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Oil and Gas Resources of Australia 2003

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. API gravity
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 AGSO.
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
Bbbl	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
cm	cubic metres
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 = 6.28981 million barrels
JPDA	Joint Petroleum Development Area
kbbl	thousands of barrels
kcm	thousand cubic metres
kL	kilolitre
km	kilometre
km^2	square kilometre
kPa	kiloPascals, a unit of pressure
LNG	liquefied natural gas
LPG	liquefied petroleum gas
m	metre
m^3	cubic metre
ML	megalitres = million litres
mm	millimetre
mRT	metres below rotary table
MW	megawatt
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	standard barrels
Tcf	trillion cubic feet = 10^{12} cubic feet
TJ	terajoule = 10^{12} joules
y	year
ZOCA	Australia–Indonesia Zone of Cooperation Area A (now JPDA)

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

1 barrel = 0.159 kilolitres

1 cubic foot = 0.283 cubic metres

1 PJ = 887.41 million cubic feet*

1 PJ of sales gas = 171.977 thousand barrels of oil equivalent*

1 tonne of LPG = 8.458 barrels of oil equivalent*

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* The values are approximate because the quality of any fuel varies with time, location, temperature, composition, etc.

Summary

Exploration 2003

Sixty-three offshore exploration wells were drilled in 2003, 17 wells more than in 2002 (46 wells) and four more than the number drilled in 2001 (59 wells). Offshore, 48 new-field wildcat wells and 15 extension/appraisal wells drilled resulted in six new-field discoveries, including those discoveries inferred from well logs and repeat formation tests. In 2003 new-field discoveries occurred in the:

- Carnarvon Basin at Crackling South, Crosby, Stybarrow (oil), Ginger (gas), Cyrano, Ravensworth (oil and gas);
- Gippsland Basin at Scallop (gas and minor oil).

Onshore 43 exploration wells were drilled in 2003, one well more than last year's level of 42 wells drilled. There were 31 new-field wildcat wells and 12 extension/appraisal wells drilled, resulting in 12 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 relinquishing in 1999 of Petroleum Exploration Licences 5 and 6 in South Australia, leading to the entry of new operators into the area. Focus continues on exploration drilling throughout the numerous production licences held in the South Australian part of the Cooper and Eromanga Basins. The drilling carried out by operators in the region during the year resulted in two oil discoveries and seven gas discoveries. Further oil and gas discoveries occurred in the Bowen and Surat Basin of Queensland at Overston 1 (gas) and Myall Creek East 1 (gas) and in the Perth Basin at Eremia 1 (oil).

In 2003, a total of 24 412 line km of 2D seismic surveys and 7554 km^2 of 3D seismic surveys took place in Australia. Offshore, 28 seismic surveys were carried out (27 completed) which collected 22 908 line km of 2D data and 7100 km^2 of 3D data. Onshore, there were 12 separate seismic surveys, which acquired 1504 line km of 2D data and 454 km^2 of 3D data.

Petroleum exploration expenditure in 2003 was $755 711 000 of which $615 211 000 was expended offshore and $140 500 000 onshore. Expenditure on development and production in 2003 was $3 071 154 000 of which $2 394 551 000 was offshore and $676 603 000 onshore.

Timor Gap Joint Petroleum Development Area (JPDA)

On 20 May 2002, the date of independence of the Democratic Republic of Timor Leste (Timor Leste), Australia and Timor Leste 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 Timor Leste 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.

The part of the Timor Sea subject to overlapping territorial claims by Australia and Timor Leste is called the Joint Petroleum Development Area (JPDA). 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. These fields are of major national interest to Australia, and revenue from them will support Timor Leste's future development.

The development of the JPDA Bayu-Undan field has commenced, with liquids revenue flowing in early 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 development and 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), provides the framework for negotiations between the Australian Government and the Timor Leste Government for the field to be developed as an integrated whole.

Reserves and resources

Most (608 of 981 GL or 3.8 of 6.2 Bbbl (billion barrels) 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.

There has been an overall increase in crude oil reserves and a reduction in condensate reserves for identified fields in the year to 1 January 2004. Oil reserves increases are predominantly due to the 'heavy' oil discoveries in the Carnarvon Basin. Production has been the main reason for the decline in condensate reserves, although revision of recent gas discoveries has led to a small downward movement in gas and condensate reserves.

The world reserves totals at the end of 2002 were 193 GL or 1213 Bbbl of crude oil and 5501 Tcf (trillion cubic feet) or 155 770 BCM of gas. The notable features are Australia's increased share of world gas reserves due to recent large discoveries on the North West Shelf and gas production secured by LNG exports from the North West Shelf. At the end of 2002, Australia ranked 30th and 13th in oil and gas reserves and 28th and 17th in oil and gas production.

Development

In September 2003, the Western Australian Government approved in-principle the restricted use of Barrow Island for the development of the Gorgon area gas fields. The Gorgon gas project revolves around the establishment of a Liquefied Natural Gas facility on Barrow Island. In April 2004, ChevronTexaco Australia Pty Ltd submitted to the Government the preliminary field development plan for the Gorgon gas field, as a precursor to an application for a Production Licence.

On 15 February 2004 the first condensate production was achieved from the Bayu-Undan gas recycle phase of the project, following the successful commissioning and start-up, and the first shipment of 54 ML or 340 000 bbl of condensate was completed on 30 March 2004.

Table S.1 Remaining commercial reserves at 1 January 2004 and estimates of reserves that have not yet been declared commercially viable (i.e. non-commercial) reserves

Commercial reserves			
Crude oil	**Condensate**	**Liquid petroleum gas**	**Sales gas**
(GL)	(GL)	(GL)	(BCM)
127.3	101.2	120.9	782.8
(million bbl)	(million bbl)	(million bbl)	(Tcf)
800	637	760	28
Non-commercial reserves			
Crude oil	**Condensate**	**Liquid petroleum gas**	**Sales gas**
(GL)	(GL)	(GL)	(BCM)
123.5	258.3	167.8	3138.0
(million bbl)	(million bbl)	(million bbl)	(Tcf)
777	1625	1056	111

The Yolla Field commenced construction in April 2003 and will be the first gas production from the Bass Basin, located in exploration permit T/RL1, 120 km offshore from Tasmania and 220 km south-east of Melbourne in a water depth of 80 m.

ROC Oil is progressing towards the development of the Cliff Head oil field, which 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.

In the Carnarvon Basin, Woodside is planning to drill additional subsea development wells into the Perseus field. The wells will be drilled in the southern and western parts of the Perseus field to drain reservoir layers not directly drained by the Perseus wells drilled from the North Rankin A platform. The first phase of this development will involve the drilling of three wells tied back to the Goodwyn A platform via a 16-inch pipeline.

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, and the development was approved by the Woodside Board in March 2004.

The Enfield oil field is located approximately 16 km north of the northermost part of Ningaloo Reef in exploration permit WA-271-P in the offshore Carnarvon Basin. The development comprises subsea wells tied back with flowlines to a floating production, storage and offloading facility (FPSO) of double-hulled construction, disconnectable mooring, its own propulsion system to allow it to evade tropical cyclones, and a storage capacity of approximately 143 000 m^3 (900 000 bbl). The FPSO will 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.

On 9 June 2003 Woodside submitted a Preliminary Development Concept to the Government as a precursor to an application for production licenses over the Geographe and Thylacine gas fields. The Geographe and Thylacine gas fields are in exploration permits

VIC/P43 and T/30P respectively, about 55 and 70 km south, respectively, of Port Campbell, Victoria, in water depths of 80–100 m. The Otway Gas Project involves the initial expenditure of A$810 million for the development of the Thylacine gas field. The Geographe gas field will be connected to the main offshore pipeline about 2–3 years after Thylacine comes into production.

In February 2004 Santos announced that expenditure had been approved for the completion by the end of 2004 of Front End Engineering and Design studies and regulatory approvals for the Casino field development. Pending a final investment decision, the first gas from the Casino field is scheduled in first quarter of 2006.

The production licences over the Mutineer and Exeter oil fields were granted. The fields are located in the northern part of the Dampier Sub-basin of the Carnarvon Basin in Western Australia, in water depths ranging from 140 m to 160 m. The field life is estimated at 7–12 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.

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 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. First Gas is targeted for early 2005.

Production

Table S.2 Daily petroleum production rates in 2003

Crude oil plus condensate		Gas	
ML/d	90.3	million m^3/d	97.2
bbl/d	567 000	BCF/d	3.4

Estimates, by Geoscience Australia, of future crude oil plus condensate production suggest production in 2005 at between about 78.0 ML/d or 490 700 bbl/d and 107.3 ML/d or 674 700 bbl/d and a decline to between about 25.0 ML/d or 157 100 bbl/d and 54.2 ML/d or 341 000 bbl/d in 2025.

Sufficiency

Crude oil and condensate remaining reserves at the end of 2003 could sustain production of 33.4 GL or 210 million bbl per year for 13 years. This average production level was calculated for the period 1993–2003. The projected consumption of crude oil and condensate in 2004 could be sustained by remaining economic reserves for only 9.3 years.

1: Exploration 2003

1.1 Exploration drilling, seismic surveys, expenditure and discoveries

In 2003, 106 exploration wells were drilled (88 in 2002). These consisted of:

		2003
Onshore	New-field wildcats	31
	Extension/appraisal	12
Offshore	New-field wildcats	48
	Extension/appraisal	15

Total exploration metres drilled in 2003 were 155 552 m (123 568 m in 2002) (Appendix A).

Seismic surveys

In 2003, 24 412 line km of 2D seismic data were recorded (26 959 km in 2002) and 7 554 km^2 of 3D data were also acquired (7 532 km^2 in 2002). Onshore, 1 504 line km of 2D data and 454 km^2 of 3D data were acquired. Offshore, 22 908 line km of 2D data and 7 100 km^2 of 3D data were collected. The 2003 level of seismic survey acquisition in Australia is generally less than the level of acquisition in 2002 except for an increase of about 13 per cent in offshore 3D seismic survey data (Table 1.1). The 2003 onshore levels, particularly 3D acquisition (454 km^2) is substantially below previous years (see Appendix B). 2D onshore acquisition also remains at a low level compared with the amount of data acquired over the last ten years. Offshore acquisition, both 2D and 3D, is also at low levels compared with the amount of data acquired over the last 10 years. Offshore 2D acquisition is at its lowest level for over a decade, and 3D acquisition is not much greater than in 2002, which itself was a low year.

Offshore 28 surveys were conducted (27 completed) during 2003. This was a decrease from 2002 when 30 surveys were conducted and a decrease from 2001 when 37 surveys were conducted. Of the 28 surveys, 8 were 3D surveys and 20 were 2D surveys. A large offshore 3D survey in the Carnarvon Basin of Western Australia continued through to 2004. In 2003, four operators acquired survey data (Western Geco — five surveys; PGS — six surveys; Multiwave Geophysical — two surveys; Veritas — 15 surveys). Most of the offshore seismic survey acquisitions were carried out on the North West Shelf of Australia (Carnarvon, Browse and Bonaparte Basins), including the Timor Sea; in the Perth Basin; and, to a lesser extent, in the Duntroon Basin off southern Australia and in the Gippsland, Sorell and Otway Basins of south-east Australia.

Onshore, 12 separate seismic surveys were carried out and completed in 2003, a decrease from the 28 surveys completed in 2002 and the 22 completed during 2001. Of these 12 seismic surveys, nine 2D surveys and three 3D surveys were completed. During 2003, Trace and Velseis were the main onshore contractors, completing 11 and one survey respectively.

Several different operating companies acquired seismic data onshore during 2003, with Santos in the Cooper and Bowen Basins, Beach Petroleum in the Cooper and Cooper/Eromanga Basins, BNG and Mozaic in the Surat Basin, NSW Department of Mines in the Darling Basin and Essential Petroleum in the Otway Basin. Seismic survey activity in 2003 is summarised in Appendix B.

Expenditure

Petroleum exploration expenditure incurred in 2003 was $755 711 000 of which $140 500 000 was onshore and $615 211 000 was offshore. Petroleum development and production expenditure incurred by operators in 2003 was $676 603 000 onshore and $2 394 551 000 offshore. Exploration, development and production expenditure incurred in the Joint Petroleum Development Area (JPDA, 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 2003.

Note that the Northern Territory administers the Commonwealth Territory of Ashmore and Cartier Islands — for petroleum purposes — under an agency agreement with the Commonwealth. Expenditure in this area is listed separately from other waters administered by the Australian Government and Northern Territory Government.

Table 1.1 Seismic survey acquisition 2002–2003

	Onshore		Offshore		Total	
Year	2D line km	3D km^2	2D line km	3D km^2	Line km	km^2
2002	3387	1237	23 572	6294	26 959	7532
2003	1504	454	22 908	7100	24 412	7554

Offshore drilling 2003

The level of offshore exploration drilling activity in 2003 (63 wells drilled) is above the average level (56 wells drilled) over the last ten years, and 17 wells more than the 46 wells drilled in 2002 (Figure 1.1). Offshore drilling in 2003 accounted for 48 new-field wildcat wells and 15 extension or appraisal wells (see Appendices A, F and G). Drilling was undertaken in 2003 in the Bonaparte, Browse, Carnarvon, Gippsland, Great Australian Bight, Otway and Perth Basins.

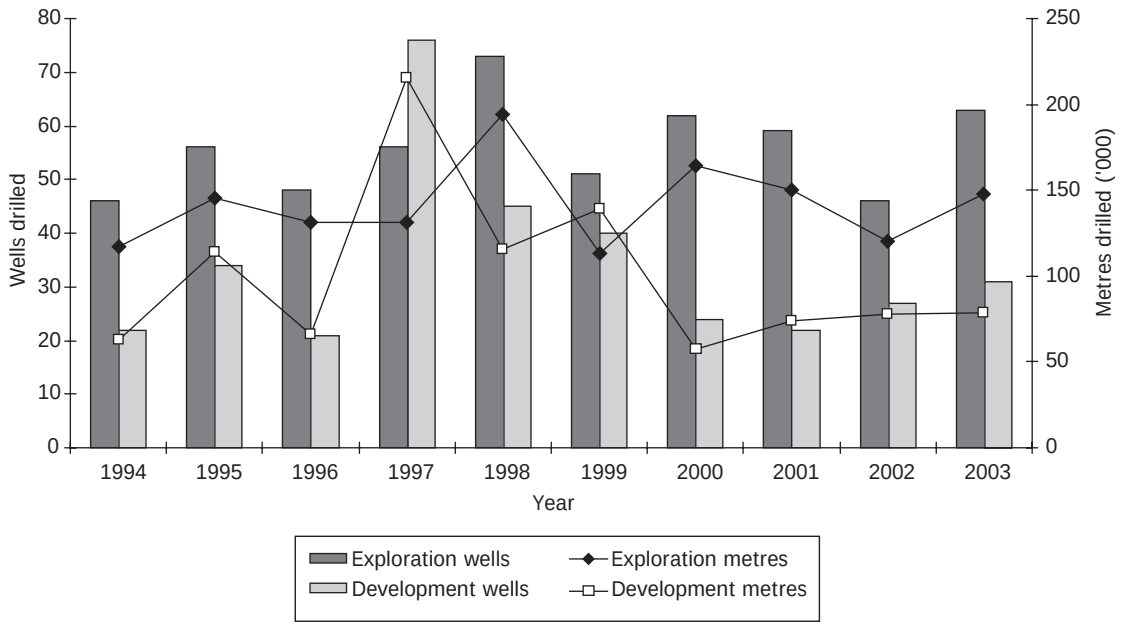

Figure 1.1 Wells and metres drilled offshore 1992–2003

Offshore discoveries 2003

There were seven new-field wildcat discoveries in 2003 compared to the record level of 23 offshore discoveries in 2000, 12 new-field wildcat discoveries in 2001 and 11 new-field discoveries in 2002. The 2003 discoveries (Figure 1.2) consisted of three oil, one gas and three oil and gas discoveries, and include those discoveries inferred from well logs and wireline formation testing. 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:

- Carnarvon Basin at Crackling South, Crosby, Stybarrow (oil), Ginger (gas), Cyrano, Ravensworth (oil and gas);
- Gippsland Basin at Scallop (gas and minor oil).

In the Carnarvon Basin, the Stybarrow, Ravensworth and Crosby discoveries were drilled in permits surrounding the Vincent and Enfield oil fields. The Crosby 1 well, drilled in permit WA-12-R to the south-east of Vincent and Enfield oil fields and to the north-west of Macedon and Pyrenees oil fields, may have discovered estimated reserves of over 100 million bbl, according to publicly available sources. The Stybarrow well, drilled in permit WA-255-P, encountered a 23 m oil column. The Ravensworth 1 well, drilled to the west of Crosby 1 in permit WA-155-P, intersected a 37 m net oil column and a 7 m net gas column. Further appraisal drilling of these discoveries is planned, to ascertain the existence of substantial oil reserves in the area.

In the Gippsland Basin the Scallop 1 well was drilled in permit VIC/RL2 in early 2003. Logs indicated the well encountered gas and oil in the Golden Beach Group. The well was subsequently plugged and abandoned.

Figure 1.2 Location of discoveries in 2003 (refer to Appendix C)

Onshore drilling 2003

In 2003, 43 onshore petroleum exploration wells were drilled (Figure 1.3). Of these, 31 were new-field wildcat wells and 12 were extension/appraisal wells (see Appendices A, F and G). Drilling was undertaken in the following basins: Bowen (1 well), Carnarvon (1 well), Cooper (6 wells), Cooper/Eromanga (18 wells), Eromanga (2 wells), Gippsland (2 wells), Maryborough (2 wells), Otway (3 wells), Perth (3 wells) and Surat (5 wells).

Onshore exploration drilling accounted for 12 new discoveries. Most of the success has been in the Cooper and Eromanga Basins of South Australia and Queensland. A list of discoveries made during the year and other relevant information appears in Appendix C.

Similarly to last year, exploration drilling in the Cooper and Eromanga Basins continued to be driven by the relinquishing in 1999 of Petroleum Exploration Licences 5 and 6 in South Australia, allowing new operators into the area. The drilling by the new operators in the region during the year has resulted in two new oilfields being discovered at Worrior and Christies, and three gas discoveries at Carrickalinga, Overston and Kiwi. Other discoveries were made by Santos at Chinook (gas), Kinta (gas), Mulberry (oil), Pelican (gas) and Surlow (gas).

There was one Bowen Basin gas discovery at Overston 1 which has been cased and suspended for future gas production. The Eremia 1 discovery well drilled in the Perth Basin has been cased and suspended as an oil producer. Logs indicated oil in the Dongara Sandstone. In the Surat Basin, Myall Creek East 1 has been cased and suspended as a gas producer. Logs detected gas in the Black Alley Shale, Rewan Group and the Tinowon Formation.

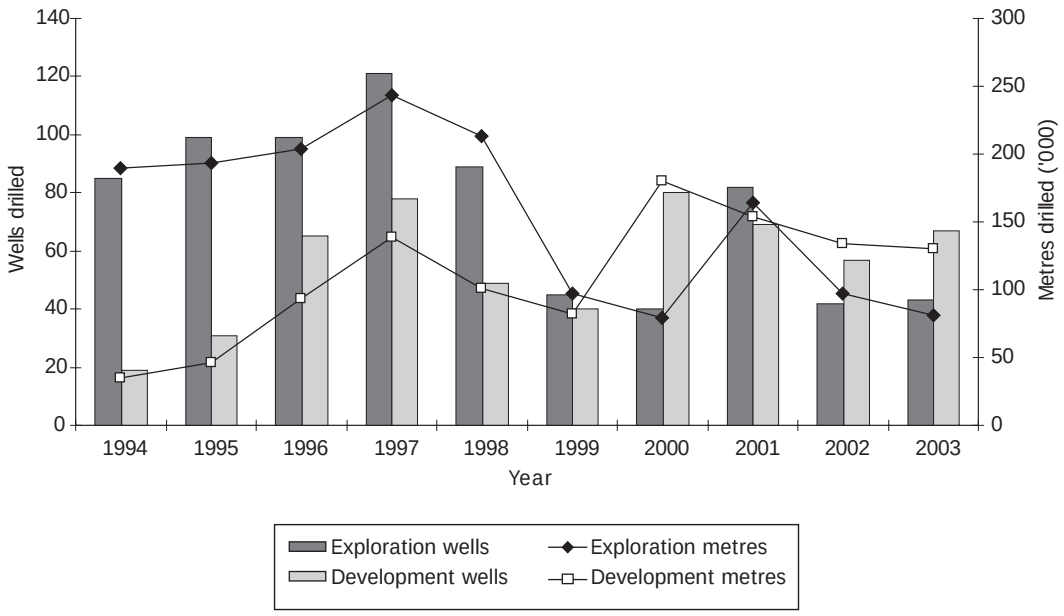

Figure 1.3 Wells and metres drilled onshore 1992–2003

1.2 Rig activity 2003

At the end of December 2003 there were 17 active rigs onshore and offshore (Figures 1.4, 1.5), four more than at the end of 2002. Twelve of the available onshore rigs were active and all seven of the offshore rigs were engaged or in the process of mobilising.

