Altona North	Air Liquide Australia Ltd	Oxygen	1.78	150	1989
155	Allansford to Portland	GasNet Australia (Operations) P/L	Gas	100.4	150	1991
157	Hastings	BOC Gases Australia	Compressed air	1.2	250	1991

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
162	Laverton North	GasNet Australia (Operations) P/L	Gas	1.6	150	1993
164	Port Melbourne to Boundary Road	GasNet Australia (Operations) P/L	Gas	0.4	150	1993
167	Dromana to Rye	Vic Gas Distribution P/L	Gas	17.3	200	1993
168	Curdievale to Cobden	Vic Gas Distribution P/L	Gas	27.7	150	1993
171	Codrington to Hamilton	GasNet Australia (Operations) P/L	Gas	54.5	150	1994
172	Crib Pt to Long Island Pt to Dandenong (previously licensed under PL11 & 12)	Elgas Reticulation Pty Ltd	LPG	43	100	1969
175	Longford to Vic/NSW border	Duke Energy	Gas	277	450	Under construction
176	Chiltern to Rutherglen	GasNet Australia (Operations) P/L	Gas	14.7	200	1998
178	Barnawatha to NSW border	GasNet Australia (Operations) P/L	Gas	5.5	450	1998
179	Carisbrook to Horsham	Coastal Gas Pipelines Victoria Pty Ltd	Gas	182	200, 100	1998
182	Rutherglen to Koonoomoo	GasNet Australia (Operations) P/L	Gas	88.8	200	1998
184	Ararat, Stawell, Horsham City Gates	TXU Networks (Gas) Pty Ltd	Gas	1	80	1997
186	Rutherglen City Gate	Vic Gas Distribution P/L	Gas	1	80	1998
187	Yarrowonga, Cobram and Koonoomoo City Gates	Vic Gas Distribution P/L	Gas	1	80	1998
188	Ballarat City Gate to Dana St	TXU Networks (Gas) Pty Ltd	Gas	7.1	200	1998
189	Bendigo City Gate to Able St	TXU Networks (Gas) Pty Ltd	Gas	9.2	200	1998
190	Derrimut, Bacchus Marsh, Ballan, Wallace, Daylesford, Rockbank and Castlemaine City Gates	TXU Networks (Gas) Pty Ltd	Gas	1	100, 80, 50	1998
191	Sydenham, Diggers Rest and Sunbury City Gates	TXU Networks (Gas) Pty Ltd	Gas	1	80, 50	1998
192	Kyneton City Gate	TXU Networks (Gas) Pty Ltd	Gas	1	80	1998
193	Maryborough City Gate	TXU Networks (Gas) Pty Ltd	Gas	1	80	1998
194	Allansford City Gate	TXU Networks (Gas) Pty Ltd	Gas	1	100	1998
195	Koroit City Gate	TXU Networks (Gas) Pty Ltd	Gas	1	50	1998
196	Portland City Gate to Portland Smelter	TXU Networks (Gas) Pty Ltd	Gas	15.8	200	1998
197	Brooklyn City Gate to Somerville Rd	TXU Networks (Gas) Pty Ltd	Gas	1.7	400	1998
198	Hoppers Crossing, Werribee, Laverton North, Kerbrook, Lara and Avalon City Gate	TXU Networks (Gas) Pty Ltd	Gas	1	100, 80	1998
199	Cobden City Gate	TXU Networks (Gas) Pty Ltd	Gas	1	80	1998
200	Hamilton City Gate	TXU Networks (Gas) Pty Ltd	Gas	1	80	1998
201	Templestowe to Keon Park East	Vic Gas Distribution P/L	Gas	16.5	450	1998
202	Keon Park East to Keon Park West	GPU Gas Net Pty Ltd	Gas	0.6	450	1998
203	Keon Park West to North Melbourne	TXU Networks (Gas) Pty Ltd	Gas	25	450	1998

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
204	Cecil St to Pickles St	United Energy	Gas	1.4	200	1998
205	Oakleigh, Clayton, Noble Park, Malvern and St Kilda East City Gates and Yarra Bank Road Spurline	United Energy	Gas	1	300, 150, 100, 80	1998
206	Pakenham City Gate	Vic Gas Distribution Pty Ltd	Gas	1	80	1998
207	Queens Wharf Road City Gate	Vic Gas Distribution Pty Ltd	Gas	1	150	1998
208	North Melbourne to West Melbourne	Vic Gas Distribution Pty Ltd	Gas	3.5	450	1998
209	Howe Parade and Lorimer St Port Melbourne City Gate	United Energy	Gas	1	100	1998
210	Gembrook City Gate	United Energy	Gas	1	80	1998
211	Healesville City Gate	Vic Gas Distribution Pty Ltd	Gas	1	80	1998
212	Warragul City Gate	Vic Gas Distribution Pty Ltd	Gas	1	100	1998
213	Clyde North City Gate	Vic Gas Distribution Pty Ltd	Gas	1	100	1998
214	Firmans Lane City Gate Morwell	Vic Gas Distribution Pty Ltd	Gas	1	80	1998
215	Tramway Rd Morwell	Vic Gas Distribution Pty Ltd	Gas	4.85	80	1998
216	Moe, Churchill, Yarragon, Trafalgar, Drouin South, Darnum, Longwarry, Lyndhurst, Huon Park Road, Cranbourne Road and Cranbourne North City Gates	Vic Gas Distribution Pty Ltd	Gas	1	100, 80, 75, 25	1998
217	Hampton Park, Narre Warren, Berwick, Traralgon and Rosedale City Gates	Vic Gas Distribution Pty Ltd	Gas	1	80	1998
218	Kyabram and Merrigum City Gates	Vic Gas Distribution Pty Ltd	Gas	1	80	1998
219	Wodonga City Gate to Murray River	Vic Gas Distribution Pty Ltd	Gas	8.3	300, 200	1998
220	Chiltern, Wallan, Broadford, Puckapunyal, Seymour, Euroa, Benalla, Monsbent, Wangaratta, Wangaratta East and Epping City Gates	Vic Gas Distribution Pty Ltd	Gas	1	100, 80, 60	1998
221	Craigieburn City Gates	TXU Networks (Gas) Pty Ltd	Gas	1	100	1998
222	Tatura City Gate	Vic Gas Distribution Pty Ltd	Gas	1	80	1998
223	Kilmore City Gate	Vic Gas Distribution Pty Ltd	Gas	1	50	1998
224	Echuca and Tongala City Gates	Vic Gas Distribution Pty Ltd	Gas	1	100, 80	1998
226	SA/Vic border to Mildura	Envestra Ltd	Gas	105.2	100	1999
227	Iona to North Paaratte	Western Underground Gas Storage Pty Ltd	Gas	7.1	150	1999
228	Shelley Beach Two Mile Bay to Minerva	BHP Billiton Petroleum (Victoria) Pty Ltd	Gas	4.5	400	2002
230	Mean low water mark to Orbost	Santos Ltd	Gas	12.5	400	2001
231	Iona to Lara	GasNet Australia (Operations) P/L	Gas	143.9	500	2000
232	Longford to NSW Border and East Coast Power Plant Bairnsdale	Duke Eastern Gas Pipeline Pty Ltd	Gas	280.57	168, 450, 610	2000
233	Bream A seaspray to site 3	Esso Australia Resources Ltd	Gas	5.8	300	2000

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
234	Traralgon to Loy Yang Power Station	Edison Mission Energy	Gas	13	300	2001
235	Colac City Gate	TXU Networks (Gas) Pty Ltd	Gas	1	80	2001
236	Longford to Shore Crossing near Seaspray	DEI Tasmanian Holdings P/L	Gas	20	450	2001
237	McIntee well to Fenton/Mylor	Santos Ltd	Gas	12.02	200	2001
238	Somerton	GasNet Australia P/L	Gas	3.4	250	2001
239	Victoria to South Australia	South East Australia Gas P/L	Gas	210	355	2002
240	Otway Basin to Heytesbury gas plant	Santos Ltd	Gas	8.5	219	2002
242	Port Campbell to Iona	GasNet Australia (Operations) P/L	Gas	9	500	2002
243	Kilcunda to gas processing Lang Lang	Origin Energy Resources Ltd	Gas and liquid	32	350	2003
244	Proposed gas processing plant near Lang Lang	Origin Energy Resources Ltd	Gas	31	250	2003
247	EGP and TGP to GasNet Longford to Dandenong	DEI Vic Hub P/L	Gas	2.1	250	2002
74	Altona to Williamstown dock, Spotwood and Yarraville	Mobil Refining Australia Pty Ltd	Liquids	11	150	1972
88	Hastings	BOC Gases Australia Ltd	Hydrogen	1.2	50	1975
89	Hastings	BOC Gases Australia Ltd	Nitrogen	1.1	150	1975
95	Yarraville to Spotswood	Mobil Oil Aust Ltd	Liquids	1.5	250	1974
158	Laverton North to Deer Park	Coogee Energy Pty Ltd	Methanol	6.17	80	1993
159	Laverton North	Coogee Energy Pty Ltd	Methanol	3.87	80	1993
160	Altona North to Laverton North	Air Liquide Australia Ltd	Oxygen	2.54	150	1993
161	Altona North to Laverton North	Air Liquide Australia Ltd	Nitrogen	11.94	150,80	1993
173	Altona North to Laverton North	Air Liquide Australia Ltd	Oxygen	1.4	300	1995

SOUTH AUSTRALIA

ONSHORE

PL1	Tarac	Epic Energy SA Pty Ltd	Gas	0.4	89	1988
PL1	Port Pirie lateral	Epic Energy SA Pty Ltd	Gas	77.8	170	1969
PL1	Nuriootpa lateral	Epic Energy SA Pty Ltd	Gas	1.6	114	1969
PL1	Moomba to Adelaide	Epic Energy SA Pty Ltd	Gas	781	560	1969
PL1	Port Douglas Lateral	Epic Energy SA Pty Ltd	Gas	11.5	114	1988
PL1	Burra lateral	Epic Energy SA Pty Ltd	Gas	15	989	1969
PL1	Port Bonython lateral	Epic Energy SA Pty Ltd	Gas	5.5	168	1988-89
PL1	Dry Creek lateral	Epic Energy SA Pty Ltd	Gas	1.3	324	1969
PL1	Taperoo lateral	Epic Energy SA Pty Ltd	Gas	1.2	324	1969
PL1	Mintaro lateral	Epic Energy SA Pty Ltd	Gas	0.3	220	1969
PL1	Wasleys to Torrens Is loop	Epic Energy SA Pty Ltd	Gas	41.5	508	1969
PL1	Angaston lateral	Epic Energy SA Pty Ltd	Gas	38.7	220	1969
PL1	Peterborough lateral	Epic Energy SA Pty Ltd	Gas	1.9	90	1969
PL1	Osbourne lateral	Epic Energy SA Pty Ltd	Gas	1.3	273	1988
PL1	Whyalla lateral	Epic Energy SA Pty Ltd	Gas	87.7	200	1988-89
na	Big Lake satellite (new to old)	Epic Energy SA Pty Ltd	Gas	10.4	500	1976

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
na	Daralingie to Moomba	Epic Energy SA Pty Ltd	Gas	44	500	1984
na	Moomba South Central to Moomba	Epic Energy SA Pty Ltd	Gas	11	450	1975
na	Big Lake to Moomba	Epic Energy SA Pty Ltd	Gas	10	450	1976
na	Gidgealpa to Moomba	Epic Energy SA Pty Ltd	Gas	25.6	400	1970
na	Kidman to Dullingari	Epic Energy SA Pty Ltd	Gas	15.5	300	1984
na	Mudrangie to Tirrawarra (abandoned)	Epic Energy SA Pty Ltd	Gas/condensate	20.3	150	1982
na	Toolachee to Della	Epic Energy SA Pty Ltd	Gas	37	750	1984
PL2	Moomba to Point Bonython	Santos Ltd	Liquids	659	355	1982
na	Tirrawarra to Moomba	Epic Energy SA Pty Ltd	Gas	49.2	500	1982
na	Tirrawarra to Moomba	Epic Energy SA Pty Ltd	Oil	49.2	250	1982
na	Strzelecki tee to Moomba	Epic Energy SA Pty Ltd	Liquids	48	219	1983
na	Strzelecki to Strzelecki tee	Epic Energy SA Pty Ltd	Liquids	12	168	1983
na	Dullingari to Strzelecki tee	Epic Energy SA Pty Ltd	Liquids	21	168	1982
na	Fly Lake to Tirrawarra	Epic Energy SA Pty Ltd	Gas	15	400	1983
na	Fly Lake to Tirrawarra	Epic Energy SA Pty Ltd	Oil	15	250	1983
na	Moorari to Tirrawarra	Epic Energy SA Pty Ltd	Gas	13.5	200	1983
na	Strzelecki to Dullingari / Moomba tie-in	Epic Energy SA Pty Ltd	Oil	12.3	168	1984
na	Burke to Dullingari	Epic Energy SA Pty Ltd	Gas	5.7	406	1982
na	Epsilon to Moomba	Epic Energy SA Pty Ltd	Gas	90	250	1992
na	Merrimelia Satellite to Tirrawarra/Moomba tie-in	Epic Energy SA Pty Ltd	Oil	16.5	168	1982
na	Wancoocha to Moomba	Epic Energy SA Pty Ltd	Oil	58.3	100	1985
na	Gidgealpa to Moomba	Epic Energy SA Pty Ltd	Oil	20.6	150	1985
na	Meranji to Merrimelia Satellite	Epic Energy SA Pty Ltd	Oil	16.5	100	1986
na	Dullingari to Della to Moomba	Epic Energy SA Pty Ltd	Oil	48.2, 20.6	168, 219	1984
na	Leleptian to Fly Lake	Epic Energy SA Pty Ltd	Gas	16.5	200	1989
na	Moomba to Moomba SC	Epic Energy SA Pty Ltd	Ethane (reinjection)	9.1, 41.4	273, 323.85	1984, 1988
na	Kurunda to Gidgealpa satellite	Epic Energy SA Pty Ltd	Gas	16.5	219	1988
PL3	Katnook to SAFRIES	Epic Energy SA Pty Ltd	Gas	4.5	60	1990
na	Bookabourdie to Tirrawarra	Epic Energy SA Pty Ltd	Gas/condensate	43.8	324	1988
na	Della to Moomba	Epic Energy SA Pty Ltd	Gas	42.6	750	1980
na	Dullingari to Della	Epic Energy SA Pty Ltd	Gas	24.8	750	1981
na	Munkarie 4 to Toolachee	Epic Energy SA Pty Ltd	Gas	3.6, 14.9	300 406	1984
PL4	Katnook/Glencoe to Mount Gambier & Snuggery	Epic Energy SA Pty Ltd	Gas	67	168	1991
PL5	Ballera to Moomba (See PL13 Queensland)	Santos Ltd	Gas and Condensate	92	400	1993
PL6	Angaston to Berri lateral Sedan Junction to Murray Bridge	Ayers Network Ltd	Gas	231	114	1994
PL7	Moomba to Qld border (Moomba-Sydney Gas Pipeline)	East Aust. Pipeline Gas Ltd	Gas	111 (10km loop incl.)	660, 864	1974

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
PL8	Moomba- Sydney	ICI Aust Engineering P/L	Ethane	101	219	1996
PL9	SW Queensland-Mettika	Santos Ltd	Gas and Condensate	3.5	324	1996
PL10	Moomba Interconnection	Origin Energy Pipeline Pty Ltd	Gas	0.087	250	1999
PL11	Berri-Mildura	Envestra Ltd	Gas	42.3	114	1999
PL12	Beverley	Heathgate Resources P/L	Gas	14.3	89	
PL13	Iona to Adelaide	South East Australia Gas P/L	Gas	417	356	
PL15		Santos Ltd	Gas	3	168.3	
WESTERN AUSTRALIA						
OFFSHORE						
TPL1	Harriet 'A' to Varanus Island	Apache Northwest Pty Ltd	Oil	6.5	219	1984
WA-1-PL	North Rankin 'A' to Withnell Bay	Woodside Energy Ltd	Gas/condensate	134	1 016	1983
WA-2-PL	Goodwyn to North Rankin 'A'	Woodside Energy Ltd	Gas and Condensate	25	762	1993
TPL2	Varanus Island Export	Apache Northwest Pty Ltd	Oil	3.5	762	1985
TPL3	Varanus Island Export	Ampolex (PPL) P/L	Oil	23.7	168	1987
TPL3	South Pepper to Airlie Is; South Pepper to North Herald	Ampolex (PPL) P/L	Oil	1.2	219	1987
WA-3-PL	Griffin FPSO to shore	BHP Petroleum (Aust) Pty Ltd	Gas	29.2	219	1993
TPL4	Airlie Island to mooring terminal	Ampolex (PPL) P/L	Oil	1.94	508	1987
WA-4-PL	Wanaea FPSO to North Rankin 'A'	Woodside Energy Ltd	Gas	32.3	324	1995
TPL5	Harriet 'A' to Varanus Island	Apache Northwest Pty Ltd	Gas	6.3	168	1989
WA-5-PL	East Spar to Varanus Island	Apache East Spar Pty Ltd	Gas	41	356	1996
TPL6	Saladin to Thevenard Island to mooring terminal	Chevron Texaco Aust Ltd	Gas	5.	114	1989
TPL6	Saladin to Thevenard Island	Chevron Texaco Aust Ltd	Oil	6.4	610	1989
WA-6-PL	Stag oilfield production facility	Apache Northwest Pty Ltd	Oil	2	219	1997
TPL6	Saladin to Thevenard Island	Chevron Texaco Aust Ltd	Oil and Gas	7.5	168	1989
TPL6	Saladin to Thevenard Island	Chevron Texaco Aust Ltd	Oil and Gas	2.8	219	1989
TPL6	Saladin to Thevenard Island	Chevron Texaco Aust Ltd	Gas	1.5	89	1989
TPL7	Chervil to Airlie Island	Ampolex (PPL) P/L	Gas/Oil/Water	6.4	210	1989
TPL8	Varanus Island to shore	Apache Northwest Pty Ltd	Gas	70	300	1992
TPL9	Barrow Island to mooring terminal	Chevron Texaco Aust Ltd	Oil	10.4	508	1967
TPL10	Griffin FPSO to shore	BHP Petroleum (Australia) Pty Ltd	Gas	32.5	219	1994
TPL11	Roller 'A' platform to shore	Chevron Texaco Aust Ltd	Gas	8.5	168	1993
TPL 12	East Spar to Varanus Island	Apache East Spar Pty Ltd	Gas/condensate/water	21.8	356	1996
na	Roller 'A' platform to Thevenard Island	West Australian Petroleum Pty Ltd	Oil/Gas	27	500	1994
TPL13	Varanus Island to mainland	Apache East Spar Pty Ltd	Gas	70	406	1998-99
na	Thevenard Island to Roller 'A' platform	West Australian Petroleum Pty Ltd	Gas	27	150	1994

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
TPL14	Wonnich platform to Varanus Island	Apache Energy Ltd	Gas/condensate/water	31	219	1998-99
ONSHORE						
na	Hamersley lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	3.7	200	1985
na	Geraldton lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	68	150	1985
PL1 R1	Dongara to Pinjarra (including Fremantle & Rockingham laterals)	CMS Gas Transmission of Australia Pty Ltd	Gas	445	356, 168, 114	1972
PL2 R1	Dongara to Pinjarra (including Fremantle & Rockingham laterals)	CMS Gas Transmission of Australia Pty Ltd	Gas	2.0	356, 168, 114	1972
PL3 R1	Dongara to Pinjarra (including Fremantle & Rockingham laterals)	CMS Gas Transmission of Australia Pty Ltd	Gas	445	356, 168, 114	1972
PL5 R1	Dongara to Pinjarra (including Fremantle & Rockingham laterals)	CMS Gas Transmission of Australia Pty Ltd	Gas	445	356, 168, 114	1972
PL6 R2	Woodada to Eneabba	Phoenix Energy Pty Limited	Gas	12	219	1982
PL7	Blina to Great Northern Highway	Capital Energy NL	Oil	29	114	1983
PL8	Karratha to Pt Lambert	Robe River Mining Co Pty Ltd	Gas	57	273	1984
PL9	Dampier (loading)	Woodside Petroleum Development Pty Ltd	Condensate	1	762	1984
PL12	Varanus Island	Apache Northwest Pty Ltd	Oil	0.26	762, 219	1985
PL14	Airlie Island	Apache Oil Australia Pty Ltd	Oil/Gas	0.64	508, 219	1987
PL15	Thevenard Island	Chevron Texaco Aust Ltd	Oil/Gas	2.7	600, 168	1988
PL16	Tubridgi to Compressor Station No 2	Sagasco South East Inc	Gas	87.5	168	1992
PL17	Shore (Varanus Is) to Compressor Station No 1	Apache Northwest Pty Ltd	Gas	30	300	1992
PL18	Beharra Springs to WANG Pipeline	Boral Energy Developments Ltd	Gas	1.6	168	1992
PL19	Tubridgi Gas Plant to Compressor Station No 2	Sagasco South East Inc	Gas	87	273	1993
PL20	Shore to Griffin Gas Plant	BHP Petroleum Pty Ltd	Gas	6	219	1994
PL21	Shore to Tubridgi Gas Plant	West Australian Petroleum Pty Ltd	Gas	8	168	1990
PL22	Karratha to Port Hedland	Epic Energy (Pilbara Pipeline) Pty Ltd	Gas	213	450	1994
PL23	Wang Pipeline to SECWA Pipeline (Dongara area)	CMS Gas Transmission of Australia	Gas	0.5	168	1994
PL24	Yaraloola to Kalgoorlie	Duke Energy WA Power Pty Ltd	Gas	1 400	400, 350	1996
PL25	Mt Keith lateral	Southern Cross Pipelines (NPL) Aust Pty Ltd	Gas	8.1	219	1996
PL26	Leinster lateral	Southern Cross Pipelines Aust Pty Ltd	Gas	5.2	219	1996
PL27	Kambalda Nickel lateral	Southern Cross Pipelines Aust Pty Ltd	Gas	44.3	219	1996
PL28	Parkerston Power Station	Southern Cross Pipelines (NPL) Aust Pty Ltd	Gas	8.2	219	1996

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
PL29	Lowendal Island	Apache East Spar Pty Ltd	Gas/Oil/water	0.6	356	1996
PL30	Varanus Island	Apache Oil Aust Pty Ltd	Gas/Oil/Water	0.6	356	1996
PL31	Port Hedland	Epic Energy Pty Ltd	Gas	5	-	1996
na	Worsley lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	33	273	1984
na	Mungarra lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	2.5	168	na
na	Viveash lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	2.5	150	1985
na	Western Mining lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	7	300, 150	1986
na	Eneabba lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	7	100	1986
PL32	Dongara area	AGL Pipelines (WA) Pty Ltd	Gas	10	-	1996
na	Withnell Bay to Wagerup	Epic Energy (WA) Transmission Pty Ltd	Gas	1,488	650, 508	1984
na	South Caversham lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	0.5	100	1984
PL33	GGT pipeline's Wiluna Scraper Station to Wiluna Gold Pty Ltd plant site	AGL Pipelines (WA) Pty Ltd	Gas	8	89	1997
na	Kwinana / Russell Rd	Epic Energy (WA) Transmission Pty Ltd	Gas	7.5	323	1986
na	East Perth lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	17.5	250	1986
na	Wagerup to Bunbury	Epic Energy (WA) Transmission Pty Ltd	Gas	42	273, 219	1984
na	Gascoyne Junction to Carnarvon	Epic Energy (WA) Transmission Pty Ltd	Gas	171	168	1987
na	Hamersley lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	0.5	219	1985
na	Pinjar lateral	Epic Energy (WA) Transmission Pty Ltd	Gas	14	355	na
PL34	GGT pipeline's Wiluna Scraper Station to Jundee Gold Mine Plant site	Newmont Yandal Operations Ltd	Gas	45	114	1997
PL35	GGT Pipeline at Three Rivers to the Plutonic Gold Mine site	Plutonic Operations Ltd	Gas	19.2	114	1997
PL36	Offtake tee in GGT Pipeline 16km W of Leonora to the Murrin Murrin plant site	Origin Energy Pipelines Pty Ltd	Gas	85	219	1997
PL37	Flange on GGT Pipeline East of Broad Arrow to Cawse Nickel plant site	Centaur Nickel Pty Ltd	Gas	35	168	1997-98
PL38	Burrup Gas Plant to Inlet station on Karratha to Port Hedland Pipeline	Epic Energy (WA) Transmission Pty Ltd	Gas	24	610	1998
PL39	Offtake tee in DBNGP to Cockburn Cement Plant near Dongara	Origin Energy Pipelines Pty Ltd	Gas	18	114	1998
PL40	Dampier to Bunbury (DBNGP)	Epic Energy (WA) Transmission Pty Ltd	Gas	1 789	660	1984

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
PL41	Thomas Rd valve station to Tiwest Cogeneration Plant	Epic Energy (WA) Transmission Pty Ltd	Gas	580	168	1998
PL42	PL17 end flange to GGT Pipeline	Apache East Spar Pty Ltd	Gas	1	-	1998-99
PL43	Geraldton to Windimurra	AGL Pipelines (WA) Pty Ltd	Gas	365	219, 168	Under construction
PL44	Parmelia Pipelines to Canning Vale Gardens Industrial Estate	CMS Gas Transmission of Australia	Gas	1	200	Under construction
PL45	Parmelia Pipeline to Jandakot Wool Scourers in East Rockingham	CMS Gas Transmission of Australia	Gas	400	200	Under construction
PL46	Parmelia to Rocla Quarry Bullsbrook	CMS Gas Transmission of Australia	Gas			1999
PL47	Compressor Station No. 10 (Kwinana) to Rockingham lateral.	Epic Energy (WA) Transmission Pty Ltd	Gas	1	-	1999
PL48	GGT offtake, (approx 16km West of Leonora), to Leonora Power Station.	Statewest Power Pty Ltd	Gas	17	-	1999
PL49	Geraldton to Mt Magnet	Anaconda Nickel Ltd	Gas	na	406.4	Imminent either PL49 or PL50
PL50	Geraldton to Murrin Murrin plant	Anaconda Nickel Ltd	Gas	na	406.4	Imminent either PL49 or PL50
PL52	Parmelia to Tiwest	CMS Gas Transmission of Australia	Gas		114.3	2000
PL53	Parmelia to Kwinana	CMS Gas Transmission of Australia	Gas		219	2000

NORTHERN TERRITORY

ONSHORE

1	Palm Valley to Alice Springs	Holyman Limited/NT Gas Pty Ltd	Gas	146	219	1983
2	Mereenie to Alice Springs	Santos Ltd	Oil	269	219	1985
4	Palm Valley to Darwin	NT Gas Pty Ltd	Gas	1512	356, 324	1986
4	Katherine lateral	NT Gas Pty Ltd	Gas	6.8	114	1986
4	Tennant Creek lateral	NT Gas Pty Ltd	Gas	23	273	1986
4	Mereenie to Tylers Pass	NT Gas Pty Ltd	Gas	116	324	1986
5	Alice Springs	Envestra Ltd	Gas	0.52	50, 40	1988
6	Ampol ADO Darwin	Ampol Explor Ltd	Oil	1.86	150	1987
7	Brewer Estate	Central Energy Australia P/L	Gas	10	114	1989
8	Cosmo Howley lateral	International Oil Pty Ltd/NT Gas Pty Ltd	Gas	25	90	1988
10	Elliot lateral	NT Gas Pty Ltd	Gas	4	60	1990
11	Manton Dam	NT Gas P/L	Gas	0.43	60.3	1989
15	Channel Island	Westfarmers Kleenheat Gas P/L	Gas	0.28	168, 89	1992
16	Alice Springs to Yirra college	Envestra Ltd	Gas	0.0013	50	1993
17	Daly Waters to McArthur River Mine	NT Gas Pty Ltd	Gas	333	168	1995
18	Darwin City Gate to Berrimah	NT Gas Pty Ltd	Gas	19	168	1996

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period constructed
19	Mt Todd Mine lateral	NT Gas Pty Ltd	Gas	10	219	1996

Appendix K 2002

Key to petroleum exploration and development titles, 2003

APPENDIX K: KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES, 2003

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
QUEENSLAND			ATP375P	249 km ² OCA* (100.00)	30-Sep-2002 (R.P.)
OFFSHORE			ATP378P	310 km ² Santos* (84.38) Vamgas (15.63)	30-Sep-2003
EXPLORATION PERMIT			ATP465P	155 km ² Roma* (80.00) Victoria Petroleum (20.00)	31-Aug-2001 (R.P.)
Q/23P	62 km ² Gulf Energy* (100.00)	12-Dec-2007	ATP470P	892 km ² OCA* (100.00)	28-Feb-2003 (R.P.)
ONSHORE			ATP471P	1 633 km ² Mosaic* (100.00)	28-Feb-2003 (R.P.)
EXPLORATION PERMIT			ATP526P	3 177 km ² Tri-Star* (100.00)	31-Oct-2004
ATP212P	371 km ² Angari* (49.00) Bridge (7.50) Mosaic (16.00) OCA (20.00) Santos (7.50)	31-Jul-2001	ATP529P	30 051 km ² Capricorn* (50.00) Beaconsfield (50.00)	30-Nov-2004
ATP244P	332 km ² Mosaic* (100.00)	31-Jul-2001 (R.P.)	ATP539P	6 392 km ² Tyers* (100.00)	31-Jan-2001 (R.P.)
ATP259P	28 106 km ² Santos* (50.00) Delhi (50.00)	31-Dec-2002 (R.P.)	ATP544P	2 833 km ² API* (100.00)	30-Apr-2001 (R.P.)
ATP267P	740 km ² Transoil* (17.47) Chimelle (40.94) Moonie (33.83) Santos (7.77)	30-Nov-2003	ATP545P	4 151 km ² Roma* (100.00)	31-Jan-2001 (R.P.)
ATP269P	2 404 km ² Beach* (68.29) Inland Oil (4.91) Petromin (7.57) Australian Gasfields (19.24)	31-Dec-2003	ATP548P	2 906 km ² IOR* (62.00) APS (15.00) Mawson (2.06) Midland (20.94)	31-Mar-2005
ATP299P	1 858 km ² Santos* (89.00) CPC (1.00) Drillsearch (10.00)	31-Dec-2004	ATP549P	9 464 km ² Australian Gasfields* (100.00)	30-Apr-2001 (R.P.)
ATP333P	415 km ² Victoria International* (64.00) Victoria Oil (36.00)	31-May-2001 (R.P.)	ATP550P	1 245 km ² Discovery* (100.00)	30-Jun-2001 (R.P.)
ATP336P	2 318 km ² AAR* (85.00) Interstate Pipelines (15.00)	30-Sep-2003	ATP552P	515 km ² Bligh* (44.39) Hyland (2.12) Maple (6.06) Tyers (25.45) Vamgas (21.97)	30-Jun-2001 (R.P.)
ATP337P	7 744 km ² Santos* (50.00) OCA (50.00)	30-Sep-2003	ATP553P	1 162 km ² Santos* (50.00) OCA (50.00)	30-Nov-2001 (R.P.)
ATP364P	8 467 km ² BHP* (99.00) CH4 (1.00)	28-Feb-2006	ATP554P	498 km ² Tipperary (25.00)	30-Nov-2001 (R.P.)