Onshore, the number of active rigs varied throughout the year between four and 12. The year commenced with nine rigs active, predominantly in the Cooper and Eromanga Basins and also in the Bowen, Gippsland, Otway and Perth Basins. By the end of the year, rig activity had risen to 12 rigs active, from only four rigs active mid-year. At the end of the December quarter, the 12 active rigs were engaged in drilling in the Cooper/Eromanga Basins , Bowen/Surat Basins, Surat and Eromanga Basins.

Offshore, rig activity varied between five and six rigs active throughout 2003. The year commenced with six rigs active working in the Bonaparte, Browse, Carnarvon, Gippsland, Otway and Perth Basins. In December, five rigs were active, undertaking drilling operations in the Bonaparte, Browse, Carnarvon, Gippsland and Otway Basins. At the end of 2003, drilling operations were continuing in Bonaparte, Browse, Gippsland and Otway Basins.

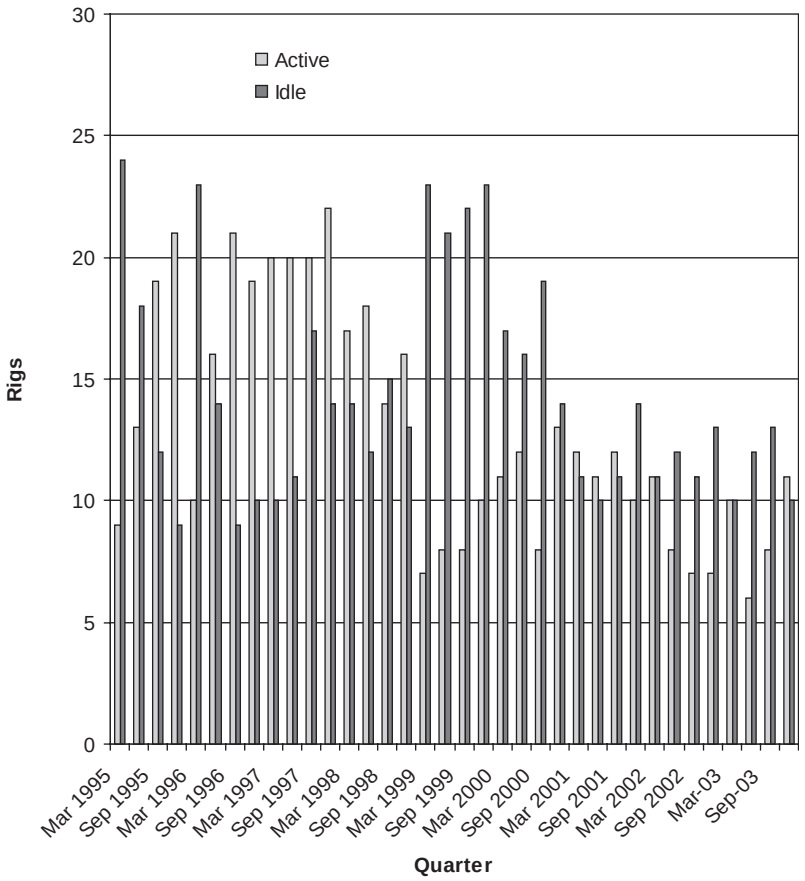

Figure 1.4 Onshore drilling rig activity 1995–2003

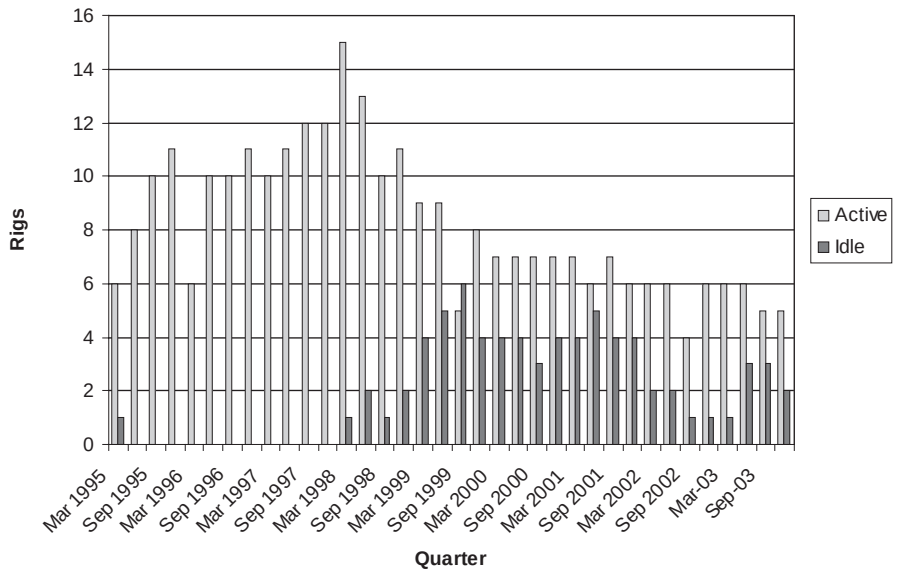

Figure 1.5 Offshore drilling rig activity 1995–2003

1.3 Petroleum permits, leases and licences

At the end of 2003, petroleum permits, leases and licences in force or pending renewal both onshore and offshore in Australia covered about 1 511 031 km^2 (1 402 168 km^2 in 2003) including the Joint Petroleum Development Area (JPDA). The onshore titles comprised about 844 162 km^2 (827 538 km^2 in 2003) and the offshore titles comprised about 666 869 km^2 (574 630 km^2 in 2003).

Onshore, exploration permits covered an area of 804 380 km^2 (797 050 km^2 in 2003), production licences were in force over an area of 38 826 km^2 (29 857 km^2 in 2003) and retention leases covered an area of 956 km^2 (631 km^2 in 2003).

Offshore, exploration permits covered an area of 634 800 km^2 (574 630 km^2 in 2003), production licences were in force over an area of 13 836 km^2 (13 369 km^2 in 2003) and retention leases covered an area of 18 233 km^2 (8264 km^2 in 2003).

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 1990 to 2003. No assumptions have been made as to whether a 'discovery' has proved or will eventually prove to be commercial. Geoscience Australia 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 1989–2003

	Success rate			Percentage success rate		
Year	Onshore	Offshore	Combined	Onshore	Offshore	Combined
1989	1:2.8	1:3.1	1:2.9	36.4	32.4	34.8
1990	1:2.9	1:4.4	1:3.4	34.9	22.6	29.3
1991	1:2.5	1:6.2	1:3.2	40.3	16.2	31.7
1992	1:3.5	1:4.3	1:3.8	28.3	23.3	26.5
1993	1:2.6	1:3.5	1:2.9	39.1	28.9	34.5
1994	1:1.7	1:3.6	1:2.1	57.6	28.1	47.3
1995	1:2.5	1:3.7	1:2.8	40.7	27.0	35.4
1996	1:2.5	1:2.7	1:2.6	40.3	36.8	39.1
1997	1:1.9	1:3.6	1:2.1	54.0	28.1	47.1
1998	1:2.1	1:4.1	1:2.8	46.6	24.2	36.3
1999	1:2.2	1:3.7	1:3.0	44.8	27.1	33.8
2000	1:2.9	1:2.3	1:2.4	34.8	43.9	41.3
2001	1:1.7	1:3.8	1:2.4	59.6	26.0	42.3
2002	1:2.7	1:2.8	1:2.8	37.0	35.7	35.7
2003	1:2.6	1:6.9	1:4.2	38.5	14.5	23.8

1.5 Release of offshore petroleum exploration areas

In Commonwealth waters (three nautical miles beyond the territorial sea baseline), Australian offshore petroleum exploration acreage is made available to the petroleum industry under a work-program bidding system. Permits are initially awarded for a term of six years. The first three years of a permit term constitutes the minimum guaranteed work program. Subsequent years (permit years 4 to 6) constitute a secondary work program which is guaranteed on a year by year basis. Offshore areas are released annually by the Australian Government in two tranches, with closing dates for bids approximately six and twelve months from the date of release. The first closing generally includes mature to sub-mature acreage (relatively well explored) 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 greater lead-times 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* which accompany the promotional material associated with the annual release of acreage. The guidelines can also be accessed by following the legislation–guideline link at: www.industry.gov.au/petexp (or accessed directly from www.industry.gov.au/petlegislation).

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

In mature, relatively well explored sedimentary basins, release areas are generally restricted to a maximum of eight graticular blocks (approximately 640 km^2) in size. In the less well explored, frontier basins, release areas generally have a maximum size of 80 graticular blocks (approximately 6400 km^2). The maximum preferred sizes of release areas in immature and sub-mature sedimentary basins are 40 and 20 graticular blocks, respectively.

In 1999, the Government implemented an Acreage Re-release Program to allow exploration companies to retain 'good standing' in the event of a default in work-program conditions in a permit. These arrangements require a defaulting company to spend the agreed value of any outstanding work 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.

In early 2004, as part of the 2004–2005 Budget, the Australian Government announced the introduction of a taxation incentive designed to encourage petroleum exploration in Australia's remote offshore areas. The Government will increase the value of deductible pre-appraisal exploration expenditures incurred in designated offshore frontier areas by 50% for the determination of petroleum resource rent tax (PRRT). This 150% uplift applies to the initial term of the exploration permit awarded over a Designated Frontier Area.

The legislative amendments to provide for the 150% uplift have yet to be implemented (February 2005).

This new incentive to promote exploration of Australia's frontier offshore areas applies to the annual offshore acreage releases for 2004 through to 2008. Up to 20% of the areas offered each year under the annual offshore Acreage Release Program can be designated as frontier acreage, eligible for this new taxation incentive, although Designated Frontier Areas must be at least 100 km from an existing commercialised oil discovery and will not be adjacent to an area designated in the previous year's Acreage Release Program. In the 2004 Acreage Release Program, six frontier, offshore areas are eligible for the new 150% uplift on PRRT.

Final results of the 2002 offshore Acreage Release Program

In 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 of 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.

Table 1.3 Offshore exploration permits awarded from the 2002 Acreage Release Program

Release area	Basin / Sub-basin	Awarded as exploration permit	Operator	Indicative expenditure in permit years 1–3 ($A)
T02-1	Otway	T/34P	Woodside	$40 000 000
T02-2	Otway	T/35P	Santos	$3 000 000
V02-2	Gippsland	VIC/P54	Liberty	$38 200 000
V02-3	Gippsland	VIC/P55	Basin Oil	$700 000
V02-4	Gippsland	VIC/P56	Nexus Energy	$11 550 000
W02-7	Carnarvon/Exmouth Plateau	WA-348-P	Woodside	$2 480 000
W02-8	Carnarvon/Exmouth Plateau	WA-347-P	Woodside	$2 460 000
W02-10	Carnarvon/Exmouth Plateau	WA-346-P	BHP Billiton	$4 040 000
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	NT/P65	National Oil & Gas	$1 700 000
NT02-4	Bonaparte/Petrel	NT/P66	Nexus Energy	$17 550 000
NT02-5	Bonaparte/Petrel	NT/P67	Santos	$500 000

In the previous issue of *Oil and Gas Resources of Australia* (OGRA 2002), four of the 41 areas offered to industry in 2002 had been awarded as exploration permits. Results of the 2002 Acreage Release Program have now been finalised (Table 1.3).

Of the 41 offshore areas offered to the petroleum industry in 2002, 14 were awarded as exploration permits, giving an annual take-up rate of 34%. This take-up rate shows a decline from that observed in the previous year (43%), but is significantly greater than the take-up rate for offshore acreage released in 2000 (19%) (Figure 1.6).

Fifteen frontier exploration areas in the Roebuck, Arafura/Money Shoal and Bight Basins were offered in 2002. None of these areas received a successful bid.

Twenty of the 41 offshore areas released in 2002 were located either entirely or predominantly in deepwater parts (>400 m water depth) of the Roebuck, Otway, Bight and Carnarvon Basins. Six of these deepwater areas (Area W02-15, Exmouth Sub-basin; Areas W02-7, 8 & 10, Exmouth Plateau; Areas T02-1 & 2, Otway Basin) have been awarded as exploration permits (Table 1.3).

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 (three graticular blocks) was re-released, with a closing date for bids coinciding with the closing date for the second tranche of acreage offered in 2002. Area W02-14 attracted a single bid on re-release and was awarded as exploration permit WA-345-P (Table 1.4).

Table 1.4 Offshore exploration permits awarded from re-released areas from the 2002 Acreage Release Program

Re-released area	Basin/Sub-basin	Awarded as exploration permit	Operator	Indicative expenditure in permit years 1–3 ($A)
W02-14	Carnarvon/Barrow	WA-345-P	OMV	$350 000
AC02-1	Bonaparte/Vulcan	AC/P33	Natural Gas Corp	$1 650 000
S02-6	Otway	EPP 33	Kerr-McGee	$2 700 000
S02-7	Otway	EPP 34	United Oil & Gas	$1 900 000

A second release area included in the first tranche of acreage for 2002 (Area AC02-1, Vulcan Sub-basin) received two unsuccessful bids and was also re-released. This area has now been awarded as exploration permit AC/P33.

Two areas in the Otway Basin were awarded as exploration permits from the 22 areas re-released from the second closing of the 2002 Acreage Release Program (Table 1.4).

2003 offshore Acreage Release Program

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

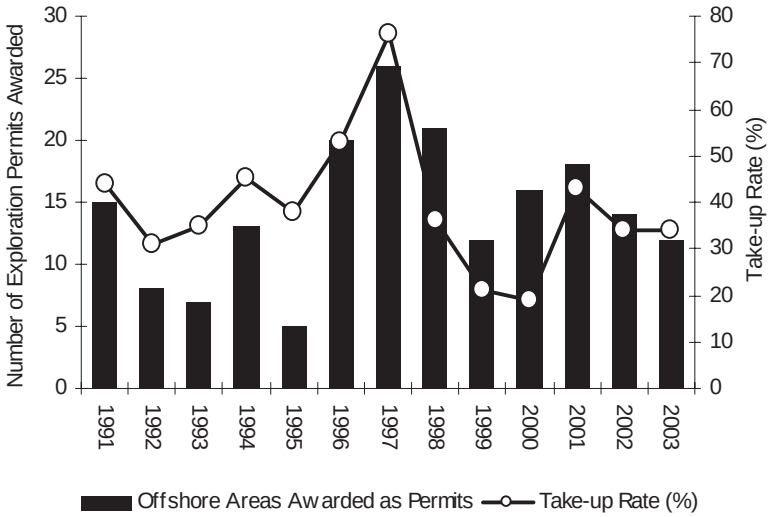

Figure 1.6 Number of offshore exploration permits awarded and annual take-up rates of offshore exploration areas from offshore Acreage Release Programs, 1991 to 2003

Table 1.5 Offshore exploration permits awarded from the 2003 Acreage Release Program

Release area	Basin/Sub-basin	Awarded as exploration permit	Operator	Indicative expenditure in permit years 1–3 ($A)
T03-4	Sorell	T/36P	Santos	$2 100 000
W03-14	Perth/Edel Sub-basin	WA-349-P	Chimelle Petroleum	$700 000
W03-9	Carnarvon/Dampier Sub-basin	WA-352-P	Drillsearch Energy	$475 000
W03-7	Carnarvon/Rankin Platform	WA-350-P	Woodside	$21 600 000
W03-4	Carnarvon/Exmouth Plateau	WA-353-P	Woodside	$2 690 000
W03-10	Carnarvon/Exmouth Plateau	WA-351-P	BHPBilliton	$1 400 000
NT03-3	Bonaparte/Malita Graben	NT/P68	TSP Arafura	$1 700 000
AC03-2	Bonaparte/Vulcan Sub-basin	AC/P34	Coogee Resources	$18 000 000
V03-1	Gippsland	VIC/P57	3D Oil	$6 085 000
V03-2	Gippsland	**To be announced**		
V03-3	Gippsland	**To be announced**		
V03-4	Gippsland	**To be announced**		

As in previous releases of offshore acreage, a wide range of acreages was made available. Of the 35 areas offered in 2003, 21 (60%) were on the North West Shelf. Seven release areas (20%) are classified as frontier while 13 (37%) comprise predominately deepwater acreage.

The closing date for bids for the first tranche of acreage (18 areas) was 25 September 2003. Bids for areas included in the second tranche (17 areas) closed on 25 March 2004. At date of writing, nine of the areas offered in the 2003 Acreage Release Program had been awarded as permits (Table 1.5).

Results of bidding on three areas offered in the Gippsland Basin (V03-2, 3 & 4) are yet to be announced. Preliminary results from the 2003 Acreage Release Program indicate that the rate of acreage take-up in 2003 is similar to rate in the preceding year Figure 1.6).

2003 offshore Acreage Re-release Program

In 2003, of the 18 areas offered in the first tranche of acreage, nine failed to attract a bid. These areas were included in the first Re-release Program for that year, with the closing date for bidding coinciding with the second closing of the 2003 Acreage Release Program. None of the nine areas offered as part of this first Re-release Program for 2003 attracted a bid.

A further 13 areas from the second tranche of acreage offered in 2003 failed to attract bids and were re-released, with bids closing in March 2004. None of the 13 areas re-released from the second tranche attracted a bid.

2004 offshore Acreage Release Program

In late March 2004, 31 offshore areas were offered to the petroleum industry as part of the 2004 offshore Acreage Release Program (Table 1.6). Acreage was made available for bidding in two tranches, with bids closing on 30 September 2004 (11 areas) and 31 March 2005 (20 areas).

Table 1.6 2004 Offshore Acreage Release Program

Release area	Basin/Sub-basin	Water depth (m)	Approx. size (km^2)
V04-1*	Otway Basin	<200–800	1905
V04-2	Otway / Torquay Sub-basin	<200	4630
T04-1*	Otway Basin	<200–1300	3105
T04-2	Bass / Durroon Sub-basin	<200	2805
T04-3	Bass / Durroon Sub-basin	<200	3060
T04-4	Bass / Durroon Sub-basin	<200	3060
T04-5+	Sorell / Port Davey Sub-basin	<200–2200	6145
W04-1	Bonaparte / Londonderry High	<200	1710
W04-2+	Carnarvon / Exmouth Plateau	800–2200	6740
W04-3	Carnarvon / Exmouth Plateau	700–1800	6500
W04-4+	Carnarvon / Exmouth Plateau	800–3000	5725
W04-5	Carnarvon / Exmouth Plateau	700–2000	5725
W04-6*	Carnarvon / Rankin Platform	<200–400	1210
W04-7*	Carnarvon / Rankin Platform	<200–700	1205
W04-8*	Carnarvon / Rankin Platform	<200–1000	1205
W04-9*	Carnarvon / Rankin Platform	<200–500	960
W04-10*	Carnarvon / Rankin Platform	<200–400	320
W04-11*	Carnarvon / Barrow Sub-basin	<200	80
W04-12*	Carnarvon / Barrow Sub-basin	200–700	955
W04-13*	Carnarvon / Barrow Sub-basin	<200–350	475
W04-14*	Carnarvon / Exmouth Sub-basin	200–500	475
W04-15+	Perth / Houtman Sub-basin	200–2000	5930
W04-16+	Perth / Houtman Sub-basin	200–2000	5960
W04-17	Perth / Vlaming Sub-basin	<200	1875
AC04-1	Bonaparte / Vulcan Sub-basin	<200–500	3430
AC04-2	Bonaparte / Vulcan Sub-basin	200–500	3410
AC04-3	Northern Browse Basin	300–500	4100
AC04-4	Northern Browse Basin	<200–300	4415
NT04-1	Northern Bonaparte Basin	<200–500	4865
NT04-2	Northern Bonaparte Basin	200–500	6960
NT04-3+	Northern Bonaparte Basin	<200–400	7700

* Area closed for bidding on 30 September 2004. (All other areas close for bidding on 31 March 2005.)
+ Area eligible for 150% uplift of pre-appraisal exploration expenditure towards PRRT projects.

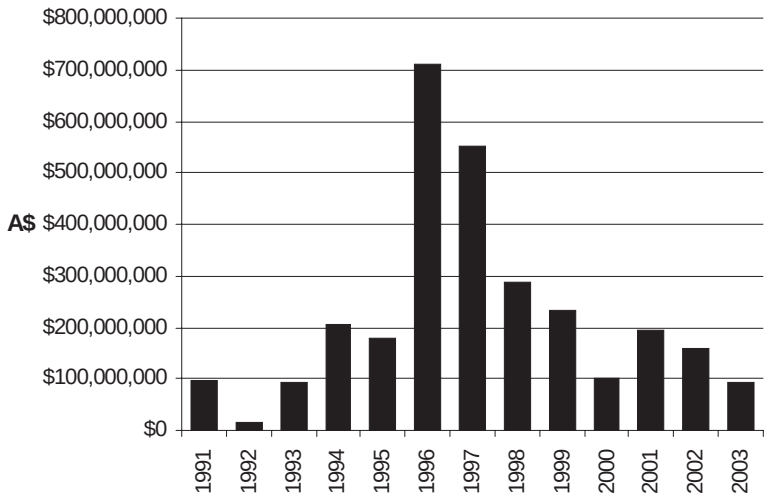

Figure 1.7 Total indicative expenditure in primary work programs (first three permit years) for offshore exploration permits awarded from offshore Acreage Release Programs, 1991 to 2003

Notes: 1. Excludes data from the JPDA, state waters and the former ZOCA.
2. Excludes cash bid permits awarded in 1991 and 1992.
3. All indicative expenditure CPI adjusted to 2003 dollars.

Six of the areas offered in 2004 are Designated Frontier Areas and eligible for the 150% uplift towards PRRT projects for pre-appraisal exploration expenditure (NT04-3, T04-5, W04-2, W04-4, W04-15 and W04-16).

Further information on the offshore areas offered as part of the 2004 Acreage Release Program is available on the DITR website: www.industry.gov.au/petexp.

Offshore acreage take-up & indicative exploration expenditure, 1996 to 2003

In 1996, over $700 million (CPI adjusted to 2003 dollars) of indicative expenditure was proposed in minimum guaranteed work programs (first three years of the permit term) of offshore exploration permits awarded from that year's Acreage Release Program (Figure 1.7). Since that time, proposed minimum-guaranteed-work-program expenditures have declined to less than $100 million in 2003. While this decline is significant, indicative expenditures proposed in 1996 were at an all-time high, and current levels of indicative expenditure and acreage take-up more closely approximate the historical average.

Several factors appear to have contributed to the recent decline in minimum-guaranteed-work-program expenditures proposed since 1996. A preliminary analysis of historical acreage release data by Geoscience Australia suggests:

i) many recent work-program bids for offshore acreage have proposed limited operational activities;

ii) there is an increasing tendency for operational activities (particularly exploration drilling) to be carried out during the secondary term of the permit (Permit Years 4 to 6), rather than in the minimum guaranteed term;

iii) since 1997, there has been a slight decline in the number of exploration permits awarded annually (in 1996–1998, between 20 and 26 permits were awarded per year, while in 2001–2003, between 12 and 18 permits were awarded per year) (Figure 1.6).

iv) The high indicative, primary work program expenditures proposed in 1996 (Figure 1.6) include expenditure associated with the anomalous 'Cornea' bid.

Although there has been a recent decline in proposed minimum-guaranteed-work-program expenditures (Figure 1.7), the take-up rates of offshore acreage from the annual Acreage Release Program have averaged around 35% over this period (although annual take-up rates show considerable variability — from over 75% in 1997 to less than 20% in 2000) (Figure 1.6).

Release of deepwater acreage

For the purposes of this publication, 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 1995, an increasing number of deepwater exploration permits have been awarded to petroleum explorers (Figure 1.8). In the mid- to late-1990s, most awards of deepwater acreage were on the North West Shelf. From 1999 onwards, however, explorers began to take up an increasing number of permits in frontier to immature areas of the Bight, Sorell, Gippsland, Perth, Duntroon and Otway Basins. At March 2004, 42 deepwater exploration permits were in force. Of these, nine were located in the Browse Basin, eight on the Exmouth Plateau and seven in the Otway Basin (Figure 1.9).

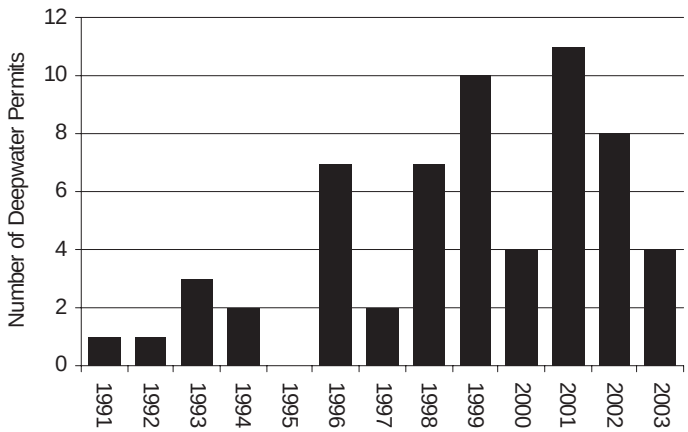

Figure 1.8 Number of predominantly deepwater (>400 m water depth) exploration permits awarded from Acreage Release and Re-release Programs, 1991 to 2003

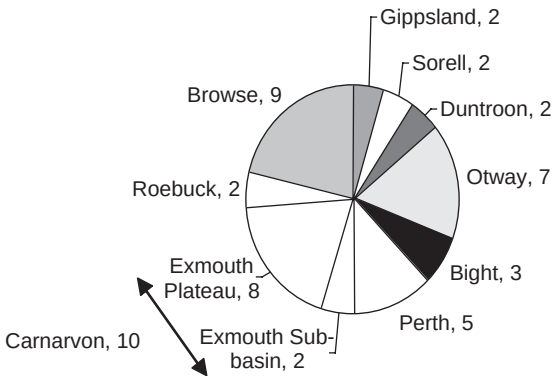

Figure 1.9 Location of predominantly deepwater (>400 m water depth) exploration permits, offshore Australia, as at March 2004

Although deepwater acreage has typically been awarded to large exploration companies, in recent years, several deepwater permits have been awarded to smaller explorers. These include exploration permits WA-314-P and WA-315-P in the outer Browse Basin (awarded to Liberty Petroleum in 2000); exploration permit WA-306-P in the southern Browse Basin (awarded to Antrim Energy Incorporated); and exploration permit EPP 34 in the Otway Basin (awarded to United Oil & Gas Pty Ltd).

Between 1996 and 1998, a total of nine deepwater exploration permits were awarded in the Carnarvon, Browse and Roebuck Basins. Minimum guaranteed work programs associated with seven of these permits (78%) included at least one exploration well. In 2002 and 2003, however, of the 12 deepwater release areas either awarded as permits or under consideration for award (Table 1.7), only three (25%) included an exploration well in the minimum guaranteed work program.

Deepwater drilling 1991 to June 2004

Between 1991 and June 2004, 42 deepwater, exploration wells were drilled offshore Australia (Figures 1.10 and 1.11). These wells made several oil and gas discoveries in the Carnarvon Basin, both on the Exmouth Plateau (Chrysaor, Orthrus, Geryon, Urania, Maenad and Jansz-Io gas discoveries) and in the Exmouth Sub-basin (Enfield, Laverda, and Stybarrow oil and gas discoveries). Deepwater exploration drilling has also resulted in commercial oil discoveries in the Bonaparte Basin (Corallina/Laminaria) and gas discoveries in the Browse Basin (Argus and Brecknock South).

Deepwater drilling peaked in 2000 when nine deepwater wells were drilled. Most of these were drilled 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), and they resulted in discoveries at Jansz-Io, Urania, Maenad and Laverda.

During 2003, eight deepwater exploration wells and two deepwater appraisal wells were drilled. The drill ship *Jack Ryan* (which, in the previous year, commenced a four-well, deepwater drilling program with the Jansz 2 appraisal well), drilled Maginnis 1 for

Table 1.7 Deepwater exploration permits awarded from the 2002 and 2003 Acreage Release and Re-release Programs

Permit	Basin/Sub-basin	Water depth range (m)	Operator	Indicative expenditure, Permit Years 1 to 3 ($A)
2002				
T/34P	Otway Basin	500–3000	Woodside	$40 000 000
T/35P	Otway Basin	500–3000	Santos	$3 000 000
EPP 33*	Otway Basin	<200–2500	Kerr-McGee	$2 700 000
EPP 34*	Otway Basin	<200–2200	United Oil & Gas	$1 900 000
WA-348-P	Carnarvon/Exmouth Plateau	1200–2000	Woodside	$2 480 000
WA-347-P	Carnarvon/Exmouth Plateau	1200–1800	Woodside	$2 460 000
WA-346-P	Carnarvon/Exmouth Plateau	800–1500	BHP Billiton	$4 040 000
WA-335-P	Carnarvon/Exmouth Sub-basin	600–1800	Apache	$26 500 000
2003				
T/36P	Sorell Basin	<200–2000	Santos	$2 100 000
WA-353-P	Carnarvon/Exmouth Plateau	1600–2200	Woodside	$2 690 000
WA-351-P	Carnarvon/Exmouth Plateau	900–1500	BHP Billiton	$1 400 000
V03-3	Gippsland	<200–2200	To be announced	

* awarded from the 2002 Re-release Program

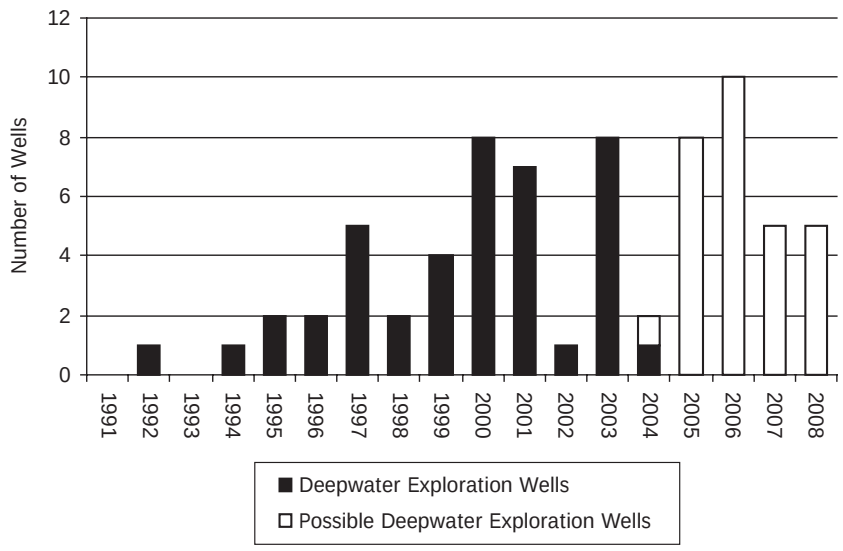

Figure 1.10 Deepwater (>400 m) exploration wells drilled offshore Australia, 1991 to June 2004 with a four-year projection of possible deepwater exploration drilling derived from existing work program data

Notes: 1. Projected deepwater drilling is based on wells proposed in work programs associated with deepwater permits current at date of writing.

2. Many of the permits denoted as 'deepwater' span a range of water depths. Consequently, not all wells proposed in these permits will be deepwater wells.

3. Over 75% of the deepwater wells proposed between 2004 and 2008 are secondary work program wells and are not guaranteed.

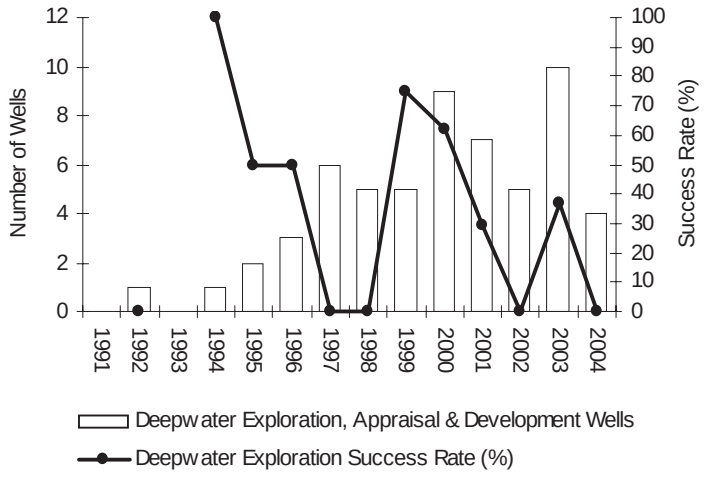

Figure 1.11 Deepwater (>400 m) exploration, appraisal and development drilling and exploration success rates, offshore Australia, 1991 to June 2004

BHP Billiton in the outer 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 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).

One deepwater exploration well was drilled on the Exmouth Plateau during 2003. Woodside Petroleum drilled Guilford 1 in exploration permit WA-269-P.

Since that time, Australian deepwater drilling has been restricted to the Exmouth Sub-basin, in exploration permits WA-255-P, WA-299-P and WA-335-P. Five exploration wells (Herdsman 1, Eskdale 1, Stybarrow 1, Skiddaw 1 and Black Dragon 1) and four appraisal wells (Stybarrow 2, 3 and 4 and Eskdale 2) have been drilled in these permits (Table 1.8). Two of these deepwater wells discovered oil accumulations (Stybarrow and Eskdale) and one appraised an extension of a known oil field (Skiddaw).

Following disappointing results from Herdsman 1, Woodside Petroleum surrendered exploration permit WA-299-P at the end of Permit Year 3.

The overall success rate for deepwater exploration wells drilled offshore Australia between 1991 and June 2004 is 33% (Figure 1.11). This compares favourably with a global deepwater exploration success rate of around 30% (Pettingill and Weimer, 2001).

Table 1.8 Deepwater (>400 m) wells drilled offshore Australia, 2003 to June 2004

Well name	Operator	Title	Basin/Sub-basin	Water depth (m)	Drilling rig
Appraisal & Development Drilling					
Stybarrow 2	BHPBilliton	WA-255-P	Carnarvon/Exmouth	820	*Atwood Falcon*
Jansz 3	ExxonMobil	WA-268-P	Carnarvon/Exmouth Plateau	1340	*Jack Ryan*
Eskdale 2*	BHPBilliton	WA-255-P	Carnarvon/Exmouth	830	*Atwood Eagle*
Stybarrow 3*	BHPBilliton	WA-255-P	Carnarvon/Exmouth	790	*Atwood Eagle*
Stybarrow 4*	BHPBilliton	WA-255-P	Carnarvon/Exmouth	790	*Atwood Eagle*
Exploration Drilling					
Wigmore 1	Kerr McGee	WA-295-P	Carnarvon/Beagle	1175	*Jack Ryan*
Herdsman 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**	Woodside	WA-255-P	Carnarvon/Exmouth	780	*Atwood Falcon*
Black Dragon 1*	Apache	WA-335-P	Carnarvon/Exmouth	1280	*Atwood Eagle*

* Drilled in 2004
** Skiddaw 1 appraised an extension of the Laverda oil field

Possible deepwater drilling, 2004 to 2008

Figure 1.10 shows a four-year, forward projection of possible deepwater exploration drilling. This projection is based on work-program data from current deepwater exploration permits.

Over 75% of the wells currently proposed in deepwater permits between 2004 and 2008 are secondary work-program wells (Permit Years 4 through 6). As a permittee may renegotiate the secondary work program on an annual basis prior to entry into any year of the secondary term, recent historical data suggest a significant proportion of the wells currently proposed in secondary work programs may not be drilled.

In addition, many deepwater permits span a range of water depths, and wells proposed in these permits may not be drilled in water depths greater than 400 metres.

Consequently, the number of deepwater wells proposed between 2004 and 2008 shown in Figure 1.10 should be viewed as a possible upper limit to deepwater drilling in these years — the number of deepwater wells actually drilled during this period may be significantly smaller. Conversely, significant discoveries in future deepwater drilling programs could stimulate an increase in deepwater drilling activity.

Beyond 2008, predictions of levels of deepwater exploration drilling become highly speculative, due to unknown future awards of deepwater acreage.

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

Australia's petroleum reservoirs occur in sedimentary rocks, ranging in age from Proterozoic to Paleogene, which underlie approximately 4.3 million km^2 of Australia's land area and 2 million km^2 of Australia's continental shelf. More than 350 sedimentary basins are now recognised, at least 65 of which lie partly or wholly offshore (Figure 2.1 shows the major sedimentary basins). Australia's exclusive economic zone covers 10.2 million km^2 and its extended continental shelf beyond 200 m water depth covers a further 3.4 million km^2. A description and outline of Australia's geological provinces may be viewed on www.ga.gov.au/oracle/provinces/.

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).

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 Cainozoic 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. Individual details about oil and gas fields are available in the *Australia Petroleum Accumulations* (APA) series of reports available from Geoscience Australia. An update of the Bonaparte Basin APA is also on the World Wide Web at www.ga.gov.au.

2.2 Significant offshore oil and gas discoveries, 2003 to June 2004

Carnarvon Basin, Exmouth Sub-basin discoveries

During 2003 and early 2004, exploration and appraisal drilling in the Exmouth Sub-basin reached record levels (Figure 2.2).

Of the 19 exploration wells drilled in the Exmouth Sub-basin between 1971 and June 2004 shown in Figure 2.2a, 12 intersected petroleum accumulations, resulting in an exploration success rate of 63%. Five discoveries (Stybarrow, Eskdale, Ravensworth, Crosby and Stickle) were made during 2003 and early 2004. These discoveries have added about 350 million bbl to oil reserves in the Exmouth Sub-basin (Figure 2.3).