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
ATP556P	3 404 km ²	30-Nov-2001 (R.P.)	ATP613P	1 546 km ²	31-Mar-2003
	Maneroo* (100.00)			Magellan* (98.00)	
ATP564P	3 778 km ²	30-Apr-2002 (R.P.)	ATP616P	619 km ²	31-Oct-1999 (R.P.)
	OCA* (50.00)			Liberty* (100.00)	
	Helm En. (25.00)		ATP618P	11 693 km ²	07-Jan-2000 (R.P.)
	Lowell (25.00)			Harlow* (100.00)	
ATP566P	542 km ²	31-May-1998 (R.P.)	ATP619P	2 633 km ²	29-Feb-2004
	Maneroo* (100.00)			Bonnerwell* (100.00)	
ATP567P	17 888 km ²	30-Apr-2002 (R.P.)	ATP620P	515 km ²	28-Feb-2004
	Pagehurst* (100.00)			Pangaca* (100.00)	
ATP574P	429 km ²	30-Apr-2002 (R.P.)	ATP621P	601 km ²	29-Feb-2004
	Victoria Petroleum* (75.00)			Bobwyns* (95.00)	
	Australian Coalbed Methane (6.25)			Qld Gas Co Ltd (5.00)	
	Sequoil (18.75)		ATP623P	172 km ²	28-Feb-2003 (R.P.)
ATP578P	5 033 km ²	30-Jun-1998 (R.P.)		OCA* (100.00)	
	Shogoil* (100.00)		ATP626P	2 323 km ²	31-Aug-1999 (R.P.)
ATP584P	915 km ²	31-Jul-2002 (R.P.)		Jakabar* (100.00)	
	OCA* (100.00)		ATP631P	2 092 km ²	31-Aug-2005
ATP587P	996 km ²	31-Jul-1998 (R.P.)		OCA* (100.00)	
	Millennium* (50.00)		ATP632P	3 719 km ²	31-Mar-2005
	Cobrex (50.00)			Qld Gas Co Ltd* (100.00)	
ATP589P	14 945 km ²	31-Aug-1998 (R.P.)	ATP641P	9 447 km ²	31-Mar-2002 (R.P.)
	Victoria Oil* (60.00)			BNG* (100.00)	
	Sequoil (40.00)		ATP643P	3 177 km ²	31-Oct-2003
ATP592P	3 520 km ²	31-Aug-2002 (R.P.)		BNG* (100.00)	
	OCA* (100.00)		ATP644P	3 177 km ²	31-Oct-2003
ATP593P	2 232 km ²	30-Sep-2002 (R.P.)		BNG* (100.00)	
	Azeeza* (60.00)		ATP645P	2 400 km ²	31-Dec-2003
	Sequoil (40.00)			BNG* (100.00)	
ATP594P	1 549 km ²	30-Sep-1998 (R.P.)	ATP647P	944 km ²	31-Jul-2005
	Icon* (50.00)			Starzap* (100.00)	
	Triple J (50.00)		ATP648P	2 710 km ²	31-Oct-2004
ATP596P	310 km ²	31-Oct-2002 (R.P.)		Icon* (95.00)	
	Rincon* (100.00)			Qgas (5.00)	
ATP598P	1 239 km ²	30-Nov-2002	ATP649P	619 km ²	30-Nov-2004
	Amity* (100.00)			Icon* (100.00)	
ATP602P	1 030 km ²	31-Dec-2006	ATP651P	1 936 km ²	31-Oct-2004
	OCA* (100.00)			Qld Gas Co Ltd* (100.00)	
ATP606P	3 263 km ²	31-Oct-2002	ATP653P		30-Sep-2006
	OCA* (100.00)			Tri-Star* (100.00)	
ATP608P	4 551 km ²	30-Nov-2002 (R.P.)	ATP654P	929 km ²	31-Dec-2004
	Victoria Petroleum* (60.00)			Victoria Petroleum* (60.00)	
	Sequoil (40.00)			Sequoil (40.00)	
ATP610P	387 km ²	31-Dec-2002 (R.P.)	ATP655P	1 549 km ²	31-Oct-2003
	Icon* (95.00)			Tipperary* (100.00)	
	Qgas (5.00)		ATP663P		30-Sep-2006
				OCA* (100.00)	

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
ATP675P	3 562 km ² Tipperary* (100.00)	29-Feb-2004	PL 3	257 km ² Timbury Hills AAR* (85.00)	28-Feb-2011
ATP676P	5 343 km ² Australian Coalbed Methane* (100.00)	30-Sep-2004	PL 4	257 km ² Pine Ridge AAR* (85.00)	28-Feb-2011
ATP678P	1 162 km ² Arrow* (100.00)	28-Feb-2005	PL 5	257 km ² Raslie, Yanalah AAR* (85.00)	28-Feb-2011
ATP679P	852 km ² Arrow* (100.00)	28-Feb-2005	PL 6	257 km ² Pringle Downs, Roma AAR* (85.00)	28-Feb-2011
ATP680P	2 323 km ² Tri-Star* (100.00)	30-Nov-2004	PL 7	26 km ² Blyth Creek, Richmond AAR* (85.00)	28-Feb-2011
ATP682P	77 km ² Kingston* (100.00)	29-Feb-2004	PL 8	257 km ² Wallumbilla South AAR* (85.00)	28-Feb-2011
ATP683P	8 307 km ² Arrow* (100.00)	29-Feb-2004	PL 9	257 km ² Anabranh, Maffra AAR* (85.00)	28-Feb-2011
ATP684P	2 689 km ² BNG* (100.00)	31-Jul-2005	PL10	26 km ² Bony Creek, Tarrawonga AAR* (85.00)	28-Feb-2011
ATP685P	1 162 km ² Santos* (100.00)	30-Apr-2004	PL11	257 km ² Back Creek, Tarrawonga AAR* (85.00)	28-Feb-2011
ATP686P	2 600 km ² Arrow* (100.00)	30-Nov-2005	PL12	257 km ² Oberina, Trinidad AAR* (85.00)	28-Feb-2011
ATP689P	4 374 km ² Australian Coalbed Methane* (100.00)	30-Nov-2004	PL13	26 km ² Pleasant Hills AAR* (85.00)	31-Oct-1992 (R.P.)
ATP690P	1 084 km ² Tipperary* (100.00)	30-Nov-2004	PL14	252 km ² Kincora OCA* (100.00)	31-May-2007
ATP692P	1 549 km ² OCA* (50.00)	30-Nov-2004	PL15	259 km ² Boxleigh Mosaic* (100.00)	29-Apr-2019
ATP693P	2 925 km ² BNG* (100.00)	30-Nov-2005	PL16	259 km ² Silver Springs Mosaic* (100.00)	29-Apr-2019
ATP695P	75 km ² Roma* (32.00) Qld Gas Co Ltd (60.00) Victoria Petroleum (8.00)	28-Feb-2002 (R.P.)	PL17	104 km ² Bennett Santos* (60.00) Petromin (10.00) Timor Oil (26.70) Golden West (3.30)	28-Feb-1999 (R.P.)
ATP698	OCA* (100.00)	30-Sep-2006	PL18	184 km ² Yellowbank Creek Brisbane Pet.* (50.00) Delbaere (50.00)	31-Aug-2003
ATP699	Tri-Star* (100.00)	30-Sep-2006			
ATP703P	Tri-Star* (100.00)	30-Sep-2006			
ATP709P	859 km ² Mosaic* (100.00)	31-Aug-2005			
ATP722P	BNG* (100.00)	20-Nov-2006			
PRODUCTION LICENCE					
PL 1	258 km ² Cabawin, Moonie Santos* (100.00)	31-Dec-2006			
PL 2	258 km ² Alton Santos* (100.00)	31-Dec-2008			

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PL21	260 km ² Beldene, Royston OCA* (64.00) Alliance (12.50) Angari (4.50) Oil Investments (19.00)	18-Apr-2004	PL28	251 km ² Avondale AAR* (46.25) Interstate Pipelines (7.50) OCA (10.74) Oil Investments (35.51)	30-Nov-2005
PL22	230 km ² Waratah OCA* (64.00) Alliance (12.50) Angari (4.50) Oil Investments (19.00)	31-May-2004	PL29	12 km ² Tintaburra CPC (1.00) Drillsearch (10.00) Santos (89.00)	19-Dec-2005
PL23	234 km ² Jackson Santos* (40.00) Drillsearch (2.00) Vamgas (15.50) Inland Oil (2.00) Delhi (32.00) Australian Gasfields (2.00) Mawson (6.50)	31-Aug-2004	PL30	37 km ² Riverslea, Yapunyah Angari* (55.00) Santos (7.50) Bridge (7.50) Mosaic (10.00) OCA (20.00)	08-Jul-2006
PL24	200 km ² Jackson South Santos* (40.00) Australian Gasfields (2.00) Delhi (32.00) Drillsearch (2.00) Inland Oil (2.00) Mawson (6.50) Vamgas (15.50)	14-Dec-2003	PL31	260 km ² Bodalla South Beach (80.00) Mawson (14.75) Petromin (5.25)	26-May-2006
PL25	257 km ² Naccowlah South Santos* (40.00) Mawson (6.50) Australian Gasfields (2.00) Vamgas (15.50) Delhi (32.00) Drillsearch (2.00) Inland Oil (2.00)	28-Feb-2005	PL32	260 km ² Kenmore Beach Pet. No liability* (22.00) Beach (58.00) Mawson (14.75) Petromin (5.25)	31-Dec-2006
PL26	257 km ² Chookoo Santos* (40.00) Australian Gasfields (2.00) Delhi (32.00) Drillsearch (2.00) Inland Oil (2.00) Mawson (6.50) Vamgas (15.50)	28-Feb-2005	PL33	257 km ² Koora, Nockatunga, Winna Chimelle* (40.94) Transoil (17.47) Moonie (33.83) Santos (7.77)	14-Apr-2007
PL27	255 km ² Newstead, Yarrabend OCA* (64.00) Angari (4.50) Alliance (12.50) Oil Investments (19.00)	31-Aug-2005	PL34	238 km ² Sigma, Tickalara Santos* (62.50) Vamgas (7.50) Delhi (30.00)	10-Jul-2007
			PL35	136 km ² Watson, Watson South Santos* (40.00) Australian Gasfields (2.00) Delhi (32.00) Drillsearch (2.00) Inland Oil (2.00) Mawson (6.50) Vamgas (15.50)	10-Jul-2007
			PL36	61 km ² Naccowlah Santos* (40.00) Inland Oil (2.00) Vamgas (15.50) Drillsearch (2.00) Delhi (32.00) Australian Gasfields (2.00) Mawson (6.50)	07-Apr-2008

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PL37	12 km ² Brumby Santos* (62.50) Delhi (30.00) Vamgas (7.50)	18-Sep-2007	PL51	55 km ² Dilkeria, Muthero, Thungo Transoil* (17.47) Chimelle (40.94) Moonie (33.83) Santos (7.77)	27-Jun-2011
PL38	134 km ² Toobunyah Santos* (89.00) CPC (1.00) Drillsearch (10.00)	16-Jun-2008	PL52	70 km ² Ipundu, Ipundu North, Tarbut Santos* (89.00) CPC (1.00) Drillsearch (10.00)	27-Jun-2011
PL39	107 km ² Talgeberry CPC (1.00) Drillsearch (10.00) Santos (89.00)	13-Aug-2008	PL53	46 km ² Yambugle OCA* (100.00)	10-Sep-2011
PL40	76 km ² Louise Brisbane Pet.* (50.00) Delbaere (50.00)	13-Sep-2008	PL54	34 km ² Moorooloo Santos* (50.00) OCA (50.00)	27-Mar-2012
PL41	157 km ² Arcturus Santos* (50.00) OCA (50.00)	25-May-2010	PL55	19 km ² Munro Santos* (52.00) Delhi (40.00) Vamgas (8.00)	12-Jun-2012
PL42	150 km ² Rolleston Santos* (50.00) OCA (50.00)	25-May-2010	PL56	19 km ² Broadway Angari* (49.00) Santos (7.50) Bridge (7.50) Mosaic (16.00) OCA (20.00)	29-Jan-2011
PL43	179 km ² Yellowbank Santos* (50.00) OCA (50.00)	25-May-2010	PL57	19 km ² Endeavour Santos (89.00) Drillsearch (10.00) CPC (1.00)	15-Apr-2013
PL44	201 km ² Merivale Santos* (50.00) OCA (50.00)	25-May-2010	PL58	62 km ² Challum Santos* (62.50) Delhi (30.00) Vamgas (7.50)	15-Apr-2034
PL45	108 km ² Glentulloch Santos* (50.00) OCA (50.00)	25-May-2010	PL59	96 km ² Challum Santos* (50.00) Delhi (20.00) Origin (25.00) Vamgas (5.00)	15-Apr-2034
PL46	34 km ² Fairymount Mosaic* (100.00)	23-Feb-2010	PL60	70 km ² Munkah Santos* (50.00) Vamgas (5.00) Origin (25.00) Delhi (20.00)	15-Apr-2019
PL47	28 km ² Blackstump Mawson* (14.75) Petromin (5.25) Beach (58.00) Beach Pet. No liability (22.00)	22-Aug-2010	PL61	158 km ² Ballera, Ballera West, Yanda Santos* (50.00) Origin (25.00) Vamgas (5.00) Delhi (20.00)	15-Apr-2019
PL48	7 km ² Noona Block Mosaic* (100.00)	31-Jan-2011			
PL49	22 km ² Taylor Mosaic* (100.00)	31-Jan-2011			
PL50	49 km ² Maxwell, Maxwell South Transoil* (17.47) Chimelle (40.94) Moonie (33.83) Santos (7.77)	27-Jun-2011			

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PL62	65 km ² Judga Santos* (40.00) Australian Gasfields (2.00) Delhi (32.00) Drillsearch (2.00) Inland Oil (2.00) Mawson (6.50) Vamgas (15.50)	01-Mar-2004	PL75	12 km ² Orientos Santos* (62.50) Vamgas (7.50) Delhi (30.00)	23-Nov-2008
PL63	145 km ² Epsilon Santos* (62.50) Delhi (30.00) Vamgas (7.50)	24-Jun-2017	PL76	39 km ² Bolan, Corella, Echuburra, Natan Santos* (40.00) Australian Gasfields (2.00) Delhi (32.00) Drillsearch (2.00) Inland Oil (2.00) Mawson (6.50) Vamgas (15.50)	23-Nov-2008
PL64	49 km ² Cogoon OCA* (83.00) Alliance (12.50) Angari (4.50)	19-Aug-2013	PL77	12 km ² Jarrar Santos* (40.00) Vamgas (15.50) Inland Oil (2.00) Drillsearch (2.00) Delhi (32.00) Australian Gasfields (2.00) Mawson (6.50)	23-Nov-2004
PL65	59 km ² Gilmore Australian Gasfields* (100.00)	15-Dec-2014	PL78	12 km ² Bowen Santos* (40.00) Australian Gasfields (2.00) Delhi (32.00) Drillsearch (2.00) Inland Oil (2.00) Mawson (6.50) Vamgas (15.50)	23-Nov-2008
PL66	125 km ² Roswin Mosaic* (100.00)	23-Feb-2007	PL79	7 km ² Costa Santos* (40.00) Delhi (32.00) Vamgas (15.50) Mawson (6.50) Australian Gasfields (2.00) Drillsearch (2.00) Inland Oil (2.00)	06-Sep-2020
PL67	113 km ² Turkey Creek OCA* (50.00) Santos (50.00)	23-Jun-2011	PL80	92 km ² Durham Downs Santos* (62.50) Delhi (30.00) Vamgas (7.50)	06-Sep-2032
PL68	25 km ² Coopers Creek Santos* (62.50) Delhi (30.00) Vamgas (7.50)	08-Dec-2001 (R.P.)	PL81	40 km ² Karmona Santos* (50.00) Delhi (20.00) Origin (25.00) Vamgas (5.00)	06-Sep-2020
PL69	303 km ² AAR* (46.25) Oil Investments (35.51) Interstate Pipelines (7.50) OCA (10.74)	08-Dec-1999			
PL70	3 km ² Berwick OCA* (100.00)	06-Jul-2000 (R.P.)			
PL71	134 km ² Namarah, Parknook Angari* (67.50) OCA (22.50) Santos (10.00)	15-Dec-2014			
PL72	18 km ² Xylolium Sykes I G* (100.00)	26-Apr-2000 (R.P.)			
PL73	3 km ² Xylex Sykes I G* (100.00)	26-Apr-2000 (R.P.)			
PL74	18 km ² Major OCA* (20.00) Santos (7.50) Angari (49.00) Bridge (7.50) Mosaic (16.00)	14-Dec-2004			

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PL82	10 km ² Okotoko East Santos* (40.00) Drillsearch (2.00) Vamgas (15.50) Inland Oil (2.00) Delhi (32.00) Australian Gasfields (2.00) Mawson (6.50)	06-Sep-2020	PL93	7 km ² Stakeyard AAR* (85.00) Interstate Pipelines (15.00)	06-Dec-2002 (R.P.)
PL83	6 km ² Okotoko West Santos* (50.00) Delhi (20.00) Origin (25.00) Vamgas (5.00)	06-Sep-2020	PL94	209 km ² Moura OCA* (100.00)	17-Apr-2032
PL84	48 km ² Stokes Santos* (62.50) Delhi (30.00) Vamgas (7.50)	06-Sep-2020	PL95	12 km ² Monler Santos* (89.00) CPC (1.00) Drillsearch (10.00)	25-Aug-2019
PL85	17 km ² Wackett Santos* (50.00) Vamgas (5.00) Origin (25.00) Delhi (20.00)	06-Sep-2032	PL97	28 km ² Cook Santos* (50.00) Vamgas (5.00) Delhi (20.00) Origin (25.00)	25-Aug-2014
PL86	11 km ² Wackett Santos* (46.88) Delhi (22.50) Origin (25.00) Vamgas (5.63)	06-Sep-2032	PL98	40 km ² Inland IOR* (29.38) Moroil (22.40) ITG (28.22) Inland Oil (20.00)	23-Oct-2021
PL87	27 km ² Wippo Santos* (40.00) Vamgas (15.50) Mawson (6.50) Drillsearch (2.00) Delhi (32.00) Australian Gasfields (2.00) Inland Oil (2.00)	06-Sep-2020	PL99	232 km ² Fairview Tri-Star* (100.00)	15-Dec-2033
PL88	45 km ² Wolgolla Santos* (62.50) Vamgas (7.50) Delhi (30.00)	06-Sep-2020	PL100	232 km ² Fairview Tri-Star* (100.00)	15-Dec-2033
PL89	59 km ² Blackbutt, Bloodwood AAR* (46.25) Oil Investments (35.51) Interstate Pipelines (7.50) OCA (10.74)	06-Dec-2002 (R.P.)	PL101	240 km ² Peat OCA* (100.00)	20-Nov-2031
PL90	232 km ² Fairview Tri-Star* (100.00)	29-Nov-2029	PL105	13 km ² Roti Santos* (40.00) Vamgas (15.50) Mawson (6.50) Delhi (32.00) Inland Oil (2.00) Drillsearch (2.00) Australian Gasfields (2.00)	28-Oct-2008
PL91	232 km ² Fairview Tri-Star* (100.00)	29-Nov-2029	PL106	6 km ² Okotoko West Santos* (50.00) Delhi (20.00) Origin (25.00) Vamgas (5.00)	28-Oct-2006
PL92	232 km ² Fairview Tri-Star* (100.00)	29-Nov-2029	PL107	13 km ² Okotoko East Santos* (40.00) Vamgas (15.50) Drillsearch (2.00) Delhi (32.00) Australian Gasfields (2.00) Mawson (6.50) Inland Oil (2.00)	28-Oct-2008

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PL108	6 km ² Costa South Santos* (50.00) Delhi (20.00) Origin (25.00) Vamgas (5.00)	28-Oct-2028	PL130	30 km ² Chiron Santos* (62.50) Vamgas (7.50) Delhi (30.00)	23-Jun-2024
PL109	10 km ² Judga North Santos* (40.00) Delhi (32.00) Inland Oil (2.00) Mawson (6.50) Drillsearch (2.00) Australian Gasfields (2.00) Vamgas (15.50)	29-Oct-2013	PL131	225 km ² Baryulah, Baryulah East, Hera, Juno, Vega Santos* (46.88) Delhi (22.50) Vamgas (5.63) Origin (25.00)	23-Jun-2050
PL110	18 km ² Stokes North Santos* (62.50) Vamgas (7.50) Delhi (30.00)	29-Oct-2013	PL132	15 km ² Costa Central Santos* (50.00) Origin (25.00) Vamgas (5.00) Delhi (20.00)	23-Jun-2021
PL111	18 km ² Yawa Santos* (50.00) Origin (25.00) Vamgas (5.00) Delhi (20.00)	28-Oct-2016	PL133	12 km ² Goora Santos* (40.00) Delhi (32.00) Drillsearch (2.00) Inland Oil (2.00) Mawson (6.50) Australian Gasfields (2.00) Vamgas (15.50)	12-Dec-2019
PL112	92 km ² Barrolka Santos* (50.00) Origin (25.00) Delhi (20.00) Vamgas (5.00)	10-Mar-2047	PL134	27 km ² Kappa Santos* (62.50) Vamgas (7.50) Delhi (30.00)	20-Dec-2058
PL113	73 km ² Tartulla Santos* (54.00) Origin (10.00) Delhi (28.80) Vamgas (7.20)	28-Oct-2018	PL135	20 km ² Keilor Santos* (50.00) Origin (25.00) Delhi (20.00) Vamgas (5.00)	23-Jun-2053
PL114	55 km ² Wareena Santos* (54.00) Delhi (28.80) Vamgas (7.20) Origin (10.00)	29-Oct-2021	PL136	53 km ² Keilor Santos* (62.50) Delhi (30.00) Vamgas (7.50)	23-Jun-2052
PL115	52 km ² Bunya Australian Gasfields* (100.00)	28-Sep-2019	PL137	88 km ² Macadama Santos* (62.50) Delhi (30.00) Vamgas (7.50)	15-Dec-2052
PL116	34 km ² Cocos Australian Gasfields* (100.00)	28-Sep-2019	PL138	77 km ² Marengo Santos* (31.50) Vamgas (16.30) Delhi (25.20) Origin (27.00)	15-Dec-2030
PL119	21 km ² Downlands Mosaic* (83.33) Santos (16.67)	11-Nov-2010	PL139	25 km ² Monte Santos* (50.00) Delhi (20.00) Origin (25.00) Vamgas (5.00)	23-Jun-2017
PL129	45 km ² Ashby, Ashby North Santos* (62.50) Delhi (30.00) Vamgas (7.50)	15-Dec-2037			

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PL140	36 km ² Moon Santos* (62.50) Delhi (30.00) Vamgas (7.50)	15-Dec-2053	PL150	158 km ² Dingera, Psyche, Winninia Santos* (62.50) Vamgas (7.50) Delhi (30.00)	23-Jun-2042
PL141	46 km ² Mount Howitt Santos* (54.00) Vamgas (7.20) Origin (10.00) Delhi (28.80)	15-Dec-2025	PL151	Origin (25.00) Santos (50.00) Vamgas (5.00) Delhi (20.00)	24-Jul-2032
PL142	12 km ² Raffle Santos* (62.50) Vamgas (7.50) Delhi (30.00)	15-Dec-2024	PL152	Delhi (20.00) Origin (25.00) Santos (50.00) Vamgas (5.00)	24-Jul-2032
PL143	27 km ² Ruby Santos* (62.50) Vamgas (7.50) Delhi (30.00)	15-Dec-2018	PL153	103 km ² Clinton Santos* (54.00) Vamgas (7.20) Delhi (28.80) Origin (10.00)	15-Dec-2046
PL144	33 km ² Thoar Santos* (62.50) Delhi (30.00) Vamgas (7.50)	15-Dec-2039	PL154	17 km ² Clinton Santos* (31.50) Delhi (25.20) Origin (27.00) Vamgas (16.30)	15-Dec-2046
PL145	28 km ² Toby Santos* (54.00) Vamgas (7.20) Delhi (28.80) Origin (10.00)	15-Dec-2048	PL155	Santos* (50.00) Vamgas (5.00) Delhi (20.00) Origin (25.00)	24-Jul-2032
PL146	60 km ² Wackett Santos* (46.88) Delhi (22.50) Origin (25.00) Vamgas (5.63)	23-Jun-2025	PL156	Santos* (62.50) Delhi (30.00) Vamgas (7.50)	24-Jul-2032
PL147	58 km ² Wackett Santos* (50.00) Vamgas (5.00) Origin (25.00) Delhi (20.00)	23-Jun-2019	PL157	40 km ² Ghina Santos* (54.00) Origin (10.00) Delhi (28.80) Vamgas (7.20)	15-Dec-2020
PL148	37 km ² Whanto Santos* (54.00) Delhi (28.80) Origin (10.00) Vamgas (7.20)	15-Dec-2029	PL158	188 km ² Marama Santos* (54.00) Delhi (28.80) Origin (10.00) Vamgas (7.20)	15-Dec-2020
PL149	12 km ² Wippo South Santos* (40.00) Delhi (32.00) Vamgas (15.50) Mawson (6.50) Drillsearch (2.00) Australian Gasfields (2.00) Inland Oil (2.00)	23-Jun-2049	PL159	27 km ² Tallalia Santos* (62.50) Delhi (30.00) Vamgas (7.50)	15-Dec-2052

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PL168	12 km ² Tennaperra Santos* (62.50) Vamgas (7.50) Delhi (30.00)	12-Feb-2014	PL182	27 km ² Wippo East Santos* (40.00) Delhi (32.00) Australian Gasfields (2.00) Drillsearch (2.00) Mawson (6.50) Inland Oil (2.00) Vamgas (15.50)	12-Sep-2024
PL169	18 km ² Gimboola Drillsearch (10.00) Santos (89.00) CPC (1.00)	12-Apr-2017	PL183	19 km ² Punchbowl Gully OCA* (50.00) Santos (50.00)	12-Sep-2021
PL170	92 km ² Koorooopa Santos (89.00) CPC (1.00) Drillsearch (10.00)	12-Apr-2017	PL184	77 km ² Thylungra Beach* (69.59) Inland Oil (5.00) Petromin (5.81) Australian Gasfields (19.60)	12-Sep-2021
PL173	84 km ² Yandina OCA* (50.00) Santos (50.00)	15-Dec-2019	PL186	62 km ² Quasar South Santos* (62.50) Delhi (30.00) Vamgas (7.50)	06-Feb-2026
PL174	43 km ² Myall Creek OCA* (100.00)	15-Dec-2014	PL187	Santos* (54.00) Origin (10.00) Vamgas (7.20) Delhi (28.80)	06-Mar-2029
PL175	27 km ² Windigo Santos* (40.00) Australian Gasfields (2.00) Delhi (32.00) Drillsearch (2.00) Inland Oil (2.00) Mawson (6.50) Vamgas (15.50)	19-Apr-2025	PL188	Delhi (28.80) Origin (10.00) Santos (54.00) Vamgas (7.20)	06-Mar-2028
PL176	213 km ² Scotia Moonie* (84.38) Vamgas (15.63)	07-Jun-2021	PL189	Santos* (40.00) Drillsearch (2.00) Delhi (32.00) Inland Oil (2.00) Mawson (6.00) OCA (0.50) Vamgas (15.50) Australian Gasfields (2.00)	06-Mar-2017
PL177	55 km ² Winninia Santos* (46.88) Delhi (22.50) Origin (25.00) Vamgas (5.63)	12-Sep-2035	PL191	CH4* (100.00)	20-Mar-2032
PL178	9 km ² Santos* (62.50) Vamgas (7.50) Delhi (30.00)	12-Sep-2035	NEW SOUTH WALES OFFSHORE EXPLORATION PERMIT		
PL181	18 km ² Roti West Santos* (40.00) Vamgas (15.50) Inland Oil (2.00) Drillsearch (2.00) Delhi (32.00) Australian Gasfields (2.00) Mawson (6.50)	12-Sep-2024	PEP 11	8 289 km ² Flare* (75.00)	23-Mar-2006

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date
ONSHORE		
EXPLORATION PERMIT		
PEL1	7 043 km ² Australian Coalbed Methane* (100.00)	10-Feb-2005
PML1	29 km ² BHP* (100.00)	12-May-2001
PEL2	8 100 km ² Sydney Gas* (100.00)	28-Mar-2005
PML2	40 km ² BHP* (100.00)	12-May-2001
PEL4	6 955 km ² Sydney Gas* (n/a) Pacific Power (n/a)	10-Nov-2005 (R.P.)
PEL5	2 026 km ² Sydney Gas (100.00)	10-Nov-2005
PEL6	5 867 km ² Eastern Energy* (100.00)	08-Dec-2005
PEL8	9 112 km ² Eastern Star (100.00)	24-Jun-2007
PEL10	436 km ² Australian Coalbed Methane* (100.00)	10-Feb-2005
PEL12	2 274 km ² Australian Coalbed Methane* (100.00)	26-Sep-2007
PEL13	2 174 km ² Pacific Power* (n/a) St. Barbara Mines (n/a)	26-Nov-2001 (R.P.)
PEL16	826 km ² Metgasco* (100.00)	12-Nov-2005
PEL238	9 093 km ² Eastern Energy* (n/a) Great Southland (n/a)	02-Aug-2007 (R.P.)
PEL267	6 138 km ² Sydney Gas* (100.00)	19-Jan-2004
PEL285	1 306 km ² Pacific Power* (100.00)	15-Apr-2005
PEL286	1 749 km ² Australian Coalbed Methane* (100.00)	10-Feb-2005
PEL419	9 450 km ² Go Resources* (100.00)	19-Dec-2003
PEL420	8 864 km ² Go Resources* (100.00)	19-Dec-2003
PEL422	4 335 km ² Eastern Energy* (100.00)	01-Feb-2004
PEL424	8 302 km ² First Sourcenergy* (100.00)	01-Feb-2004