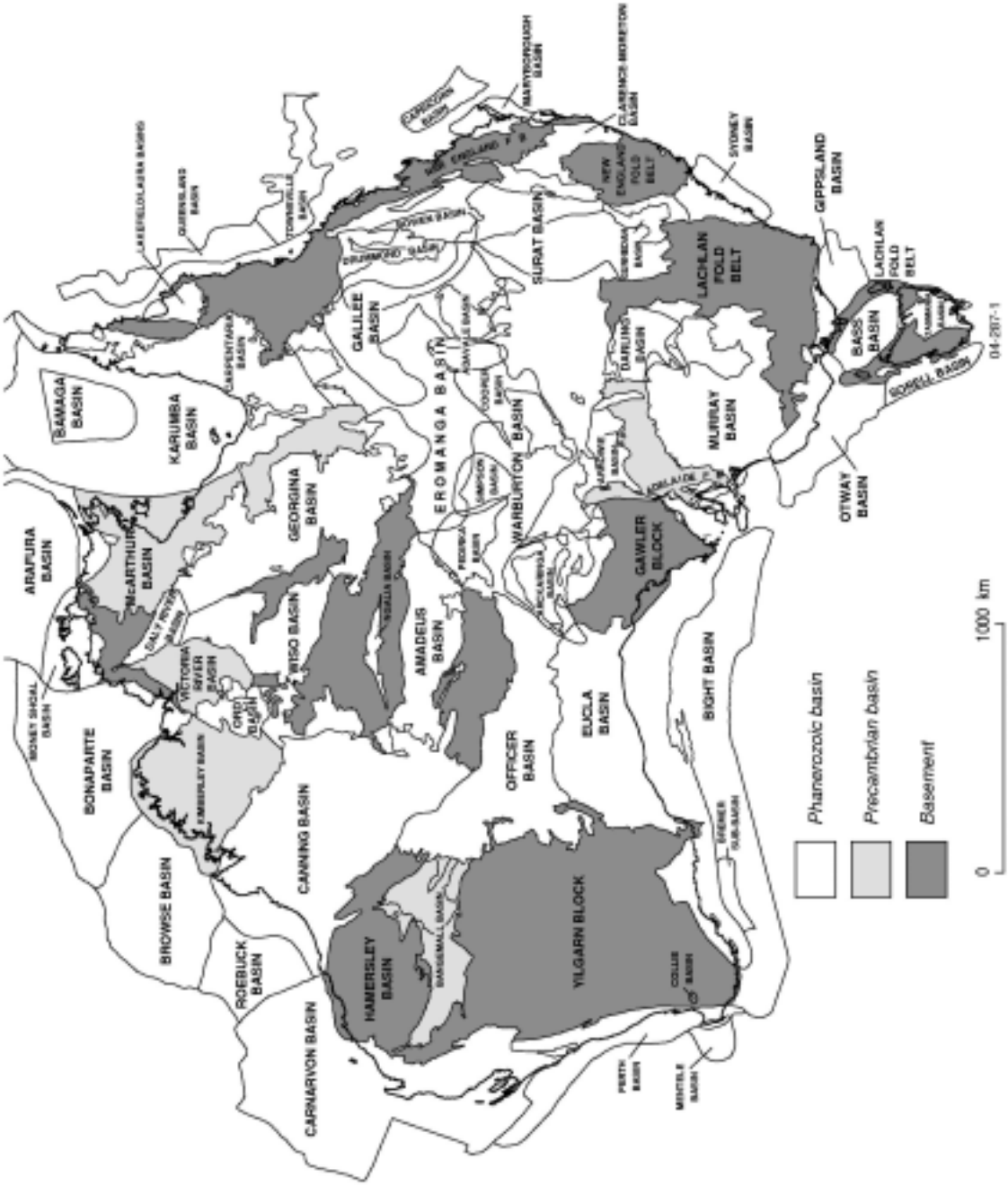

Figure 2.1 Australia's sedimentary basins

Table 2.1 Australia's petroleum reservoirs

Sedimentary basin	Onshore / Offshore	Age of petroleum reservoir
Adavale	Onshore	Devonian
Amadeus	Onshore	Ediacaran & Ordovician
Bass	Offshore	Paleogene
Bonaparte	Offshore	Mesozoic & Permian
Bonaparte	Onshore	Carboniferous & Devonian
Bowen	Onshore	Permian & Triassic
Browse	Offshore	Mesozoic
Canning	Onshore	Permian, Carboniferous & Devonian
Carnarvon	Offshore & Onshore	Mesozoic
Clarence-Moreton	Onshore	Jurassic
Cooper	Onshore	Permian & Triassic
Eromanga	Onshore	Cretaceous & Jurassic
Georgina	Onshore	Ordovician
Gippsland	Offshore & Onshore	Paleogene & Cretaceous
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

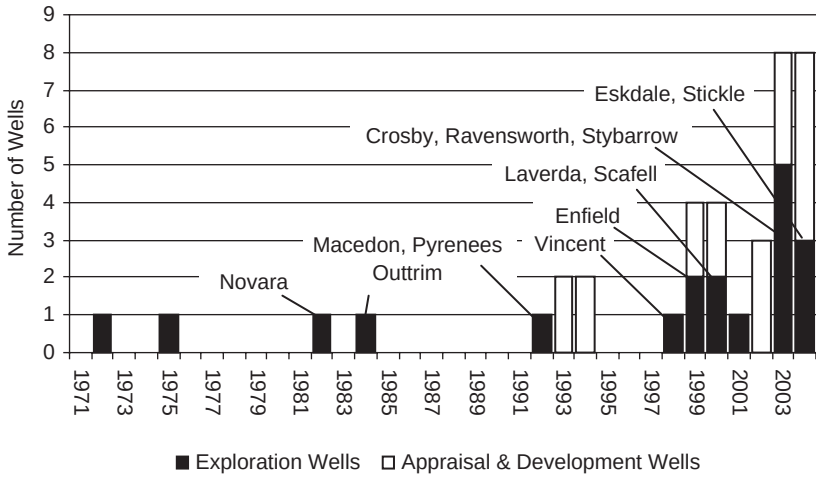

Figure 2.2 Exploration, appraisal and development drilling, Exmouth Sub-basin, 1971 to June 2004

Notes: 1. Shows wells drilled in Commonwealth waters only.
2. Drilling results to June 2004.
3. Van Gogh-1, Coniston-1 and Skiddaw-1 classified as appraisal wells.

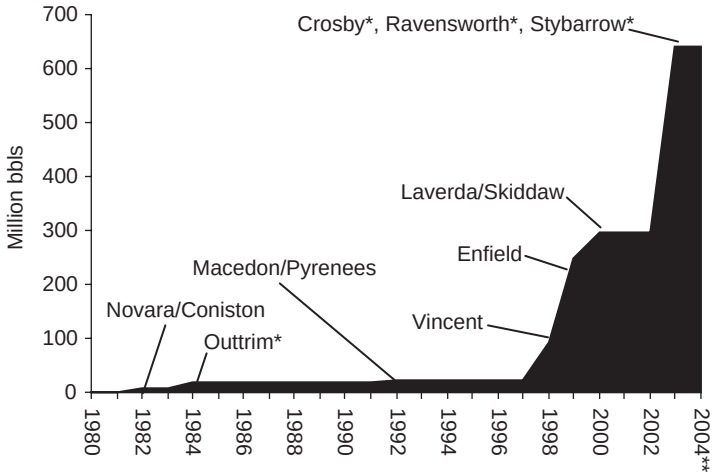

Figure 2.3 Cumulative oil reserves, Exmouth Sub-basin

Notes: 1. Reserve estimates for Eskdale and Stickle (2004) unavailable.
2. ** Data to June 2004.
3. * Unbooked resources as at December 2003.
4. Source: *Western Australian Oil and Gas Review 2004* (Reserve figures provided to the Western Australian Department of Industry and Resources by operating companies as at 31 December 2003).

Two wells drilled in the Exmouth Sub-basin during 2003 (Skiddaw 1 and Van Gogh 1) and a third drilled in 2000 (Coniston 1) tested extensions of known oil accumulations. For the purposes of Figure 2.2, these wells are considered as appraisal wells.

Skiddaw 1 was drilled to test a possible extension of the Laverda oil field into WA-255-P (R1) from adjacent exploration permit WA-271-P. The well was sidetracked at a depth of 1540 m (the sidetrack was renamed by the operator as Skiddaw 2) and drilled to a total depth of 2248 m. The sidetrack intersected a hydrocarbon column in the Macedon Sandstone Member.

Van Gogh 1 was drilled by BHP Billiton in WA-155-P (R3) to test a possible extension of the Vincent oil discovery in adjacent exploration permit WA-271-P. The well intersected an oil column in the Barrow Group.

Coniston 1, drilled in exploration permit WA-225-P, appraised the Novara heavy oil accumulation discovered by Esso in 1982.

Stybarrow

In February 2003, BHP Billiton drilled the first well in an exploration program associated with first renewal of exploration permit WA-255-P (R1). Drilled in water depths of around 825 m, Stybarrow 1 is located 8 km north-north-west of the Laverda oil discovery. The well intersected a 23 m gross oil column (18.6 m net pay) in the Macedon Sandstone Member of the Barrow Group. Three appraisal wells have subsequently been drilled on the Stybarrow discovery — Stybarrow 2, 3 and 4. All the appraisal wells intersected oil columns in the Macedon Sandstone Member reservoir.

Eskdale

Following the success at Stybarrow 1 in early 2003, BHP Billiton drilled Eskdale 1. Located 13 km north of the Stybarrow discovery, Eskdale 1 was plugged and abandoned after encountering encouraging oil and gas shows. An appraisal well (Eskdale 2) drilled in May 2004, intersected a 24 m gas column over a 13 m oil column (interpreted from wireline logs) in the Macedon Sandstone Member.

Ravensworth

In July 2003, BHP Billiton drilled Ravensworth 1 in exploration permit WA-155-P (R3). Located in the Exmouth Sub-basin, 10 km from the Vincent oil discovery, the well was drilled to a total depth of 1432 m in a water depth of 209 m.

Wireline logs, pressure data and sample recoveries indicate that the well intersected a 37 m net oil column overlain by 8 m of net gas pay in the Lower Barrow Group. Oil recovered on test at Ravensworth has a gravity of 19 degrees API. The Lower Barrow Group reservoir intersected by Ravensworth 1 is of high quality and the permittees did not consider that a production test of the hydrocarbon bearing zone was necessary.

In June 2004, an appraisal well (Ravensworth 2) was drilled to a depth of 1459 m. The well intersected a 30 m gross oil column (11 m net pay) in the Pyrenees Member of the Lower Barrow Group. A common oil/water contact between Ravensworth 2 and the discovery well was identified. The top of the Pyrenees Member reservoir was intersected approximately 15 m high to prognosis, which increased the areal extent of the Ravensworth accumulation (as mapped by the permittees) to the north.

Crosby

In October 2003, Crosby 1 was drilled by BHP Billiton to a depth of 1226 m in the Exmouth Sub-basin. Located within the Macedon/Pyrenees Retention Lease (WA-12-R), the well encountered a 34 m oil column in the Pyrenees Member of the Barrow Group. Crosby lies in 197 m of water and approximately 2 km to the east of the Ravensworth oil discovery in exploration permit WA-155-P. The Crosby 1 well was not tested, but recovered heavy oil from the Barrow Group.

A joint development with the nearby Ravensworth discovery is currently under consideration.

Stickle

In May 2004, Stickle 1 was spudded-in within the Macedon/Pyrenees Retention Lease (WA-12-R). Located 5 km east of the Ravensworth oil discovery and 3 km east of the Crosby oil discovery, Stickle 1 intersected a 27 m oil column in the Pyrenees Member of the Barrow Group. Although the presence of an oil accumulation was confirmed by wireline logs, pressure data and wireline oil recovery, the well was not flow-tested.

BHP Billiton, as operator, holds a 71.43% working interest in Stickle 1, while Apache Energy owns a 28.7% working interest in the discovery. An appraisal well on the Stickle discovery is currently under consideration.

Carnarvon Basin, Exmouth Plateau Discoveries

Deepwater, exploration drilling on the Exmouth Plateau during the 1990s led to the discovery of the Chrysaor, Orthrus, Geryon, Maenad, Dionysus and Jansz-Io gas discoveries. In June 2003, the drill ship *Jack Ryan* returned to the North West Shelf from the Bight Basin to drill the final well (Jansz 3) in a four-well, deepwater drilling program. Jansz 3 appraised the giant Jansz-Io gas discovery and flowed gas on test at 72 mmcf per day. Latest reserve estimates by joint venture partner ChevronTexaco indicate gas reserves at Jansz-Io may be in the order of 20 Tcf.

Guilford

In April 2003, prior to drilling Jansz 3, Woodside Petroleum drilled Guilford 1 as a Year 5 commitment well in exploration permit WA-269-P. Drilled by the *Atwood Falcon* in water depths of around 1032 m, Guilford 1 tested a seismic anomaly. A 25 m gas column has been inferred from wireline logs within the base Paleocene section at Guilford 1. The well was plugged and abandoned.

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 2004 are presented in Table 2.2, and are categorised by basin. The corresponding estimates according to the McKelvey reporting system are listed in Table 2.3. Bonaparte Basin estimates include the total reserves in the JPDA with Timor Leste.

Initial and remaining crude oil, condensate and gas reserves, together with production, for the period 1960–2003 are shown in Figure 2.4. Remaining crude oil reserves are continuing to show signs of a slow decline after 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 a Geoscience Australia study, the ongoing results of which can be found in Chapter 3.

There has been an overall increase in crude oil reserves and a reduction in condensate reserves for identified fields in the year to 1 January 2004. Oil reserves increases are predominantly due to the heavy oil discoveries in the Carnarvon Basin. Production has been the main contributor to the decline in condensate reserves, while revision of recent gas discoveries has led to a small downward movement in gas and condensate reserves.

Australia's relative reserves and production position are shown in Figure 2.5. The world reserves totals at the end of 2002 were 1213 Bbbl of crude oil and 5501 Tcf of gas. The notable features are Australia's share of world gas reserves (2.6%) following recent large discoveries on the North West Shelf, and Australia's share of world gas production (1.5%) secured by LNG exports from the North West Shelf. At the end of 2002, Australia ranked 30th and 13th in oil and gas reserves and 28th and 17th in oil and gas production respectively.

Table 2.2 Petroleum reserves estimates by basin as at 1 January 2004

Category and Basin	Crude oil GL	Crude oil million bbl	Condensate GL	Condensate million bbl	LPG GL	LPG million bbl	Sales gas BCM	Sales gas 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	0.33	2.04	0.22	1.38	4.20	0.15
Bonaparte	10.62	66.80	0.00	0.00	0.00	0.00	0.14	0.01
Bowen	0.03	0.19	0.07	0.45	0.08	0.48	2.03	0.07
Canning	0.02	0.12	0.00	0.00	0.00	0.00	0.00	0.00
Carnarvon	72.75	457.58	83.67	526.24	90.07	566.50	622.46	21.98
Cooper	1.00	6.30	3.08	19.40	5.31	33.39	40.87	1.44
Eromanga	4.78	30.03	0.02	0.10	0.00	0.00	0.15	0.01
Gippsland	34.80	218.89	14.00	88.06	25.20	158.50	109.70	3.87
Otway	0.00	0.00	0.03	0.16	0.00	0.00	0.98	0.03
Perth	2.51	15.79	0.00	0.01	0.00	0.00	0.88	0.03
Surat	0.05	0.33	0.01	0.09	0.02	0.11	1.01	0.04
TOTAL	**127.26**	**800.42**	**101.20**	**636.55**	**120.89**	**760.37**	**782.79**	**27.64**
PREVIOUS	**130.25**	**819.24**	**105.84**	**665.71**	**123.39**	**776.08**	**831.58**	**29.37**
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	9.30	58.46	59.77	375.92	35.85	225.48	537.95	19.00
Bowen	0.00	0.00	0.00	0.03	0.01	0.05	4.54	0.16
Browse	0.29	1.79	86.44	543.72	69.67	438.19	732.69	25.88
Canning	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.01
Carnarvon	100.35	631.16	100.05	629.28	51.67	324.97	1745.77	61.65
Cooper	0.11	0.70	1.12	7.04	1.20	7.54	13.42	0.47
Eromanga	0.40	2.51	0.05	0.30	0.05	0.30	0.40	0.01
Gippsland	10.91	68.64	3.66	23.00	0.10	0.63	53.06	1.87
Gunnedah	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.01
Otway	0.00	0.00	0.34	2.14	0.00	0.00	12.40	0.44
Perth	0.00	0.00	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	**123.46**	**776.54**	**258.31**	**1624.69**	**167.84**	**1055.70**	**3138.03**	**110.82**
PREVIOUS	**113.62**	**714.65**	**278.95**	**1754.51**	**230.21**	**1447.98**	**3214.83**	**113.53**
GRAND TOTAL	**250.72**	**1576.97**	**359.51**	**2261.23**	**288.73**	**1816.07**	**3920.83**	**138.46**
PREVIOUS TOTAL	**243.87**	**1533.89**	**384.79**	**2420.22**	**353.60**	**2224.06**	**4046.43**	**142.90**

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 Table 2.3.

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

Table 2.3 McKelvey classification estimates by basin as at 1 January 2004

Category and Basin	Crude oil GL	Crude oil million bbl	Condensate GL	Condensate million bbl	LPG GL	LPG million bbl	Sales gas BCM	Sales gas Tcf
Economic Demonstrated Resources								
Adavale	0	0	0	0	0	0	0	0
Amadeus	1	4	0	2	0	1	4	0
Bass	1	7	2	14	2	12	8	0
Bonaparte	12	75	49	309	36	225	218	8
Bowen	0	0	0	0	0	0	2	0
Canning	0	0	0	0	0	0	0	0
Carnarvon	125	788	177	1116	142	891	2042	72
Cooper	1	6	3	19	5	33	41	1
Eromanga	5	30	0	0	0	0	0	0
Gippsland	38	241	15	92	25	159	135	5
Otway	0	0	0	1	0	0	10	0
Perth	3	16	0	0	0	0	1	0
Surat	0	0	0	0	0	0	1	0
TOTAL	**186**	**1168**	**247**	**1554**	**210**	**1323**	**2462**	**87**
PREVIOUS	**176**	**1108**	**276**	**1737**	**274**	**1726**	**2528**	**89**
Subeconomic Demonstrated Resources								
Amadeus	0	0	0	0	0	0	0	
Bass	1	6	5	30	7	47	7	0
Bonaparte	8	50	11	67	0	0	320	11
Bowen	0	0	0	0	0	0	5	0
Browse	0	2	86	544	70	438	733	26
Canning	0	0	0	0	0	0	0	0
Carnarvon	48	300	6	40	0	0	326	12
Cooper	0	1	1	7	1	8	13	0
Eromanga	0	3	0	0	0	0	0	0
Gippsland	7	47	3	19	0	0	27	1
Gunnedah	0	0	0	0	0	0	0	0
Otway	0	0	0	1	0	0	4	0
Perth	0	0	0	0	0	0	23	1
Surat	0	0	0	0	0	0	0	0
TOTAL	**65**	**409**	**112**	**707**	**78**	**493**	**1459**	**52**
PREVIOUS	**68**	**426**	**109**	**683**	**79**	**498**	**1518**	**54**
GRAND TOTAL	**251**	**1577**	**360**	**2261**	**289**	**1816**	**3921**	**138**
PREVIOUS TOTAL	**244**	**1534**	**385**	**2420**	**354**	**2224**	**4046**	**143**

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 Table 2.2.

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

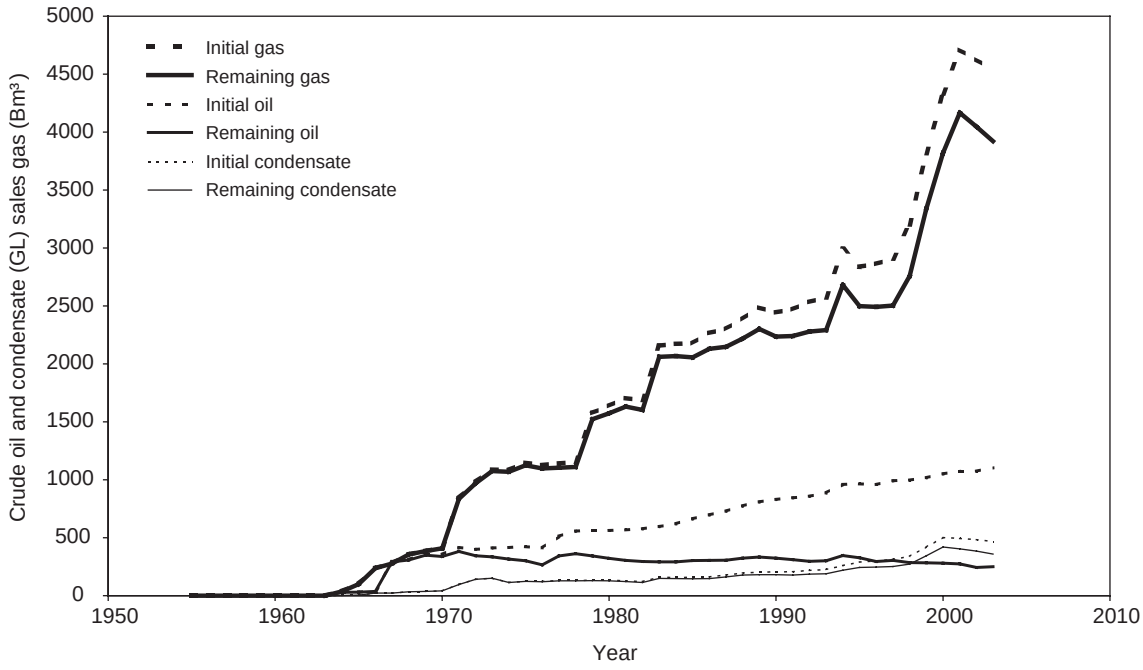

Figure 2.4 Australia's initial and remaining commercial plus non-commercial reserves of crude oil, condensate and sales gas

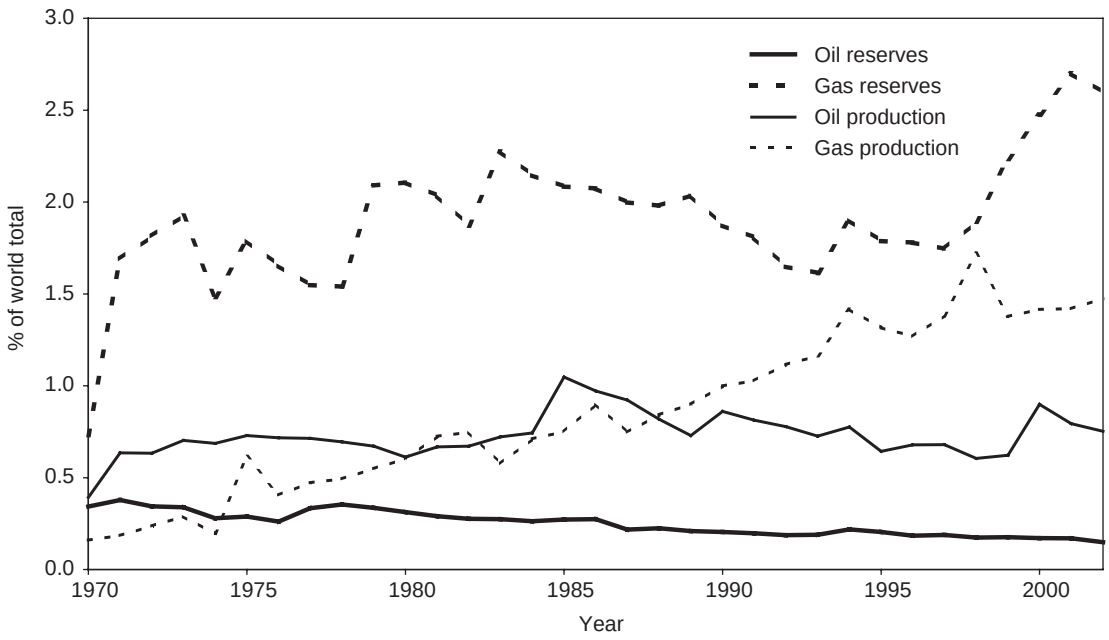

Figure 2.5 Australia's world ranking for crude oil and sales gas reserves and production

References

Western Australian Oil and Gas Review (2004) Western Australian Government, Department of Industry and Resources.

Bradshaw, M.T., Foster, C.B., Fellows, M.E. and Rowland, D.C. (1999) The Australian search for petroleum: patterns of discovery. *APPEA Journal* 39(1), 12–29.

Longley, I.M., Bradshaw, M.T. and Hebberger, J. (2002) Australian petroleum provinces of the 21st century. In: Downey, M., Threet, J. and Morgan, W., eds, *Petroleum Provinces of the 21st Century*, AAPG Memoir 74.

3: Opportunity for growth

3.1 Medium-term potential of the Dampier Sub-basin and Rankin Platform

During 2003–2004, an updated assessment of the undiscovered resources of the Dampier Sub-basin and the adjacent part of the Rankin Platform has been undertaken (Figures 3.1, 3.2). Due to the high degree of uncertainty with forecast drilling activity, three different drilling scenarios have been produced. The results reveal that for the medium drilling scenario there is a medium-term mean expectation for

- 26 GL or 163 million bbl of oil,
- 123 BCM or 0.4 Tcf of gas, and
- 4 GL or 26 million bbl of condensate

to be discovered by new-field wildcat wells in the next 10–15 years.

The last assessment undertaken by Geoscience Australia in this area was for the whole of the Carnarvon Basin. This was published in 1998 and it gave a mean expectation of 600 million bbl of oil and 21 Tcf of gas.

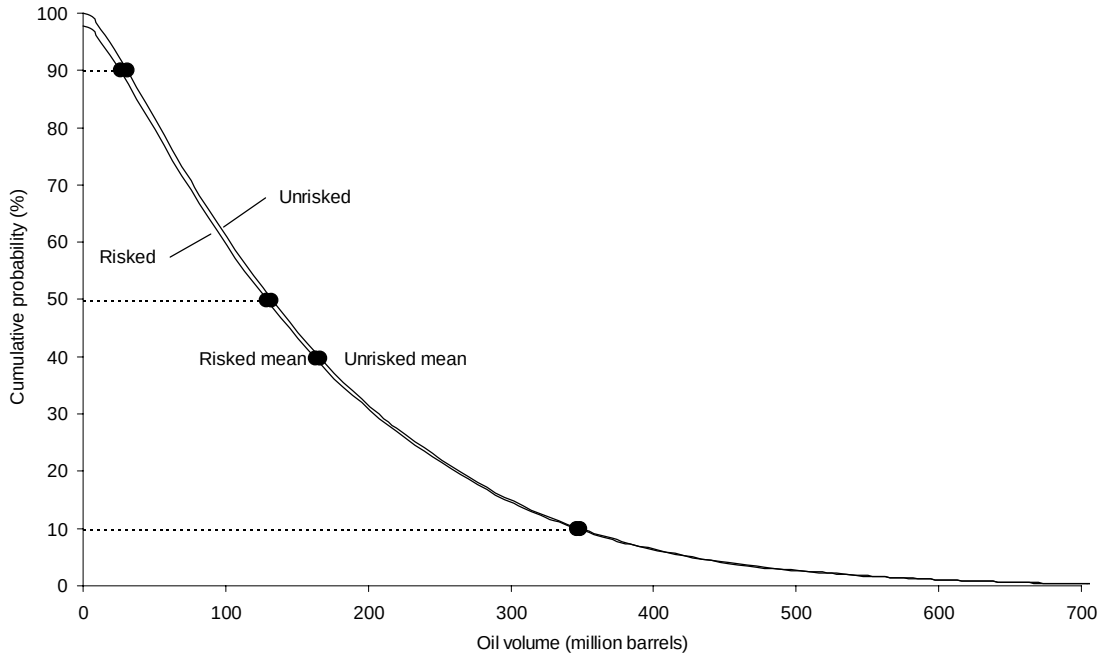

Figure 3.1 Dampier Sub-basin and Rankin Platform undiscovered oil resources

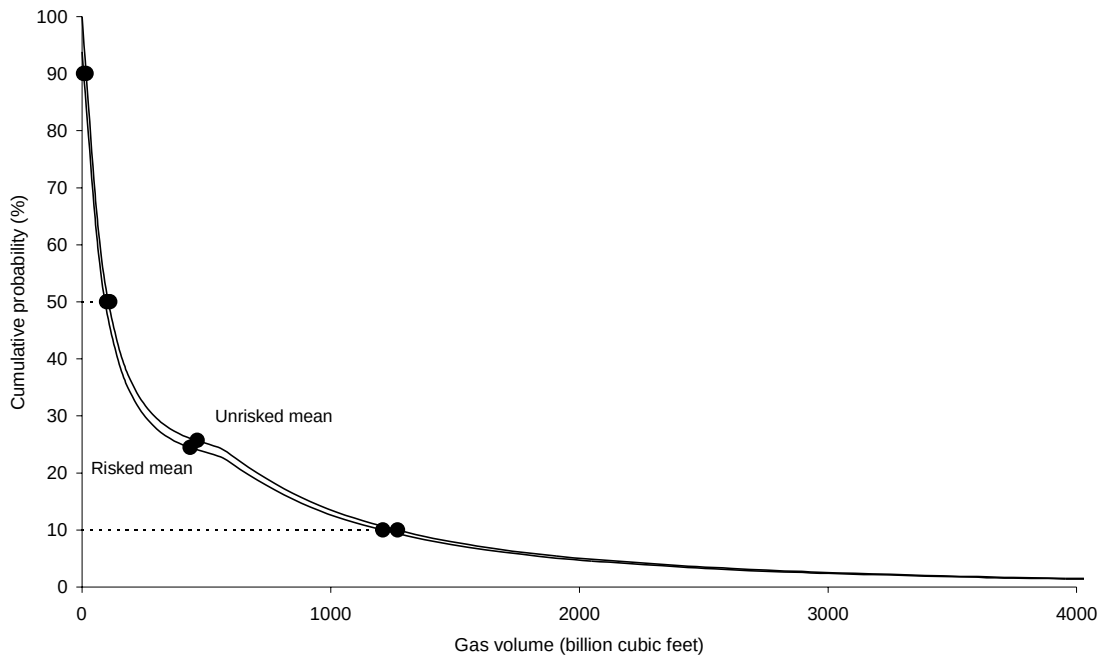

Figure 3.2 Dampier Sub-basin and Rankin Platform undiscovered gas resources

Table 3.1 shows in more detail the results of the assessment, with an expansion of the medium drilling scenario shown in Table 3.2.

Table 3.1 Assessment of undiscovered hydrocarbon resources in the Dampier Sub-basin and Rankin Platform

	Oil		Gas		Condensate	
	million bbl	GL	Tcf	BCM	million bbl	GL
Oil PS						
Low (10 wells)	62	10	0.0	1.1	1	0
Medium (30 wells)	161	26	0.1	3.0	3	1
High (60 wells)	259	41	0.2	4.8	5	1
Gas PS						
Low (0 wells)	0	0	0	0	0	0
Medium (3 wells)	1	0	0.3	9.4	23	4
High (6 wells)	2	0	0.4	12.6	30	5
Summed						
Low (10 + 0)	62	10	0.0	1.1	1	0
Medium (30 + 3)	163	26	0.4	12.3	26	4
High (60 + 6)	261	41	0.6	17.3	35	6

PS = petroleum system

Table 3.2 Risked assessment for medium drilling scenario — Dampier Sub-basin and Rankin Platform

		P90	P50	P10	Mean
Oil	million bbl	26	129	346	163
	GL	4	20	55	26
Gas	Tcf	0.0	0.1	1.2	0.4
	BCM	0.2	2.8	34.3	12.3
Condensate	million bbl	0	5	76	26
	GL	0	1	12	4

3.1.1 Discussion

This year's assessment has followed the AUSTPLAY methodology outlined in *Oil and Gas Resources of Australia 2001* (Petrie and others, 2002). Two petroleum systems were defined: a Jurassic oil system and a Triassic gas system.

Discoveries in these two systems have followed two very different paths. In the gas system, the North Rankin, Rankin and Goodwyn gas accumulations were discovered within the first year (1971) of exploration, and contribute approximately 90% of the reserves found to date. The oil system, on the other hand, has shown a more continuous discovery profile with early success at Legendre (1968), followed by Lambert (1973), Talisman (1984), Wanaea (1989), Cossack (1990), Wandoo (1991), Stag (1993), Mutineer (1998) and Exeter (2002).

Three different drilling activity scenarios have been modelled for each petroleum system.

For the oil system, the range is 10 wells (low case), 30 wells (medium case) and 60 wells (high case). The low case has been determined by attempting to assess the wells likely to be drilled purely on the basis of permit commitments, with no allowance for discretionary drilling. The medium case is based upon the historical drilling rate; 75 wildcat wells have been drilled in 36 years giving approximately two wells per year. The high case is based upon the drilling rate in the last 10 years; 40 wildcat wells have been drilled, giving a rate of four wells per year.

For the gas system the range is zero wells (low case), three wells (medium case) and six wells (high case). This petroleum system is both really restricted and relatively well-explored, leaving little room for further exploration. It is conceivable that no wildcat drilling will take place in the next 15 years (low side case), and that any drilling in this period is likely to be extension or development drilling. The medium case is based upon an assessment of permit drilling commitments, while the high side case estimate is the same as the number of wildcat wells that have been drilled in the last 15 years.

3.1.2 Ultimate potential of the Carnarvon Basin

In *Oil and Gas Resources of Australia 2000* (Petrie and others, 2001), a detailed discussion was presented on the results of the USGS World Petroleum Assessment (USGS, 2000) for four basins. The mean expectation for the Carnarvon Basin (or Northwest Shelf Province as referred to by the USGS) was:

- 2381 million bbl of oil,
- 64.7 Tcf of gas,
- 3682 million bbl of condensate.

These volumes are significantly higher than the assessment conducted by Geoscience Australia and presented here, but it is important to understand the reasons. Firstly, the assessment is for a vastly different area: the whole of the basin compared to a part of the basin. The AUSTPLAY assessment is also attempting to model discoveries in the next 10–15 years whereas the USGS assessment is attempting the same but for a 30-year period. The USGS assessment is thus more focussed at estimating an ultimate resource potential.

3.2 Reserves growth

3.2.1 Background

Oil and Gas Resources of Australia 2002 (Petrie and others, 2003) presented preliminary results of an updated study of reserves growth in Australian accumulations. The US Geological Survey (USGS) method, as used in its 1992 study of reserves growth from year of discovery for 45 656 US fields (Attanasi and Root, 1993), was applied to the Australian data-set of some 730 accumulations. While it was possible to derive predictive curves from the data to indicate ultimate growth of 100% for oil and 240% for gas, the fit was poor and other approaches, more appropriate to Australian conditions, were suggested. This section describes two of those approaches: reserves growth from production startup, and reserves growth by wells drilled.

3.2.2 Reserves growth from production startup

A data-set of 237 producing oil accumulations and 325 producing gas accumulations was prepared using the reserves estimates since the first year of production for each accumulation. Unlike the earlier study where accumulations were counted as either oil or gas, based on their gas : oil ratio, this study included accumulations in both categories if they contain both oil and gas. A growth function (G-curve) was calculated, used to 'hindcast' the data-set and then used to forecast future reserves growth using the previous method (Petrie and others, 2003).

As can be seen from the graphs in Figures 3.3 and 3.4, this approach gives a good fit to the oil data and a reasonable fit for gas. The exponential best fit curves are described by the following equations, whose functional form was chosen because it reproduces the initial and asymptotic behaviour of the data:

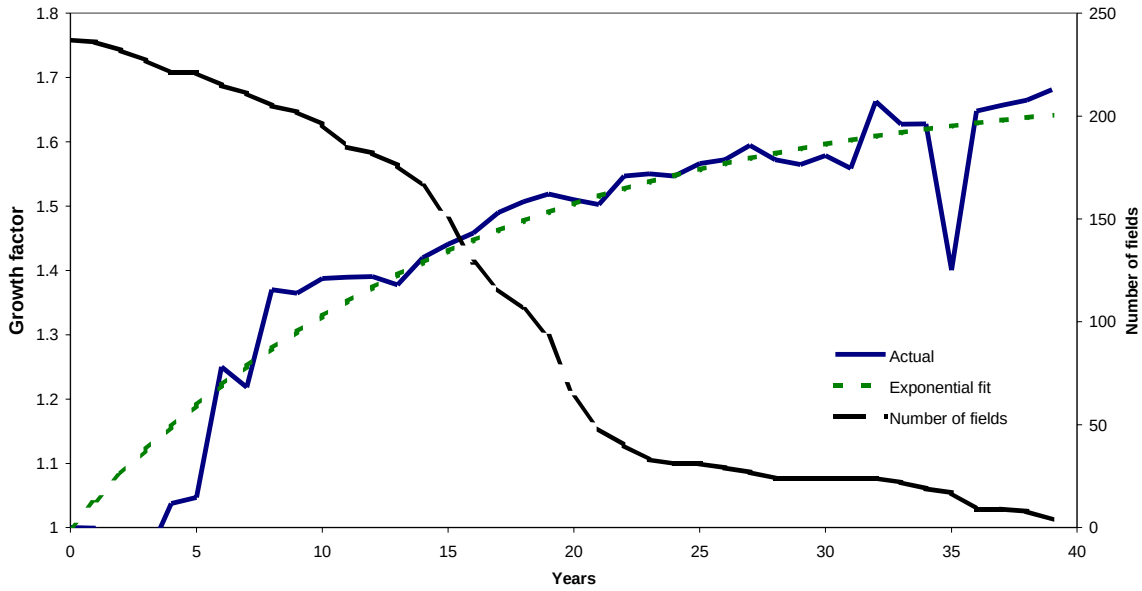

Figure 3.3 Growth factors for Australian producing oil accumulations

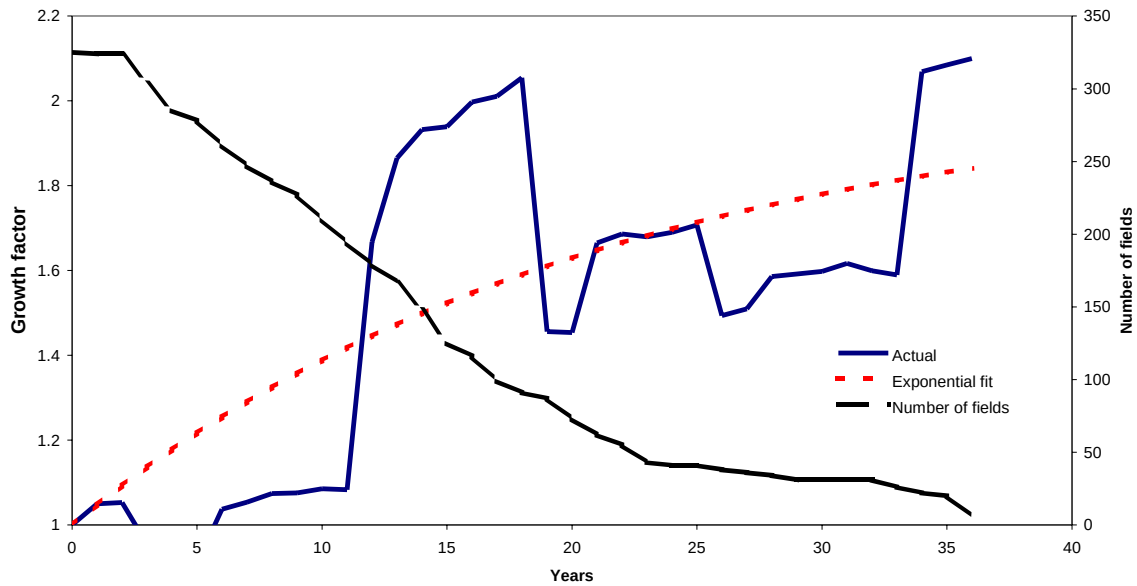

Figure 3.4 Growth factors for Australian producing gas accumulations

$$y = 1 + 0.701(1 - e^{-0.063x}) \text{ for oil,}$$

and

$$y = 1 + 1.027(1 - e^{-0.047x}) \text{ for gas.}$$

The ultimate growth factors for fields from production startup, obtained from the exponential fits, are 70% for oil and 103% for gas.

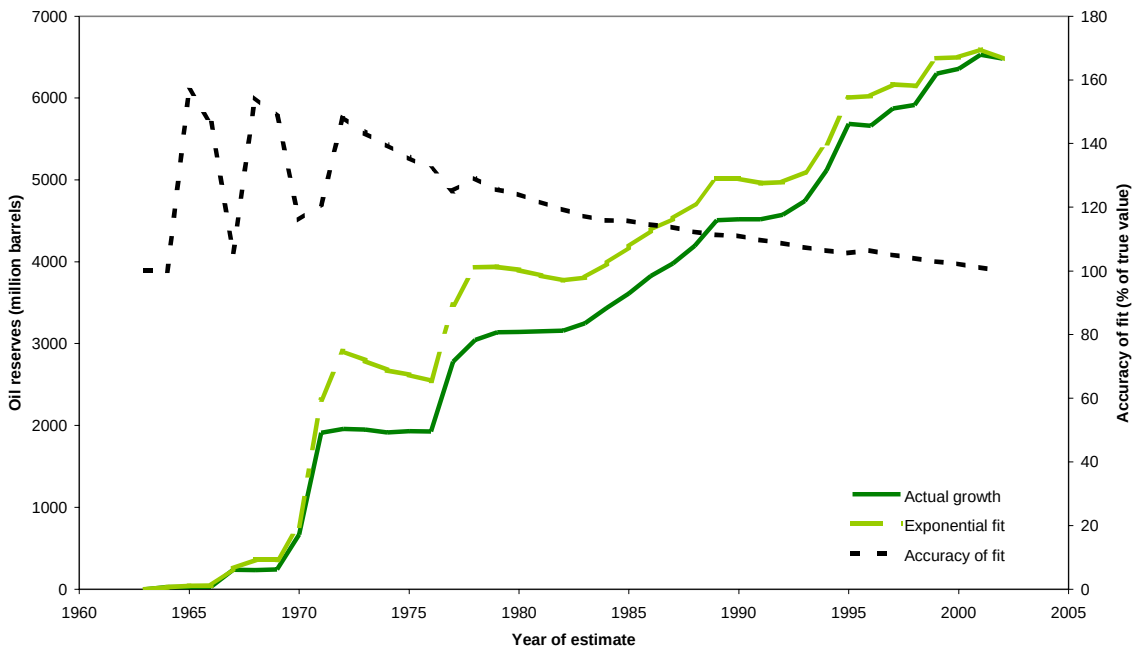

Figure 3.5 Hindcast reserves growth for producing oil accumulations

Figure 3.6 Hindcast reserves growth for producing gas accumulations

The data-set was hindcast using the best fit curves, and the per cent errors in the fit were calculated. It should be noted that while the least squares method uses the absolute differences to calculate the curve of best fit, it is necessary to use relative errors to make an estimate of the accuracy of forecast growth. Hindcasting the data gives the curves shown in Figures 3.5 and 3.6.