Title	Area and Title holder	Expiry date
PEL425	9 450 km ² Black Rock* (100.00)	26-Feb-2004
PEL426	5 998 km ² Pacific Power* (n/a) St. Barbara Mines (n/a)	20-Apr-2004
PEL427	8 728 km ² Strike Oil* (100.00)	20-May-2004
PEL428	10 342 km ² Strike Oil* (80.00) Planet (20.00)	14-Sep-2004
PEL432	2 120 km ² Arrow* (100.00)	21-Dec-2006
PEL433	10 216 km ² Eastern Star* (100.00)	13-Feb-2007
PEL434	Eastern Star (100.00)	13-Feb-2007
PEL435	9 748 km ² Australian Coalbed Methane* (100.00)	18-Mar-2004
PEL436	9 343 km ² Australian Coalbed Methane* (100.00)	18-Mar-2004
PEL437	Pangaea* (100.00)	06-May-2007
PEL438	6 799 km ² Pannonian* (100.00)	20-Aug-2007
PEL439	5 155 km ² Magnum* (100.00)	23-Oct-2004
PEL440	9 248 km ² Magnum* (100.00)	23-Oct-2004
PEL441	Sydney Gas* (100.00)	10-Nov-2005
PEL442	Apex* (100.00)	26-Feb-2208
PEL443	Harlow* (100.00)	23-Jan-2009
VICTORIA		
OFFSHORE		
EXPLORATION PERMIT		
VIC/P41	2 160 km ² Eagle Bay* (80.00) Bass Strait (20.00)	13-Feb-2005
VIC/P42	1 890 km ² Omeo Bass Strait* (50.00) Inpex Indo Pet. (50.00)	13-Jan-2006
VIC/P43	3 645 km ² Origin* (30.00) CalEnergy Gas (15.00) Woodside (55.00)	10-Aug-2005

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
VIC/P44	3 037 km ² Strike Oil* (50.00) Santos (50.00)	10-Aug-2005	VIC/L 7	325 km ² Kingfish Esso* (50.00) BHP Billiton (50.00)	19-Sep-2010
VIC/P45	877 km ² BHP Billiton* (60.00) Inpex (40.00)	15-May-2006	VIC/L 8	260 km ² Kingfish Esso* (50.00) BHP Billiton (50.00)	19-Sep-2010
VIC/P46	1 864 km ² Essential* (100.00)	27-May-2007	VIC/L 9 R1	260 km ² Tuna Esso* (50.00) BHP Billiton (50.00)	12-Jul-2016
VIC/P47	742 km ² Eagle Bay* (100.00)	27-May-2007	VIC/L10	260 km ² Emperor, Moonfish, Snapper, Sweetlips Esso* (50.00) BHP Billiton (50.00)	28-May-2018
VIC/P48	2 919 km ² EnCana* (100.00)	15-Oct-2007	VIC/L11	130 km ² Flounder, Grunter, Stonefish Esso* (50.00) BHP Billiton (50.00)	28-May-2018
VIC/P49	2 375 km ² EnCana* (100.00)	15-Oct-2007	VIC/L13	202 km ² Bream, Luderick Esso* (50.00) BHP Billiton (50.00)	15-Dec-2006
VIC/P50	Essential* (100.00)	16-Sep-2008	VIC/L14	202 km ² Bream Esso* (50.00) BHP Billiton (50.00)	15-Dec-2006
VIC/P51	Santos* (80.00) Inpex (20.00)	26-Aug-2008	VIC/L15	130 km ² Dolphin Esso* (50.00) BHP Billiton (50.00)	13-Jun-2010
VIC/P52	Santos* (33.33) Inpex (33.33) Uncol Sth Asean (33.34)	26-Aug-2008	VIC/L16	130 km ² Torsk Esso* (50.00) BHP Billiton (50.00)	13-Jun-2010
VIC/P53	Aust Crude Oil* (100.00)	15-Oct-2008	VIC/L17	65 km ² Perch Esso* (50.00) BHP Billiton (50.00)	13-Jun-2010
VIC/P54	Liberty* (100.00)	07-Apr-2009	VIC/L18	130 km ² Seahorse Esso* (50.00) BHP Billiton (50.00)	13-Jun-2010
PRODUCTION LICENCE			VIC/L19	65 km ² Halibut Esso* (50.00) BHP Billiton (50.00)	12-Jul-2016
VIC/L 1	260 km ² Barracouta, Tarwhine, Whiptail Esso* (50.00) BHP Billiton (50.00)	24-Aug-2009	VIC/L20	195 km ² Blackback, Volador Esso* (50.00) BHP Billiton (50.00)	01-Jan-2019
VIC/L 2	325 km ² Barracouta, Whiting, Wirrah Esso* (50.00) BHP Billiton (50.00)	24-Aug-2009	VIC/L21	137 km ² Patricia/Baleen OMV* (5.00) Basin (55.00) Trinity (40.00)	26-Dec-2022
VIC/L 3	325 km ² Marlin Esso* (50.00) BHP Billiton (50.00)	24-Aug-2009	VIC/L22	BHP Billiton* (90.00) Santos (10.00)	31-Oct-2023
VIC/L 4	260 km ² Angelfish, Batfish, Marlin Esso* (50.00) BHP Billiton (50.00)	24-Aug-2009			
VIC/L 5	325 km ² Halibut, Mackerel, Trumpeter, Yellowtail Esso* (50.00) BHP Billiton (50.00)	19-Sep-2010			
VIC/L 6	260 km ² Gudgeon, Halibut Esso* (50.00) BHP Billiton (50.00)	19-Sep-2010			

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date
RETENTION LEASE		
VIC/RL1	67 km ² Mulloway Esso* (50.00) BHP Billiton (50.00)	13-Apr-2005
VIC/RL2	67 km ² Kipper Esso* (25.00) BHP Billiton (25.00) Woodside (30.00) Santos (7.05) Crusader (12.95)	14-Dec-2003
VIC/RL3	202 km ² Sole Basin* (65.00) Santos (35.00)	13-Apr-2005
VIC/RL4	67 km ² Remora, Sunfish Esso* (50.00) BHP Billiton (50.00)	27-Feb-2006
VIC/RL6	67 km ² Basker, Manta Woodside* (100.00)	29-Oct-2005
VIC/RL7	202 km ² La Bella BHP Billiton* (90.00) Santos (10.00)	27-Feb-2003
VIC/RL9	68 km ² Manta Woodside* (100.00)	21-Mar-2006
VIC/RL10	68 km ² Gummy Woodside* (100.00)	21-Mar-2006
VIC/RL1(V)	90 km ² Golden Beach Bridge* (66.67) Basin (33.33)	27-Aug-2007
ONSHORE		
EXPLORATION PERMIT		
PEP151	1 718 km ² Essential* (100.00)	15-May-2007
PEP152	755 km ² Origin* (50.51) Lakes (15.59) Essential (33.90)	03-Feb-2005
PEP153	1 062 km ² Santos* (100.00)	28-Feb-2005
PEP154	832 km ² Santos* (90.00) Beach (10.00)	30-Mar-2005
PEP155	1 578 km ² Petrotech* (100.00)	28-Aug-2005
PEP156	3 207 km ² Petrotech* (100.00)	16-Aug-2005
PEP157	1 889 km ² Petrotech* (100.00)	16-Aug-2005

Title	Area and Title holder	Expiry date
PEP158	799 km ² Petrotech* (100.00)	16-Mar-2005
PEP159	2 280 km ² Origin* (50.00) Essential (50.00)	29-Oct-2005
PEP160	3 660 km ² TMOC* (60.00) Origin (40.00)	13-Nov-2005
PEP161	2 923 km ² Knight* (100.00)	18-Feb-2005
PEP162	2 950 km ² Karoo Gas PL* (100.00)	15-May-2006
PEP163	2 923 km ² Mirboo* (100.00)	18-Jul-2007
PEP164	2 827 km ² Mirboo* (100.00)	09-Oct-2007
PEP165	6 081 km ² Knight* (100.00)	09-Oct-2007
PEP166	3 551 km ² Petrotech* (50.00) Ausam (50.00)	02-Jan-2008
PRODUCTION LICENCE		
PPL1	76 km ² Dunbar, Grumby, Langley, North Paaratte, Port Campbell 1, Port Campbell 3, Port Campbell 4, Skull Creek, Vaughan, Wallaby Creek TXU* (100.00)	01-Mar-2000
PPL2	8 km ² Iona TXU* (100.00)	31-Dec-2005
PPL3	2 km ² Boggy Creek Boggy Creek* (100.00)	09-May-2008
PPL4	6 km ² Fenton Creek, Tregony Santos* (100.00)	06-Apr-2014
PPL5	6 km ² Penryn Santos* (100.00)	
PPL6	4 km ² McIntee, Tregony Santos* (90.00) Beach (10.00)	
PPL7	2 km ² Santos* (100.00)	
PPL8	69 km ² Dunbar, Port Campbell Origin* (100.00)	31-Dec-2099
PPL9	1 km ² Lavers Santos* (90.00) Beach (10.00)	06-Dec-2099
PPL 10	7 km ² Croft, Naylor Santos* (90.00) Beach (10.00)	06-Dec-2099

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date
PPL 11	3 km ² Santos* (90.00) Beach (10.00)	13-May-2099
PPL 12	3 km ² Santos* (100.00)	03-Feb-2099
TASMANIA		
OFFSHORE		
EXPLORATION PERMIT		
T/18P R3	1 080 km ² Origin* (41.40) CalEnergy Gas (23.50) AWE (22.60)	22-Sep-2004
T/30P	6 817 km ² Benaris* (12.70) CalEnergy Gas (6.00) Origin (28.75) Woodside (51.60)	09-Jul-2003
T/32P	Santos* (50.00) Uncol Sth Asean (50.00)	21-Aug-2008
T/33P	Santos* (80.00) Inpex (20.00)	21-Aug-2008
PRODUCTION LICENCE		
T/L1	27 km ² Origin* (n/a) AWE (n/a) CalEnergy Gas (n/a) Wandoo (n/a)	17-Apr-2033
RETENTION LEASE		
T/RL1 R2	607 km ² Yolla Origin* (37.50) Santos (5.00) CalEnergy Gas (20.00) AWE (37.50)	14-Oct-2006
ONSHORE		
EXPLORATION PERMIT		
EL13/98	32 576 km ² Great Southland* (100.00)	18-May-2004
SOUTH AUSTRALIA		
OFFSHORE		
EXPLORATION PERMIT		
EPP24	1 935 km ² Crayfish, Troas Otway* (100.00)	29-May-2003

Title	Area and Title holder	Expiry date
EPP27	3 962 km ² Woodside* (90.00) Great Artesian Oil&Gas (10.00)	24-Feb-2006
EPP28	15 896 km ² Woodside* (40.00) Anadarko (30.00) EnCana (30.00)	11-Jul-2006
EPP29	18 763 km ² Woodside* (40.00) Encona (30.00) Anadarko (30.00)	11-Jul-2006
EPP30	22 225 km ² Woodside* (40.00) Anadarko (30.00) EnCana (30.00)	11-Jul-2006
EPP31	Woodside* (40.00) EnCana (30.00) Anadarko (30.00)	26-Jun-2008
EPP32	Santos* (100.00)	12-Dec-2008
ONSHORE		
EXPLORATION PERMIT		
PEL 27	240 km ² Sawpit OCA* (67.00) Origin (33.00)	30-Jul-2004
PEL 32	530 km ² Wynn Sagasco* (56.00) Omega (24.00) Origin (20.00)	18-Feb-2005
PEL 57	408 km ² Lakes* (30.00) Victoria Petroleum (10.00) Mirboo (10.00) Origin (50.00)	17-Nov-2006
PEL 66	376 km ² Kalangadoo Origin* (70.00) Beach (30.00)	17-Jun-2006
PEL 72	504 km ² Essential* (100.00)	25-Mar-2007
PEL 73	625 km ² David M. Schuette* (100.00)	26-Jun-2005
PEL 82	275 km ² Beach* (40.00) Wenk, A. (10.00) A. Hosking (25.00) Allender J F (25.00)	21-Sep-2006

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PEL 83	413 km ² Origin* (60.00) Beach (40.00)	14-Mar-2006	PPL 7	254 km ² Moomba, Moomba North Santos* (41.31) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Vamgas (8.51) Reef Oil (1.97)	31-Dec-2005
PEL 86	4 316 km ² Aust Crude Oil* (100.00)	07-Jan-2007			
PEL 87	4 315 km ² Aust Crude Oil* (100.00)	15-Nov-2006			
PEL 88	4 987 km ² Liberty* (100.00)	15-Nov-2006			
PEL 89	4 891 km ² Aust Crude Oil* (100.00)	07-Jan-2007			
PEL 90	1 365 km ² Stuart Petroleum* (n/a) Mawson (n/a)	29-Oct-2006	PPL 8	254 km ² Moomba, Moomba South Santos* (41.31) Origin (13.19) Alliance (3.97) Basin (2.10) Bridge (3.99) Novus (4.75) Reef Oil (1.97) Vamgas (8.51) Delhi (20.21)	31-Dec-2005
PEL 91	2 964 km ² Great Artesian Oil&Gas* (100.00)	07-Jan-2007			
PEL 92	2 878 km ² Beach* (100.00)	04-Nov-2006			
PEL 93	1 884 km ² Stuart Petroleum* (100.00)	04-Nov-2006			
PEL 94	2 703 km ² Beach* (50.00) Magellan (50.00)	04-Nov-2006	PPL 9	133 km ² Moomba, Moomba South Santos* (41.31) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97) Vamgas (8.51)	31-Dec-2005
PEL 95	3 893 km ² Beach* (50.00) Magellan (50.00)	29-Oct-2006			
PEL 102	650 km ² Stuart Petroleum* (100.00)	23-Oct-2007			
PEL 135	1 418 km ² Beach* (100.00)	07-May-2007			
PEL 136	3 371 km ² Beach* (100.00)	07-May-2007	PPL10	226 km ² Cowan, Daralingie, Deina, Yapani Santos* (41.31) Alliance (3.97) Origin (13.19) Bridge (3.99) Novus (4.75) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Basin (2.10)	31-Dec-2005
PRODUCTION LICENCE					
PPL 6	257 km ² Gidgealpa, Mawson Santos* (41.31) Alliance (3.97) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Basin (2.10) Bridge (3.99)	31-Dec-2005			

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL11	160 km ² Big Lake Santos* (41.31) Bridge (3.99) Reef Oil (1.97) Origin (13.19) Vamgas (8.51) Delhi (20.21) Basin (2.10) Alliance (3.97) Novus (4.75)	31-Dec-2005	PPL15	154 km ² Della Santos* (41.31) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97) Vamgas (8.51)	31-Dec-2005
PPL12	157 km ² Burke, Dullingari, Dullingari North Santos* (41.31) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Vamgas (8.51) Origin (13.19) Reef Oil (1.97)	31-Dec-2005	PPL16	127 km ² Big Lake, Namur Santos* (41.31) Alliance (3.97) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Basin (2.10) Bridge (3.99)	31-Dec-2005
PPL13	54 km ² Amyema, Brumby, Marsilea Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97)	31-Dec-2005	PPL17	141 km ² Merrimelia, Pelican (Santos) Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Bridge (3.99) Reef Oil (1.97) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2005
PPL14	233 km ² Toolachee Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	31-Dec-2005	PPL18	109 km ² Fly Lake/Brolga Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2005
			PPL19	37 km ² Moorari Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Alliance (3.97) Novus (4.75) Bridge (3.99) Basin (2.10) Origin (13.19)	31-Dec-2005

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL20	130 km ² Gooranie, Tirrawarra Santos* (41.31) Alliance (3.97) Origin (13.19) Vamgas (8.51) Reef Oil (1.97) Delhi (20.21) Bridge (3.99) Basin (2.10) Novus (4.75)	31-Dec-2005	PPL25	20 km ² Narcoonowie Santos* (41.31) Basin (2.10) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Alliance (3.97) Vamgas (8.51) Delhi (20.21)	31-Dec-2006
PPL21	145 km ² Caroline Air Liquide* (100.00)	30-Apr-2021	PPL26	4 km ² Cuttapirrie Santos* (25.60) Origin (10.54) Vamgas (43.75) Delhi (17.14) Novus (2.97)	10-Jun-2007
PPL22	234 km ² Marabooka, Mina, Mudera, Nanima, Strzelecki, Wanara Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Basin (2.10) Alliance (3.97) Novus (4.75)	31-Dec-2006	PPL27	23 km ² Mudrangie Santos* (41.31) Vamgas (8.51) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97)	31-Dec-2006
PPL23	80 km ² Munkarie Santos* (41.31) Novus (4.75) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Vamgas (8.51) Delhi (20.21)	31-Dec-2006	PPL28	16 km ² Kanowana Santos* (41.31) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Alliance (3.97) Vamgas (8.51) Basin (2.10)	06-May-2007
PPL24	168 km ² Boongala, Caraka, Coochilara, Dieri, Kidman, Marana Santos* (41.31) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21) Vamgas (8.51)	31-Dec-2006	PPL29	3 km ² Rakoonna Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Alliance (3.97) Delhi (20.21) Basin (2.10)	31-Dec-2008

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL30	49 km ² Limestone Creek/Biala Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Basin (2.10) Alliance (3.97) Novus (4.75)	31-Dec-2006	PPL35	21 km ² Meranji Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	31-Dec-2006
PPL31	6 km ² Wancoocha Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Bridge (3.99) Reef Oil (1.97) Basin (2.10) Alliance (3.97) Delhi (20.21)	06-May-2007	PPL36	47 km ² Alwyn, Jena, Ulandi Santos* (41.31) Vamgas (8.51) Origin (13.19) Alliance (3.97) Basin (2.10) Bridge (3.99) Novus (4.75) Reef Oil (1.97) Delhi (20.21)	31-Dec-2006
PPL32	6 km ² Muteroo Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	06-May-2007	PPL37	8 km ² Spencer Santos* (41.31) Vamgas (8.51) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97)	06-Oct-2007
PPL33	15 km ² Bookabourdie Santos* (41.31) Delhi (20.21) Reef Oil (1.97) Alliance (3.97) Novus (4.75) Bridge (3.99) Basin (2.10) Vamgas (8.51) Origin (13.19)	31-Dec-2006	PPL38	10 km ² Dirkala, Dirkala South, Dirkala West Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Alliance (3.97) Basin (2.10)	06-Oct-2007
PPL34	9 km ² McKinlay Santos* (41.31) Novus (4.75) Reef Oil (1.97) Vamgas (8.51) Origin (13.19) Bridge (3.99) Alliance (3.97) Basin (2.10) Delhi (20.21)	31-Dec-2006	PPL39	2 km ² Nungeroo Santos* (41.31) Origin (13.19) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2006

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL40	11 km ² Lepena Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2007	PPL45	1 km ² Taloola Santos* (41.31) Alliance (3.97) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Novus (4.75)	29-Mar-2010
PPL41	20 km ² Kapinka, Mundi Santos* (41.31) Delhi (20.21) Reef Oil (1.97) Alliance (3.97) Novus (4.75) Bridge (3.99) Basin (2.10) Vamgas (8.51) Origin (13.19)	31-Dec-2011	PPL46	2 km ² Tantanna Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Alliance (3.97) Delhi (20.21) Basin (2.10) Novus (4.75)	20-Dec-2009
PPL42	7 km ² Bookabourdie Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2008	PPL47	4 km ² Sturt, Sturt East Santos* (41.31) Novus (4.75) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Vamgas (8.51) Alliance (3.97) Delhi (20.21)	20-Dec-2009
PPL43	3 km ² Taylor South Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	31-Dec-2008	PPL48	2 km ² Kurunda Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2010
PPL44	5 km ² Bimbaya Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2008	PPL49	8 km ² Andree/Leleptian Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Alliance (3.97) Novus (4.75) Bridge (3.99) Basin (2.10) Origin (13.19)	31-Dec-2010

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL50	17 km ² Andree/Leleptian Santos* (41.31) Origin (13.19) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Delhi (20.21) Novus (4.75) Basin (2.10) Alliance (3.97)	31-Dec-2009	PPL55	10 km ² Varanus Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Alliance (3.97) Novus (4.75) Bridge (3.99) Basin (2.10) Origin (13.19)	31-Dec-2011
PPL51	7 km ² Kirralee Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2011	PPL56	4 km ² Varanus, Varanus South Santos* (41.31) Origin (13.19) Alliance (3.97) Reef Oil (1.97) Vamgas (8.51) Delhi (20.21) Basin (2.10) Bridge (3.99) Novus (4.75)	31-Dec-2013
PPL52	2 km ² Gooranie South Santos* (41.31) Delhi (20.21) Reef Oil (1.97) Alliance (3.97) Novus (4.75) Bridge (3.99) Basin (2.10) Vamgas (8.51) Origin (13.19)	31-Dec-2009	PPL57	10 km ² Thurakinna Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	16-Jul-2011
PPL53	2 km ² Spencer West Santos* (41.31) Novus (4.75) Reef Oil (1.97) Vamgas (8.51) Origin (13.19) Bridge (3.99) Alliance (3.97) Basin (2.10) Delhi (20.21)	04-Dec-2010	PPL58	15 km ² Mettika Santos* (41.31) Vamgas (8.51) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Reef Oil (1.97) Origin (13.19)	31-Dec-2010
PPL54	1 km ² Pintari North Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	15-Jun-2010	PPL59	10 km ² Garanjanie Santos* (41.31) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97) Vamgas (8.51)	16-Jul-2011

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL60	7 km ² Wirrarie, Wirrarie North Santos* (41.31) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Vamgas (8.51) Delhi (20.21)	25-May-2014	PPL65	6 km ² Kujani Santos* (41.31) Novus (4.75) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Bridge (3.99) Alliance (3.97) Vamgas (8.51) Basin (2.10)	17-Jul-2012
PPL61	12 km ² Arrakis/Murta Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	17-Oct-2011	PPL66	11 km ² Jack Lake Santos* (41.31) Novus (4.75) Reef Oil (1.97) Vamgas (8.51) Origin (13.19) Bridge (3.99) Alliance (3.97) Basin (2.10) Delhi (20.21)	24-Nov-2012
PPL62	29 km ² Haselgrove, Katnook, Ladbroke Grove Origin* (20.00) Omega (24.29) Sagasco (55.71)	26-Nov-2011	PPL67	11 km ² Keena Santos* (41.31) Delhi (20.21) Reef Oil (1.97) Vamgas (8.51) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	17-Jul-2012
PPL63	1 km ² Malgoona Santos* (41.31) Novus (4.75) Alliance (3.97) Basin (2.10) Delhi (20.21) Origin (13.19) Vamgas (8.51) Bridge (3.99) Reef Oil (1.97)	23-May-2012	PPL68	14 km ² Cooba Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2011
PPL64	2 km ² Malgoona Santos* (41.31) Delhi (20.21) Reef Oil (1.97) Novus (4.75) Vamgas (8.51) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	23-May-2012	PPL69	12 km ² Tarwonga Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	31-Dec-2011

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL70	6 km ² Farina Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	25-May-2014	PPL75	6 km ² Caladan Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	26-Oct-2016
PPL71	16 km ² Kerna Santos* (41.31) Alliance (3.97) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Novus (4.75)	31-Dec-2013	PPL76	3 km ² Telopea Santos* (25.60) Delhi (17.14) Novus (2.97) Origin (10.54) Vamgas (43.75)	26-Oct-2016
PPL72	17 km ² Dilchee, Pira Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Alliance (3.97) Novus (4.75) Bridge (3.99) Basin (2.10) Origin (13.19)	31-Dec-2013	PPL77	10 km ² Keleary Santos* (25.60) Origin (10.54) Delhi (17.14) Vamgas (43.75) Novus (2.97)	26-Oct-2016
PPL73	1 km ² Mudlalee Santos* (41.31) Delhi (20.21) Reef Oil (1.97) Vamgas (8.51) Novus (4.75) Basin (2.10) Alliance (3.97) Origin (13.19) Bridge (3.99)	31-Dec-2015	PPL78	6 km ² Baratta Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	31-Dec-2016
PPL74	5 km ² Allambi Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	31-Dec-2015	PPL79	2 km ² Gahnia Santos* (41.31) Reef Oil (1.97) Novus (4.75) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21) Vamgas (8.51)	31-Dec-2016

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL80	3 km ² Correa Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Basin (2.10) Alliance (3.97) Novus (4.75)	31-Dec-2016	PPL85	3 km ² Alisma Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	31-Dec-2017
PPL81	4 km ² Caladan, Caladan North East Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Oct-2017	PPL86	2 km ² Carmina Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2017
PPL82	6 km ² Waukatanna Santos* (41.31) Alliance (3.97) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Novus (4.75)	31-Dec-2016	PPL87	5 km ² Boobook Santos* (41.31) Alliance (3.97) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Novus (4.75)	31-Dec-2017
PPL83	3 km ² Pogona Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Alliance (3.97) Novus (4.75) Bridge (3.99) Basin (2.10) Origin (13.19)	31-Dec-2016	PPL88	2 km ² Lycosa Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Alliance (3.97) Novus (4.75) Bridge (3.99) Basin (2.10) Origin (13.19)	31-Dec-2017
PPL84	28 km ² Barina Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Basin (2.10) Alliance (3.97) Delhi (20.21)	06-Jun-2018	PPL89	6 km ² Bobs Well Santos* (41.31) Bridge (3.99) Reef Oil (1.97) Origin (13.19) Vamgas (8.51) Basin (2.10) Alliance (3.97) Delhi (20.21) Novus (4.75)	31-Dec-2017

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL90	61 km ² Packsaddle, Pondrinie Santos* (41.31) Reef Oil (1.97) Origin (13.19) Vamgas (8.51) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Novus (4.75)	31-Dec-2017	PPL95	12 km ² Nephrite Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	21-May-2019
PPL91	9 km ² Cowralli Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2017	PPL96	3 km ² Beckler Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2017
PPL92	2 km ² Plantago Santos* (41.31) Alliance (3.97) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Novus (4.75)	31-Dec-2017	PPL97	2 km ² Beckler South Santos* (41.31) Alliance (3.97) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Novus (4.75)	31-Dec-2017
PPL93	7 km ² Wilpinnie Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Alliance (3.97) Novus (4.75) Bridge (3.99) Basin (2.10) Origin (13.19)	31-Dec-2017	PPL98	7 km ² Merupa Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Alliance (3.97) Delhi (20.21) Basin (2.10) Novus (4.75)	31-Dec-2017
PPL94	7 km ² Atreides Santos* (41.31) Bridge (3.99) Reef Oil (1.97) Origin (13.19) Vamgas (8.51) Basin (2.10) Alliance (3.97) Novus (4.75) Delhi (20.21)	08-Jan-2019	PPL99	7 km ² Merindal Santos* (41.31) Bridge (3.99) Origin (13.19) Reef Oil (1.97) Novus (4.75) Vamgas (8.51) Basin (2.10) Alliance (3.97) Delhi (20.21)	31-Dec-2017

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL100	5 km ² Nappacoongee, Nappacoongee East Santos* (41.31) Alliance (3.97) Vamgas (8.51) Basin (2.10) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97) Bridge (3.99)	31-Dec-2017	PPL104	259 km ² Santos* (41.31) Novus (4.75) Origin (13.19) Alliance (3.97) Basin (2.10) Bridge (3.99) Reef Oil (1.97) Vamgas (8.51) Delhi (20.21)	02-Nov-2018
PPL101	214 km ² Nappameri Trough, Swan Lake Santos* (41.31) Basin (2.10) Vamgas (8.51) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97) Alliance (3.97)	02-Nov-2018	PPL105	256 km ² Kirby Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Novus (4.75)	02-Nov-2018
PPL102	231 km ² Nappameri Trough, Wantana Santos* (41.31) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Vamgas (8.51) Reef Oil (1.97)	02-Nov-2018	PPL106	254 km ² Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Alliance (3.97) Delhi (20.21) Basin (2.10)	02-Nov-2018
PPL103	258 km ² Wantana Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Basin (2.10) Alliance (3.97) Novus (4.75)	02-Nov-2018	PPL107	217 km ² Davren Santos* (41.31) Alliance (3.97) Basin (2.10) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97) Vamgas (8.51) Bridge (3.99)	02-Nov-2018
			PPL108	254 km ² Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Basin (2.10) Alliance (3.97) Novus (4.75)	02-Nov-2018

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL109	248 km ² Bulgeroo Santos* (41.31) Reef Oil (1.97) Delhi (20.21) Vamgas (8.51) Alliance (3.97) Bridge (3.99) Basin (2.10) Origin (13.19) Novus (4.75)	02-Nov-2018	PPL114	242 km ² Santos* (41.31) Alliance (3.97) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Vamgas (8.51)	02-Nov-2018
PPL110	228 km ² Burley Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	02-Nov-2018	PPL115	251 km ² Three Queens Santos* (41.31) Vamgas (8.51) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97)	02-Nov-2018
PPL111	254 km ² McLeod Santos* (41.31) Origin (13.19) Alliance (3.97) Basin (2.10) Bridge (3.99) Novus (4.75) Reef Oil (1.97) Vamgas (8.51) Delhi (20.21)	02-Nov-2018	PPL116	249 km ² Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97)	02-Nov-2018
PPL112	255 km ² Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	02-Nov-2018	PPL117	239 km ² Wilpinnie Santos* (41.31) Bridge (3.99) Vamgas (8.51) Basin (2.10) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97) Alliance (3.97)	02-Nov-2018
PPL113	232 km ² Moomba Santos* (41.31) Origin (13.19) Vamgas (8.51) Reef Oil (1.97) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Novus (4.75)	02-Nov-2018	PPL118	1 km ² Kudrieke North Santos* (25.60) Origin (10.54) Delhi (17.14) Novus (2.97) Vamgas (43.75)	26-May-2019

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL119	7 km ² Kudrieke, Mitchie Santos* (41.31) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Vamgas (8.51) Reef Oil (1.97)	31-Dec-2017	PPL125	9 km ² Gudi Santos* (25.60) Vamgas (43.75) Novus (2.97) Delhi (17.14) Origin (10.54)	11-Feb-2020
PPL120	4 km ² Lake MacMillan Santos* (41.31) Reef Oil (1.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Vamgas (8.51) Alliance (3.97)	31-Dec-2017	PPL126	1 km ² Daralingie North Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97)	21-Feb-2020
PPL121	5 km ² Tarragon Santos* (25.60) Novus (2.97) Vamgas (43.75) Origin (10.54) Delhi (17.14)	26-May-2019	PPL127	4 km ² Nulla Santos* (41.31) Alliance (3.97) Basin (2.10) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97) Vamgas (8.51) Bridge (3.99)	21-Feb-2020
PPL122	6 km ² Tallerangie Santos* (25.60) Delhi (17.14) Novus (2.97) Origin (10.54) Vamgas (43.75)	23-Sep-2019	PPL128	1 km ² Garanjanie Santos* (41.31) Origin (13.19) Alliance (3.97) Basin (2.10) Bridge (3.99) Novus (4.75) Reef Oil (1.97) Vamgas (8.51) Delhi (20.21)	21-Feb-2020
PPL123	5 km ² Pennie Santos* (25.60) Delhi (17.14) Novus (2.97) Vamgas (43.75) Origin (10.54)	23-Sep-2019	PPL129	1 km ² Thurakinna Santos* (41.31) Bridge (3.99) Alliance (3.97) Basin (2.10) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21)	20-Apr-2020
PPL124	5 km ² Bindah Santos* (41.31) Delhi (20.21) Basin (2.10) Alliance (3.97) Novus (4.75) Bridge (3.99) Vamgas (8.51) Origin (13.19) Reef Oil (1.97)	31-Dec-2018			