Table 3.3 Forecast oil and gas reserves growth for producing accumulations

Year	Initial reserves plus growth potential	
	Oil (million bbl)	Gas (Tcf)
2003	6482	38
2010	6926	41
2020	7242	44
2030	7410	45
2040	7499	46
2050	7546	47

The curves were used to forecast reserves growth potential in currently producing fields. The dangers in over extrapolating the curves are clear in the hindcast graphs because the exponential fit overestimates reserves growth in producing fields by some 10%, over an 11-year period for oil and an 8-year period for gas, increasing to 20% after 21 and 13 years respectively. This potential for error should be kept in mind when considering the forecast reserves growth presented in Table 3.3.

The results for oil growth give the same percentage increase over 50 years as for growth since discovery, while gas growth is around 15% less. This may be due to the short average lead-time to startup — four years for oil fields — while a significant proportion of Australia's large gas fields remain undeveloped. The expected growth for undeveloped gas fields may need to be revised downwards on the basis of these results.

3.2.3 Reserves growth by wells drilled

Spencer (1990) attributed the comparatively early reserves growth from discovery, seen in BP's North Sea fields (when compared to other North Sea fields), to the company's conservative reporting of initial reserves, more aggressive appraisal drilling strategy, and early drilling of step-out wells. The distributions of field sizes in both BP's and other operators' fields were similar, so it is unlikely that this was a factor in the growth. There was significant additional growth in reserves between discovery and production startup for BP's fields compared to other operators' fields. Over a 10-year period after first production, reserves growth was about 20% in both cases. For this data-set the comparative acceleration in reserves growth attributed to BP's drilling strategy was of the order of 10 years.

Comparative data for Australia are presented in Figures 3.7 and 3.8 below. The data do not identify the trigger for drilling the additional wells (field performance, improved geological or geophysical understanding, or a combination of these), but the results show a clear relationship between drilling and reserves growth in oil accumulations. Although it is natural that reserves increase after successful appraisal and development drilling, the data lends support to Spencer's assertion that drilling results in reserves growth in oil accumulations. Note that this approach does not allow for the future estimation of reserves growth, unless a model of wells likely to be drilled is developed.

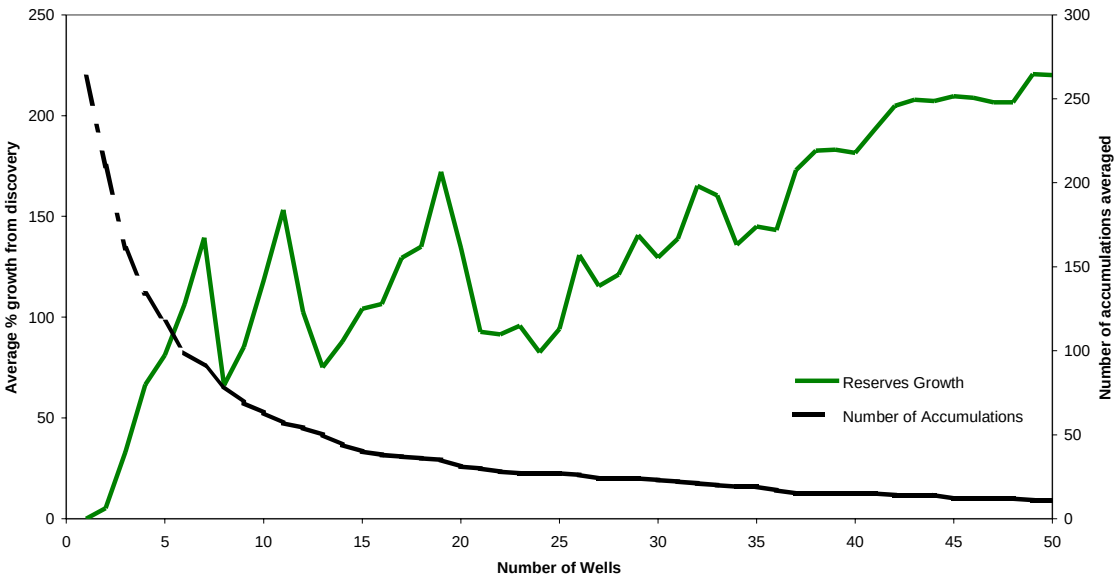

Figure 3.7 Oil reserves growth versus number of post-discovery wells drilled into a field

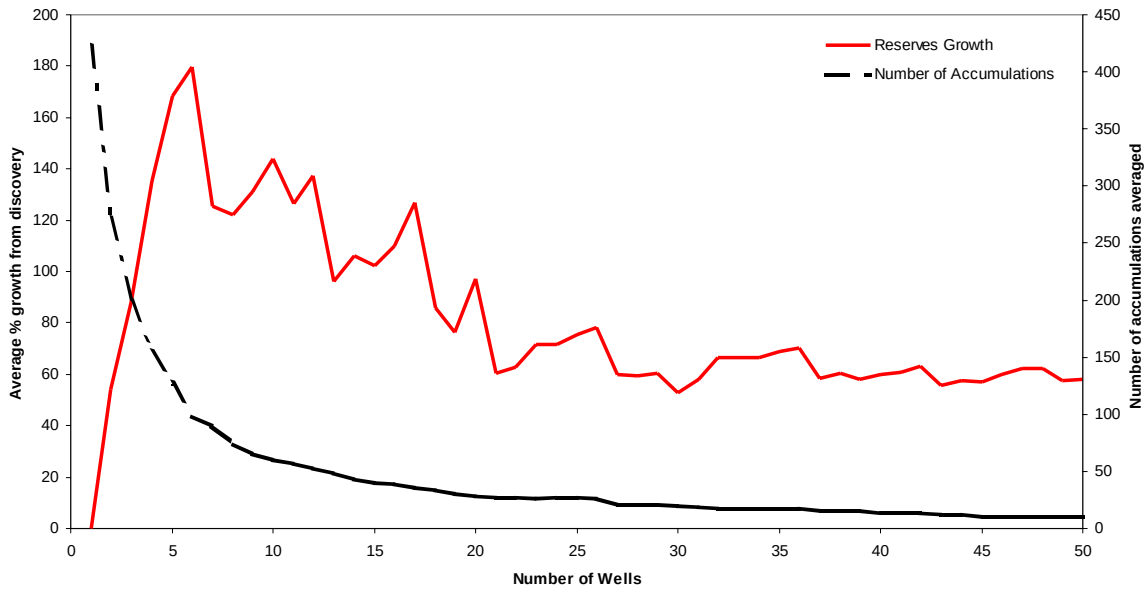

Figure 3.8 Gas reserves growth versus number of post-discovery wells drilled into a field

Gas accumulations seem to show a transition from exploration to production phase in their life. The average delay between discovery and startup for all Australian gas accumulations is seven years for those that have gone into production (and four years for oil). It may be that the pressure decline data on startup quickly defines the reserves for a gas accumulation and causes reserves estimates to stabilise soon after initial development drilling is completed.

3.2.4 Discussion

As the Australian producing resource base moves to smaller accumulations with shorter economic production lives, it becomes more important that operators adopt aggressive drilling strategies in order to identify new opportunities and so maximise recovery during the shorter economic field life.

Other approaches to reserves growth include depletion-based models (Wright and le Poidevin, 1992) and studies of individual factors contributing to reserves increases. Such individual factors are changes in gross rock volume, net-to-gross ratio, porosity, hydrocarbon saturation, formation volume factor and recovery factor. Offshore and onshore fields could also be considered separately.

It is envisaged that a finalised reserves growth model will be applied to improve estimates of both identified and undiscovered accumulations. The importance of reserves growth, its contribution to Australian resources, and the need for accurate growth modelling have been discussed recently (Powell, 2004).

References

Attanasi, E.D. and Root, D.H. (1993) The enigma of oil and gas field growth, *AAPG Bulletin*, 78(3), 321–332.

Petrie, E. and others (2001) *Oil and Gas Resources of Australia 2000*, Geoscience Australia, Canberra, Australia.

Petrie, E. and others (2002) *Oil and Gas Resources of Australia 2001*, Geoscience Australia, Canberra, Australia.

Petrie, E. and others (2003) *Oil and Gas Resources of Australia 2002*, Geoscience Australia, Canberra, Australia.

Powell, T.G. (2001) Understanding Australia's petroleum resources, future production trends and the role of frontiers, *The APPEA Journal*, 41(1), 273–287.

Powell, T.G. (2004) Australia's hydrocarbon provinces — Where will future production come from? *The APPEA Journal*, 44(1), 729–740.

Spencer, J.A. (1990) *Advances in Oil and Gas Reservoir Appraisal*, BP Exploration Company Limited.

USGS (2000) *US Geological Survey World Petroleum Assessment 2000 — Description and Results*, US Geological Survey World Energy Assessment Team, USGS Digital Data Series DDS-60 4 CD-ROM set.

Wright, D.J. and le Poidevin, S.R. (1992) Development options for offshore oil and gas fields: implications for optimum long-term recovery. *The APEA Journal*, 32(1), 391–396.

4: Developments

4.1 Major new developments

Offshore

In September 2003 the Western Australian Government approved in principle the restricted use of Barrow Island for a development of the Gorgon area gas fields. The Gorgon gas project depends on the establishment of a liquefied natural gas facility on Barrow Island. The Greater Gorgon area is situated approximately 130 km off the north-west coast of Western Australia and includes the Gorgon, West Tryal Rocks, Spar, Chrysaor, Dionysus, Io/Jansz, Orthrus, Geryon and Urania fields.

In April 2004, ChevronTexaco Australia Pty Ltd submitted to the Joint Authority the preliminary field development plan for the Gorgon gas field, as a precursor to an application for a Production Licence. The Gorgon field is expected to be the first gas field developed in the Greater Gorgon area as it is the most mature in terms of reservoir knowledge and market opportunities. The development of Gorgon is the key to unlocking the Greater Gorgon area gas resource.

The preliminary Gorgon field development plan consists of sub-sea development wells, a sub-sea gathering system, a 70 km sub-sea pipeline to Barrow Island and a gas processing facility located on Barrow Island. The base case for the initial development of Gorgon field is a two-train Liquefied Natural Gas (LNG) processing facility producing approximately 10 million tonnes of LNG per annum, plus delivery of 300 million cubic feet of natural gas per day to existing mainland domestic gas infrastructure. Carbon dioxide would be removed and re-injected into the deep saline water reservoirs.

On 15 February 2004 the first condensate production was achieved from the Bayu-Undan gas recycle phase of the project following the successful commissioning and start-up, and the first shipment of 54 ML (340 kbbl) of condensate was completed on 30 March 2004. The Bayu-Undan field is located in the Bonaparte Basin, approximately 500 km north-west of Darwin in the JPDA (previously known as Area A of the Zone of Cooperation) in the Timor Sea. The field is being developed in two phases. The first phase is a US$1.8 billion gas-recycle project, where gas liquids are removed and the dry gas is reinjected. The second phase is a proposed LNG project. The LNG project is expected to commence production in the first quarter of 2006 and involves the transportation of residual dry gas via a sub-sea pipeline to Wickham Point, Darwin, in the Northern Territory, for processing into LNG for export to Japan. The LNG project is estimated to cost around US$1.5 billion.

The Bayu-Undan development consists of a remote wellhead platform, a central production and processing complex and a floating storage and offloading facility. Both the wellhead platform and central production and processing complex serve as drilling centres for up to 16 wells (11 producers and 5 injectors) during the first gas-recycling phase for both wet gas production and lean gas reinjection. Approximately 26 wells will be required over the field life to produce the reserves. The wells have been drilled from the two fixed

platform drilling centres using a cantilever jack-up drilling rig. The central production and processing complex comprises two platforms: the drilling, production and processing platform and the compression, utilities and quarters platform. The sales products are pumped via sub-sea pipelines to the floating storage and offloading facility for storage and export via chartered tankers. The production facilities are designed to allow the future export of up to 14.7 million m^3 of sales gas per day (520 million scf/d). The expected commercial field life is approximately 25 years.

The Yolla development commenced construction in April 2003 and will represent the first gas production from the Bass Basin and Commonwealth waters jointly administered by Tasmania. The Yolla gas and oil field is located in Production Licence T/L1 in the Bass Basin, 120 km offshore from Tasmania and 220 km south-east of Melbourne, in a water depth of 80 m. The field was discovered in 1985 by Amoco's well Yolla 1 which intersected gas in the Intra-Eastern View Coal Measures (EVCM) reservoir units between 2718 and 3000 m. Yolla 1 also tested oil and gas from the Top EVCM reservoir unit at around 1800 m. Yolla 2 was drilled in 1998 as a downdip appraisal of the gas column intersected in Yolla 1, and tested gas in the Intra-EVCM reservoir. The reserves are publicly estimated at 256 PJ of sales gas, 1 million tonnes of LPG and 14 million bbl of condensate.

The Yolla field development consists of a conventional steel platform, two deviated development wells, a 350-mm-diameter 147-km-long plain carbon steel sub-sea pipeline for the export of raw gas and condensate to an onshore treatment plant near Lang Lang in Victoria. The pipeline leads to a subterranean shore crossing near Kilcunda in Victoria, water handling facilities in excess of 600 bbl/d (95.3 kL), gas dehydration and compression facilities, provision for the tie-in of additional Yolla gas reserves and future discoveries, and provision for wellhead compression facilities. A further two wells are planned in future to maintain deliverability. The offshore platform will not normally be staffed. The platform will support the wellheads and the gas processing facilities used to treat the gas extracted from the undersea reservoir to the quality where it can be piped to shore. The water extracted with the gas-stream will be separated, treated on the platform and then discharged overboard. First gas is expected in the second half of 2004.

ROC Oil is progressing towards the development of the Cliff Head oil field, which 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 3 kbbl/d using an electrical submersible pump.

In December 2003 a preliminary development plan was submitted to Government. The development concept includes an unmanned offshore production platform tied back to an onshore processing facility, where power generation, processing, storage and water injection facilities will be located. Export will most likely be via truck to the BP Kwinana refinery or by truck to Geraldton for shipping. The first oil is expected in the fourth quarter of 2005 at initial production oil rates of 16 kbbl/d to 24 kbbl/d.

In the Carnarvon Basin, Woodside is planning to drill additional sub-sea development wells into the Perseus field. The wells will be drilled in the southern and western parts of the Perseus field to drain reservoir layers not directly drained by the Perseus wells drilled from the North Rankin A platform. The first phase of this development will involve the drilling of three wells tied back to the Goodwyn A platform via a 400-mm-diameter pipeline.

The Perseus field has an expected remaining life in excess of 30 years, based on current production forecasts and field expectation volumes. The field lies within the graben between the Goodwyn and North Rankin horsts. The field was first penetrated in 1972 by the North Rankin-4 well, but was considered uneconomic because of the poor reservoir quality encountered in the well and the limited extent of the mapped closure. Following the acquisition of 3D seismic data over the field in 1983, and the subsequent reprocessing of data in 1987, a small pinch-out closure was mapped on a structural nose plunging to the north-west of the North Rankin-4 well. The closure was tested in 1991 by the deviated appraisal well North Rankin A22 drilled from the North Rankin platform. The well encountered a gross gas column of 144 m in excellent quality reservoir, and has been producing since completion through the North Rankin facilities.

During the early phase of production from this well it was observed that the pressure decline in the reservoir was less rapid than expected with such a small closure. This indicated much greater reservoir energy and therefore, potentially, a larger gas accumulation. The acquisition of regional 3D seismic data in 1992 served as a basis for a re-evaluation of the closure and identified the possibility of a much larger trap. This evaluation led to the drilling of exploration well Perseus-1 in 1995. This well confirmed the existence of a large trap.

In March 2003, Woodside Energy Ltd submitted the preliminary field development plan to the Joint Authority as a precursor to an application for a Production Licence over the Enfield oil field, and the development was approved by the Woodside Board in March 2004.

The Enfield oil field is located approximately 16 km north of the northern part of 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 22º, while a gas cap was encountered in Enfield 5.

The development comprises sub-sea wells tied back with flowlines to a floating production storage and offloading facility (FPSO) of double-hulled construction, disconnectable mooring, with its own propulsion system to allow it to evade tropical cyclones and a storage capacity of approximately 143 000 kL (900 kbbl). In normal operations an offshore crew of around 34 personnel will be on board the vessel. After stabilisation on the FPSO, export crude oil will be stored in the FPSO's tanks and periodically exported through an offloading hose to tandem moored offtake tankers. Typical export cargoes will be approx 550 kbbl. Production is expected to extend over a long period, and the facilities have been designed for 20 years operation. The FPSO is intended to remain on station for the entire design life without recourse to dry docking for maintenance or survey.

The FPSO will be positioned west of Enfield in a water depth of 550 m. The 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 are planned. Start up is planned for late 2006.

The P50 reserves have been assessed at 23.9 GL (150 million bbl). The peak daily oil production of 12 800 kL/d (80 500 bbl/d) is expected in 2007. Gas production is expected to peak at 1.086 million m^3/d (38.35 million scf/d) with gas injection reaching 0.980 million m^3/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 million m^3/d (27.2 million scf/d) for the field life. Average water injection ranges from 13 200 kL/d (83.0 kbbl/d) in 2007 to 13 500 kL/d (84.9 kbbl/d) in 2020.

On 9 June 2003 Woodside submitted a Preliminary Development Concept to the Government as a precursor to an application for production licences over the Geographe and Thylacine gas fields. The Geographe and Thylacine gas fields are in exploration permits VIC/P43 and T/30P respectively, about 55 and 70 km south of Port Campbell, in water depths of 80 to 100 m. Subsequently the field development plan was prepared by Woodside and submitted to the Government, and in April 2004 the Government notified Woodside of their intent to grant the production licences for both fields. In May 2004 the Joint Venture Partners approved development of both fields. Construction work was expected to start in October 2004 with production scheduled for mid 2006.

The Otway Gas Project involves the initial expenditure of A$810 million for the development of the Thylacine gas field in the offshore Tasmania permit T/30P, about 70 km south of Port Campbell. The Geographe gas field, 55 km south of Port Campbell in the offshore Victoria permit Vic/P43, will be connected to the main offshore pipeline about 2–3 years after Thylacine comes into production.

The initial phase of the project includes construction of the onshore gas processing plant at Port Campbell, construction of the 11.5 km onshore pipeline from the shore-crossing to the gas plant, 70 km of offshore pipeline tied-in to the Thylacine offshore platform, construction and installation of the offshore platform over the Thylacine gas field, and drilling of the four Thylacine production wells. Initially the Otway Gas Project will produce about 60 PJ of sales gas per year. The reserves for the combined Geographe and Thylacine fields are publicly estimated at about 800 BCF of gas and 9 million bbl of condensate.

In February 2004, Santos announced that expenditure had been approved for the completion by the end of 2004 of Front End Engineering and Design studies and regulatory approvals for the Casino gas field development. Pending a final investment decision, the first gas from the Casino field is scheduled in first quarter of 2006. The Casino gas field was discovered in September 2002 by Casino-1 well which encountered a 47-m gas column in the Waarre sandstone. The field is located offshore, 29 km south-west of Port Campbell in 70 m of water. The gas reserves are publicly estimated at 210 BCF. Commercialisation of the field is expected to include the drilling of two, or possibly three, sub-sea completed development wells and the installation of a pipeline from the field to underneath the coastline near Port Campbell, continuing to the existing Texas Utilities' (TXU's) Iona gas plant. The gas will be processed prior to its distribution to Victorian and interstate customers through the existing pipeline network. Small quantities of water and condensate will be removed at the TXU facility. The water will be disposed of through

TXU's existing water treatment facility and the condensate will be stored for transport to the Geelong refinery by road tankers approximately two to three times a week. Condensate production from the Casino gas field will decline significantly after one to two years of operation.

The production licences over the Mutineer and Exeter oil fields were granted. The fields are located in the northern part of the Dampier Sub-basin of the Carnarvon Basin in Western Australia 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 fields will be developed via an FPSO vessel moored between the two fields, horizontal production wells equipped with down-hole electrical pumps to provide artificial lift, 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. Sub-sea 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 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 is 22 ML/d
(140 kbbl/d), with a design oil throughput of 15.9 ML/d (100 kbbl/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 kbbl/d) after two years of production. The P50 reserves have been publicly estimated at 18.6 GL (117 million bbl). Capital expenditure for the Mutineer–Exeter development is A$480 million. Development drilling commenced in the first quarter of 2004 and production from the fields is expected to commence in mid 2005.