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL130	1 km ² Thurakinna Santos* (41.31) Vamgas (8.51) Origin (13.19) Novus (4.75) Alliance (3.97) Basin (2.10) Delhi (20.21) Bridge (3.99) Reef Oil (1.97)	20-Apr-2020	PPL135	11 km ² Goyder Santos* (41.31) Basin (2.10) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Alliance (3.97)	31-Dec-2019
PPL131	40 km ² Coonatie Santos* (25.60) Novus (2.97) Origin (10.54) Vamgas (43.75) Delhi (17.14)	20-Apr-2020	PPL136	33 km ² Cuttapirrie Santos* (25.60) Delhi (17.14) Origin (10.54) Vamgas (43.75) Novus (2.97)	17-Jun-2020
PPL132	1 km ² Packsaddle, Pondrinie Santos* (41.31) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Vamgas (8.51)	31-Dec-2019	PPL137	7 km ² Moonanga Santos* (41.31) Reef Oil (1.97) Vamgas (8.51) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19) Delhi (20.21)	25-May-2020
PPL133	1 km ² Packsaddle, Pondrinie Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Basin (2.10) Alliance (3.97) Novus (4.75)	31-Dec-2019	PPL138	25 km ² Cabernet Santos* (41.31) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Vamgas (8.51)	10-Aug-2020
PPL134	1 km ² Packsaddle, Pondrinie Santos* (41.31) Bridge (3.99) Vamgas (8.51) Alliance (3.97) Basin (2.10) Delhi (20.21) Origin (13.19) Reef Oil (1.97) Novus (4.75)	31-Dec-2019	PPL139	16 km ² Milluna Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	31-Dec-2019

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL140	162 km ² Nephrite South Santos* (41.31) Delhi (20.21) Alliance (3.97) Basin (2.10) Bridge (3.99) Reef Oil (1.97) Origin (13.19) Novus (4.75) Vamgas (8.51)	31-Dec-2019	PPL145	18 km ² Koree, Koree South Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19) Novus (4.75)	10-Aug-2020
PPL141	125 km ² Beckler Santos* (41.31) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Reef Oil (1.97) Vamgas (8.51) Origin (13.19)	31-Dec-2019	PPL146	10 km ² Balcaminga Santos* (41.31) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Vamgas (8.51)	31-Dec-2019
PPL142	28 km ² Moolion Santos* (25.60) Delhi (17.14) Novus (2.97) Vamgas (43.75) Origin (10.54)	10-Aug-2020	PPL147	3 km ² Balcaminga Santos* (25.60) Delhi (17.14) Novus (2.97) Origin (10.54) Vamgas (43.75)	10-Aug-2020
PPL143	93 km ² Dorodillo Santos* (41.31) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97) Origin (13.19) Vamgas (8.51)	31-Dec-2019	PPL148	8 km ² Welcome Lake East Santos* (41.31) Origin (13.19) Vamgas (8.51) Alliance (3.97) Delhi (20.21) Basin (2.10) Bridge (3.99) Reef Oil (1.97) Novus (4.75)	10-Aug-2020
PPL144	7 km ² Keena Santos* (41.31) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Vamgas (8.51) Origin (13.19) Reef Oil (1.97)	10-Aug-2020	PPL149	33 km ² Jalbu West Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	31-Dec-2019

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL150	22 km ² Raven Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Delhi (20.21) Alliance (3.97) Basin (2.10) Origin (13.19) Novus (4.75)	10-Aug-2020	PPL155	9 km ² Bungee Santos* (41.31) Alliance (3.97) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Vamgas (8.51)	10-Aug-2020
PPL151	66 km ² Napowie Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	31-Dec-2019	PPL156	35 km ² Beanbush Santos* (25.60) Delhi (17.14) Novus (2.97) Origin (10.54) Vamgas (43.75)	10-Aug-2020
PPL152	4 km ² Napowie Santos* (25.60) Vamgas (43.75) Novus (2.97) Delhi (17.14) Origin (10.54)	10-Aug-2020	PPL157	3 km ² Muscat Santos* (41.31) Origin (13.19) Vamgas (8.51) Alliance (3.97) Delhi (20.21) Basin (2.10) Bridge (3.99) Reef Oil (1.97) Novus (4.75)	10-Aug-2020
PPL153	43 km ² Shiraz Santos* (41.31) Alliance (3.97) Vamgas (8.51) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Reef Oil (1.97)	31-Dec-2019	PPL158	67 km ² Verona Santos* (25.60) Delhi (17.14) Novus (2.97) Origin (10.54) Vamgas (43.75)	08-Aug-2020
PPL154	4 km ² Ficus Santos* (41.31) Origin (13.19) Vamgas (8.51) Reef Oil (1.97) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Novus (4.75)	31-Dec-2019	PPL159	4 km ² Touriga Santos* (41.31) Basin (2.10) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Alliance (3.97) Delhi (20.21)	22-Jul-2020

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
PPL160	3 km ² Mica Santos* (41.31) Reef Oil (1.97) Basin (2.10) Vamgas (8.51) Novus (4.75) Alliance (3.97) Bridge (3.99) Delhi (20.21) Origin (13.19)	22-Jul-2020	PPL165	4 km ² Malgoona Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	26-Aug-2020
PPL161	7 km ² Malgoona Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	08-Aug-2020	PPL166	1 km ² Taylor South Santos* (41.31) Vamgas (8.51) Origin (13.19) Reef Oil (1.97) Delhi (20.21) Bridge (3.99) Alliance (3.97) Basin (2.10) Novus (4.75)	31-Dec-2019
PPL162	3 km ² Sturt Santos* (41.31) Basin (2.10) Reef Oil (1.97) Vamgas (8.51) Novus (4.75) Alliance (3.97) Bridge (3.99) Delhi (20.21) Origin (13.19)	08-Aug-2020	PPL167	7 km ² Moolion Santos* (25.60) Vamgas (43.75) Origin (10.54) Novus (2.97) Delhi (17.14)	02-Sep-2020
PPL163	1 km ² Brumby Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	31-Dec-2019	PPL168	9 km ² Redman Origin* (20.00) Sagasco (55.71) Omega (24.29)	25-Jun-2020
PPL164	3 km ² Packsaddle Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97) Delhi (20.21)	31-Dec-2019	PPL170	10 km ² Andree/Leleptian, Reglet Santos* (41.31) Novus (4.75) Origin (13.19) Vamgas (8.51) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	
			PPL171	24 km ² Atreides Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date
PPL172	127 km ² Yalcumma Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19) Novus (4.75)	
PPL173	135 km ² Boongala, Kerna Ridge Santos* (41.31) Novus (4.75) Vamgas (8.51) Origin (13.19) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	
PPL174	13 km ² Cactus, Deparanic Santos* (41.31) Basin (2.10) Origin (13.19) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Alliance (3.97) Delhi (20.21)	
PPL175	46 km ² Caladan North Santos* (41.31) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97)	
PPL176	8 km ² Callabonna Santos* (41.31) Alliance (3.97) Basin (2.10) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Delhi (20.21) Origin (13.19) Bridge (3.99)	

Title	Area and Title holder	Expiry date
PPL177	12 km ² Charo Santos* (41.31) Novus (4.75) Origin (13.19) Vamgas (8.51) Delhi (20.21) Bridge (3.99) Basin (2.10) Alliance (3.97) Reef Oil (1.97)	
PPL178	9 km ² Davren North Santos* (41.31) Origin (13.19) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Delhi (20.21) Bridge (3.99) Alliance (3.97) Basin (2.10)	
PPL179	6 km ² Fortanna Santos* (41.31) Origin (13.19) Vamgas (8.51) Alliance (3.97) Reef Oil (1.97) Delhi (20.21) Novus (4.75) Bridge (3.99) Basin (2.10)	
PPL180	4 km ² Gooranie East Santos* (41.31) Delhi (20.21) Basin (2.10) Bridge (3.99) Vamgas (8.51) Novus (4.75) Alliance (3.97) Reef Oil (1.97) Origin (13.19)	
PPL181	18 km ² Grenache Santos* (41.31) Alliance (3.97) Basin (2.10) Vamgas (8.51) Delhi (20.21) Bridge (3.99) Novus (4.75) Origin (13.19) Reef Oil (1.97)	

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date
PPL182	3 km ² James Santos* (25.70) Novus (3.00) Origin (10.50) Vamgas (43.70) Delhi (17.10)	
PPL183	15 km ² Kanowana Santos* (41.31) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97) Vamgas (8.51) Bridge (3.99) Alliance (3.97) Basin (2.10)	
PPL184	2 km ² Kerinna Santos* (41.31) Origin (13.19) Vamgas (8.51) Alliance (3.97) Basin (2.10) Bridge (3.99) Novus (4.75) Reef Oil (1.97) Delhi (20.21)	
PPL185	34 km ² Kirralee Santos* (41.31) Reef Oil (1.97) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Origin (13.19) Vamgas (8.51) Novus (4.75)	
PPL186	21 km ² Kobari Santos* (41.31) Alliance (3.97) Basin (2.10) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Vamgas (8.51) Reef Oil (1.97)	

Title	Area and Title holder	Expiry date
PPL187	17 km ² Lamdina Santos* (25.70) Delhi (17.10) Novus (3.00) Origin (10.50) Vamgas (43.70)	
PPL188	16 km ² McKinlay Santos* (41.31) Basin (2.10) Vamgas (8.51) Alliance (3.97) Bridge (3.99) Delhi (20.21) Novus (4.75) Origin (13.19) Reef Oil (1.97)	
PPL189	260 km ² Allunga, Bauhaus Santos* (41.31) Delhi (20.21) Alliance (3.97) Bridge (3.99) Novus (4.75) Origin (13.19) Reef Oil (1.97) Vamgas (8.51) Basin (2.10)	
PPL190	232 km ² Big Lake, Boobook, Merlot Santos* (41.31) Basin (2.10) Alliance (3.97) Bridge (3.99) Novus (4.75) Origin (13.19) Reef Oil (1.97) Vamgas (8.51) Delhi (20.21)	
PPL191	10 km ² Moondie Santos* (25.70) Vamgas (43.70) Origin (10.50) Novus (3.00) Delhi (17.10)	

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date
PPL192	23 km ² Haloragis, Pirraminta Santos* (41.31) Delhi (20.21) Vamgas (8.51) Reef Oil (1.97) Novus (4.75) Bridge (3.99) Basin (2.10) Alliance (3.97) Origin (13.19)	
PPL193	10 km ² Quartpot Santos* (41.31) Basin (2.10) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Novus (4.75) Bridge (3.99) Alliance (3.97) Delhi (20.21)	
PPL194	6 km ² Reg Sprigg Santos* (25.70) Novus (3.00) Delhi (17.10) Vamgas (43.70) Origin (10.50)	
PPL195	8 km ² Scrubby Creek Santos* (41.31) Bridge (3.99) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Basin (2.10) Alliance (3.97) Novus (4.75)	
PPL196	111 km ² Moorari, T'irrawarra, Woolkina Santos* (41.31) Bridge (3.99) Delhi (20.21) Alliance (3.97) Novus (4.75) Origin (13.19) Reef Oil (1.97) Vamgas (8.51) Basin (2.10)	

Title	Area and Title holder	Expiry date
PPL197	3 km ² Moorari, T'irrawarra, Woolkina Santos* (25.70) Origin (10.50) Delhi (17.10) Novus (3.00) Vamgas (43.70)	
PPL198	25 km ² Wilpinnie Santos* (41.31) Reef Oil (1.97) Origin (13.19) Novus (4.75) Alliance (3.97) Basin (2.10) Delhi (20.21) Vamgas (8.51) Bridge (3.99)	
PPL199	13 km ² Wooloo Santos* (41.31) Novus (4.75) Vamgas (8.51) Reef Oil (1.97) Origin (13.19) Delhi (20.21) Basin (2.10) Alliance (3.97) Bridge (3.99)	

WESTERN AUSTRALIA

OFFSHORE

EXPLORATION PERMIT

WA-1-P R6	1 328 km ² Santos* (22.56) Apache (31.50) Woodside (45.94)	16-Nov-2007
WA-18-P R5	664 km ² Tern Santos* (70.00) Bonaparte (30.00)	01-Jun-2004
WA-28-P R5	1 245 km ² Eaglehawk, Haycock Woodside* (16.67) Japan Australia LNG (16.67) Shell (16.67) BP (16.67) BHP (16.67) Chevron (16.67)	13-Feb-2007

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
WA-28-P R6	1 245 km ² Eaglehawk, Haycock Woodside* (16.67) Japan Australia LNG (16.67) Shell (16.67) BHP Billiton (16.67) BP (16.67) ChevTex Aust (16.67)	13-Feb-2007	WA-209-P R2	810 km ² Apache* (33.33) Globex (12.50) Santos (54.17)	09-Nov-2005
WA-33-P R3	3 985 km ² Brecknock, Scott Reef Woodside* (50.00) BP (16.67) Shell (8.33) ChevTex Aust (16.67) BHP Billiton (8.33)	26-Feb-2003	WA-214-P R2	1 079 km ² Santos* (20.00) Apache (55.00) AEC (25.00)	06-Mar-2008
WA-35-P R5	1 328 km ² Shell* (66.67) ChevTex Aust (33.33)	06-Sep-2003	WA-226-P R1	4 027 km ² Dana E & P* (12.81) Apache (28.75) Chimelle (5.00) Dana WA (12.66)	23-Nov-2002
WA-149-P R3	703 km ² Pan Pacific (10.00) Apache (48.81) Ampolex (12.47) Santos (18.71)	09-Nov-2004	WA-239-P R1	4 732 km ² Nexen* (100.00)	24-May-2004
WA-155-P R3	1 162 km ² BHP Billiton* (71.43) Mobil (28.57)	12-Jan-2004	WA-242-P R1	7 886 km ² Woodside* (66.66) Santos (33.33)	14-Nov-2004
WA-191-P R3	1 328 km ² Kufpec* (33.40) Woodside (8.20) Santos (33.40) Nippon (25.00)	01-Jun-2004	WA-246-P R1	270 km ² Apache* (45.00) Pan Pacific (10.00) Globex (15.00) Kufpec (n/a) Woodside (n/a)	23-Oct-2005
WA-192-P R3	996 km ² Tap* (12.22) Kufpec (19.28) New World (0.10) Texaco Aus. (11.25) Apache (57.25)	08-Jul-2004	WA-248-P R1	3 071 km ² Woodside* (80.00) Japan Australia LNG (20.00)	11-Jun-2005
WA-202-P R2	1 079 km ² Apache* (50.00) AWE (10.00) Wandoo (40.00)	03-Aug-2004	WA-253-P R1	2 158 km ² ChevTex Aust* (50.00) Texaco Aus. (50.00)	21-Feb-2007
WA-205-P R2	945 km ² Shell (28.57) Texaco Aus. (28.57) Mobil (14.29)	03-Dec-2005	WA-254-P R1	249 km ² Apache* (47.89) Victoria Petroleum (6.17) Woodside (24.38) Sun (7.86) Pan Pacific (2.99) First Australian (10.71)	02-May-2006
WA-208-P R2	1 328 km ² Woodside* (44.03) Santos (29.85) Mosaic (7.46) AGIP (18.66)	03-Jun-2007	WA-255-P R1	3 105 km ² BHP Billiton* (50.00) Woodside (50.00)	01-Aug-2005
			WA-256-P R1	664 km ² Apache* (69.44) Globex (15.00) Wandoo (15.57)	15-Oct-2007
			WA-257-P	498 km ² Apache* (64.40) Wandoo (35.60)	28-Mar-2003 (R.P.)

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date
WA-261-P R1	415 km ² Apache* (45.13) Victoria Petroleum (12.50) Sun (6.15) Strike Oil (36.22)	11-Jul-2007
WA-264-P	664 km ² Santos* (66.70) Idemitsu (33.30)	03-Feb-2008
WA-264-P R1	664 km ² Santos* (66.70) Idemitsu (33.30)	03-Feb-2008
WA-267-P	5 645 km ² BP (12.50) Mobil (25.00) Shell (12.50)	19-May-2005
WA-268-P	14 610 km ² Mobil* (50.00) Texaco Aus. (50.00)	04-Dec-2004
WA-269-P	10 460 km ² Woodside* (100.00)	04-Sep-2003
WA-270-P	7 803 km ² Woodside* (100.00)	04-Jun-2004
WA-271-P	6 309 km ² Woodside* (100.00)	11-Aug-2003
WA-274-P	5 728 km ² Coveyork* (100.00)	18-Aug-2004
WA-275-P	4 649 km ² BHP Billiton (20.00) BP (20.00) ChevTex Aust (20.00) Shell (20.00)	18-Aug-2004
WA-276-P	2 324 km ² Kerr-McGee* (39.00) Pan Canadian (34.00) Tap (17.00) SK (10.00)	18-Aug-2004
WA-277-P	2 490 km ² Kerr-McGee* (39.00) Tap (17.00) Pan Canadian (34.00) SK (10.00)	18-Aug-2004
WA-278-P	2 490 km ² Kerr-McGee* (39.00) SK (10.00) Tap (17.00) EnCana (34.00)	18-May-2006

Title	Area and Title holder	Expiry date
WA-279-P	3 238 km ² Blacktip Woodside* (20.00) AGIP (30.00) Shell (50.00)	18-Aug-2004
WA-280-P	3 736 km ² Woodside* (35.00) Shell (35.00)	18-Aug-2004
WA-281-P	4 649 km ² Santos* (34.14) Petroz (24.83) Oil Search (31.03) Beach (10.00)	18-Feb-2005
WA-282-P	5 977 km ² Santos* (52.76) Petroz (37.24) Beach (10.00)	18-Dec-2004
WA-283-P	4 317 km ² Santos* (40.34) Petroz (24.66) Coastal O&G Aust. 283 PL (27.50) Beach (7.50)	18-Feb-2005
WA-285-P	5 147 km ² Inpex* (100.00)	18-Aug-2004
WA-286-P	17 433 km ² AWE* (12.50) ROC (45.00) Wandoo (25.00) Westranch (5.00) Chimelle (5.00) Arc Energy (7.50)	21-Feb-2005
WA-287-P	2 075 km ² Magellan* (100.00)	21-Feb-2005
WA-288-P	2 407 km ² Magellan* (35.00) Inpex (65.00)	21-Feb-2005
WA-290-P	498 km ² OMV* (100.00)	25-Mar-2005
WA-291-P	9 214 km ² Magellan* (100.00)	03-Aug-2005
WA-292-P	6 309 km ² Nebo OMV* (33.33) IB Res. (33.33) AGIP (33.33)	03-Aug-2005
WA-293-P	17 018 km ² Woodside* (100.00)	03-Aug-2005

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
WA-294-P	9 713 km ² BP* (20.00) Japan Australia LNG (20.00) Shell (20.00) Woodside (20.00) ChevTex Aust (20.00)	16-Aug-2005	WA-305-P	5 222 km ² BHP Billiton* (33.33) Kerr-McGee (33.33) TexaBar (33.33)	24-Jul-2006
WA-295-P	14 361 km ² AGIP* (50.00) Kerr-McGee (50.00)	16-Aug-2006	WA-306-P	4 629 km ² Magellan (37.50) Rawson Res. (25.00)	24-Jul-2006
WA-296-P	12 286 km ² BHP Billiton* (19.00) Japan Australia LNG (16.66) Shell (16.66) Woodside (14.33) ChevTex Aust (16.66) BP (16.66)	16-Feb-2006	WA-307-P	3 462 km ² AntrimEn* (37.50) Magellan (37.50) Rawson Res. (25.00)	22-Aug-2006
WA-297-P	10 875 km ² Woodside* (20.00) Shell (20.00) Japan Australia LNG (20.00) BP (20.00) ChevTex Aust (20.00)	16-Aug-2005	WA-308-P	400 km ² OMV* (100.00)	11-Jun-2007
WA-298-P	83 km ² Mobil* (35.00) Santos (20.00) Apache (20.00) EncIntl (25.00)	15-Feb-2006	WA-309-P	270 km ² OMV* (100.00)	11-Jun-2007
WA-299-P	5 546 km ² Shell* (99.00) Woodside (1.00)	24-Jul-2006	WA-310-P	1 852 km ² West Oil* (50.00) Bounty (50.00)	20-Aug-2007
WA-300-P	6 466 km ² Shell* (99.00) Woodside (1.00)	24-Jul-2006	WA-311-P	1 999 km ² Inpex* (65.00) Magellan (35.00)	02-Sep-2007
WA-301-P	7 665 km ² BHP Billiton* (50.00) Kerr-McGee (50.00)	24-Jul-2006	WA-312-P	1 849 km ² Victoria Petroleum* (18.33) Strike Oil (15.00) Pan Continental (33.33) Sun (33.33)	17-Sep-2007
WA-302-P	4 417 km ² BHP Billiton* (33.33) TexCap (33.33) Kerr-McGee (33.33)	24-Jul-2006	WA-313-P	2 040 km ² Penguin Woodside* (33.34) Shell (33.33)	24-Sep-2007
WA-303-P	5 236 km ² BHP Billiton* (33.33) Kerr-McGee (33.33) TexaBar (33.33)	24-Jul-2006	WA-314-P	1 959 km ² Liberty* (100.00)	11-Nov-2007
WA-304-P	3 491 km ² BHP Billiton* (50.00) Kerr-McGee (50.00)	24-Jul-2006	WA-315-P	1 996 km ² Liberty* (100.00)	11-Nov-2007
			WA-316-P	1 675 km ² Ashmore* (100.00)	05-Dec-2001
			WA-317-P	2 246 km ² Drillsearch* (100.00)	12-Dec-2007
			WA-318-P	3 327 km ² Drillsearch* (100.00)	12-Dec-2007
			WA-319-P	2 323 km ² Drillsearch* (100.00)	12-Dec-2007
			WA-320-P	311 km ² OMV* (100.00)	13-Mar-2008
			WA-321-P	563 km ² Octanex* (50.00) Strata (50.00)	21-Mar-2008
			WA-322-P	719 km ² Octanex* (50.00) Strata (50.00)	21-Mar-2008

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
WA-323-P	322 km ² Octanex* (50.00) Strata (50.00)	21-Mar-2008	WA-340-P	Strike Oil* (40.00) Pan Continental (20.00) Sun (20.00) Victoria Petroleum (20.00)	07-Mar-2008
WA-324-P	Daytona* (100.00)	04-Jul-2008	WA-341-P	Batavia O&G* (n/a) Hawkestone Oil (n/a) Alpha (n/a) Goldborough (n/a)	28-May-2009
WA-325-P	ROC* (37.50) Chimelle (15.00) Bounty (10.00) Apache (37.50)	23-Jul-2008	WA-342-P	Batavia O&G* (n/a) Alpha (n/a) Goldborough (n/a) Hawkestone Oil (n/a)	28-May-2009
WA-326-P	AGIP* (100.00)	23-Jul-2008	TP/ 2 R2	310 km ² ChevTex Aust* (n/a) Santos (n/a) Texaco Aus. (n/a) Mobil (n/a)	09-May-2003
WA-327-P	Apache* (37.50) ROC (37.50) Chimelle (15.00) Bounty (10.00)	23-Jul-2008	TP/ 3 R2	1 084 km ² Texaco Aus. (n/a) Kufpec (n/a) Santos (n/a) Apache (n/a) Tap (n/a)	21-Apr-2004
WA-328-P	AGIP* (67.00) Santos (33.00)	24-Jul-2008	TP/ 4	1 162 km ² Woodside* (n/a) ChevTex Aust (n/a) BHP Billiton (n/a) BP (n/a) Shell (n/a)	26-Feb-2003
WA-329-P	Octanex* (50.00) Strata (50.00)	04-Sep-2008	TP/ 6 R2	1 162 km ² Apache* (100.00)	12-Oct-2003 (R.P.)
WA-330-P	Octanex* (50.00) Strata (50.00)	04-Sep-2008	TP/ 7 R2	1 247 km ² Pepper, South Chervil Santos* (n/a) Pan Pacific (n/a) Apache (n/a) Ampolex (n/a)	16-Apr-2005
WA-331-P	Rawson Res.* (25.00) Eagle Bay (25.00) Icon (25.00) Rough Range (25.00)	04-Sep-2008	TP/ 8 R2	1 239 km ² Cypad Apache (n/a)	14-Nov-2004
WA-334-P	Apache* (80.00) Tap (20.00)	16-Dec-2008	TP/ 9 R2	387 km ² Apache* (100.00)	09-Jul-2006 (R.P.)
WA-335-P	Apache* (100.00)	16-Dec-2008	TP/15	3 902 km ² AWE* (n/a) Hardman (n/a) Bounty (n/a) Arc Energy (n/a)	21-Apr-2004
WA-336-P	Petroz* (100.00)	17-Dec-2008			
WA-337-P	Kerr-McGee* (100.00)	14-Jan-2009			
WA-338-P	Santos* (71.50) SK (28.50)	14-Jan-2009			
WA-339-P	Santos* (50.00) Kerr-McGee (50.00)	14-Jan-2009			

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
TP/17	498 km ² Strike Oil* (n/a)	25-Jun-2004	EP 420	12 km ² Tap* (n/a)	11-Oct-2007
TP/18	70 km ² Strike Oil* (n/a) Tap (n/a)	11-Oct-2007	EP 421	Strike Oil (n/a)	20-Mar-2008
TP/19	Strike Oil (n/a)	20-Mar-2008	EP 423	Strike Oil* (100.00)	02-Apr-2008
TP/20	Tap (n/a)	02-Apr-2008		Rawson Res.* (n/a)	
TP/21	Rawson Res. (n/a) Icon (n/a) Rough Range (n/a)	02-Apr-2008		Rough Range (n/a)	
EP 325 R2	1 626 km ² Victoria Petroleum* (n/a) Sun (n/a) Springfield O&G Ltd (n/a) Santos (n/a) Hughes, D J (n/a) Hughes, D A (n/a) Amity (n/a) Geary, J K (n/a)	03-Aug-2004		Eagle Bay (n/a)	
EP 341 R2	1 239 km ² Tap* (n/a) Apache (n/a)	22-May-2005		Icon (n/a)	
EP 342 R2	1 084 km ² Apache* (n/a)	19-Apr-2005	PRODUCTION LICENCE		
EP 395 R1	232 km ² Tap* (n/a) Apache (n/a) Goodrich (n/a) Sun (n/a) First Australian (n/a)	11-Feb-2007	WA-1-L R1	415 km ² Woodside* (23.33) BHP Billiton (15.00) BP (16.67) ChevTex Aust (16.67) Japan Australia LNG (13.34)	29-Sep-2022
EP 397	135 km ² Tap* (n/a) First Australian (n/a) Goodrich (n/a) Tubridgi (n/a)	13-Jun-2003	WA-2-L R1	332 km ² Woodside* (23.33) BP (16.67) ChevTex Aust (16.67) Japan Australia LNG (13.34) Shell (15.00) BHP Billiton (15.00)	29-Sep-2022
EP 403 R1	270 km ² Apache* (n/a) Tap (n/a)	10-Dec-2007	WA-3-L	415 km ² Angel Woodside* (23.33) Shell (15.00) Radford R A (n/a) Japan Australia LNG (13.34) ChevTex Aust (16.67) BP (16.67) BHP Billiton (15.00)	29-Sep-2022
EP 406	5 111 km ² Euro Pacific* (n/a) Victoria Diamond (n/a)	28-Nov-2002	WA-4-L	332 km ² Angel Woodside* (23.33) Japan Australia LNG (13.34) BHP Billiton (15.00) ChevTex Aust (16.67) Shell (15.00) BP (16.67)	29-Sep-2022
EP 409	155 km ² Apache* (n/a) Kufpec (n/a) OMV (n/a) Tap (n/a)	21-Sep-2003	WA-5-L R1	415 km ² Woodside* (23.33) BP (16.67) BHP Billiton (15.00) ChevTex Aust (16.67) Japan Australia LNG (13.34) Shell (15.00)	29-Sep-2022

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
WA-6-L R1	332 km ² Woodside* (23.33) Japan Australia LNG (13.34) BHP Billiton (15.00) BP (16.67) ChevTex Aust (16.67) Shell (15.00)	29-Sep-2022	WA-16-L	83 km ² Hermes, Lambert Woodside* (16.67) BP (16.67) ChevTex Aust (16.67) Japan Australia LNG (16.67) Shell (16.67) BHP Billiton (16.67)	11-Sep-2018
WA-7-L	155 km ² Barrow Island ChevTex Aust* (57.14) Mobil (14.29) Texaco Aus. (n/a) Shebandowan (28.57)	03-Feb-2009	WA-17-L	249 km ² Athena, North Rankin Mobil* (50.00) Phillips (50.00)	14-Jan-2020
WA-8-L	166 km ² Talisman Mobil* (42.63) Topshelf (20.00) Kufpec (10.00) Santos (27.37)	16-Aug-2009	WA-18-L	83 km ² Laminaria BHP Billiton* (100.00)	12-May-2020
WA-9-L	83 km ² Cossack Woodside* (16.66) BHP Billiton (16.67) BP (16.67) ChevTex Aust (16.67) Japan Australia LNG (16.67) Shell (16.67)	11-Apr-2012	WA-19-L	166 km ² Buffalo Nexen* (100.00)	05-Sep-2020
WA-10-L	310 km ² Bowers, Chinook/Scindian, Griffin BHP Billiton* (45.00) Inpex (20.00) Mobil (35.00)	18-Feb-2014	WA-20-L	83 km ² Legendre Woodside* (45.94) Apache (31.50) Santos (22.56)	15-Nov-2020
WA-11-L	166 km ² Wanaea Woodside* (16.66) Shell (16.67) Japan Australia LNG (16.67) ChevTex Aust (16.67) BP (16.67) BHP Billiton (16.67)	30-Sep-2014	WA-21-L	83 km ² Buffalo Nexen* (100.00)	25-Nov-2020
WA-12-L	77 km ² Griffin, Ramilles BHP Billiton* (71.43) Mobil (28.57)	13-Feb-2015	WA-22-L	77 km ² East Spar EncIntl* (40.00) Mobil (20.00) Tap West (10.00) British Borneo (30.00)	28-Feb-2021
WA-13-L	232 km ² East Spar Santos* (45.00) Apache (55.00)	18-Feb-2017	WA-23-L	81 km ² Echo, Yodel ChevTex Aust (16.67) Woodside (16.67) Shell (16.67) Japan Australia LNG (16.67) BHP Billiton (16.67) BP (16.67)	12-Sep-2022
WA-14-L	232 km ² Wandoo Mobil* (60.00) Wandoo (40.00)	19-Mar-2017	WA-24-L	81 km ² Rankin Shell* (16.67) Woodside (16.67) Japan Australia LNG (16.67) ChevTex Aust (16.67) BP (16.67) BHP (16.67)	12-Sep-2022
WA-15-L	155 km ² Stag Santos* (54.17) Apache (33.33) Globex (12.50)	25-Aug-2018	WA-25-L	AGIP* (65.00) Mobil (20.00) Tap West (15.00)	
			TL/1	387 km ² Bambra, Harriet, Ulidia Apache* (n/a)	06-Nov-2006

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
TL/2	387 km ² Chervil, North Herald, South Pepper Ampolex (n/a) Apache (n/a) Pan Pacific (n/a) Santos (n/a)	25-Nov-2008	WA-2-R R1	830 km ² Gorgon ChevTex Aust* (57.14) Shell (28.57) Mobil (14.29)	08-Jun-2002 (R.P.)
TL/3	542 km ² Barrow Island ChevTex Aust* (n/a) Mobil (n/a) Santos (n/a) Texaco Aus. (n/a)	03-Feb-2009	WA-3-R R1	83 km ² Gorgon ChevTex Aust* (57.14) Mobil (14.29) Shell (28.57)	08-Jun-2002 (R.P.)
TL/4	310 km ² Cowle, Saladin ChevTex Aust* (n/a) Tap (n/a) Texaco Aus. (n/a) Santos (n/a) Mobil (n/a)	14-Nov-2010	WA-4-R R1	166 km ² Spar ChevTex Aust* (57.14) Mobil (14.29) Shell (28.57) Texaco Aus. (n/a)	06-Aug-2002 (R.P.)
TL/5	232 km ² Campbell, Orpheus, Sinbad Apache (n/a)	03-Nov-2012	WA-5-R R1	249 km ² West Tryal Rocks ChevTex Aust* (57.14) Texaco Aus. (n/a) Shell (28.57) Mobil (14.29)	08-Jun-2002 (R.P.)
TL/6	321 km ² Agincourt, Alkimos, Rosette Apache (n/a)	03-Nov-2012	WA-6-R	830 km ² Petrel Bonaparte* (44.51) Santos (35.49) OrigEnBona (5.00) Alliance (15.00)	31-Jan-2005
TL/7	155 km ² Roller, Skate ChevTex Aust* (n/a) Mobil (n/a) Santos (n/a) Texaco Aus. (n/a)	15-Dec-2014	WA-7-R	249 km ² Wilcox Woodside* (16.66) Japan Australia LNG (16.66) Chevron (16.66) BP (16.66) BHP (16.66) Shell (16.66)	08-Nov-2005
TL/8	310 km ² Wonnich Apache (n/a) Shell (n/a) Woodside (n/a)	20-Sep-2019	WA-7-R R1	249 km ² Wilcox Woodside* (16.67) BHP Billiton (16.67) ChevTex Aust (16.67) Japan Australia LNG (16.67) Shell (16.67) BP (16.67)	08-Nov-2005
TL/9	Apache (n/a)	28-Nov-2023	WA-9-R	83 km ² Dixon Woodside* (16.66) BP (16.66) Chevron (16.66) Shell (16.66) Japan Australia LNG (16.66) BHP (16.66)	05-Aug-2007
L 12	Mobil (n/a) Santos (n/a) Texaco Aus. (n/a) ChevTex Aust (n/a)	28-Jul-2023			
L 13	Mobil (n/a) Texaco Aus. (n/a) ChevTex Aust (n/a) Santos (n/a)	28-Jul-2023			
RETENTION LEASE					
WA-1-R R2	727 km ² Scarborough BHP Billiton* (50.00) Esso (50.00)	03-Aug-2004 (R.P.)			

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
WA-9-R R1	83 km ² Dixon Woodside* (16.66) Japan Australia LNG (16.66) ChevTex Aust (16.66) BP (16.66) BHP Billiton (16.67) Shell (16.66)	05-Aug-2007	TR/2	80 km ² Apache* (n/a) Kufpec (n/a) Tap (n/a)	31-Jan-2004
WA-10-R	166 km ² Egret, Montague Woodside* (16.67) Japan Australia LNG (16.66) BHP Billiton (16.66) Shell (16.67) BP (16.66) ChevTex Aust (16.66)	11-Jul-2007	TR/3	30 km ² Blencathra Apache* (100.00)	19-Nov-2006
WA-10-R R1	166 km ² Montague Woodside* (16.67) Japan Australia LNG (16.67) ChevTex Aust (16.67) BP (16.67) Shell (16.67) BHP Billiton (16.67)	11-Jul-2007	TR/4	Koolinda ChevTex Aust* (n/a) Mobil (n/a) Santos (n/a) Texaco Aus. (n/a)	28-Jul-2007 (R.P.)
WA-12-R	415 km ² Macedon/Pyrenees BHP Billiton* (71.43) Mobil (28.57)	12-Oct-2003	ONSHORE		
WA-13-R	134 km ² Turtle OMV* (70.60) Frontier (5.90) Basin (23.50)	18-Oct-2005	EXPLORATION PERMIT		
WA-14-R	81 km ² Chrysaor ChevTex Aust* (57.14) Shell (28.57) Mobil (14.29)	08-Nov-2005	EP 23 R6	697 km ² Ausam* (100.00)	09-Jun-2007
WA-15-R	322 km ² Chrysaor ChevTex Aust* (100.00)	19-Apr-2006	EP 36 R3	83 km ² Woodside* (n/a) BP (n/a) Shell (n/a) ChevTex Aust (n/a) BHP (n/a)	26-Feb-2003
WA-16-R	Iago ChevTex Aust* (28.57) Mobil (14.29) Texaco Aus. (28.57) Shell (28.57)	22-Aug-2007	EP 41 R5	697 km ² Lansvale* (n/a) Rough Range (n/a) Pace (n/a)	27-Aug-2002
WA-17-R	Iago Texaco Aus.* (50.00) ChevTex Aust (50.00)	01-Oct-2007	EP 61 R6	310 km ² ChevTex Aust* (n/a) Texaco Aus. (n/a) Santos (n/a) Mobil (n/a) Kufpec (n/a) Apache (n/a) Tap (n/a)	11-Dec-2007
WA-18-R	Jansz Mobil* (50.00) Texaco Aus. (50.00)	29-Oct-2007	EP 62 R5	77 km ² Chevron* (n/a) Santos (n/a) Texaco Aus. (n/a) Mobil (n/a)	11-Sep-2002
TR/1	160 km ² Errol Apache* (n/a) Kufpec (n/a) Tap (n/a)	31-Jan-2004	EP 62 R6	77 km ² ChevTex Aust* (n/a) Mobil (n/a) Santos (n/a) Texaco Aus. (n/a)	11-Sep-2002
			EP 104 R4	996 km ² Gulliver* (n/a) Chimelle (n/a) Indigo Oil (n/a) First Australian (n/a)	09-Nov-2004 (R.P.)

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
EP 110 R4	691 km ² Carnarvon* (n/a) Pan Pacific (n/a) Euro Pacific (n/a) Hardman (n/a)	23-Jan-2005	EP 366 R1	3 981 km ² Kimberley Oil* (n/a)	04-May-2005
EP 129 R4	735 km ² Terratek* (n/a)	08-Jul-2006	EP 368 R2	619 km ² AWE* (n/a) Hardman (n/a) Origin (n/a) Chimelle (n/a)	10-Nov-2007 (R.P.)
EP 137 R4	1 360 km ² Tap* (n/a) JED NWS (n/a)	22-May-2005 (R.P.)	EP 369 R1	2 400 km ² Euro Pacific* (n/a) Vigilant Oil PL (n/a)	12-Oct-2003
EP 307 R3	161 km ² Apache* (n/a) Kufpec (n/a) Tap (n/a)	17-Sep-2005	EP 371 R1	3 675 km ² Kimberley Oil* (n/a)	04-May-2005
EP 320 R3	1 316 km ² Origin* (n/a) AWE (n/a)	23-Jul-2007	EP 373 R1	4 981 km ² Black Rock* (n/a)	23-Aug-2003
EP 321 R2	1 755 km ² Ausam* (n/a) Capital Consultant (n/a) Hardman (n/a) Origin (n/a) Victoria Petroleum (n/a) Geary, J K (n/a)	01-Jul-2003	EP 380 R1	11 615 km ² Amadeus* (n/a) Jagen Nominees (n/a)	13-Jul-2003
EP 357 R1	232 km ² ChevTex Aust* (n/a) Santos (n/a) Texaco Aus. (n/a) Mobil (n/a)	10-Oct-2001	EP 381 R1	1 417 km ² Amity* (n/a) Empire (n/a) Geopetro (n/a)	10-Dec-2003
EP 357 R2	ChevTex Aust* (n/a) Mobil (n/a) Santos (n/a) Texaco Aus. (n/a)	29-Apr-2007	EP 386 R1	7 554 km ² Bonaparte, Garimala, Ningbing, Waggon Creek Amity* (n/a) Bonaparte Gulf (n/a) Frontier (n/a) Geopetro (n/a)	11-Jan-2004
EP 358 R1	387 km ² Apache* (n/a)	14-Nov-2004	EP 389 R1	2 052 km ² Empire* (n/a) CalEnergy Gas (n/a)	24-Sep-2005
EP 359 R1	1 626 km ² Lansvale* (n/a) Rough Range (n/a) Sun (n/a) Pace (n/a)	06-Apr-2004	EP 390 R1	10 792 km ² Kimberley Oil* (100.00)	28-Jun-2006
EP 363 R2	310 km ² Apache* (n/a) Kufpec (n/a) Tap (n/a)	11-Aug-2007	EP 391 R1	9 796 km ² Kimberley Oil* (100.00)	28-Jun-2006
EP 364 R1	77 km ² Tap* (n/a) Westranch (n/a)	14-Nov-2004	EP 405	8 750 km ² Empire* (n/a)	12-Oct-2003
			EP 407	1 755 km ² Ausam* (n/a) Capital Consultant (n/a)	04-Mar-2003
			EP 408	1 755 km ² Amity* (n/a) Tap (n/a) Geopetro (n/a) Apache (n/a) Kufpec (n/a)	01-Jul-2003

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date
EP 410	1 549 km ² Gulliver* (n/a) Falcore (n/a) Indigo Oil (n/a) Kufpec (n/a) Tap (n/a) Apache (n/a)	29-Sep-2003
EP 411	1 147 km ² CalEnergy Gas* (n/a) Tap (n/a) Kufpec (n/a) Apache (n/a) Empire (n/a)	26-Aug-2004
EP 412	5 343 km ² Flare* (100.00) ROC (n/a) Rough Range (n/a) Westranch (n/a)	18-Mar-2004
EP 413 R1	852 km ² Origin* (n/a) Chimelle (n/a) Victoria Petroleum (n/a) Hardman (n/a) AWE (n/a) Burns A R (n/a) Euro Pacific (n/a) Geary, J K (n/a)	25-Aug-2004
EP 414 R1	1 012 km ² Ausam* (n/a) Burns A R (n/a) Empire (n/a) Euro Pacific (n/a)	25-Aug-2004
EP 415	1 417 km ² CalEnergy Gas* (100.00) Empire (n/a)	25-Aug-2005
EP 416	3 847 km ² Empire* (100.00)	25-Aug-2005
EP 417	6 475 km ² New Standard* (100.00)	21-Feb-2006
EP 422	Ausoil* (100.00)	21-Mar-2008
PRODUCTION LICENCE		
L 1 R1	387 km ² Dongara Arc Energy* (n/a) Tap (n/a) Apache (n/a) Kufpec (n/a) Origin (n/a)	17-May-2014

Title	Area and Title holder	Expiry date
L 1H R1	697 km ² Barrow Island ChevTex Aust* (n/a) Texaco Aus. (n/a) Santos (n/a) Mobil (n/a)	09-Feb-2009
L 2 R1	310 km ² Dongara Arc Energy* (n/a) Origin (n/a)	17-May-2014
L 4	387 km ² Woodada Hardman* (n/a)	24-Mar-2004
L 5	310 km ² Woodada Hardman* (n/a) Woodside (n/a) Shell (n/a)	28-Dec-2004
L 6	415 km ² Blina Terratek* (n/a) Woodside (n/a)	22-Sep-2004
L 7	155 km ² Mount Horner Petro Energy (n/a)	13-May-2005
L 8	332 km ² Sundown, West Terrace Terratek* (n/a)	21-Oct-2005
L 9	232 km ² Tubridgi Sagasco* (n/a) Origin (n/a) Pan Pacific (n/a)	03-Jun-2008
L 10	619 km ² Barrow Island ChevTex Aust* (n/a) Kufpec (n/a) Texaco Aus. (n/a) Tap (n/a) Mobil (n/a) Apache (n/a) Santos (n/a)	03-Feb-2009
L 11	77 km ² Beharra Springs Origin* (n/a) AWE (n/a)	14-May-2013

NORTHERN TERRITORY

OFFSHORE

EXPLORATION PERMIT

NT/P48	12 369 km ² Evans Shoal Shell* (50.00) Osaka (10.00) Santos(NGA) (40.00)	02-Jun-2007
NT/P49	9 131 km ² Lynedoch Shell* (66.67) Woodside (33.33)	14-May-2003

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date
NT/P55	7 720 km ² Sunrise Woodside* (26.66) Osaka (10.00) Phillips (30.00) Shell (33.33)	18-Jan-2005
NT/P57	4 234 km ² Woodside* (70.00) AGIP (30.00)	18-Jan-2005
NT/P58	8 467 km ² Nexen* (100.00)	16-Aug-2005
NT/P59	8 301 km ² Nexen* (100.00)	16-Aug-2005
NT/P60	9 298 km ² TSP Arafura* (75.00) Oz-Exoil (25.00)	16-Aug-2005
NT/P61	5 299 km ² Santos* (100.00)	13-Nov-2007
RETENTION LEASE		
NT/RL1	747 km ² Petrel Santos* (50.49) Bonaparte (44.51) OrigEnBona (5.00)	31-Jan-2005
NT/RL2	1 826 km ² Sunrise, Troubadour Woodside* (35.00) Osaka (10.00) Phillips (30.00) Shell (25.00)	16-Jan-2007
NT/RL3	67 km ² Barnett OMV* (75.00) Frontier* (5.00) Basin (20.00)	18-Mar-2006
ONSHORE		
EXPLORATION PERMIT		
EP 66	9 547 km ² Spirit Hill Amity* (56.50) Bonaparte (20.00) Frontier (15.00) Geopetro (8.50)	30-Sep-2004
EP 69	1 394 km ² IOR* (36.72) ITG (35.28) Moroil (28.00)	12-Jul-2006
EP 76	4 986 km ² Sweatpea* (100.00)	07-Mar-2006
EP 97	11 377 km ² Rawson Res.* (100.00)	20-Oct-2006

Title	Area and Title holder	Expiry date
PRODUCTION LICENCE		
L3	616 km ² Palm Valley Magellan* (52.02) Canso (15.38) Farmout (9.38) Santos (23.22)	08-Nov-2003
L4	123 km ² Mereenie Santos* (6.25) Petromin (7.50) Moonie (21.00) Magellan (20.00) Farmout (6.25) Canso (15.00) Transoil (9.00)	17-Nov-2023
L5	158 km ² Mereenie Santos* (6.25) Canso (15.00) Farmout (6.25) Magellan (20.00) Moonie (21.00) Petromin (7.50) Transoil (9.00)	17-Nov-2023
RETENTION LEASE		
RL 1	166 km ² Weaber Amity* (76.50) Bonaparte Gulf (8.50) Frontier (15.00)	03-Jun-2006
RL 2	465 km ² Dingo Santos* (49.88) Canso (5.14) Farmout (5.50) Magellan (34.34) Moonie (3.56) Petromin (0.02) Transoil (1.53)	26-Oct-2003
TERRITORY OF ASHMORE AND CARTIER ISLANDS ADJACENT AREA		
OFFSHORE		
EXPLORATION PERMIT		
AC/P4 R4	1 992 km ² Woodside* (80.00) OMV (20.00)	13-Aug-2007
AC/P8 R4	996 km ² Woodside* (75.00) Shell (25.00)	07-Apr-2007 (R.P.)

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date
AC/P17	581 km ² Audacious, Tenacious OMV* (35.00) Cosmo (35.00) Woodside (30.00)	08-Jul-2007
AC/P18	1 660 km ² OMV* (18.00) Pan Canadian (25.00) Wandoo (25.00) Newfield Ausralia (AC) (14.00) Cosmo (18.00)	29-May-2003
AC/P19	1 494 km ² Sahul Shoals Odyssey* (80.00) IndoPacAust (20.00)	29-May-2003
AC/P20	1 494 km ² Maple Coastal* (50.00) Newfield (40.00) Todd (10.00)	29-May-2005
AC/P21	1 577 km ² East Swan, Eclipse, Swan Coastal* (57.00) AGIP (43.00)	29-Oct-2004
AC/P22	1 826 km ² Puffin Ashmore* (50.00) Westranch (50.00)	29-May-2003
AC/P23	4 649 km ² Crux, Keeling, Maret Nippon* (75.00) Timor Sea (25.00)	31-Aug-2003
AC/P24	1 660 km ² OMV* (38.47) EncIntl (38.46) Wandoo (23.08)	25-Feb-2004
AC/P25	1 162 km ² Bounty* (100.00)	25-Feb-2004
AC/P26	415 km ² West Oil* (50.00) IndoPacAust (5.00) Trans-Orient (45.00)	25-May-2005
AC/P27	1 162 km ² Bounty* (100.00)	25-Jun-2005
AC/P28	4 400 km ² West Oil* (100.00)	16-Sep-2005
AC/P30	4 068 km ² BHP Billiton* (66.67) EncIntl (33.33)	16-Dec-2004
AC/P31	83 km ² Odyssey* (80.00) IndoPacAust (20.00)	11-Sep-2005

Title	Area and Title holder	Expiry date
AC/P32	1 079 km ² Daytona* (18.00) West Oil (18.00) Westranch (34.00) Eagle Bay (30.00)	27-Feb-2007

PRODUCTION LICENCE

AC/L1	332 km ² Jabiru, Pengana Newfield Ausralia (AC)* (50.00) Cultus (18.75) Mobil (6.25) Santos (10.31) Union Pacific (14.69)	16-Jul-2006
AC/L2	332 km ² Challis, Jabiru Newfield* (50.00) Union Pacific (14.69) Santos (10.31) Cultus (18.75) Mobil (6.25)	16-Jul-2006
AC/L3	747 km ² Cassini, Challis Newfield* (50.00) Mobil (6.25) Santos (10.31) Union Pacific (14.69) Cultus (14.69)	28-Jan-2009
AC/L5	166 km ² Corallina, Laminaria Woodside* (50.00) BHP Billiton (25.00) Shell (25.00)	05-Feb-2018

RETENTION LEASE

AC/RL1	83 km ² Talbot West Oil* (100.00)	31-Jan-2005
AC/RL3	249 km ² Bilyara, Montara, Tahbilk Newfield Ausralia (AC)* (50.00) Coogee (50.00)	21-Feb-2007

JOINT PETROLEUM DEVELOPMENT AREA OFFSHORE

EXPLORATION PERMIT

JPDA 00-21	3 071 km ² Phillips* (75.00) AGIP (25.00)	27-Mar-2011
JPDA 91-01	1 225 km ² Jahal Woodside* (40.00) Inpex (35.00) Santos (25.00)	08-Jan-2002

APPENDIX K (cont'd)

Title	Area and Title holder	Expiry date	Title	Area and Title holder	Expiry date
JPDA 91-12	1 470 km ² Bayu, Bayu/Undan, Elang, Flamingo, Kakatua ConocoPhillips* (42.42) Santos (21.43) Petroz (13.37) Emet (1.58) Inpex (21.21)	06-Feb-2002			
JPDA 91-13	1 406 km ² Bayu/Undan, Fohn ConocoPhillips* (37.50) AGIP (27.50) ConocoPhillips (12.50) Phillips (22.50)	16-Dec-2001			
JPDA 95-18	2 354 km ² AGIP* (100.00)	15-Nov-2002			
JPDA 95-19	2 262 km ² Sunrise, Troubadour Woodside* (27.67) ConocoPhillips (30.00) Osaka (10.00) Shell (32.33)	03-Oct-2002			
JPDA 96-16	2 684 km ² ConocoPhillips* (66.00) NWE (14.00) ZOCA 96-16 (10.00)	15-Nov-2002			
JPDA 96-20	3 216 km ² Sunrise Woodside* (26.67) Osaka (10.00) Shell (33.33)	11-Nov-2002			

NOTE:

*: Denotes the operator for the title.

(R.P.): Renewal Pending

(n/a): Equity not available.

"Area" refers to 5' X 5' graticular blocks
unless otherwise indicated.

APPENDIX K: PETROLEUM EXPLORATION AND DEVELOPMENT TITLES, 2002

PETROLEUM TITLES BY COMPANY

Listed below in alphabetical order are all petroleum companies that hold interest, whole or in part, in the current petroleum titles.

AEC International (Australia) Pty Ltd

Western Australia	WA-214-P R1, WA-298-P
Ashmore-Cartier	AC/P15, AC/L1, AC/L2, AC/L3, AC/P24, AC/P22, AC/P30

AGIP Australia Ltd

Western Australia	WA-313-P, WA-208-P R2, WA-25-L
Ashmore-Cartier	AC/P21

AGIP Exploration BV

Western Australia	WA-292-P
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Air Liquide Australia Ltd

South Australia	PPL21
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Allender J F

South Australia	PEL 82
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Alliance Minerals Australia NL

Queensland	PL21, PL22, PL27, PL64
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Alliance Petroleum Australia Pty Ltd

South Australia	PPL170, PPL 6, PPL 7, PPL 8, PPL171, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL137, PPL138, PPL139, PPL140, PPL141, PPL143, PPL144, PPL145, PPL146, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181
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Alvin Hosking

South Australia	PEL 82
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Amadeus Petroleum NL

Western Australia	EP 380 R1
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Amity Oil NL

Queensland	ATP598P
Western Australia	EP 408, EP 325 R2, EP 381 R1, EP 386 R1
Northern Territory	EP 66, RL 1

Ampolex (PPL) Pty Ltd

Western Australia	TL/2, WA-149-P R3, TP/ 7 R2
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Anadarko Australia Company Pty Ltd

South Australia	EPP28, EPP29, EPP30
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Angari Pty Ltd

Queensland	ATP212P, PL21, PL22, PL27, PL30, PL56, PL64, PL71, PL74
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Anthony Barton Pty Ltd

Northern Territory	RL 1
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Antrim Energy Inc.

Western Australia	WA-306-P, WA-307-P
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Apache AE Pty Ltd

Western Australia	WA-214-P R1
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Apache East Spar Pty Ltd

Western Australia	WA-13-L
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Apache Harriet Pty Ltd

Western Australia	EP 358 R1, TL/6, TL/8, TR/1, TL/1, TL/5, TP/ 8 R2, TR/2, WA-192-P R3, EP 307 R3
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Apache Kersail Pty Ltd

Western Australia	WA-13-L
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Apache Lowendal Pty Ltd

Western Australia	TL/6, TL/8, TR/1, TR/2, WA-192-P R3, EP 358 R1, EP 307 R3, TL/1, TL/5, TP/ 8 R2
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Apache Miladin Pty Ltd

Western Australia	TL/6, TL/8, TR/1, TR/2, WA-192-P R3, EP 358 R1, EP 307 R3, TL/1, TL/5, TP/ 8 R2
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Apache Nasmah Pty Ltd

Western Australia	TL/6, TL/8, TR/1, TR/2, WA-192-P R3, EP 358 R1, EP 307 R3, TL/1, TL/5, TP/ 8 R2
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Apache Northwest Pty Ltd

Western Australia	TP/ 9 R2, EP 358 R1, EP 395 R1, TL/6, TL/8, TL/1, TL/5, TR/1, TP/ 8 R2, TP/ 9 R1, TR/2, WA-15-L, WA-192-P R3, TR/3, WA-20-L, WA-215-P R1, WA-257-P, WA-256-P R1, TP/ 6 R2, WA-254-P PARTS 1,3 & 4, WA-254-P PART 2, EP 342 R2, EP 307 R3, WA-209-P R2, WA-246-P R1, WA-1-P R6, WA-261-P R1
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APPENDIX K cont'd

Apache Oil Australia Pty Ltd

Western Australia TL/2, WA-13-L, WA-149-P R3, WA-214-P R1, EP 409, TP/ 7 R2, WA-298-P

APS Oil Pty Ltd

Queensland ATP548P

Arc Energy NL

Western Australia L 1 R1, L 2 R1, WA-286-P

Ashmore-Cartier AC/P27

Arrow Energy NL

Queensland ATP689P, ATP686P, ATP683P, ATP678P, ATP679P

New South Wales PEL432

Asamera Australia Ltd

Western Australia TP/ 9 R1

Ashmore Oil Pty Ltd

Ashmore-Cartier AC/P22

Associated Petroleum Pty Ltd

Queensland ATP336P, PL 3, PL 4, PL 5, PL 6, PL 7, PL 8, PL 9, PL10, PL12, PL13, PL11, PL28, PL69, PL89, PL93

Ausam Resources NL

Western Australia EP 321 R2, EP 407, EP 414 R1

Ausoil Exploration Pty Ltd

Western Australia EP 422

Australian Coalbed Methane Pty Ltd

Queensland ATP574P, ATP676P

New South Wales PEL1, PEL10, PEL12, PEL286, PEL435, PEL436

Australian Gasfields Ltd

Queensland PL24, PL25, PL26, PL36, ATP269P, ATP549P, PL105, PL107, PL115, PL116, PL23, PL77, PL35, PL78, PL62, PL65, PL76, PL79, PL82, PL87, PL175, PL181, PL182, PL184, PL109, PL133, PL149

Australian Petroleum Industries Pty Ltd

Queensland ATP544P

AWE (Perth Basin) Ltd

Western Australia EP 413 R1, L 11, TP/15

AWE Oil (WA) NL

Western Australia WA-286-P

AWE Petroleum Ltd

Tasmania T/18P R3

South Australia PEL 84

Western Australia TP/ 9 R2, EP 342 R2, TP/ 9 R1

Azeeza Pty Ltd

Queensland ATP593P

Basin Oil NL

Victoria VIC/RL1(V)

South Australia PPL170, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL137, PPL138, PPL139, PPL140, PPL141, PPL143, PPL144, PPL145, PPL146, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181

Western Australia EP 104 R4, WA-13-R

Northern Territory NT/RL3

Basin Oil Pty Ltd

Victoria VIC/RL5, VIC/L21

Bass Petroleum (Victoria) Pty Ltd

Victoria PEP162

Bass Petroleum Pty Ltd

Victoria PEP131

Bass Strait Oil Company Pty Ltd

Victoria VIC/P42

Beach Oil & Gas Pty Ltd

South Australia PEL 82, PEL 83

Beach Petroleum NL

Queensland PL31, PL32, PL47

Victoria PEP154, PPL6, PPL9, PPL 10

South Australia PEL 92, PEL 94, PEL 95, PEL 135, PEL 136, PEL 66

Western Australia WA-281-P, WA-282-P, WA-283-P

Beaconsfield Energy Development Pty Ltd

Queensland ATP529P

Benaris International NV

Tasmania T/30P

APPENDIX K cont'd

BHP Billiton Petroleum (Australia) Pty Ltd

Western Australia WA-255-P R1

BHP Billiton Petroleum (Bass Strait) Pty Ltd

Victoria VIC/L 1, VIC/L 2, VIC/L 3, VIC/L 4, VIC/L 5, VIC/L 6, VIC/L 7, VIC/L 8, VIC/L 9 R1, VIC/L10, VIC/L11, VIC/L13, VIC/L14, VIC/L15, VIC/L16, VIC/L17, VIC/L18, VIC/L19, VIC/L20, VIC/RL4

BHP Billiton Petroleum (North West Shelf) Pty Ltd

Western Australia WA-7-R R1

BHP Billiton Petroleum (Victoria) Pty Ltd

Victoria VIC/RL1, VIC/RL2, VIC/RL7, VIC/RL8, VIC/L22

BHP Coal Pty Ltd

Queensland ATP364P

BHP Petroleum (Australia) Pty Ltd

Victoria VIC/P45

Western Australia WA-10-L, WA-11-L, WA-12-L, WA-12-R, WA-155-P R3, WA-1-L R1, WA-239-P R1, WA-289-P, WA-290-P

Ashmore-Cartier AC/P30

BHP Petroleum (North West Shelf) Pty Ltd

Western Australia EP 36 R3, WA-10-R R1, WA-16-L, WA-18-L, WA-19-L, WA-1-R R2, WA-21-L, WA-260-P, WA-2-L R1, WA-275-P, WA-28-P R5, WA-296-P, WA-33-P R3, WA-3-L R1, WA-4-L R1, WA-5-L R1, WA-6-L R1, WA-9-L, WA-9-R R1, WA-23-L, TP/ 4, WA-24-L, WA-301-P, WA-302-P, WA-303-P, WA-304-P, WA-305-P

Ashmore-Cartier AC/L5

BHP Steel (AIS) Pty Ltd

New South Wales PML1, PML2

Black Rock Petroleum NL

Western Australia EP 373 R1

Black Rock Resources Australia NL

Western Australia EP 419

BNG (Surat) Pty Ltd

Queensland ATP684P, ATP693P, ATP645P

BNG Pty Ltd

Queensland ATP641P, ATP643P, ATP644P

Bobwyns Pty Ltd

Queensland ATP621P

Boggy Creek Pty Ltd

Victoria PPL3

Bonaparte Gas & Oil Pty Ltd

Western Australia WA-18-P R5, WA-6-R R1

Northern Territory NT/RL1

Bonaparte Gulf Oil & Gas Pty Ltd

Western Australia EP 386 R1

Northern Territory EP 66

Bonnerwell Pty Ltd

Queensland ATP619P

Boral Energy Bonaparte Pty Ltd

Northern Territory NT/RL1

Bounty Oil & Gas NL

New South Wales PEP 11

Western Australia WA-310-P

BP Developments Australia Pty Ltd

Western Australia EP 36 R3, WA-11-L, WA-10-R R1, WA-16-L, WA-1-L R1, WA-28-P R5, WA-33-P R3, WA-2-L R1, WA-3-L R1, WA-4-L R1, WA-5-L R1, WA-6-L R1, WA-9-L, WA-9-R R1, WA-23-L, TP/ 4, WA-24-L, WA-7-R R1

BP Exploration (Alpha) Ltd

Western Australia WA-267-P

BP Petroleum Developments (NWS) Pty Ltd

Western Australia WA-275-P, WA-294-P, WA-296-P, WA-297-P

Bridge Oil Developments Pty Ltd

South Australia PPL170, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL137, PPL138, PPL139, PPL140, PPL141, PPL143, PPL144, PPL145, PPL146, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL171, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181

Bridge Oil Exploration Pty Ltd

Queensland ATP212P, PL30, PL56, PL74

Victoria VIC/RL1(V)

APPENDIX K cont'd

Brisbane Petroleum NL

Queensland ATP552P, PL18, PL40

British Borneo Australia Ltd

Western Australia WA-22-L

British Borneo Exploration Inc.