Onshore

In the Northern Perth Basin, activity was concentrated on the development of the Hovea and Eremia oil fields operated by Arc Energy. The Hovea 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 acquisition of the Hovea 3D seismic survey in 2002 to better delineate the field and the surrounding area. On the basis of this survey a series of appraisal/development wells were then drilled.

The development of the Hovea field used centralised directional/horizontal production wells at the Hovea production facility to the extent operationally practicable. The Hovea development drilling was completed in mid 2004 and the next major project will be installation of gas lift facilities to maximise oil recovery.

The Eremia oil field is located 2.5 km to the west of the Hovea production facility. The field was discovered by Eremia 1 exploration well drilled and completed in March 2003 after encountering an 18 m oil column in the Dongara reservoir. Eremia 1 was then placed on test production through temporary facilities. In July 2004 the Hovea and Eremia fields were producing oil in excess of 6 kbbl/d. The combined reserves of the Hovea and Eremia fields are publicly estimated at 9.4 million bbl of oil.

The production rates from Jingemia field reached 4000 bbl/d after the successful drilling of the Jingemia 4 development well in May 2004. The field is operated by Origin Energy and is located some 24 km south of the Dongara field in the Perth Basin. The field was discovered in October 2002 by the Jingemia-1 exploration well which penetrated an approximate 30 m gross oil column in the Dongara sandstone. A subsequent two-week production test sustained rates in excess of 2000 bbl/d. Further appraisal/development drilling and a series of extended production tests were then carried out until 21 May 2004, to gain reservoir information to enable the formulation of a field development plan and confirm the facilities required for permanent field development. The field was put into permanent production on 23 May 2004 following the approval of a production licence. The production facilities consist of separation, water handling and injection, flare, gas fuel system, storage and loadout. The oil is transported by road tankers to the BP refinery in Kwinana.

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 sub-sea 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, sub-sea 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. Initial reserves for fields are from published sources and may not be accurate. Indicative initial production where publicly available is given for recent developments. Locations are given in Figure 4.1; offshore production facilities are listed in Appendix H.

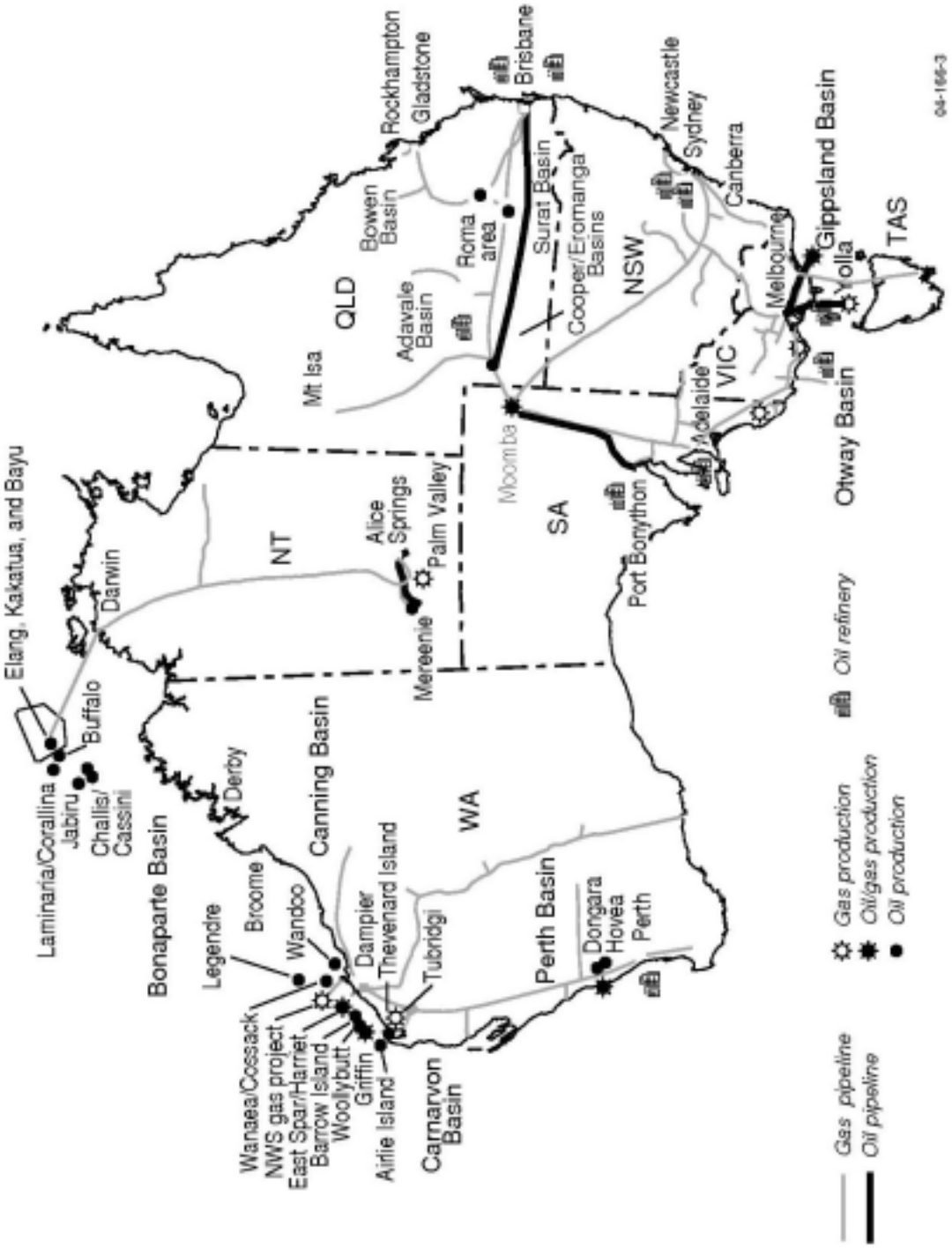

Figure 4.1 Locations of oil and gas production and pipelines

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 field development consists of an unmanned wellhead platform supporting three vertical wells producing to a nearby FPSO. Publicly estimated initial reserves are 2.79 GL (17.5 million bbl) of oil.

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 sub-sea wells, and eleven sub-sea 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. Publicly estimated initial reserves are 8.1 GL (51 million bbl) of oil.

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 sub-sea completion of the existing vertical Elang 1 and 2 and Kakatua 1 wells connected to an FPSO vessel *Modec Venture 1* (formerly the *Skua Venture*) moored over the Elang field. Export of crude is via shuttle tankers. The combined Elang/Kakatua reserves are estimated at 2.7 GL (17 million bbl), while peak production is expected to reach 5250 kL/d (33 kbbl/d). The Kakatua North development involved sub-sea 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 GL (12 million bbl). 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 sub-sea 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 sub-sea wellhead. Crude oil is transferred from the FPSO to a shuttle tanker moored in tandem. Publicly estimated initial reserves are 15.9 GL (100 million bbl) of oil.

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 thickness 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 sub-sea 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 sub-sea 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 kbbl/d) and a storage capacity of 0.22 GL (1.4 million bbl). The combined reserves have been estimated at 39.7 GL (250 million bbl). The peak production rate from the two fields is expected to be up to 27 000 kL/d (170 kbbl/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. Publicly estimated reserves of up to 39.7 GL (250 million bbl) of oil may be present in Laminaria and about 50 million bbl of oil in Corallina.

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 million bbl) of oil from the three producing wells. The field was still producing at 300 kL/d (1.9 kbbl/d) when production was shut-in on 30 January 1997. The FPSO facility was later re-used on the Elang oil field.

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 sub-sea 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. The monopod was designed to support up to three wells.

Alkimos

The Alkimos oil and gas field is situated in the Harriet production area. The Alkimos 1 well was drilled directionally from Varanus Island in August 1994 and completed as an oil producer in September 1994. The well was recompleted as a gas producer in November 1995 and was shut down in March 1997. The well is currently used as a water disposal well.

Bambra

The Bambra gas and oil field, discovered in 1983, 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. Current publicly estimated initial oil reserves are 1.2 GL or 7.5 million bbl and 19.6 PJ of sales gas. Gas production is planned from the Bambra 5-H well.

Campbell

The Campbell gas field is situated 40 km north-east of Barrow Island in water 39 m deep. The field was discovered in 1979 and commenced production in October 1992. 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.

Double Island

The Double Island oil field is situated in the Harriet production area about 8.8 km southwest of the South Plato and Gibson oil fields. The field was discovered in January 2002 by Double Island 1 well. The field was put in production in February 2003 by one horizontal well producing to the Varanus Island facilities. Publicly estimated initial reserves are 4.5 million bbl of oil.

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 sub-sea gas-gathering system operated via an unmanned navigation control and communication (NCC) buoy. The concept of controlling an entire sub-sea facility via an unmanned buoy is a world first. The buoy controls the operation of the sub-sea facility via electrohydraulic umbilicals which connect it to all control and monitoring devices on the sub-sea 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 sub-sea 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 sub-sea 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 sub-sea wells (East Spar 1 and 3) and conveyed to a sub-sea manifold through 1.8 km of 150 mm flexible flowlines after cooling in sub-sea heat exchangers. Provision for the tie-in of up to two further East Spar sub-sea wells and a future pipeline from another field is included in the manifold design. The combined wet gas production fluid is transported from the sub-sea manifold through a 356 mm, 62.5 km carbon steel pipeline to new processing facilities on Varanus Island.

In November 1996, two 3.14 million m^3/d (110 million scf/d) gas processing trains were commissioned immediately adjacent to the two existing 1.57 million m^3/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. Publicly estimated initial reserves are 12.5 BCM (440 BCF) of gas.

Endymion

The Endymion gas field is situated in the Harriet production area. The field was discovered in October 2002 by Endymion 1 well which encountered a 20.6 m gas column in the Flag Sandstone. The field is located 2 km to the south of the Sinbad platform in 41 m water-depth. Production commenced in November 2002.

Gibson

Gibson oil field is situated in the Harriet production area about 2 km south of the Tanami-4 well. The field commenced production from Gibson 1 well in June 2002. An additional development well was drilled in February 2003. The field ceased production in April 2003.

Gipsy/North Gipsy

Gipsy and North Gipsy oil and gas fields are situated in the Harriet area. The fields were developed by sub-sea horizontal wells tied back through a pipeline to the existing processing facilities on the Varanus Island. They came into production in February 2001. North Gipsy field was abandoned in August 2003.

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 sub-sea 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 field development features sub-sea 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 sub-sea well completions at the seabed, linked back by flowlines to the centrally located FPSO facility, *Griffin Venture*. 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 sub-sea 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 million m^3 (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.

Hoover

The Hoover oil field is situated in the Harriet production area about 2.8 km east of the Victoria field. The field was discovered in April 2002 by the Hoover 1 well. The field was put in production in September 2003 by the Hoover 2 well which was drilled from the Victoria platform producing to the Varanus Island facilities.

Lambert/Hermes

The Lambert and Hermes oilfields are two separate oil accumulations in 125 m of water. Production from the Lambert/Hermes oil field commenced in October 1997. The field was discovered in November 1973 by the 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. The 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 sub-sea wells tied back to the *Cossack Pioneer* FPSO via the sub-sea manifold and a 15 km flexible flowline.

Legendre

The Legendre fields lie in 50 m water-depth in Production Licence WA-20-L in the Dampier Sub-basin of the Carnarvon Basin. The Legendre North oil field was discovered in 1968 with the drilling of the Legendre 1 well which indicated, at that time, a small uneconomic field. However, the Legendre South pool was discovered in 1997–98 by further appraisal and exploration drilling — Titan 1 in 1995, Jaubert 1 in 1997 and Legendre South 1 in 1998 — which changed the initial assessment.

The Legendre development includes three horizontal development wells in Legendre North and one in Legendre South producing into a Mobile Offshore Production Unit (MOPU), converted from an existing jack-up drilling rig. Oil is exported from the production facility via a 2.5 km pipeline to an FSO moored to a Catenary Anchored Leg Mooring (CALM) buoy. Excess associated gas is reinjected into the reservoir via a dedicated injection well located downdip of the main field. The Legendre fields' initial reserves were calculated at 40 million bbl. Production at Legendre reached steady state in January 2002 after production start-up on May 15 2001.

Little Sandy

The Little Sandy oil field is situated in the Harriet production area about 5 km south of the South Plato and Gibson. The field commenced production from Little Sandy 1 well in November 2002.

North Herald/South Pepper

The North Herald and South Pepper oil 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 sub-sea completion 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 Pedirka

The North Pedirka oil field is situated in the Harriet production area about 4.6 km south of the South Plato and Gibson oil fields. The field was discovered in August 2003 by North Pedirka 1 well. The field was put in production in September 2003 by North Pedirka 1 well producing to the Varanus Island facilities.

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 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 million m^3/d (1.65 billion scf/d). The pipeline maximum design pressure is 13 100 kPa (1900 psi).

Pedirka

The Pedirka oil field is situated in the Harriet production area about 4.6 km south of South Plato and Gibson in 7.5 m water-depth. The field commenced production from Pedirka 1 well in November 2002.

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 kbbl/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 kbbl/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 million m^3/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.

Rosette

The Rosette 1 well was directionally drilled from Varanus Island in 1987 and commenced oil production test in April 1988 and ceased production in September 1988. The well was recompleted as a gas well in July 1992. The well watered out in November 2002 and has been converted into a water disposal well.

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.

Simpson

The Simpson oil field is within the Harriet production area. The field was discovered in June 2000 during drilling of the Tanami 4 well which intersected a 19 m gross oil interval in the Flag sandstone. In December 2001 the field started production at 3.34 kL/d (21 kbbl/d) from three wells (Tanami 4, Simpson 1 and horizontal well Simpson 3H). They were connected by pipeline to the field processing equipment at Varanus Island. Simpson 3H well watered out in July 2002. Additional wells, Simpson 4H and West Simpson 1, were drilled and completed in April 2003. The successful appraisal wells Simpson 6 and South Simpson 2 were drilled and put in production in December 2003.

Sinbad

The Sinbad gas field is situated 30 km north-east of Barrow Island and 16 km north-east of the Harriet A platform, in 37 m water-depth. The Sinbad field is produced via a monopod facility to the Harriet gas-gathering facilities on Varanus Island.

South Plato

The South Plato oil field is situated in the Harriet production area 2 km south-west of Gibson and 4 km south-west of the Tanami 4 well. The field was discovered in February 2001 by South Plato 1 well. The field was developed by two wells, South Plato 1 and South Plato 3H, producing to the Varanus Island facilities.

Stag

The Stag field is located in 46 m of water, 30 km north-west of Dampier. The field's initial oil reserves have been publicly estimated at 7 GL (44 million bbl). 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 sub-sea 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 sub-sea 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.

Tanami

The Tanami 1 well was drilled directionally from Varanus Island in July 1991 and commenced oil production under an extended test in October 1991. Production facilities were installed in December 1993. The second production well, Tanami 6, was drilled and completed in October 2002.

Victoria

The Victoria oil field is situated in the Harriet production area about 5 km south of the South Plato and Gibson oil fields. The field was discovered in February 2001 by Victoria 1 well. The field was put in production in November 2002 by Victoria 1 well producing to the Varanus Island facilities.

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 million bbl) of which 29.2 GL (184 million bbl) is at Wanaea and 10.5 GL (66 million bbl) 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 kbbl/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 sub-sea completion production wells on Wanaea and one horizontal production well on Cossack are connected through 40 km of flexible flowlines to four sub-sea 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 (8000 bbl/d), and has since been increased to around 2540 kL/d (16 kbbl/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. Publicly estimated initial reserves are 31.8 GL (200 million bbl) of oil.

Wandoo

The Wandoo oil field is located 75 km offshore north-west 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 kL/d (8000 bbl/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 kL (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 kL/d (120 kbbl/d) of total fluid. This fluid handling capacity is required as a significant amount of water is expected to 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. Publicly estimated initial reserves are 11.9 GL (75 million bbl) of oil.

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.

Woollybutt

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.

The Woollybutt oil field was put in production in March 2003 by the operator Eni Australia Limited. The leased 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 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 sub-sea well heads and flexible flow lines to the *Four Vanguard*.

Expected abandonment date is between 32 and 36 months after initial production. Oil reserves are estimated to be 19.9 million bbl 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. Publicly estimated initial reserves are 4 GL (25 million bbl) of oil.

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 sub-sea completions, Tarwhine and Seahorse are produced via the Barracouta platform. The Blackback sub-sea 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 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 sub-sea 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 kbbl/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 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 m^3. 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. Topside 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 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 the Kingfish A platform, and a 400 mm nominal diameter pipeline, 3.9 km long, connects the Kingfish A and Kingfish B platforms. 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. Peak production rates reached 795 kL/d (5000 bbl/d).

Perch

The Perch oil field was discovered in March 1968 and production started in January 1990. The 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 and the deck is

17 m above the sea level. The total weight of platform structural steel is 2204 t. The platform has two 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 sub-sea 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 sub-sea 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, 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. Topside 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. Lateral pipelines linking the Cannington mine and the Bunya, Vernon and Cocos gas fields to the Ballera to Mt Isa pipeline were completed 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 the Katnook gas field to Sasfries 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 was completed in late 2003. The pipeline links Adelaide, Melbourne and Sydney. The pipeline supplies gas from the Minerva gas field located 15 km offshore from Port Campbell and from other projects proposed and under construction at Casino, 30 km offshore from Port Campbell, Thylacine, 70 km offshore from Port Campbell, and Geographe, 55 km offshore. The Minerva project requires the construction of a 250 mm diameter pipeline, 10 km to shore and a 4.5 km 400 mm onshore pipeline to a gas processing plant. The Casino pipeline requires the installation of a 30 km pipeline from the field to underneath the coastline near Port Campbell and an onshore pipeline to the Iona gas processing plant. The Thylacine gas field is located about 70 km south of Port Campbell and will require both offshore and onshore pipe installation to link up with a new gas plant to be constructed near the Iona gas plant. The Geographe field will be connected to the Thylacine pipeline in a later development phase.

The Yolla gas field project located in Bass Strait involved the construction of an offshore multi-phase flow pipeline 147 km from the field to near Kilcunda on the coast connecting to a gas plant at Lang Lang and a 30 km sales gas pipeline to Pakenham to tie into the regional gas grid. This project is expected to come on-stream in late 2004.

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, Plumpton, 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. 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 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's final capacity is 110 PJ gas/year 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.

Construction of a pipeline distribution system began in mid 2004 in the Central Ranges Region connecting Dubbo with Gilgandra, Coonabarabran, Gulgong, Mudgee, Coolah, Werris Creek, Quirindi, Gunnedah and Tamworth. It is expected to be completed by mid-2005 and comprise 250 km of 200 mm pipe and 92 km of 150 mm pipe including the 40 km 150 mm lateral to Gunnedah.

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 150 mm diameter gas pipeline from the Goldfields pipeline at Kambalda to a power plant at Esperance was completed in late 2003. The first gas flowed into the pipeline in February 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 Pensinsula. The 1016 mm diameter pipeline was completed in November 2004. Commissioning of the pipeline began in February 2004 and will meet additional capacity requirements in both domestic and overseas markets.

Construction is underway of a 450 km 250 mm diameter pipeline from existing infrastructure at Port Hedland to an onsite power station at the gold–copper mine at Telfer.

The pipeline will be capable of expanded capacity by the addition of further compression to provide for future expansion of the Telfer goldmine or the connection of existing or new mining projects.

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 500 km 660 mm diameter gas pipeline is under construction from the Bayu-Undan gas and condensate field in the Timor Sea to an LNG facility currently under construction at Wickham Point near Darwin. Condensate and LPG production from the Bayu-Undan field commenced in February 2004.

Under consideration for completion in 2007 is the construction of a pipeline for the delivery of natural gas from the Blacktip gas field located 90 km offshore in the Bonaparte Gulf to onshore, to Wadeye and then to Alcan Gove's alumina refinery expansion on the Gulf of Carpentaria. The project requires the construction of about 940 km of pipeline across the top end of the Northern Territory.

5: Coalbed methane

5.1 Coalbed methane policy development

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

The Queensland Government is finalising a new coalbed methane regime that will address issues that arise where coal and coalbed methane exploration and production activities occur or may occur in the same area. The new regime is designed 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. The new regime will be implemented through the new *Petroleum and Gas (Production and Safety) Bill 2004*, which was introduced into Parliament in May 2004. This Bill is intended to provide a modern, efficient and flexible framework for the exploration and production of petroleum, including coalbed methane, and for the upstream pipeline industry. Under the Bill, a production lease for petroleum or coal cannot be granted over another production lease of the alternative commodity without the consent of the prior lease holder.