Western Australia WA-295-P

Burns, Alan Robert

Western Australia EP 413 R1, EP 414 R1

Cadex Petroleum Pty Ltd

Western Australia WA-226-P R1

CalEnergy Gas (Australia) Ltd

Western Australia EP 415

CalEnergy Gas (UK) Ltd

Victoria VIC/P43

Tasmania T/18P R3

Western Australia EP 389 R1

Canso Resources Ltd

Northern Territory L3, L4, L5, RL 2

Capital Consultant Services Pty Ltd

Western Australia EP 407, EP 321 R2

Capital Energy NL

New South Wales PEL283

Capricorn Energy Pty Ltd

Queensland ATP529P

Carnarvon Oil and Gas NL

Western Australia WA-254-P PART 2

Carnarvon Petroleum NL

Western Australia TP/ 9 R2, EP 342 R2, TP/ 9 R1, WA-254-P PARTS 1,3 & 4, EP 110 R4

CH4 Pty Ltd

Queensland ATP364P

Chevron Asiatic Ltd

Western Australia EP 357 R1, EP 62 R5, EP 66 R5, L 10, L 1H R1, TL/3, TL/4, TL/7, TP/14, WA-11-L, WA-10-R R1, WA-16-L, WA-1-L R1, WA-215-P R1, WA-25-P R5, WA-267-P, WA-275-P, WA-28-P R5, WA-294-P, WA-296-P, WA-297-P, WA-2-R R1, WA-33-P R3, WA-35-P R5, WA-3-R R1, WA-2-L R1, WA-3-L R1, WA-4-R R1, WA-5-R R1, WA-7-L, WA-4-L R1, WA-5-L R1, WA-6-L R1, WA-9-L, WA-9-R R1, WA-15-R, WA-23-L, TP/ 2 R2, TP/ 3 R2, WA-24-L, WA-14-R, WA-205-P R2

Chevron Australia Pty Ltd

Western Australia EP 36 R3, WA-1-L R1, TP/ 4

Chevron Overseas Petroleum Ltd

Western Australia EP 357 R1, EP 66 R5, TL/4, TL/7, TP/ 3 R2

Chevron Texaco Australia Pty Ltd

Western Australia WA-253-P R1, WA-7-R R1

Chimelle Petroleum Ltd

Queensland ATP267P, PL33, PL50, PL51

Western Australia EP 104 R4, EP 413 R1

CMS Gas Transmission of Australia

Western Australia L 1 R1

Coastal Development III Ltd

Western Australia WA-283-P

Coastal Oil & Gas Australia 20 Pty Ltd

Ashmore-Cartier AC/P20

Coastal Oil & Gas Australia 21 Pty Ltd

Ashmore-Cartier AC/P21

Cobrex Pty Ltd

Queensland ATP587P

Coogee Resources Pty Ltd

Ashmore-Cartier AC/RL3

Cooper-Eromanga Oil Inc.

Queensland ATP582P

Cosmo Oil Ashmore Ltd

Ashmore-Cartier AC/P17

Cosmo Oil Cartier Ltd

Ashmore-Cartier AC/P18

Coveyork Pty Ltd

Western Australia WA-274-P

CPC Energy Pty Ltd

Queensland ATP299P, PL29, PL38, PL39, PL52, PL57, PL95, PL169, PL170

Crusader (Victoria) Pty Ltd

Victoria VIC/RL2

Cultus Timor Sea Ltd

Western Australia WA-13-R, WA-308-P, WA-309-P

Cultus Timor Sea Pty Ltd

Victoria VIC/RL5

Dana Petroleum (E&P) Ltd

Western Australia WA-226-P R1

Dana Petroleum (WA) LLC

Western Australia WA-226-P R1

David M. Schuette

South Australia PEL 73

Daytona Energy Corporation

Ashmore-Cartier AC/P32

APPENDIX K cont'd

Delbaere Associates Pty Ltd

Queensland PL18, PL40

Delhi Petroleum Pty Ltd

Queensland PL178, PL24, PL25, PL26, PL36, PL105, PL106, PL107, PL108, PL110, PL111, PL112, PL113, PL109, PL114, PL129, PL130, PL131, PL23, PL186, PL77, PL78, PL34, PL35, PL79, PL37, PL55, PL58, PL59, PL60, PL61, PL62, PL63, PL68, PL75, PL76, PL80, PL81, PL83, PL84, PL85, PL82, PL87, PL86, PL88, PL97, ATP259P, PL132, PL134, PL135, PL136, PL139, PL133, PL137, PL138, PL140, PL141, PL142, PL143, PL144, PL145, PL146, PL147, PL148, PL150, PL153, PL154, PL157, PL149, PL158, PL159, PL168, PL175, PL181, PL182, PL177

South Australia PPL170, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL26, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL76, PPL77, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL118, PPL121, PPL122, PPL123, PPL125, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL136, PPL137, PPL138, PPL139, PPL140, PPL141, PPL142, PPL143, PPL144, PPL145, PPL146, PPL147, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL152, PPL156, PPL158, PPL167, PPL131, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL187, PPL191, PPL194, PPL197, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL182

Diamond Gas Resources Pty Ltd

Victoria VIC/L21

Discovery Geo (Australia) Corporation

Queensland ATP550P

Drillsearch Energy NL

Queensland PL23, PL24, PL25, PL26, PL35, PL109, PL36, PL62, PL76, PL77, PL29, PL78, PL38, PL39, PL105, PL52, PL57, PL107, PL79, PL82, PL95, PL87, PL133, PL149, PL170, PL175, PL169

Western Australia WA-317-P, WA-318-P, WA-319-P

Dyad-Australia Inc.

Queensland ATP554P

Eagle Bay Resources NL

Victoria VIC/P41, VIC/P47

Western Australia EP 423

Ashmore-Cartier AC/P32

Eastern Energy Australia Pty Ltd

New South Wales PEL238, PEL422, PEL6

Eastern Star Gas Ltd

New South Wales PEL433

EDC Australia Ltd

Western Australia WA-226-P R1

Empire Oil Company (WA) Ltd

Western Australia EP 405, EP 411, EP 381 R1, EP 415, EP 416, EP 414 R1, EP 389 R1

EnCana Corporation

Victoria VIC/P48, VIC/P49

Eoil Pty Ltd

South Australia PEL 85

Essential Petroleum Resources Ltd

Victoria PEP159, PEP152, VIC/P46

South Australia PEL 72

Esso Australia Resources Ltd

Victoria VIC/L 1, VIC/L 2, VIC/L 3, VIC/L 4, VIC/L 5, VIC/L 6, VIC/L 7, VIC/L 8, VIC/L 9 R1, VIC/L10, VIC/L11, VIC/L13, VIC/L14, VIC/L15, VIC/L16, VIC/L17, VIC/L18, VIC/L19, VIC/L20, VIC/RL1, VIC/RL2, VIC/RL4

Western Australia WA-1-R R2

Euro Pacific Energy Pty Ltd

Western Australia EP 406, EP 413 R1, EP 369 R1, EP 414 R1, EP 110 R4

Falcore Pty Ltd

Western Australia EP 410

Farmout Drillers Pty Ltd

Northern Territory L3, L4, L5, RL 2

First Australian Resources Limited

Western Australia EP 395 R1

First Australian Resources NL

Western Australia EP 104 R4, EP 397, WA-254-P PARTS 1,3 & 4, WA-254-P PART 2

First Sourcenergy Group Inc.

New South Wales PEL421, PEL423, PEL424

Flare Petroleum NL

New South Wales PEP 11

Western Australia EP 412

Ashmore-Cartier AC/P25, AC/P27

APPENDIX K cont'd

Forcenergy International Inc.

Western Australia EP 381 R1

Frontier Bonaparte Pty Ltd

Western Australia EP 386 R1

Northern Territory NT/RL3, EP 66, RL 1

Frontier Exploration Ltd

Western Australia WA-13-R

Geary, John Kevin

Western Australia EP 413 R1, EP 414 R1

Geopetro Resources Company

Western Australia EP 408, EP 381 R1, EP 386 R1

Northern Territory EP 66

Globex Far East

Western Australia WA-15-L, WA-209-P R2, WA-246-P R1

Globex Far East Pty Ltd

Western Australia WA-256-P R1

Go Resources (Aust) Pty Ltd

New South Wales PEL419, PEL420

Golden West Hydrocarbons Pty Ltd

Queensland PL17

Goodrich Petroleum Company

Western Australia EP 397, EP 395 R1

Great Southland Minerals Pty Ltd

Tasmania EL13/98

Great Southland Petroleum Pty Ltd

New South Wales PEL238

Guinness Peat plc

Tasmania T/31P

Gulf (Aust) Resources NL

Western Australia TP/ 9 R1

Gulf Energy Pty Ltd

Queensland Q/23P

Gulliver Productions Pty Ltd

Western Australia EP 410, EP 104 R4

Hardman Oil and Gas Pty Ltd

Western Australia EP 413 R1, EP 110 R4

Harlow Australia Pty Ltd

Queensland ATP618P

Hughes and Hughes Oil and Gas

Western Australia EP 353 R1

Hughes, Dan Allen

Western Australia EP 414 R1

Hughes, Dudley Joe

Western Australia EP 414 R1

Hyland Bay Pty Ltd

Queensland ATP552P

IB Resources Pty Ltd

Western Australia WA-292-P

Icon Energy Ltd

Queensland ATP632P, ATP594P, ATP648P, ATP649P, ATP610P

Western Australia EP 423

Idemitsu Oil Exploration (Barrow) Pty Ltd

Western Australia WA-264-P

Indigo Oil Pty Ltd

Western Australia EP 410, EP 104 R4

Inland Oil (Production) Pty Ltd

Queensland PL24, PL25, PL26, PL36, ATP269P, PL105, PL107, PL23, PL77, PL78, PL35, PL62, PL109, PL76, PL79, PL82, PL87, PL98, PL175, PL149, PL181, PL182, PL184, PL133

Innovative Technological Geo-Exploration Pty Ltd

Queensland PL98

Northern Territory EP 69

Inpex Alpha Ltd

Victoria VIC/P42, VIC/P45

Western Australia WA-10-L

Inpex Browse Ltd

Western Australia WA-285-P

International Frontier Resources Ltd

Western Australia WA-274-P

Interstate Energy Pty Ltd

Queensland ATP552P, PL119

Interstate Pipelines Pty Ltd

Queensland ATP336P, PL 3, PL 4, PL 5, PL 6, PL 7, PL 8, PL 9, PL10, PL12, PL13, PL11, PL28, PL69, PL89, PL93

IOR Exploration (NT) Pty Ltd

Northern Territory EP 69

IOR Exploration Pty Ltd

Queensland ATP548P, PL98

Jagen Nominees Pty Ltd

Western Australia EP 380 R1

Jakabar Pty Ltd

Queensland ATP626P

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Japan Australia LNG (MIMI) Pty Ltd

Western Australia	WA-11-L, WA-10-R R1, WA-16-L, WA-1-L R1, WA-28-P R5, WA-294-P, WA-296-P, WA-297-P, WA-2-L R1, WA-3-L R1, WA-4-L R1, WA-5-L R1, WA-6-L R1, WA-9-L, WA-9-R R1, WA-23-L, WA-24-L, WA-7-R R1
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Japex AC, Ltd

Ashmore-Cartier	AC/P29
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JED North West Shelf Pty Ltd

Western Australia	EP 137 R4
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Jervois Mining Ltd

Western Australia	EP 111 R4
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Jubilee Oil NL

Western Australia	EP 418
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Karimbla Oil Pty Ltd

Western Australia	L 6, L 8, EP 129 R4
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Kerr-McGee NW Shelf Australia Energy Pty Ltd

Western Australia	WA-276-P, WA-277-P, WA-278-P, WA-295-P, WA-301-P, WA-302-P, WA-303-P, WA-304-P, WA-305-P
Ashmore-Cartier	AC/P15

Kestrel Energy Inc.

Western Australia	EP 325 R2, WA-254-P PARTS 1,3 & 4, WA-254-P PART 2
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Kimberley Oil NL

Western Australia	EP 104 R4, EP 390 R1, EP 391 R1, EP 366 R1, EP 371 R1
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Kingston Petroleum Pty Ltd

Queensland	ATP682P
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Knight Industries Pty Ltd

Victoria	PEP161
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Kufpec Australia Pty Ltd

Western Australia	EP 358 R1, TL/6, TL/8, TL/1, TR/1, TL/5, TP/8 R2, TR/2, WA-192-P R3, EP 307 R3, WA-246-P R1
Northern Territory	L3

Lakes Oil NL

Victoria	PEP152
South Australia	PEL 57

Lansvale Oil and Gas Pty Ltd

Western Australia	EP 41 R5, EP 359 R1
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Liberty Petroleum Corporation

Queensland	ATP616P
South Australia	PEL 88
Western Australia	WA-314-P, WA-315-P

Lowell Petroleum NL

Queensland	ATP564P
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Magellan Petroleum (Eastern) Pty Ltd

Queensland	ATP613P
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Magellan Petroleum (NT) Pty Ltd

South Australia	PEL 94, PEL 95
Northern Territory	L3, L4, L5, RL 2

Magellan Petroleum (WA) Pty Ltd

Western Australia	WA-311-P, WA-281-P, WA-282-P, WA-283-P, WA-287-P, WA-288-P, WA-291-P
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Magnum Gold NL

New South Wales	PEL440, PEL439
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Maneroo Oil Company Ltd

Queensland	ATP556P, ATP566P
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Maple Oil and Exploration NL

New South Wales	PEL8
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Mathews, J S

Queensland	ATP651P
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Mawson Oil NL

Queensland	PL175
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Mawson Petroleum NL

Queensland	PL24, PL25, PL26, PL36, ATP548P, PL105, PL107, PL109, PL23, PL77, PL78, PL35, PL79, PL62, PL76, PL82, PL87, PL133, PL149, PL181, PL182
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Metgasco Pty Ltd

New South Wales	PEL16
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Mid-Eastern Oil NL

Ashmore-Cartier	AC/L5
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Midland Exploration Pty Ltd

Queensland	ATP548P
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Millennium Resources Qld Pty Ltd

Queensland	ATP587P
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Mirboo Ridge Pty Ltd

South Australia	PEL 57
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Mobil (Legendre) Pty Ltd

Western Australia	WA-14-L, WA-202-P R2
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Mobil Australia Resources Company Pty Ltd

Victoria	VIC/RL3
Western Australia	EP 357 R1, EP 62 R5, EP 66 R5, L 10, TL/3, TL/4, TL/7, TP/14, WA-12-L, WA-12-R, WA-155-P R3, WA-17-L, WA-191-P R3, WA-257-P, WA-25-P R5, WA-267-P, WA-2-R R1, WA-3-R R1, WA-4-R R1, WA-5-R R1, WA-7-L, WA-8-L, WA-22-L, TP/ 2 R2, TP/ 3 R2, L 1H R1, WA-205-P R2, WA-25-L

Mobil Exploration and Producing Australia Pty Ltd

Western Australia	WA-10-L, WA-217-P R1, WA-268-P, WA-14-R, WA-298-P
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Moonie Oil NL

Queensland PL169, PL170, PL176

Moonie Oil Pty Ltd

Queensland ATP267P, ATP299P, ATP378P, PL29, PL33, PL38, PL39, PL50, PL51, PL52, PL57, PL95

Northern Territory I4, I5, RL 2

Moroil Pty Ltd

Queensland PL98

Northern Territory EP 69

Mosaic Oil NL

Queensland ATP212P, PL119, PL30, PL46, PL56, PL74

Western Australia WA-208-P R2

Ashmore-Cartier AC/P26

Mosaic Oil QLD Pty Ltd

Queensland ATP709P, ATP212P, ATP244P, ATP471P, PL119, PL48, PL49, PL56, PL66, PL74, PL15, PL16

Natural Gas Australia Pty Ltd

Northern Territory NT/P47, NT/P48

Nerdlihc Company Inc.

Western Australia EP 374 R1, EP 375 R1, EP 376 R1

New Standard Exploration NL

Western Australia EP 417

New World Oil & Developments Pty Ltd

Western Australia WA-192-P R3

Newfield Australia (Ashmore Cartier) Pty Ltd

Western Australia TP/ 9 R2

Ashmore-Cartier AC/RL3, AC/P24, AC/P18

Newfield Australia (Cartier) Pty Ltd

Ashmore-Cartier AC/L1, AC/L2, AC/L3, AC/P20, AC/P21

Newfield Exploration Australia Ltd

Western Australia TP/ 9 R1

News Corp Ltd

Victoria VIC/RL10, VIC/RL9

Nexen Petroleum Australia Pty Ltd

Western Australia WA-19-L, WA-21-L, WA-260-P, WA-289-P, WA-290-P, WA-239-P R1

Northern Territory NT/P60, NT/P58, NT/P59

Nippon Oil Exploration (Dampier) Pty Ltd

Western Australia WA-191-P R3

Nippon Oil Exploration (Vulcan) Pty Ltd

Ashmore-Cartier AC/P23

Novus Australia Resources NL

South Australia PPL170, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL26, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL76, PPL77, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL118, PPL121, PPL122, PPL123, PPL125, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL136, PPL137, PPL138, PPL139, PPL140, PPL141, PPL142, PPL143, PPL144, PPL145, PPL146, PPL147, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL152, PPL156, PPL158, PPL167, PPL131, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL187, PPL191, PPL194, PPL197, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL182

Octanex NL

Western Australia WA-321-P, WA-322-P, WA-323-P

Odyssey International Pty Ltd

Ashmore-Cartier AC/P19, AC/P31

Oil Company of Australia (Moura) Pty Ltd

Queensland ATP525P, ATP564P, ATP602P, PL101, PL94

Oil Company of Australia Ltd

Queensland PL24, PL25, PL26, PL36, ATP212P, ATP269P, ATP299P, ATP337P, ATP375P, ATP470P, ATP525P, ATP553P, PL14, PL101, PL105, PL107, PL109, PL21, PL22, PL23, PL27, PL28, PL77, PL78, PL30, PL31, PL32, PL35, PL41, PL42, PL43, PL44, PL45, PL47, PL79, PL53, PL54, PL56, PL62, PL64, PL67, PL69, PL70, PL71, PL74, PL76, PL82, PL89, PL87, PL133, PL149, PL173, PL174, PL175, ATP692P, PL181, PL182, PL183, PL184

South Australia PEL 27

Oil Investments Ltd

Queensland PL21, PL22, PL27, PL28, PL69, PL89

Oil Search (Australia) Pty Ltd

Western Australia WA-281-P

Oil Wells of Kentucky Inc.

Queensland ATP560P

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Olympus Resources Ltd

Queensland ATP552P

Omega Oil NL

South Australia PEL 32, PPL62, PPL168

Western Australia EP 325 R2

OMV Australia Pty Ltd

Western Australia WA-13-R

OMV Barrow Pty Ltd

Western Australia WA-289-P, WA-290-P, EP 409

OMV Beagle Pty Ltd

Western Australia WA-292-P

OMV Petroleum Pty Ltd

Western Australia WA-320-P, WA-308-P, WA-309-P

OMV Timor Sea Pty Ltd

Victoria VIC/L21

Western Australia WA-320-P

Northern Territory NT/RL3

Ashmore-Cartier AC/L1, AC/L2, AC/L3, AC/P17, AC/P24, AC/P18

Origin Energy Amadeus NL

Western Australia L 9

Origin Energy Bonaparte Pty Ltd

Western Australia WA-6-R R1

Origin Energy Developments Pty Ltd

Western Australia EP 413 R1, L 1 R1, L 2 R1, L 11

Origin Energy Petroleum Pty Ltd

Victoria PEP159, PEP152, PEP160, PPL8

Western Australia L 9

Origin Energy Resources Ltd

Queensland PL177, PL106, PL108, PL111, PL112, PL113, PL114, PL131, PL59, PL60, PL61, PL81, PL83, PL85, PL86, PL97, PL132, PL135, PL139, PL138, PL141, PL145, PL146, PL147, PL148, PL153, PL154, PL157, PL158

Victoria VIC/P43

Tasmania T/18P R3, T/30P

South Australia PEL 83, PEL 27, PEL 32, PEL 57, PPL170, PEL 66, PEL 72, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL26, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL62, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL76, PPL77, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL118, PPL121, PPL122, PPL123, PPL125, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL136, PPL137, PPL138, PPL139, PPL140, PPL141, PPL142, PPL143, PPL144, PPL145, PPL146, PPL147, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL152, PPL156, PPL158, PPL167, PPL168, PPL131, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL187, PPL191, PPL194, PPL197, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL182

Western Australia TP/ 9 R2, EP 342 R2, TP/ 9 R1, WA-257-P, WA-8-L

ORS

New South Wales PEL438

Osaka Gas Australia Pty Ltd

Northern Territory NT/P47, NT/P48, NT/P55, NT/RL2

Otto Oil Pty Ltd

New South Wales PEL425

Otway Resources Pty Ltd

South Australia EPP24

Oz-Exoil NL

Northern Territory NT/P60

Pace Petroleum Pty Ltd

Western Australia EP 41 R5, EP 359 R1

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Pacific Power

New South Wales PEL13, PEL285, PEL4, PEL426, PEL5

Pagehurst Pty Ltd

Queensland ATP567P

Pan Canadian Petroleum Ltd

South Australia EPP28, EPP29, EPP30

Ashmore-Cartier AC/P18

Pan Continental Oil and Gas NL

Western Australia EP 104 R4, WA-312-P

Pan Pacific Petroleum (South Aust) Pty Ltd

Western Australia TL/2, WA-149-P R3, EP 110 R4, TP/ 7 R2, WA-246-P R1

Pan Pacific Petroleum NL

Western Australia L 9, WA-254-P PARTS 1,3 & 4, WA-254-P PART 2

PanCanadian Petroleum Ltd

Western Australia WA-276-P, WA-277-P, WA-278-P, WA-22-L

Pangaea Oil And Gas Pty Ltd

Queensland ATP620P

Pannonian International Ltd

New South Wales PEL438

Pasminco Australia Ltd

Western Australia EP 373 R1

Peedamullah Petroleum Pty Ltd

Queensland ATP552P

Western Australia EP 364 R1, EP 341 R2

Pelsoil NL

Western Australia EP 104 R4

Petro Energy Pty Ltd

Western Australia L 7

Petromin NL

Queensland ATP269P, PL17

Northern Territory L4, L5

Petromin Pty Ltd

Queensland PL31, PL32, PL47, PL184

Northern Territory RL 2

Petrotech Pty Ltd

Victoria PEP155, PEP156, PEP157, PEP158

Petroz NL

Western Australia EP 359 R1, WA-281-P, WA-282-P, WA-283-P, WA-149-P R3

Phillips Oil Company Australia

Western Australia WA-17-L, WA-269-P, WA-270-P

Phillips STH Pty Ltd

Northern Territory NT/P55

Phillips STL Pty Ltd

Northern Territory NT/RL2

Phoenix Energy Pty Ltd

Western Australia EP 359 R1, L 4, L 5, TP/15

Planet Resources Pty Ltd

Western Australia WA-226-P R1

Premier Petroleum (Australia) Ltd

Western Australia WA-202-P R2

Qgas Pty Ltd

Queensland ATP613P

Queensland Gas Pty Ltd

Queensland ATP632P, ATP648P, ATP610P, ATP650P, ATP691P

Radford, Roy Antony

Western Australia EP 110 R4

Rawson Resources NL

Western Australia EP 423, WA-306-P, WA-307-P

Northern Territory EP 97

Reef Oil NL

South Australia PPL170, PPL 6, PPL 7, PPL 8, PPL171, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL137, PPL138, PPL139, PPL140, PPL141, PPL143, PPL144, PPL145, PPL146, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181

Rincon-Australia Pty Ltd

Queensland ATP596P

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ROC Oil WA Pty Ltd

Western Australia WA-286-P

Roma Petroleum Company Pty Ltd

Queensland ATP695P, ATP530P, ATP545P

Tasmania T/31P

Roma Petroleum NL

Queensland ATP465P

Rough Range Oil Pty Ltd

Western Australia EP 41 R5, EP 423

Sagasco South East Inc.

South Australia PEL 32, PPL62, PPL168

Western Australia L 9

Santos (299) Pty Ltd

Queensland ATP299P, PL29, PL38, PL39, PL52, PL57, PL95, PL169, PL170

Victoria VIC/P44

Santos (BOL) Pty Ltd

Queensland ATP212P, PL119, PL30, PL56, PL74

Victoria PPL4, VIC/RL7, VIC/RL8, PPL5, PEP153, PEP154, PPL6, PPL7, PPL9, PPL 10, VIC/L22

South Australia PPL170, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL137, PPL138, PPL139, PPL140, PPL141, PPL143, PPL144, PPL145, PPL146, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL171, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181

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Ashmore-Cartier AC/P15

Santos Australian Hydrocarbons Pty Ltd

Queensland PL113, PL114, PL58, PL80, PL136, PL137, PL141, PL145, PL148, PL153, PL157, PL158, PL159

Santos Exploration Pty Ltd

Queensland PL 1, PL 2, PL17, PL71

Northern Territory L3, L4, L5, RL 2

Santos Gnuco Pty Ltd

Queensland ATP267P, ATP299P, PL29, PL33, PL38, PL39, PL50, PL51, PL52, PL57, PL95, PL169, PL170

Santos Ltd

Queensland PL178, PL24, PL25, PL26, PL36, ATP259P, PL105, PL106, PL107, PL108, PL110, PL111, PL112, PL113, PL109, PL114, PL129, PL130, PL131, PL23, PL186, PL77, PL78, PL34, PL35, PL79, PL37, PL55, PL58, PL59, PL60, PL61, PL62, PL63, PL68, PL75, PL76, PL80, PL81, PL83, PL84, PL85, PL82, PL87, PL86, PL88, PL97, PL132, PL134, PL135, PL136, PL139, PL133, PL137, PL138, PL140, PL141, PL142, PL143, PL144, PL145, PL146, PL147, PL148, PL150, PL153, PL154, PL157, PL149, PL158, PL159, PL181, PL168, PL175, PL182, PL177

Victoria VIC/RL3

South Australia PPL170, PPL171, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL26, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL76, PPL77, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL118, PPL121, PPL122, PPL123, PPL125, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL136, PPL137, PPL138, PPL139, PPL140, PPL141, PPL142, PPL143, PPL144, PPL145, PPL146, PPL147, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL152, PPL156, PPL158, PPL167, PPL131, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL187, PPL191, PPL194, PPL197, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL182, PPL183

Western Australia WA-15-L, WA-18-P R5, WA-191-P R3, WA-20-L, WA-8-L, WA-6-R R1, WA-209-P R2, WA-1-P R6

Northern Territory NT/RL1, L3, RL 2

APPENDIX K cont'd

Santos offshore Pty Ltd

Victoria	VIC/RL2
Western Australia	TP/ 2 R2, TP/ 3 R2, EP 325 R2, EP 357 R1, EP 62 R5, L 10, TL/3, TL/4, TL/7, TP/14, WA-18-P R5, WA-264-P, WA-281-P, WA-282-P, WA-283-P, EP 66 R5, L 1H R1, WA-208-P R2
Northern Territory	NT/P61, NT/RL1

Santos Petroleum Operations Pty Ltd

Queensland	ATP337P, ATP553P, PL41, PL42, PL43, PL44, PL45, PL54, PL67, PL173, PL183
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Santos Petroleum Pty Ltd

Queensland	PL178, PL106, PL108, PL110, PL111, PL112, PL129, PL130, PL131, PL186, PL37, PL59, PL60, PL61, PL63, PL68, PL75, PL81, PL83, PL84, PL85, PL86, PL88, PL97, PL132, PL134, PL135, PL139, PL140, PL142, PL143, PL144, PL146, PL147, PL150, PL168, PL177
South Australia	PPL170, PPL 6, PPL 7, PPL 8, PPL171, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL137, PPL138, PPL139, PPL140, PPL141, PPL143, PPL144, PPL145, PPL146, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181

Santos QNT Pty Ltd

Queensland	ATP685P
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Sequoil Pty Ltd

Queensland	ATP589P, ATP593P, ATP608P, ATP574P, ATP654P
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Shell Development (Australia) Pty Ltd

Western Australia	EP 353 R1, EP 36 R3, EP 65 R5, WA-11-L, WA-10-R R1, WA-16-L, WA-1-L R1, WA-215-P R1, WA-25-P R5, WA-267-P, WA-275-P, WA-279-P, WA-280-P, WA-28-P R5, WA-294-P, WA-296-P, WA-297-P, WA-2-R R1, WA-33-P R3, WA-35-P R5, WA-3-R R1, WA-2-L R1, WA-3-L R1, WA-4-R R1, WA-5-R R1, WA-7-L, WA-4-L R1, WA-5-L R1, WA-6-L R1, WA-9-L, WA-9-R R1, WA-23-L, TP/ 4, WA-24-L, WA-299-P, WA-300-P, WA-14-R, WA-205-P R2, WA-313-P, WA-7-R R1
Northern Territory	NT/P47, NT/P48, NT/P49, NT/P55, NT/P57, NT/RL2
Ashmore-Cartier	AC/L5

Shogoil Australia Pty Ltd

Queensland	ATP578P
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SK Corporation

Western Australia	WA-276-P, WA-277-P, WA-278-P
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Southern Amity Inc.

Western Australia	EP 408, EP 381 R1
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Southern Diamond Resources (EP342/TP9) Pty Ltd

Western Australia	TP/ 9 R1
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Southern Diamond Resources (WA-239-P) Pty Ltd

Western Australia	WA-239-P R1
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Springfield Oil & Gas Ltd

Western Australia	EP 414 R1
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St. Barbara Mines Ltd

New South Wales	PEL13, PEL426
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Starzap Pty Ltd

Queensland	ATP647P
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Strata Resources NL

Western Australia	WA-321-P, WA-322-P, WA-323-P
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Strike Oil NL

New South Wales	PEL427, PEL428
Victoria	VIC/P44
South Australia	PEL 75
Western Australia	TP/18, EP 421, EP 420, TP/17, TP/19, WA-261-P R1

Stuart Petroleum NL

South Australia	PEL 90, PEL 93
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Sun Resources NL

Western Australia	EP 325 R2, EP 359 R1, EP 395 R1, WA-254-P PARTS 1,3 & 4, WA-254-P PART 2, WA-312-P, WA-261-P R1
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Sunoco Inc. of Australia

Queensland	ATP692P
New South Wales	PEL429, PEL430, PEL431

APPENDIX K cont'd

Sweetpea Corporation Pty Ltd

Northern Territory EP 76

Sydney Gas Operations Pty Ltd

New South Wales PEL2, PEL267, PEL4

Sykes Ian Grant

Queensland PL73, PL72

Tap (Harriet) Pty Ltd

Western Australia EP 358 R1, TL/6, TL/8, TL/1, TR/1, TL/5, TP/8 R2, TR/2, WA-192-P R3, EP 307 R3, WA-246-P R1

TAP (SHELFAL) Pty Ltd

Western Australia EP 364 R1, EP 395 R1, EP 137 R4, EP 341 R2, EP 397

TAP Oil Limited

Western Australia TP/18

Tap Oil NL

Western Australia WA-276-P, WA-277-P, WA-278-P

Tap West Pty Ltd

Western Australia WA-22-L, WA-25-L

Terratek Drilling Tools Pty Ltd

Western Australia L 6, L 8, EP 129 R4

Texaco Australia Pty Ltd

Western Australia EP 357 R1, EP 66 R5, EP 62 R5, L 10, TL/3, TL/4, TL/7, TP/14, WA-192-P R3, WA-215-P R1, WA-253-P R1, WA-25-P R5, WA-267-P, WA-268-P, WA-2-R R1, WA-3-R R1, WA-4-R R1, WA-5-R R1, WA-7-L, WA-8-L, WA-15-R, TP/ 2 R2, WA-302-P, WA-303-P, WA-305-P, WA-14-R, L 1H R1, TP/ 3 R2, WA-205-P R2

Timor Oil Ltd

Queensland PL17

Timor Sea Petroleum Pty Ltd

Ashmore-Cartier AC/P23

Tipperary Oil & Gas (Australia) Pty Ltd

Queensland ATP554P, ATP655P, ATP675P, ATP690P

TMOC Exploration Pty Ltd

Victoria PEP160

Todd Petroleum Australia Ltd

Ashmore-Cartier AC/P20

Total Exploration Australia Pty Ltd

Queensland PL34

Trans-Orient Petroleum Ltd

Ashmore-Cartier AC/P26

Transoil (NT) Pty Ltd

Northern Territory L4, L5

Transoil Pty Ltd

Queensland ATP267P, ATP299P, PL29, PL33, PL38, PL39, PL50, PL51, PL52, PL57, PL95, PL169, PL170

Northern Territory RL 2

Tri-Star Energy Company

Queensland ATP680P, ATP333P

Tri-Star Petroleum Company

Queensland ATP631P, ATP526P, ATP584P, ATP592P, ATP606P, ATP623P, PL90, PL91, PL92, PL99, PL100

Trinity Gas Resources Pty Ltd

Victoria VIC/RL5

Triple J Resources Pty Ltd

Queensland ATP594P

TSP Arafura Petroleum Pty Ltd

Northern Territory NT/P60

Tubridgi Petroleum Pty Ltd

Western Australia L 9

TXU Gas Storage Pty Ltd

Victoria PPL1, PPL2

Tyers Investments Pty Ltd

Queensland ATP539P

New South Wales PEL283

South Australia EPP27

Tyers Petroleum Pty Ltd

Queensland ATP552P

United Oil & Gas Company (NT) Pty Ltd

Northern Territory L4, L5

APPENDIX K cont'd

Vamgas Pty Ltd

Queensland	PL178, PL24, PL25, PL26, PL36, ATP378P, PL105, PL106, PL107, PL108, PL110, PL111, PL112, PL113, PL109, PL114, PL129, PL130, PL131, PL23, PL186, PL77, PL78, PL34, PL35, PL79, PL37, PL55, PL58, PL59, PL60, PL61, PL62, PL63, PL68, PL75, PL76, PL80, PL81, PL83, PL84, PL85, PL82, PL87, PL86, PL88, PL97, PL132, PL134, PL135, PL136, PL139, PL137, PL133, PL138, PL140, PL141, PL142, PL143, PL144, PL145, PL146, PL147, PL148, PL150, PL153, PL154, PL157, PL149, PL158, PL159, PL168, PL175, PL176, PL181, PL182, PL177
South Australia	PPL170, PPL 6, PPL 7, PPL 8, PPL171, PPL 9, PPL10, PPL11, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL26, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL36, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, PPL44, PPL45, PPL46, PPL47, PPL48, PPL49, PPL50, PPL51, PPL52, PPL53, PPL54, PPL55, PPL56, PPL57, PPL58, PPL59, PPL60, PPL61, PPL63, PPL64, PPL65, PPL66, PPL67, PPL68, PPL69, PPL70, PPL71, PPL72, PPL73, PPL74, PPL75, PPL76, PPL77, PPL78, PPL79, PPL80, PPL81, PPL82, PPL83, PPL84, PPL85, PPL86, PPL87, PPL88, PPL89, PPL90, PPL91, PPL92, PPL93, PPL94, PPL95, PPL96, PPL97, PPL98, PPL99, PPL100, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL119, PPL120, PPL118, PPL121, PPL122, PPL123, PPL125, PPL124, PPL126, PPL127, PPL128, PPL130, PPL129, PPL132, PPL133, PPL134, PPL135, PPL136, PPL137, PPL138, PPL139, PPL140, PPL141, PPL142, PPL143, PPL144, PPL145, PPL146, PPL147, PPL148, PPL149, PPL150, PPL151, PPL153, PPL154, PPL155, PPL157, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL152, PPL156, PPL158, PPL167, PPL131, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL187, PPL191, PPL194, PPL197, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL182, PPL183

Vernon E Faulconer Australia Inc.

Queensland	ATP543P, PL117
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Victoria International Petroleum NL

Queensland	ATP333P
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Victoria Oil Exploration (1977) Pty Ltd

Queensland	ATP589P
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Victoria Oil Pty Ltd

Queensland	ATP333P
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Victoria Petroleum (WA-209-P) Pty Ltd

Western Australia	WA-312-P
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Victoria Petroleum Ltd

Queensland	ATP654P
Western Australia	WA-254-P PART 2

Victoria Petroleum NL

Queensland	ATP695P, ATP465P, ATP574P, ATP608P
South Australia	PEL 57
Western Australia	EP 325 R2, WA-254-P PARTS 1,3 & 4, WA-261-P R1

Victoria Petroleum Offshore Pty Ltd

Western Australia	EP 413 R1
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Wandoo Petroleum Pty Ltd

Western Australia	WA-14-L, WA-202-P R2, WA-256-P R1
Ashmore-Cartier	AC/L1, AC/L2, AC/L3, AC/P18, AC/P24

Wenk, Andrew

South Australia	PEL 82
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West Australian Petroleum Pty Ltd

Western Australia	EP 65 R5, TP/13
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West Oil NL

Western Australia	WA-284-P, WA-316-P, WA-310-P
Ashmore-Cartier	AC/RL1, AC/P26, AC/P28

Westranch Holdings Pty Ltd

Ashmore-Cartier	AC/P22, AC/P32
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Woodside Eastern Energy Pty Ltd

Victoria	VIC/RL10, VIC/RL2, VIC/RL6, VIC/RL9
Western Australia	WA-23-L, WA-24-L

Woodside Energy Ltd

Victoria	VIC/RL10, VIC/P43, VIC/RL2, VIC/RL6, VIC/RL9
Tasmania	T/30P
South Australia	EPP28, EPP29, EPP30
Western Australia	EP 36 R3, WA-11-L, WA-16-L, WA-20-L, WA-1-L R1, WA-242-P R1, WA-313-P, WA-275-P, WA-279-P, WA-280-P, WA-28-P R5, WA-293-P, WA-296-P, WA-297-P, WA-33-P R3, WA-2-L R1, WA-3-L R1, WA-4-L R1, WA-6-L R1, WA-9-L, WA-10-R R1, WA-9-R R1, TP/ 4, WA-294-P, WA-254-P PARTS 1,3 & 4, WA-254-P PART 2, WA-248-P R1, WA-1-P R6, WA-208-P R2, WA-5-L R1, WA-7-R R1
Northern Territory	NT/P55, NT/P57, NT/RL2, NT/P49
Ashmore-Cartier	AC/P17

Woodside Oil Ltd

Western Australia	WA-191-P R3, WA-269-P, WA-271-P, WA-270-P
Ashmore-Cartier	AC/L5

Woodside Petroleum Development Pty Ltd

Ashmore-Cartier	AC/L5
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APPENDIX K cont'd

Yukong Ltd

Ashmore-Cartier AC/P15

Ashmore-Cartier is the Territory of Ashmore and Cartier Islands Adjacent Area
JPDA is the Joint Petroleum Development Area

Appendix L 2002

Significant Australian offshore oil and gas discoveries up to the end of 2002

APPENDIX L: SIGNIFICANT AUSTRALIAN OFFSHORE OIL AND GAS DISCOVERIES UP TO THE END OF 2003

The listing of a 'discovery' in this Appendix is a reflection of company classification and should not be interpreted as a finalised Geoscience Australia classification. Current status is determined at the date of the last titles publication, usually in April.

CAPITALS denotes discoveries in production licences and abandoned producers;

Bold denotes discoveries in retention leases;

Italics denotes discoveries in vacant acreage and

Lower case denotes other discoveries.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
BARRACOUTA	Esso	31-May-65	Mar-69	Gippsland	Oil and Gas
MARLIN	Esso	03-Feb-66	Nov-69	Gippsland	Oil and Gas
KINGFISH	Esso	29-May-67	Apr-71	Gippsland	Oil
Golden Beach	Burmah	17-Jul-67		Gippsland	Gas
HALIBUT	Esso	29-Aug-67	Mar-70	Gippsland	Oil
DOLPHIN	Esso	21-Nov-67	Jan-90	Gippsland	Oil
PERCH	Esso	02-May-68	Jan-90	Gippsland	Oil
TUNA	Esso	07-May-68	May-79	Gippsland	Oil and Gas
FLOUNDER	Esso	28-Sep-68	Dec-84	Gippsland	Oil and Gas
LEGENDRE	Burmah	31-Oct-68	May-01	Carnarvon	Oil
SNAPPER	Esso	09-Dec-68	Jul-81	Gippsland	Oil and Gas
BREAM	Esso	16-Apr-69	Mar-88	Gippsland	Oil and Gas
MACKEREL	Esso	23-Apr-69	Dec-77	Gippsland	Oil
Flinders Shoal	WAPET	09-Jul-69		Carnarvon	Oil and Gas
Pelican (Esso)	Esso	24-Apr-70		Bass	Gas
EMPEROR	Esso	29-Jun-70	not producing	Gippsland	Oil and Gas
<i>Cormorant</i>	Esso	27-Jul-70		Bass	Oil
Petrel	Arco	08-Nov-70		Bonaparte	Gas
Scott Reef	Burmah	26-May-71		Browse	Gas
NORTH RANKIN	Burmah	25-Jun-71	Jun-84	Carnarvon	Gas
Tern	Arco	04-Jul-71		Bonaparte	Gas
RANKIN	Burmah	23-Sep-71	Dec-01	Carnarvon	Oil and Gas
GOODWYN	Burmah	25-Nov-71	Feb-95	Carnarvon	Oil and Gas
ANGEL	Burmah	11-Jan-72	not producing	Carnarvon	Gas
Puffin	Arco	08-Jun-72		Bonaparte	Oil
<i>Penguin</i>	Arco	23-Jul-72		Bonaparte	Gas
Iago	WAPET	28-Jul-72		Carnarvon	Gas
Eaglehawk	Woodside	13-Dec-72		Carnarvon	Oil
Swan	Arco	30-Jan-73		Bonaparte	Oil and Gas
Sole	Shell	05-Feb-73		Gippsland	Gas
West Tryal Rocks	WAPET	03-Mar-73		Carnarvon	Gas
Egret	Woodside	12-May-73		Carnarvon	Oil
DOCKRELL	Woodside	17-Aug-73	not producing	Carnarvon	Oil and Gas
LAMBERT	Woodside	23-Nov-73	Oct-97	Carnarvon	Oil and Gas
Sunfish	Esso	01-Mar-74		Gippsland	Oil and Gas
Sunrise	Woodside	15-Aug-74		Bonaparte	Gas

APPENDIX L (cont'd)

CAPITALS denotes discoveries in production licences and abandoned producers;

Bold denotes discoveries in retention leases;

Italics denotes discoveries in vacant acreage and

Lower case denotes other discoveries.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
Troubadour	Woodside	15-Aug-74		Bonaparte	Gas
GRIFFIN	WAPET	19-Sep-74	Jan-94	Carnarvon	Oil
BLACKBACK	Esso	01-Sep-75	Jun-99	Gippsland	Oil
TIDEPOL	Burmah	26-Nov-75	not producing	Carnarvon	Oil and Gas
Spar	WAPET	02-Sep-76		Carnarvon	Gas
SEAHORSE	Esso	31-Aug-78	Sep-90	Gippsland	Oil and Gas
<i>Jupiter (Phillips)</i>	Phillips	14-Oct-79		Carnarvon	Gas
Brecknock	Woodside	13-Nov-79		Browse	Gas
Scarborough	Esso	13-Dec-79		Carnarvon	Gas
Brewster	Woodside	08-Dec-80		Browse	Gas
Gorgon	WAPET	11-Jan-81		Carnarvon	Gas
YELLOWTAIL	Esso	01-Nov-81	not producing	Gippsland	Oil
Patricia/Baleen	Hubday	17-Nov-81		Gippsland	Gas
TARWHINE	Esso	20-Jan-82	May-90	Gippsland	Oil and Gas
Novara	Esso	25-Oct-82		Carnarvon	Oil
WIRRAH	Esso	18-Nov-82	not producing	Gippsland	Oil and Gas
SOUTH PEPPER	Mesa	12-Dec-82	Jan-88	Carnarvon	Oil and Gas
Wilcox	Woodside	17-Feb-83		Carnarvon	Gas
WHITING	Esso	05-Apr-83	Oct-89	Gippsland	Oil and Gas
Basker	Shell	12-Jun-83		Gippsland	Oil and Gas
NORTH HERALD	Mesa	19-Jun-83	Dec-87	Carnarvon	Oil
LUDERICK	Esso	23-Jun-83	not producing	Gippsland	Oil and Gas
CHERVIL	Mesa	02-Aug-83	Aug-89	Carnarvon	Oil and Gas
BAMBRA	Occidental	27-Aug-83	not producing	Carnarvon	Oil and Gas
JABIRU	BHP	29-Sep-83	Aug-86	Bonaparte	Oil
South Chervil	Wesminco	20-Nov-83		Carnarvon	Oil and Gas
HARRIET	Occidental	22-Nov-83	Jan-86	Carnarvon	Oil and Gas
Turtle	Wesminco	10-Feb-84		Bonaparte	Oil
Manta	Shell	20-Mar-84		Gippsland	Oil and Gas
<i>Veilfin</i>	Esso	30-Mar-84		Gippsland	Gas
Dixon	Woodside	26-May-84		Carnarvon	Oil and Gas
Outtrim	Esso	02-Jul-84		Carnarvon	Oil
TALISMAN	Marathon	24-Aug-84	Jan-89	Carnarvon	Oil
CHALLIS	BHP	23-Oct-84	Dec-89	Bonaparte	Oil
GRUNTER	Esso	11-Nov-84	not producing	Gippsland	Oil and Gas
SWIFT	BHP	10-Jan-85	not producing	Bonaparte	Oil
Barnett	Aust Aquitaine	06-Feb-85		Bonaparte	Oil
Montague	Woodside	07-Mar-85		Carnarvon	Gas
ELDER	Wesminco	29-May-85	not producing	Carnarvon	Gas
SALADIN	WAPET	19-Jun-85	Dec-89	Carnarvon	Oil and Gas

APPENDIX L (cont'd)

CAPITALS denotes discoveries in production licences and abandoned producers;

Bold denotes discoveries in retention leases;

Italics denotes discoveries in vacant acreage and

Lower case denotes other discoveries.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
WHIPTAIL	Esso	09-Aug-85	not producing	Gippsland	Oil
Yolla	Amoco	21-Aug-85		Bass	Oil and Gas
ANGELFISH	Esso	16-Dec-85	not producing	Gippsland	Oil and Gas
SKUA	BHP	26-Dec-85	Dec-91	Bonaparte	Oil and Gas
Leatherjacket	Esso	27-Feb-86		Gippsland	Oil
CAMPBELL	Bond	01-Mar-86	Jul-92	Carnarvon	Oil and Gas
Kipper	Esso	28-Mar-86		Gippsland	Oil and Gas
Remora	Esso	21-May-87		Gippsland	Oil and Gas
ROSETTE	Bond	16-Oct-87	Apr-88	Carnarvon	Oil and Gas
Oliver	BHP	02-Feb-88		Bonaparte	Oil and Gas
Montara	BHP	26-Apr-88		Bonaparte	Oil and Gas
CASSINI	BHP	18-Jul-88	Dec-89	Bonaparte	Oil
Evans Shoal	BHP	18-Aug-88		Bonaparte	Gas
Bilyara	BHP	13-Sep-88		Bonaparte	Oil and Gas
Mulloy	Esso	19-Feb-89		Gippsland	Oil
<i>Angler</i>	Petrofina	13-May-89		Gippsland	Gas
WANAEA	Woodside	26-May-89	Nov-95	Carnarvon	Oil
SWEETLIPS	Esso	18-Aug-89	not producing	Gippsland	Oil and Gas
Anemone	Petrofina	04-Sep-89		Gippsland	Gas
Talbot	Santos	28-Nov-89		Bonaparte	Oil and Gas
COWLE	WAPET	22-Dec-89	Apr-91	Carnarvon	Oil and Gas
COSSACK	Woodside	06-Jan-90	Nov-95	Carnarvon	Oil
Maple	BHP	11-Jan-90		Bonaparte	Gas
Keeling	Norcen	11-Jan-90		Bonaparte	Gas
ROLLER	WAPET	19-Jan-90	Mar-94	Carnarvon	Oil and Gas
SINBAD	Hadson	25-Mar-90	Jul-92	Carnarvon	Gas
Archer	Petrofina	27-Mar-90		Gippsland	Oil and Gas
Gummy	Shell	02-Jun-90		Gippsland	Gas
BIRCH	BHP	01-Aug-90	not producing	Bonaparte	Oil
Tahbilk	BHP	01-Dec-90		Bonaparte	Gas
Minden	BHP	17-May-91		Carnarvon	Gas
WANDOO	Ampol	15-Jun-91	Oct-93	Carnarvon	Oil
Leatherback	Lasmo	21-Jun-91		Carnarvon	Oil
TANAMI	Hadson	08-Jul-91	Oct-91	Carnarvon	Oil
Halcyon	Lasmo	29-Jul-91		Bonaparte	Gas
SKATE	WAPET	18-Nov-91	Mar-94	Carnarvon	Oil and Gas
MOONFISH	Esso	12-Jul-92	Jul-97	Gippsland	Oil and Gas
Maitland	Wesminco	09-Sep-92		Carnarvon	Gas
<i>Fishburn</i>	BHP	22-Oct-92		Bonaparte	Gas
Macedon/Pyrenees	BHP	31-Oct-92		Carnarvon	Oil and Gas

APPENDIX L (cont'd)

CAPITALS denotes discoveries in production licences and abandoned producers;

Bold denotes discoveries in retention leases;

Italics denotes discoveries in vacant acreage and

Lower case denotes other discoveries.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
ULIDIA	Hadson	26-Nov-92	not producing	Carnarvon	Gas
Troas	BHP	06-Jan-93		Otway	Gas
La Bella	BHP	08-Feb-93		Otway	Gas
EAST SPAR	Wesminco	29-Mar-93	Oct-96	Carnarvon	Gas
Minerva	BHP	07-Apr-93		Otway	Gas
STAG	Hadson	18-Jun-93	May-98	Carnarvon	Oil
Australind	WAPET	19-Sep-93		Carnarvon	Oil and Gas
ELANG	BHP	10-Feb-94	Jul-98	Bonaparte	Oil
ALKIMOS	Hadson	31-Aug-94	Sep-94	Carnarvon	Oil and Gas
Saffron	Woodside	03-Oct-94		Carnarvon	Oil and Gas
LAMINARIA	Woodside	09-Oct-94	Nov-99	Bonaparte	Oil
KAKATUA	BHP	08-Dec-94	Jul-98	Bonaparte	Oil
Chrysaor	WAPET	13-Dec-94		Carnarvon	Gas
Bayu/Undan	Phillips	03-Feb-95		Bonaparte	Oil and Gas
GUDGEON	Esso	27-Apr-95	not producing	Gippsland	Oil
Gwydion	BHP	08-Jun-95		Browse	Oil
WONNICH	Ampolex	31-Jul-95	Jul-99	Carnarvon	Oil and Gas
Blencathra	BHP	18-Sep-95		Carnarvon	Oil
CORALLINA	Woodside	21-Dec-95	Nov-99	Bonaparte	Oil
Jahal	BHP	06-May-96		Bonaparte	Oil
AGINCOURT	Apache	09-Jun-96	Aug-97	Carnarvon	Oil
BUFFALO	BHP	27-Sep-96	Dec-99	Bonaparte	Oil
Nimrod	BHP	10-Oct-96		Carnarvon	Gas
Buller	BHP	13-Dec-96		Bonaparte	Oil
<i>Cornea</i>	Shell	07-Jan-97		Browse	Oil and Gas
KEAST	Woodside	21-Jan-97	not producing	Carnarvon	Gas
Cherring	Mobil	09-Mar-97		Carnarvon	Gas
WOOLLYBUTT	Mobil	23-Apr-97	not producing	Carnarvon	Oil
Pitcairn	Santos	18-Jun-97		Carnarvon	Oil
Mutineer	Santos	18-Jun-97		Carnarvon	Oil
Tenacious	Cultus	21-Jun-97		Bonaparte	Oil and Gas
Krill	BHP	19-Jul-97		Bonaparte	Oil
Reindeer	Apache	26-Oct-97		Carnarvon	Gas
Psepotus	Woodside	28-Feb-98		Browse	Gas
GIPSY	Apache	02-Mar-98	Feb-01	Carnarvon	Oil
ROSE	Apache	20-Jul-98	not producing	Carnarvon	Oil and Gas
Bluff	BHP	21-Jul-98		Bonaparte	Oil
John Brookes	Mobil	16-Oct-98		Carnarvon	Gas
Vincent	Woodside	26-Dec-98		Carnarvon	Oil and Gas
LEE	Apache	25-Jan-99	not producing	Carnarvon	Gas

APPENDIX L (cont'd)

CAPITALS denotes discoveries in production licences and abandoned producers;

Bold denotes discoveries in retention leases;

Italics denotes discoveries in vacant acreage and

Lower case denotes other discoveries.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
Sage	Apache	25-Mar-99		Carnarvon	Oil
Enfield	Woodside	05-Apr-99		Carnarvon	Oil and Gas
Geryon	WAPET	15-Sep-99		Carnarvon	Gas
Orthrus	WAPET	15-Oct-99		Carnarvon	Gas
NORTH GIPSY	Apache	28-Oct-99	Feb-01	Carnarvon	Oil
Cadell	Apache	08-Nov-99		Carnarvon	Gas
Nasutus	Apache	18-Nov-99		Carnarvon	Oil and Gas
Narvik	Apache	28-Nov-99		Carnarvon	Gas
COASTER	WAPET	30-Dec-99	not producing	Carnarvon	Oil
JOSEPHINE	Apache	11-Jan-00	not producing	Carnarvon	Gas
BAKER	Apache	20-Jan-00	not producing	Carnarvon	Gas
Urania	WAPET	11-Feb-00		Carnarvon	Gas
Scafell	BHP	27-Feb-00		Carnarvon	Gas
Maenad	Chevron	28-Mar-00		Carnarvon	Gas
Corvus	Apache	07-Apr-00		Carnarvon	Gas
Padthaway	BHP	09-Apr-00		Bonaparte	Oil and Gas
Oryx	Apache	26-Apr-00		Carnarvon	Oil
Jansz	Mobil	27-Apr-00		Carnarvon	Gas
Crux	Nippon	03-May-00		Bonaparte	Gas
Brecknock South	Woodside	18-Aug-00		Browse	Gas
LINDA	Apache	18-Aug-00	not producing	Carnarvon	Gas
Chamois	Apache	28-Aug-00		Carnarvon	Oil and Gas
Argus	BHP	14-Sep-00		Browse	Gas
Tusk	Apache	15-Sep-00		Carnarvon	Oil
Laverda	Woodside	27-Oct-00		Carnarvon	Oil and Gas
GAEA	Woodside	02-Dec-00	not producing	Carnarvon	Gas
Audacious	OMV	31-Jan-01		Bonaparte	Oil
SIMPSON	Apache	07-Feb-01	Mar-01	Carnarvon	Oil
SOUTH PLATO	Apache	27-Feb-01	Feb-03	Carnarvon	Oil
GIBSON	Apache	27-Feb-01	Feb-02	Carnarvon	Oil
Kuda Tasi	Woodside	16-Mar-01		Bonaparte	Oil
Thylacine	Origin	18-May-01		Otway	Gas
Geographe	Woodside	16-Jun-01		Otway	Gas
Blacktip	Woodside	10-Aug-01		Bonaparte	Gas
Gudrun	Apache	08-Oct-01		Carnarvon	Oil
Cliff Head	ROC	29-Dec-01		Perth	Oil
DOUBLE ISLAND	Apache	20-Jan-02	Feb-03	Carnarvon	Oil
PEDIRKA	Apache	24-Feb-02	Nov-02	Carnarvon	Oil
LITTLE SANDY	Apache	17-Mar-02	Nov-02	Carnarvon	Oil
VICTORIA	Apache	24-Mar-02	Nov-02	Carnarvon	Oil

APPENDIX L (cont'd)

CAPITALS denotes discoveries in production licences and abandoned producers;
Bold denotes discoveries in retention leases;
Italics denotes discoveries in vacant acreage and
 Lower case denotes other discoveries.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
Hoover	Apache	03-Apr-02		Carnarvon	Oil
Exeter	Santos	14-Apr-02		Carnarvon	Oil
Casino	Santos	14-Sep-02		Otway	Gas
ENDYMION	Apache	11-Oct-02	Nov-02	Carnarvon	Gas
Ravensworth	BHP Billiton	22-Jul-03		Carnarvon	Oil
Crosby	BHP Billiton	09-Oct-03		Carnarvon	Oil

* Total depth date of discovery well

** Approximate, where available

NOTES:

MARLIN includes Turrum and North Turrum

KINGFISH includes WEST KINGFISH (produced Dec-82)

HALIBUT includes COBIA (produced Jun-79) and FORTESCUE (produced Sep-83)

MACKEREL includes SOUTH MACKEREL

Rankin includes ECHO/YODEL, Dockerell, Sculptor and Keast

GRIFFIN field was discovered by the Hilda 1A well, includes Ramillies

BLACKBACK field was discovered by the Hapuku 1 well

SALADIN includes YAMMADERRY

Macedon/Pyrenees field was discovered by the West Muiron 3 well

NORTH RANKIN includes PERSEUS, ATHENA, Capella, Perseus South and Searipple

Brewster includes Dinichthys, Gorgonichthys and Titanichthys

TALISMAN was abandoned in 1992

NORTH HERALD, SKUA and SOUTH PEPPER were abandoned in 1997

Appendix M 2002

Australian producing onshore oil and gas discoveries up to the end of 2002

APPENDIX M: AUSTRALIAN PRODUCING ONSHORE OIL AND GAS DISCOVERIES UP TO THE END OF 2002

The listing of a 'discovery' in this Appendix is a reflection of company classification and should not be interpreted as a finalised Geoscience Australia classification.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
Hospital Hill	Qld Government	17-Oct-1900	1900	Surat	Gas
Lakes Entrance	Lakes Entrance	01-Jul-1924	1930	Gippsland	Oil
Rough Range	WAPET	08-May-55	1955	Carnarvon	Oil
Timbury Hills	CSR	04-Apr-60	1961	Surat	Gas
Pickanjinie	AAO	12-Jul-60	1969	Bowen/Surat	Gas
Cabawin	Union Oil	26-Mar-61	1977	Bowen/Surat	Oil and Gas
Moonie	Union Oil	06-Dec-61	1964	Surat	Oil
Glentulloch	AAO	24-Dec-61	2001	Bowen	Gas
Westgrove	CSR	04-Jun-62	2002	Bowen	Gas
Sunnybank	AAO	01-Jan-63	1963	Bowen	Oil and Gas
Bony Creek	AAO	27-Mar-63	1969	Surat	Gas
Richmond	AAO	24-Aug-63	1969	Bowen/Surat	Oil and Gas
Myall Creek	Union Oil	20-Jan-64	2002	Bowen/Surat	Gas
Rolleston	Associated Freney	25-Jan-64	1990	Bowen	Gas
Gidgealpa	Delhi	10-Feb-64	1969	Cooper/Eromanga	Oil and Gas
Mereenie	Exoil	11-Feb-64	1984	Amadeus	Oil and Gas
Warooby South	AAO	27-Feb-64	1995	Surat	Gas
Blyth Creek	AAO	12-Mar-64	1993	Surat	Gas
Back Creek	Amalgamated Petroleum	24-Mar-64	1987	Bowen	Gas
Yardarino	WAPET	04-Jun-64	1978	Perth	Oil and Gas
Snake Creek	Amalgamated Petroleum	15-Jun-64	1969	Bowen	Oil and Gas
Beaufort	AAO	02-Jul-64	1984	Bowen/Surat	Gas
Duarran	AAO	02-Jul-64	1969	Surat	Oil and Gas
Alton	Union Oil	17-Jul-64	1966	Bowen/Surat	Oil
Yanalah	AAO	20-Jul-64	1970	Surat	Gas
Barrow Island	WAPET	04-Aug-64	1967	Carnarvon	Oil and Gas
Conloi	Union Oil	24-Aug-64	1966	Surat	Oil
Raslie	AAO	27-Sep-64	1969	Bowen/Surat	Gas
Gilmore	Phillips	24-Oct-64	1995	Adavale	Gas
Arcturus	Associated Freney	17-Nov-64	1990	Bowen	Gas
Merrimelia	Delhi	20-Nov-64	1983	Cooper	Oil and Gas
Lamen	CSR	28-Nov-64	1976	Surat	Gas
Pine Ridge	CSR	25-Jan-65	1965	Bowen/Surat	Gas
Oberina	Amalgamated Petroleum	04-Feb-65	1996	Surat	Gas
Trinidad	Amalgamated Petroleum	14-Feb-65	1965	Surat	Oil
Mount Horner	WAPET	22-Mar-65	1984	Perth	Oil
Anabranh	CSR	26-Mar-65	1965	Surat	Oil and Gas
Gingin	WAPET	31-Mar-65	1972	Perth	Gas
Hollyrood	CSR	08-Apr-65	1991	Surat	Gas
Major	Union Oil	20-Apr-65	1995	Bowen	Gas
Palm Valley	Magellan	01-May-65	1983	Amadeus	Gas
Maffra	CSR	14-Jun-65	1966	Surat	Oil and Gas
Bennett	Union Oil	18-Oct-65	1966	Surat	Oil
Nappacoongee	Delhi	06-Nov-65	2002	Cooper	Gas
Tarrawonga	Inter	07-Dec-65	1969	Bowen/Surat	Gas
Spencer	Delhi	30-Dec-65	1986	Eromanga	Oil

APPENDIX M (cont'd)

The listing of a 'discovery' in this Appendix is a reflection of company classification and should not be interpreted as a finalised Geoscience Australia classification.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
Leichhardt	Union Oil	22-Feb-66	1992	Surat	Oil and Gas
Moomba	Delhi	20-Apr-66	1969	Cooper/Eromanga	Oil
Lyndon Caves	CSR	28-May-66	1988	Surat	Gas
Dongara	WAPET	28-Jun-66	1971	Perth	Oil and Gas
Tubridgi	WAPET	08-Nov-66	1991	Carnarvon	Oil and Gas
Caroline	Alliance	29-Jan-67	1968	Otway	Gas
Pasco	WAPET	25-May-67	1972	Carnarvon	Oil and Gas
Wallumbilla South	CSR	12-Jun-67	1969	Bowen	Gas
Hope Creek	CSR	07-Oct-67	1971	Surat	Gas
Pringle Downs	CSR	15-Oct-67	1971	Bowen/Surat	Oil and Gas
Stakeyard	CSR	30-Nov-67	1995	Bowen	Gas
Daralingie	Delhi	10-Dec-67	1984	Cooper	Oil and Gas
Pleasant Hills	CSR	07-Nov-68	1969	Bowen/Surat	Gas
Mondarra	WAPET	25-Nov-68	1972	Perth	Gas
Grafton Range	CSR	22-Mar-69	1981	Surat	Gas
Toolachee	Delhi	22-Mar-69	1984	Cooper	Gas
Mooga	CSR	26-Jul-69	1976	Surat	Gas
Kincora	Union Oil	02-Dec-69	1977	Bowen/Surat	Oil and Gas
Boxleigh	Union Oil	03-Jun-70	1979	Bowen	Gas
Tirrawarra	Bridge	11-Jun-70	1983	Cooper	Oil and Gas
Packsaddle/Pondrinie	Alliance	12-Jun-70	1996	Cooper/Eromanga	Gas
Westlands	CSR	02-Aug-70	1993	Surat	Gas
Euthulla	CSR	10-Aug-70	1976	Bowen/Surat	Gas
Della	Pursuiy	16-Aug-70	1971	Cooper/Eromanga	Gas
Noorindoo	Union Oil	09-Oct-70	1970	Bowen	Oil and Gas
Strzelecki	Pursuiy	05-Dec-70	1982	Cooper/Eromanga	Oil and Gas
Mudrangie	Alliance	01-Jan-71	1985	Cooper	Gas
Moorari/Woolkina	Bridge	28-Feb-71	1983	Cooper/Eromanga	Oil and Gas
Walering	WAPET	10-Apr-71	1972	Perth	Gas
Coonatie	Flinders	05-Jul-71	1999	Cooper	Gas
Fly Lake	Delhi	15-Oct-71	1983	Cooper	Oil and Gas
Big Lake	Delhi	29-Dec-71	1972	Cooper/Eromanga	Oil and Gas
Epsilon	Delhi	03-Jan-72	1989	Cooper/Eromanga	Oil and Gas
Brumby	Delhi	06-Apr-72	1985	Cooper	Gas
Burke	Delhi	08-Aug-72	1982	Cooper	Gas
Dullingari	Delhi	06-Oct-72	1982	Cooper	Oil and Gas
Kanowana	Vamgas	08-Jan-73	1990	Cooper	Oil and Gas
Durham Downs	Delhi	01-Oct-73	1999	Cooper	Gas
Wolgolla	Delhi	01-Nov-73	2002	Cooper	Gas
Silver Springs/Renlim	Bridge	29-Jun-74	1978	Bowen	Gas
Karmona	Aust Aquitaine	01-Aug-76	1998	Cooper	Oil and Gas
Barrollka	Aust Aquitaine	05-Sep-76	2000	Cooper	Gas
Namur	Delhi	05-Nov-76	1979	Eromanga	Gas
Kidman	Delhi	15-Oct-77	1984	Cooper	Gas
Munkarie	Delhi	16-Feb-78	1985	Cooper	Gas
Mascotte	Jimilly	17-May-78	1982	Surat	Gas
Wackett	Delhi	20-Aug-78	1998	Cooper/Eromanga	Gas
Boggo Creek	Bridge	02-Sep-78	1978	Bowen	Oil
Parknook	BHP	27-Dec-78	1994	Bowen	Gas
Warroon	BHP	31-Aug-79	1994	Bowen	Oil and Gas
Dullingari North	Delhi	23-Sep-79	1982	Cooper/Eromanga	Gas
Beldene	Hartogen	23-Oct-79	1982	Bowen/Surat	Gas
Thomby Creek	Bridge	13-Nov-79	1979	Bowen	Oil

APPENDIX M (cont'd)

The listing of a 'discovery' in this Appendix is a reflection of company classification and should not be interpreted as a finalised Geoscience Australia classification.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
North Paaratte	Beach	21-Nov-79	1986	Otway	Gas
Cuttapirrie	Santos	12-Apr-80	1985	Cooper/Eromanga	Oil and Gas
Woodada	Hughes and Hughes	12-Jun-80	1982	Perth	Gas
Glen Fosslyn	Bridge	09-Jul-80	1994	Bowen	Oil and Gas
Newstead	Hartogen	14-Dec-80	1983	Bowen/Surat	Gas
Marabooka	Delhi	30-Jan-81	1982	Cooper/Eromanga	Oil and Gas
Mudera	Delhi	08-Mar-81	1992	Cooper	Gas
Wallaby Creek	Beach	29-Mar-81	1996	Otway	Gas
Yapeni	Delhi	25-Apr-81	1984	Cooper	Gas
Kerna	Delhi	30-Apr-81	1993	Cooper	Gas
McKinlay	Delhi	26-May-81	1985	Eromanga	Oil
Blina	Home	08-Jun-81	1983	Canning	Oil
Wantana	Delhi	18-Jun-81	2002	Cooper	Gas
Royston	Hartogen	20-Jul-81	1982	Surat	Gas
Riverslea	BHP	24-Aug-81	1981	Surat	Oil
Namarah	Hematite	08-Oct-81	1994	Bowen	Gas
Dilchee	Delhi	28-Oct-81	1993	Cooper	Gas
Avondale	AAR	10-Nov-81	1984	Surat	Oil and Gas
Wanara	Delhi	19-Nov-81	1989	Cooper	Gas
Waggamba	Bridge	20-Nov-81	1982	Bowen	Gas
Jackson	Delhi	14-Dec-81	1983	Eromanga	Oil
Merivale	AAR	02-Jan-82	1990	Bowen	Gas
Yellowbank	AAR	12-Feb-82	1990	Bowen	Gas
Newington	Hartogen	06-Apr-82	1989	Bowen	Gas
Jackson South	Delhi	06-Apr-82	1984	Eromanga	Oil
Jack Lake	Delhi	14-Apr-82	1996	Cooper	Gas
Yellowbank Creek	Bridge	15-Apr-82	1982	Bowen	Oil
Borah Creek	Hartogen	28-Apr-82	1982	Bowen/Surat	Oil and Gas
Sandy Creek	Hartogen	27-May-82	1982	Bowen/Surat	Oil and Gas
Sirrah	Bridge	08-Jun-82	1985	Bowen	Gas
Waratah	Hartogen	15-Jun-82	1983	Bowen	Oil and Gas
Yapunya	Hematite	01-Jul-82	1982	Bowen	Oil
Didgeridoo	Hartogen	13-Jul-82	1986	Surat	Gas
Punchbowl Gully	AAR	04-Aug-82	1992	Bowen	Gas
Cogoon River	Hartogen	16-Aug-82	1993	Surat	Gas
Andree/Leleptian	Delhi	23-Sep-82	1990	Cooper/Eromanga	Oil and Gas
Marana	Delhi	06-Oct-82	1987	Cooper	Gas
Sundown	Home	23-Nov-82	1983	Canning	Oil
Rakoona	Delhi	08-Dec-82	1988	Cooper	Gas
South Pepper	Mesa	12-Dec-82	1988	Carnarvon	Oil and Gas
Scotia	Oilmin	12-Jan-83	2002	Bowen	Gas
Springvale	CSR	23-Jan-83	1990	Bowen	Gas
Broadway	BHP	29-Apr-83	1992	Surat	Gas
North Herald	Mesa	19-Jun-83	1987	Carnarvon	Oil
Gunna	Delhi	29-Jul-83	1984	Eromanga	Oil
Chookoo	Delhi	30-Aug-83	1985	Eromanga	Oil and Gas
Narcoonowie	Delhi	21-Sep-83	1985	Eromanga	Oil
Nockatunga	Pancontinental	27-Sep-83	1984	Eromanga	Oil
Yambugle	Hartogen	11-Oct-83	1991	Bowen	Gas
Munkah	Delhi	27-Oct-83	1994	Cooper	Gas
Naccowlah South	Delhi	01-Nov-83	1984	Cooper/Eromanga	Oil and Gas
Wilson	Delhi	05-Nov-83	1984	Eromanga	Oil
Yarrabend	Hartogen	15-Nov-83	1985	Bowen/Surat	Gas

APPENDIX M (cont'd)

The listing of a 'discovery' in this Appendix is a reflection of company classification and should not be interpreted as a finalised Geoscience Australia classification.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
Tinpilla	Delhi	14-Dec-83	1984	Eromanga	Oil
Challum	Delhi	22-Dec-83	1985	Cooper/Eromanga	Oil and Gas
Naccowlah West	Delhi	22-Dec-83	1984	Eromanga	Oil
Sigma	Delhi	29-Dec-83	1985	Eromanga	Oil
Tintaburra	Hartogen	31-Dec-83	1984	Eromanga	Oil
Roswin	Bridge	07-Feb-84	1993	Bowen	Gas
Myrteville	CSR	26-Feb-84	1990	Bowen	Gas
Yanda	Delhi	11-Mar-84	1985	Cooper/Eromanga	Oil and Gas
Springton	CSR	08-May-84	1990	Bowen	Gas
Moorooloo	CSR	23-Jun-84	1991	Bowen	Gas
Bogala	Delhi	27-Jun-84	1984	Cooper/Eromanga	Oil and Gas
Bodalla South	Lasmo	27-Jun-84	1984	Eromanga	Oil
Bloodwood	Hartogen	28-Jun-84	1993	Bowen	Gas
Kerinna	Delhi	08-Jul-84	1985	Eromanga	Oil
Limestone Creek/Biala	Delhi	28-Jul-84	1985	Cooper/Eromanga	Oil
Talisman	Marathon	24-Aug-84	1989	Carnarvon	Oil
West Kora	Esso	27-Aug-84	1989	Canning	Oil
Naccowlah East	Delhi	28-Aug-84	1988	Cooper/Eromanga	Oil and Gas
Moolion	Delhi	19-Oct-84	2002	Cooper	Gas
Carbean	Hartogen	26-Oct-84	1985	Bowen/Surat	Gas
Berwick	Hartogen	11-Nov-84	1994	Bowen/Surat	Gas
Wancoocha	Delhi	17-Nov-84	1985	Cooper/Eromanga	Oil and Gas
Ballera	Delhi	27-Nov-84	1994	Cooper	Gas
Bookabourdie	Delhi	27-Nov-84	1985	Cooper/Eromanga	Oil and Gas
Baryulah	Delhi	05-Dec-84	2001	Cooper	Gas
Tickalara	Delhi	24-Dec-84	1985	Eromanga	Oil
Merrit	AAR	13-Jan-85	1988	Surat	Gas
Mayfield	AAR	25-Jan-85	1985	Surat	Gas
Ulandi	Delhi	03-Mar-85	1985	Cooper	Oil
Baratta	Delhi	09-Mar-85	1995	Cooper	Gas
Alwyn	Delhi	22-Mar-85	1985	Eromanga	Oil
Mooliampah	Delhi	07-Apr-85	1985	Eromanga	Oil
Muteroo	Delhi	21-Apr-85	1985	Eromanga	Oil
Lepena	Delhi	15-May-85	1987	Cooper	Gas
West Terrace	Home	28-May-85	1985	Canning	Oil
Koorooopa	Hartogen	01-Jun-85	1985	Eromanga	Oil
Watson South	Delhi	22-Jun-85	1985	Eromanga	Oil
Kenmore	Lasmo	26-Jun-85	1985	Eromanga	Oil
Jena	Delhi	04-Jul-85	1985	Cooper	Oil
Talgeberry	Hartogen	08-Jul-85	1985	Eromanga	Oil
Meranji	Delhi	12-Jul-85	1985	Cooper/Eromanga	Oil and Gas
Wippo	Delhi	31-Jul-85	2000	Cooper	Gas
Gooranie	Delhi	31-Jul-85	1987	Cooper	Gas
Koora	Pancontinental	01-Sep-85	1985	Eromanga	Oil
Washpool	Hartogen	07-Sep-85	1987	Bowen	Oil
Cook	Delhi	09-Sep-85	1985	Eromanga	Oil
Glenvale	Lasmo	16-Sep-85	1985	Eromanga	Oil
Nulla	Delhi	04-Oct-85	1999	Cooper	Gas
Fairymount	Sydney Oil	04-Oct-85	1985	Bowen	Oil
Louise	Bridge	13-Oct-85	1986	Bowen	Oil
Winna	Pancontinental	17-Oct-85	1985	Eromanga	Oil
Toobunyah	Hartogen	06-Nov-85	1985	Eromanga	Oil
Takyah	Hartogen	28-Nov-85	1986	Eromanga	Oil

APPENDIX M (cont'd)

The listing of a 'discovery' in this Appendix is a reflection of company classification and should not be interpreted as a finalised Geoscience Australia classification.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
McWhirter	Sunland	01-Dec-85	1985	Bowen	Oil
Watson	Delhi	15-Dec-85	1986	Eromanga	Oil
Skua	BHP	26-Dec-85	1991	Bonaparte	Oil and Gas
Deepwater	AAR	27-Dec-85	1988	Surat	Gas
Pira	Delhi	04-Jan-86	2000	Cooper	Gas
Ipundu	Hartogen	07-Jan-86	1986	Eromanga	Oil
Dirkala	Delhi	13-Feb-86	1986	Cooper/Eromanga	Oil and Gas
Garanjanie	Delhi	09-Mar-86	1990	Cooper	Gas
Black Stump	Lasmo	10-Mar-86	1986	Eromanga	Oil
Thungo	Pancontinental	15-Mar-86	1986	Cooper/Eromanga	Oil
Cowralli	Delhi	30-Mar-86	1997	Cooper	Gas
Kihee	Pancontinental	02-Apr-86	1986	Eromanga	Oil
Nanima	Delhi	13-Apr-86	1987	Eromanga	Gas
Taylor	Bridge	23-Apr-86	1988	Bowen	Oil and Gas
Nungeroo	Delhi	26-Apr-86	1986	Eromanga	Oil
Dilkera	Pancontinental	02-May-86	1989	Eromanga	Oil
Goyder	Delhi	16-May-86	1998	Cooper	Gas
Bimbaya	Santos	30-May-86	1988	Cooper	Gas
Narrows	Bridge	13-Jul-86	1986	Bowen	Oil
Okotoko	Delhi	04-Aug-86	1991	Cooper	Gas
Tennaperra	Delhi	08-Sep-86	1995	Eromanga	Oil
Tarwonga	Delhi	14-Oct-86	1991	Cooper	Gas
Merupa	Santos	04-Nov-86	1997	Cooper/Eromanga	Oil and Gas
Thurakinna	Delhi	04-Nov-86	1990	Cooper	Gas
Cooroo	Delhi	29-Nov-86	1987	Eromanga	Oil
Swan Lake	Santos	07-Dec-86	1997	Cooper	Gas
Mundi	Delhi	14-Dec-86	1991	Cooper	Gas
Cooroo North	Delhi	31-Dec-86	1987	Eromanga	Oil
Lake MacMillan	Delhi	14-Jan-87	2002	Cooper	Gas
Kurunda	Delhi	15-Jan-87	1989	Cooper	Gas
Toby	Delhi	31-Jan-87	1987	Cooper/Eromanga	Oil and Gas
Taylor South	Santos	10-Feb-87	1988	Cooper	Gas
Balcaminga	Santos	02-Apr-87	1999	Cooper	Gas
Maxwell	Pancontinental	06-Apr-87	1987	Eromanga	Oil
Wingnut	CSR	18-Apr-87	1988	Bowen/Surat	Gas
Cancon	CSR	06-May-87	1988	Surat	Gas
Dingera	Delhi	18-May-87	1988	Cooper/Eromanga	Oil and Gas
Mawson	Delhi	22-May-87	1987	Cooper/Eromanga	Oil and Gas
Keena	Delhi	20-Jun-87	1991	Cooper	Gas
Lloyd	Home	09-Jul-87	1987	Canning	Oil
Monler	Hartogen	15-Jul-87	1987	Eromanga	Oil
Waukatanna	Santos	17-Jul-87	1996	Cooper	Gas
Kanaloo	Hartogen	19-Jul-87	1987	Bowen/Surat	Gas
Deina	Santos	03-Aug-87	1988	Cooper	Gas
Kungarri	Hartogen	20-Aug-87	1989	Bowen	Gas
Pelican (Santos)	Santos	21-Sep-87	1989	Cooper	Oil
Cranstoun	Hartogen	02-Nov-87	1987	Eromanga	Oil
Karri	Delhi	05-Nov-87	1990	Cooper/Eromanga	Oil and Gas
Pintari North	Santos	10-Nov-87	1988	Eromanga	Oil
Judga	Delhi	26-Nov-87	1994	Cooper	Gas
Yuranigh	Hartogen	04-Dec-87	1989	Bowen	Gas
North Colgoon	Hartogen	20-Dec-87	1988	Surat	Gas
Katnook	Ultramar	31-Dec-87	1991	Otway	Gas

APPENDIX M (cont'd)

The listing of a 'discovery' in this Appendix is a reflection of company classification and should not be interpreted as a finalised Geoscience Australia classification.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
Pitchery	Delhi	21-Jan-88	1988	Eromanga	Oil
Walpanara	Hartogen	01-Feb-88	1991	Bowen	Gas
Munro	Delhi	01-Mar-88	1988	Cooper/Eromanga	Oil
Iona	Beach	17-Mar-88	1993	Otway	Gas
Natan	Delhi	20-Mar-88	1988	Eromanga	Oil
Massy	Santos	13-Apr-88	2000	Cooper	Gas
Narie	Santos	09-May-88	1990	Cooper	Oil and Gas
Kujani	Santos	09-May-88	1991	Cooper	Gas
Taloola	Santos	29-May-88	1988	Eromanga	Oil
Tarbat	Hartogen	15-Jun-88	1988	Eromanga	Oil
Sturt	Santos	06-Jul-88	1988	Cooper/Eromanga	Oil and Gas
Varanus	Santos	16-Jul-88	1991	Cooper	Gas
Tantanna	Santos	23-Jul-88	1989	Eromanga	Oil
James	Santos	07-Sep-88	1989	Cooper	Oil
Kirrilee	Santos	02-Nov-88	1991	Cooper	Gas
Arrakis	Santos	06-Nov-88	1992	Cooper/Eromanga	Gas
Kudrieke	Santos	15-Nov-88	2002	Cooper	Oil and Gas
Beechwood	Bridge	09-Dec-88	1992	Bowen	Gas
Tinker	Bridge	30-Dec-88	1993	Bowen	Gas
Mettika	Santos	02-Feb-89	1990	Cooper	Gas
Spencer West	Santos	10-Apr-89	1989	Eromanga	Oil
Marsilea	Santos	04-May-89	1990	Cooper	Gas
Amyema	Santos	27-May-89	1990	Cooper	Gas
Chinook/Scindian	BHP Billiton	27-Jun-89	1994	Carnarvon	Oil and Gas
Naccowlah	Delhi	15-Jul-89	1989	Eromanga	Oil
Gidgee	Delhi	31-Jul-89	1989	Eromanga	Oil
Pinaroo	Delhi	24-Aug-89	1989	Eromanga	Oil
Muthero	Command	25-Aug-89	1989	Eromanga	Oil
Wandilo	Delhi	07-Sep-89	1989	Eromanga	Oil
Maxwell South	Command	15-Sep-89	1990	Eromanga	Oil
Ipundu North	Ampol	22-Sep-89	1989	Eromanga	Oil
Corella	Delhi	22-Sep-89	1989	Eromanga	Oil
Endeavour	Ampol	06-Oct-89	1989	Eromanga	Oil
Orientos	Delhi	18-Dec-89	1990	Eromanga	Oil
Bowen	Delhi	29-Dec-89	1990	Eromanga	Oil
Pogona	Santos	23-Feb-90	1996	Cooper	Gas
North Yardanogo	Barrack	02-Mar-90	1990	Perth	Oil
Moolalla	Santos	15-Apr-90	1990	Cooper	Gas
Caraka	Santos	15-Apr-90	1990	Cooper	Gas
Beharra Springs	Barrack	05-May-90	1990	Perth	Gas
Bottletree	OCA	06-Jul-90	1991	Bowen	Gas
Alisma	Santos	26-Jul-90	1994	Cooper	Gas
Boundary	Petroleum Securities	16-Aug-90	1990	Canning	Oil
Malgoona	Santos	17-Aug-90	1990	Cooper	Oil and Gas
Rheims	Delhi	19-Aug-90	1990	Eromanga	Oil
Beranga South	OCA	24-Aug-90	1991	Bowen	Gas
Cogoon River West	OCA	10-Oct-90	1991	Surat	Oil
Jarrar	Delhi	16-Dec-90	1990	Eromanga	Oil
Bolan	Delhi	04-Jan-91	1991	Eromanga	Oil
Cooba	Santos	26-Mar-91	1991	Cooper	Gas
Echuburra	Delhi	01-Apr-91	1991	Eromanga	Oil
North Boxleigh	Bridge	20-Apr-91	1993	Bowen	Gas
Cowan	Santos	18-May-91	1995	Cooper	Gas

APPENDIX M (cont'd)

The listing of a 'discovery' in this Appendix is a reflection of company classification and should not be interpreted as a finalised Geoscience Australia classification.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
East Glen	Bridge	23-May-91	1993	Bowen	Gas
Wallawanny North	Delhi	06-Jun-91	1991	Eromanga	Oil
Patroclus	Delhi	21-Jun-91	1991	Cooper/Eromanga	Oil and Gas
Cooloon South	Santos	02-Jul-91	1992	Cooper	Gas
Wilga	OCA	15-Sep-91	1992	Bowen	Oil and Gas
Keleary	Santos	13-Oct-91	1991	Cooper	Oil
Martini	OCA	22-Nov-91	1992	Bowen	Oil and Gas
Genoa	Delhi	03-Jan-92	1992	Eromanga	Oil
Boongala	Santos	14-Jan-92	1993	Cooper	Gas
Gimboola	Ampolex	10-Jul-92	1992	Eromanga	Oil
Roswin North	Bridge	20-Jul-92	1993	Bowen	Gas
Farina	Santos	14-Sep-92	1993	Cooper	Gas
Wirrarie	Santos	01-Oct-92	1995	Cooper	Gas
Coopers Creek	Santos	11-Nov-92	1992	Cooper	Gas
Turkey Creek	AGL	16-Nov-92	1993	Bowen	Gas
Genoa North	Santos	16-Dec-92	1993	Eromanga	Oil
Glenloth	OCA	16-Jan-93	1995	Bowen	Gas
Stokes	Santos	14-Jun-93	1997	Cooper	Gas
Lark	Bridge	16-Jun-93	1994	Bowen	Gas
Costa	Santos	06-Jul-93	1995	Cooper	Gas
Mudlalee	Santos	30-Jul-93	1993	Eromanga	Oil
Snake Creek East	Santos	02-Oct-93	1994	Bowen/Surat	Gas
Bargie	OCA	11-Jan-94	1994	Eromanga	Oil
Crest	WAPET	06-Feb-94	1994	Carnarvon	Oil
Link	Bridge	17-Mar-94	1995	Bowen	Gas
Haselgrove	Sagasco	27-May-94	2000	Otway	Gas
Inland	Inland Oil	24-Jun-94	1995	Eromanga	Oil
Mylor	Bridge	27-Jun-94	1999	Otway	Oil and Gas
Caladan	Santos	30-Jul-94	1994	Cooper/Eromanga	Gas
Iliad	Santos	10-Aug-94	1994	Eromanga	Oil
Alkimos	Hadson	31-Aug-94	1994	Carnarvon	Oil and Gas
Ballera West	Santos	01-Sep-94	1997	Cooper	Gas
Telopea	Santos	13-Oct-94	1994	Cooper	Oil
Allambi	Santos	20-Oct-94	1995	Cooper	Gas
Caxton	OCA	24-Jan-95	1995	Bowen/Surat	Gas
Tarrawonga North	Santos	04-May-95	1995	Bowen/Surat	Gas
Tallerangie	Santos	25-May-95	2001	Cooper	Gas
Gahnia	Santos	04-Aug-95	1995	Cooper	Gas
Costa South	Santos	10-Aug-95	1996	Cooper	Gas
Koorroopa North	Santos	20-Sep-95	1996	Eromanga	Oil
Correa	Santos	06-Nov-95	1996	Cooper	Gas
New Royal	OCA	09-Nov-95	1995	Bowen	Oil and Gas
Pennie	Santos	01-Dec-95	1998	Cooper	Gas
Plantago	Santos	05-Dec-95	1998	Cooper	Gas
Yawa	Santos	21-Feb-96	1999	Cooper	Gas
Reg Sprigg	Santos	10-Jun-96	1996	Eromanga	Oil
Roti	Santos	03-Jul-96	2001	Cooper	Gas
Carmina	Santos	13-Sep-96	1996	Eromanga	Oil
Chiron	Santos	17-Sep-96	2001	Cooper	Oil and Gas
Bindah	Santos	10-Oct-96	2001	Cooper	Gas
Gudi	Santos	23-Oct-96	1998	Cooper	Gas
Stokes North	Santos	24-Oct-96	1999	Cooper	Gas
Beckler	Santos	30-Nov-96	1999	Cooper	Gas

APPENDIX M (cont'd)

The listing of a 'discovery' in this Appendix is a reflection of company classification and should not be interpreted as a finalised Geoscience Australia classification.

Discovery	Discovery operator	Discovered*	Produced**	Basin(s)	Type
Juno	Santos	09-Dec-96	2002	Cooper	Gas
Judga North	Santos	06-Jan-97	1997	Cooper	Gas
Merindal	Santos	16-Jan-97	1997	Cooper	Gas
Nephrite	Santos	18-Jan-97	1997	Cooper	Gas
Tarragon	Santos	23-Jan-97	1997	Eromanga	Oil
Koree South	Santos	10-Feb-97	1999	Cooper	Gas
Utopia	Oil Wells of Kentucky	24-Mar-97	1997	Eromanga	Oil
Weribone East	OCA	30-Mar-97	1998	Surat	Gas
Fenton Creek	Santos	04-Apr-97	1999	Otway	Gas
Riverside	OCA	13-Jun-97	1998	Surat	Gas
Nephrite South	Santos	19-Jun-97	1998	Cooper	Gas
Dorodillo	Santos	17-Jul-97	1997	Cooper	Gas
Hackett	Santos	18-Jul-97	2002	Cooper	Gas
Wippo South	Santos	01-Aug-97	2001	Cooper	Gas
Regatta	OCA	05-Aug-97	1998	Surat	Gas
Milluna	Santos	17-Aug-97	1998	Cooper	Gas
Costa Central	Santos	24-Oct-97	2001	Cooper	Gas
Vega	Santos	08-Nov-97	2002	Cooper	Gas
Cabernet	Santos	06-May-98	1998	Cooper	Gas
Digger	OCA	10-May-98	1998	Surat	Gas
Hera	Santos	30-Jun-98	2001	Cooper	Gas
Welcome Lake East	Santos	09-Sep-98	1999	Cooper	Gas
Moolion North	Santos	10-Sep-98	1998	Cooper	Gas
Moonanga	Santos	05-Nov-98	1999	Cooper	Gas
Verona	Santos	05-Nov-98	1999	Cooper	Gas
Yandina	OCA	14-Dec-98	2000	Bowen	Gas
Mica	Santos	22-Dec-98	1999	Cooper	Gas
Raven	Santos	13-Jan-99	1999	Cooper	Gas
Touriga	Santos	01-Feb-99	1999	Cooper	Gas
Windigo	Santos	30-Sep-99	2001	Cooper/Eromanga	Gas
Juno North	Santos	02-Dec-99	2001	Cooper	Gas
Wild Dog Road	Boral	22-Dec-99	2000	Otway	Gas
Penryn	Santos	19-Jan-00	2001	Otway	Gas
Tarrango	Santos	15-Jan-01	2001	Cooper/Eromanga	Gas
McIntee	Santos	22-Feb-01	2001	Otway	Gas
Tregony	Santos	15-Mar-01	2001	Otway	Gas
Moona	Santos	15-Mar-01	2001	Cooper/Eromanga	Gas
Quasar South	Santos	11-Apr-01	2002	Cooper/Eromanga	Gas
Croft	Santos	12-Apr-01	2002	Otway	Gas
Tellus	Santos	29-Apr-01	2001	Cooper/Eromanga	Gas
Naylor	Santos	17-May-01	2001	Otway	Gas
Wellington	Santos	18-Aug-01	2002	Cooper	Gas
Crowsnest	Santos	10-Oct-01	2002	Cooper/Eromanga	Gas
Hovea	Origin	13-Oct-01	2003	Perth	Oil
Quasar Southeast	Santos	12-Dec-01	2002	Cooper/Eromanga	Gas
Tellus South	Santos	11-Jan-02	2002	Cooper/Eromanga	Gas
Stokes Central	Santos	19-Feb-02	2002	Cooper/Eromanga	Gas

* Total depth date of discovery well

** Approximate, where available