Until the new arrangements came into force, interim arrangements are covered by provisions in the *Mineral Resources and Another Act Amendment Act 2003*.

Originally it was intended that the new Bill would replace the *Petroleum Act 1923* and that all existing petroleum tenures would be transitioned to become equivalent tenures under the Bill. Rather than being transitioned to the new Bill, however, tenures that are likely to be affected by native title will continue under the *Petroleum Act 1923*. The new Bill has two coalbed methane themes. Firstly, there are requirements and encouragement for alternative commodity tenure holders to exchange information, consult, negotiate and reach agreements. Secondly, when there is lack of agreement between tenure holders, the Minister is empowered to provide for the best resource management outcome. Apart from some transitional mining leases with coalmine methane, all commercial coalbed methane production will be undertaken under the new Bill. Further information and updates may be available at the following website. http://www.nrme.qld.gov.au/mines/legislation/current_leg.html

In a separate but related policy development in Queensland, a new gas scheme was 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 the draft *Electricity (13% Gas Scheme) Amendment Bill 2004*, which was released in June 2004. The draft Bill is intended to amend

the *Electricity Act 1994*, but the 13% gas scheme has already acted as a catalyst for active exploration and development programs for coalbed methane.

The greenhouse gas abatement program ('GGAP') is a Commonwealth 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 financial assistance from GGAP since May 1999 when this environmental initiative was announced. Round 3 of GGAP was announced in May 2003, and the assessment of grant applications is in progress (as at August 2004).

5.2 Coalbed methane exploration and 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. Some of new production wells are in pairs (a medium-radius surface to in-seam lateral drainage well ('horizontal well') and a connecting vertical production well), or groups of these (two horizontal wells and a vertical well).

Coalbed methane drilling activity for exploration and development has been increasing substantially in the last four years in terms of both the number of wells and the metres drilled. A total of 142 coalbed methane exploration and development wells and about 89 000 m were drilled in 2003 (Table 5.1). In comparison, 110 conventional petroleum exploration and development wells comprising 165 500 m were drilled onshore in the same period. The Bowen Basin in Queensland remained the most actively explored and developed basin in years 2000 to 2003. The basin's share of coalbed methane drilling activity exceeded 75% of Australia's total in 2003, in terms of number of wells and metres drilled. The uppermost coal seams in the Baralaba Coal Measures of Late Permian age are the primary target, and wells are typically about 775 m deep in this basin (Table 5.1). A total of 21 vertical and horizontal (lateral) development wells were drilled in the Moranbah project area in the basin in 2003.

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 in New South Wales. Much of coalbed methane drilling activity in this region in 2003 was carried out for the commercial development of the Camden project.

A recent trend in coalbed methane exploration is to look for 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 Paleogene age has also become the target for coalbed methane exploration. 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 (100 to 600 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.

Table 5.1 Coalbed methane (CBM) drilling in 2000, 2001, 2002 and 2003

Year	State	Basin	Coal type	No. of CBM wells	Metres drilled	Average total depth (m)
2000				50	36818	736
	Queensland			39	28415	729
		Bowen	high rank	30	22814	760
		Clarence-Moreton	low rank	2	456	228
		Galilee	high rank	4	4536	1134
		Surat	low rank	3	609	203
	NSW			11	8402	764
		Gunnedah	high rank	3	2782	927
		Sydney	high rank	8	5620	703
2001				100	60867	609
	Queensland			87	51821	596
		Bowen	high rank	57	39266	689
		Surat	low rank	30	12555	418
	NSW			9	7971	886
		Clarence-Moreton	low rank	5	4725	945
		Gunnedah	high rank	1	792	792
		Sydney	high rank	3	2454	818
	Victoria			4	1075	269
		Otway	lignite	4	1075	269
2002				117	82524	705
	Queensland			99	69325	700
		Bowen	high rank	67	51909	775
		Clarence-Moreton	low rank	2	944	472
		Cooper	high rank	1	1537	1537
		Surat	low rank	29	14936	515
	NSW			16	12986	812
		Gunnedah	high rank	2	673	337
		Sydney	high rank	14	12313	879
	Victoria			2	213	107
		Otway	lignite	2	213	107
2003				142	88858	626
	Queensland			127	81309	640
		Bowen	high rank	108	71156	659
		Clarence-Moreton	low rank	1	545	545
		Surat	low rank	18	9608	534
	NSW			12	7225	602
		Murray	lignite	1	235	235
		Sydney	high rank	11	6990	635
	Victoria			3	324	108
		Otway	lignite	3	324	z108

Coalmine methane drainage wells that are administered under coal mining legislation are not counted.

The data have been compiled from information provided by State governments or available at the websites of various companies.

Some figures are different from those in last year's survey results. Some data entries are provisional. Some wells are horizontal (lateral).

Drilling activity in the Surat Basin in Queensland is declining. 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 500 m deep in the Surat Basin.

Drilled in 2004, the Boyne River-1 well is the first coalbed methane exploration well in the Nagoorin Basin, which is known to contain oil shale. The basin is of Paleogene age and situated 50 km south of Gladstone. Gas effervesced from low-rank coal chip samples in water. A production test on the coalbed methane discovery well was conducted over an interval between 565 and 610 m. The well was located adjacent to the Nagoorin-1 petroleum exploration well, from which conventional natural gas flowed in 2002.

Located close to the Swanbank power generation complex, the Swanbank-1 and 2A wells were drilled in 2002 and 2003 and intersected gassy low-rank coal seams of the Ipswich Coal Measures of Late Triassic age in the Ipswich Basin. The Mt Lindesay-1 well, in 2004, discovered both coalbed methane within the Walloon Coal Measures of Middle Jurassic age in the Clarence-Moreton Basin and over-pressured conventional natural gas within sandstone below the coal seams. These three wells are located close to Brisbane.

In New South Wales, the Noonameena-1 well drilled in 2003 was the first coalbed methane exploration well in the Murray Basin and is the first well to explore biogenic coalbed methane in New South Wales. The well reached total depth at 235 m in weathered granite, after intersecting two Eocene brown coal seams. The well was completed to test the gas production potential of the seams. This project is called the Murray Basin biogas project.

A maximum flow rate of 1.2 million scf/d was recorded at the Darkes Forest-1 well drilled in 2004 on the up-thrown fault block of the abandoned Coalcliff colliery in the southern Sydney Basin. The gas contains 84% methane and 15% carbon dioxide. This well was drilled as the first well of the Wollongong coalbed methane and coalmine methane project.

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). Granting of these licences has been delayed pending resolution of issues of conflicting rights with coal leases. Coal deposits in South Australia range in age from Paleogene 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. Applications for these petroleum exploration permits closed in September 2003. A Special Prospecting Authority was granted for coalbed methane exploration in August 2004.

5.3 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 a coalbed methane well is less productive than a conventional gas well, a large number of wells are required to develop a coalbed methane field. The production wells are so inflexible that the gas flow

rate cannot be controlled easily as it can at 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 nought in 1995 but has substantially increased in recent years. Production is estimated to have reached 40 PJ/y (36 BCF/y, 109 TJ/d or 99 million scf/d) in 2003. Coalbed methane now accounts for about 4% of Australia's total primary and domestic natural gas consumption. Cumulative coalbed methane production has been about 134 PJ (121 BCF) in Australia for the eight years since 1996 when commercial production began in the Moura colliery in Queensland (Table 5.2). The following single conversion factor is used in this report: 1 million scf = 1.1 TJ; or 1 BCF = 1.1 PJ. This conversion factor represents coalbed methane comprising about 97 (mole) % methane and 3% inert gases.

Table 5.2 Coalbed methane production

Year	Queensland				NSW				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	92	84
2003	31	28	85	77	9	8	24	22	40	36	109	99
Total	87	79				47	42		134	121		

1BCF = 1.1 PJ; mmcf/d = million cubic feet per day

Coalmine methane utilisation is included.

The Queensland figures are estimated from information available at the websites of Origin Energy and other companies. The NSW figures are rough estimates only.

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 2003, coalbed methane production, including coalmine methane utilisation, in Queensland was about 31 PJ/y (28 BCF/y). This amount represents about 29% of Queensland's total primary gas demand.

Brief descriptions of individual coalbed methane production projects are now given, including 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 m^3/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/y of coalmine methane (8.2 TJ/d or 7.5 million scf/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/d (17 million scf/d) in the near future. The infrastructure of the colliery has at present a capacity to process 27 TJ/d (25 million scf/d).

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 adjoins the Moura coalmine area. This project is now operated by Origin Energy in Petroleum Lease (PL) 94. The produced coalbed methane is connected through a 47 km lateral pipeline with the Wallumbilla–Gladstone 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. About 100 coalbed methane production wells have been drilled at these fields, and about 50 wells are in production. This project was producing 3 PJ/y of gas (8 TJ/d or 7 million scf/d; as at 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.

Fairview and Durham (or Spring Gully)

The Fairview and Durham (Spring Gully) coalbed methane fields are located in PLs 90, 91, 92, 99, 100, 195 and 204 and in Authority to Prospect (ATP) 584P, 592P, 623P and 701P. The fields are situated 100 km north of Roma on the southern section of the north-trending Comet Ridge anticline, which separates the Denison and Taroom Troughs in the Bowen Basin. The Fairview field produces coalbed methane from Permian coal seams at 31 TJ/d (28 million scf/d) from about 33 production wells out of the 70 wells drilled (as at September 2003), giving an average of about 0.85 million scf/d per well. At the same time, water production is about 42 000 bbl/d. A number of Fairview wells flow free gas with no associated water, indicating the presence of structural closures. 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.

Adjoining the Fairview field, the Durham coalbed methane field is under production test and will be linked to the existing Fairview infrastructure facilities. A 12-well drilling campaign was being completed in 2002 and 2003, and 40 production wells will have been drilled by the end of 2004 in the Durham field. Commercial production from the Durham field will commence in 2005. A new 100-km pipeline will be laid to connect the Durham fields with the gas transmission network at Wallumbilla for the Moomba–Wallumbilla–Brisbane pipeline. Fairview is operated by Tipperary, and Durham is operated by Origin Energy.

A long-term supply and transportation arrangement with Australian Gas Light was exchanged in December 2002. Under the contract term, 340 PJ of coalbed methane will be suppled from May 2005 bound for the South Australia, New South Wales and Australian Capital Territory markets for 15 years. This is the largest coalbed methane supply contract in Australia. Of the total volume, 195 PJ will be sourced from the Fairview and Durham fields. The coalbed methane will be delivered to Moomba through existing pipelines and through the new gas pipeline being built.

Origin Energy has signed a 15-year contract to supply coalbed methane to an alumina refinery operated by Queensland Alumina in Gladstone. Under the contract, 11 to 13 PJ of gas will be supplied per annum from November 2006 with a total contract of 180 PJ. Much of the gas is likely to be sourced from the Durham field.

Peat

The Peat coalbed methane field, 15 km east of Wandoan, is operated by Origin Energy 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 supply to the BP Bulwer Island Clean Fuels Project in Brisbane, where the gas is utilised for heating crude oil in the refining process, for generation of electricity and for production of hydrogen. Gas production from Permian coal seams of the Bowen Basin commenced in February 2001, and this field produces 6 PJ/y (16 TJ/d or 15 million scf/d; as of early 2003) of gas.

Scotia

Santos has 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. This field is characterised by the entrapment of coalbed methane within a valid structural closure.

Capable of delivering 26.5 TJ/d of coalbed methane through the Peat/Scotia pipeline to the Roma–Brisbane transmission line, the Scotia gas treatment plant began supplying 120 PJ of methane in September 2002, under contract for up to 15 years (8 PJ/y) to the Swanbank power

station, operated by CS Energy, near Ipswich. The gas is used to drive a newly-installed 385 MW combined-cycle gas turbine, making it Queensland's largest gas-fired power station. A new drilling program will begin later 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 Origin Energy. A seasonal gas sales agreement was exchanged in August 2002. A portion of the gas is 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 began in 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.

Drilling of commercial development wells and fracture stimulation commenced in June 2003. Connecting two existing wells and new nine wells to new gas treatment facilities was part of the first phase of the commercial production program. The wells were progressively brought on stream later in 2003. The installation of an 8-km spur pipeline was completed in October 2003 between Mungi and the existing Dawson Valley processing facilities at Moura. Commercial gas production commenced in March 2004. Gas is produced at 2.2 TJ/d (2 million scf/d; as of March 2004). The gas compressor at the field has a capacity to process up to 6 TJ/d of gas. A formal gas sales agreement is expected to be finalised later in 2004.

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 coalmining 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, in ATP 364P.

Five pairs — a horizontal drainage well and a connecting vertical production well — and a set of triple wells consisting of two horizontal drainage wells and a connecting vertical production well, were drilled in 2001 and 2003. Each horizontal well is about 1000 m long, and the connecting vertical well is about 330 m deep. The horizontal well is oriented down-dip towards the vertical well and provides a pathway for both coalbed methane and water to drain to the vertical well. The initial dewatering phase continued for about 80 days. Having attained a peak production phase with an average maximum of 0.61 million scf/d per production well, the wells are in a hyperbolic decline phase with an average of 0.38 million scf/d per production well (as of October 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. Initially the converted power station will consume between 11 to 14 PJ/d of gas from February 2005, but the demand will increase to 20 PJ/y (55 TJ/d or 50 million scf/d). The Moranbah coalbed methane project will provide the power station with a total of 290 PJ of gas over a 15 year period. A new 391-km pipeline will connect the power station with the coalbed methane project area. The proposed pipeline had initially been configured for 20 PJ/y, but in August 2003 it was announced that the capacity would be substantially increased to 110 PJ/y by upgrading the pipeline size. The power station is operated by Transfield, and new gas treatment and compression facilities and the pipeline will be operated by Enertrade.

Another gas sales contract was exchanged to supply up to 1.2 PJ/y for 15 years to Ergon's two new 6-MW electricity generators in the Moranbah area, with any excess electricity exported into the regional grid. Target completion date for the construction of the first generator was July 2004.

In addition to the existing six pilot production wells, a total of 29 new sets of triple wells will have been drilled by December 2004 to meet the start-up requirement of 12.6 PJ/y (35 TJ/d or 31 million scf/d) of gas for the Enertrade contract. A further 13 sets will be drilled in 2005. To meet the Enertrade and Ergon contracts of 21.2 PJ/y of gas (58 TJ/d or 53 million scf/d), a total of 48 production wells will be supplying 58 TJ of gas per day.

Berwyndale South

The Berwyndale South coalbed methane pilot development site is located near Condamine in south-eastern Queensland, within 13 km of the Roma–Brisbane pipeline. A conditional gas supply contract of 4–6 PJ/y with a total of 60–90 PJ for 15 years was exchanged in December 2002 for a tie-in to CS Energy's Roma–Brisbane pipeline in early 2005. PL 201 was granted over the project site in June 2004.

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

Spaced 500 m apart, pilot production 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, gas production performance has improved substantially. Total gas production reached 1.3 TJ/d (1.22 million scf/d; weekly average, as of July 2004), with nine pilot wells and one step-out well. Average water production from the wells is about 9000 bbl/d.

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. Four Argyle wells were flow-tested between November 2003 and April 2004. Initial maximum flow rates of up to 0.536 million scf/d or 15.2 kcm/d from a well indicate the presence of free gas in addition to the gas adsorbed to the coal. Cores extracted from a core well have confirmed high average gas, while drill stem tests at the well confirmed that the coals at Argyle have high permeability, similar to that at the nearby Berwyndale South pilot. Applications for Petroleum Leases were submitted in January 2004.

Kogan North (pilot production)

The Kogan North coalbed methane pilot production is operated by Arrow Energy in Petroleum Lease Application (PLA) 194 in ATP 676P, located near Dalby and 5 km north of the Roma–Brisbane gas pipeline. Commissioned in January 2003, this 5-well pilot project targets the Walloon Coal Measures in the Surat Basin. The pilot production commenced in January 2003 and achieved a gas flow rate of 0.55 TJ/d (0.503 million scf/d) with a flow of 4000 bbl/d (636 cm/d) of water (as of September 2003). The centrally-located well within the pilot had the highest flow rate. During the first nine-month period, the gas rate steadily increased. A 35 well drilling program will commence in late 2004.

A conditional sales contract was exchanged in August 2003 to supply CS Energy from Kogan North with 4 PJ/y of gas for 15 years. Another conditional contract was exchanged in June 2004 with BP Bulwer Island Clean Fuels Project in Brisbane to supply 15 PJ of coalbed methane from the Kogan North and Tipton West projects over 5 years from January 2006.

Tipton West (pilot production)

The Tipton West coalbed methane pilot production is a project operated by Arrow Energy. The site in PLA 198 within ATP 683P is located near Dalby. This pilot production commenced in June 2003. The project consists of four producing wells and seven monitoring wells, and dewatering of the four wells began in May 2004. Target coal seams of the Walloon Coal Measures lie at depths of 150–300 m.

A conditional agreement of 4 PJ/y of gas for 15 years from early 2006 was exchanged in December 2003. The sales gas will be used to fire a proposed 50-MW combined-cycle power generation plant at a site near Dalby and operated by Wambo Power Ventures. Another agreement was exchanged with Ergon Energy in February and July 2004 for the supply of 3.2 PJ/y for 15 years from January 2006 to feed new 20-MW power generators and new 12-MW well-head electricity generators.

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 tops of the coal seams are 480 m below the 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 aggregated gas production from five wells fluctuated from an initial 0.026 TJ/d (0.025 million scf/d) to a high of 0.26 TJ/d (0.25 million scf/d). Production has been suspended for further evaluation.

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 pilot project in ATP 692P began in 2002, and Origin Energy will commence a 9-well production test later in 2004.

Harcourt (pilot production)

The Harcourt coalbed methane pilot production area is situated in ATP 564P, 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 Origin Energy (then, the Oil Company of Australia) in 2001 and 2002. Two of the wells are a pair consisting of an in-seam dual lateral well and a connecting vertical production well. A production test started in late 2003 but was soon suspended.

Timmy (pilot production)

A set of three wells (two horizontal drainage wells and a vertical production well) were drilled in the Timmy coalbed methane pilot production area in ATP 602 in the Bowen Basin in 2002 by Origin Energy (then, 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 was carried out from 2003 to 2004.

Meenawarra (pilot production)

The Meenawarra coalbed methane pilot project began in 2003. Operated by Arrow Energy, this project is located 15 km south of the Tipton West project in ATP 683P. Its target seams occur at depths of 360–400 m within the Taroom Coal Measures of Jurassic age.

Grasstree (German Creek) colliery

In June 2003, an announcement was made 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 Commonwealth Government's Greenhouse Gas Abatement Program. Full commercial operation is scheduled for late 2004. This project will utilise 2.5 PJ of waste coalmine methane a year (6.8 TJ or 6.2 million scf/d of methane equivalent).

North Goonyella colliery

Ten 1-MW reciprocating gas engines will be installed and operated by Envirogen at the North Goonyella colliery operated by BHP Billiton 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 was expected to start in June 2004.

New South Wales

Coalbed methane production in New South Wales was about 9 PJ/y (8 BCF/y of methane equivalent) in 2003. Much of this came from coalmine methane utilisation at the Appin and Westcliff collieries. Two production licences, which were granted in 2002 for the Camden coalbed methane project, are the first petroleum production leases granted in New South Wales.

Appin and Westcliff collieries

The Appin and Westcliff collieries are operated by BHP Billiton in the Southern Coalfield of the Sydney Basin. These collieries have been utilising 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.

In-seam drainage gas from the three collieries is piped to the Appin and Tower power stations with 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 utilised as a fuel source at these power plants. Some 20 million scf/d of methane equivalent is required for the generation capacity. A total of 7.5 PJ/y of coalmine methane is utilised (21 TJ/d or 19 million scf/d of methane equivalent) 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/d or 27 million scf/d of methane equivalent) 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 in 2001 as a demonstration trial to burn mine ventilation air, which contains 0.3–0.8% methane, as combustion air. This plant utilised fumigant methane before it was emitted to the atmosphere while simultaneously capturing its energy value. Operated by BHP Billiton, this pilot project will be scaled up as a commercial plant at the West Cliff colliery with the use of low quality (<1.3% methane by volume) mine ventilation air as primary fuel source. With financial support by the Commonwealth Government's greenhouse gas abatement program, the West Cliff ventilation air methane project should be fully operational by mid-2006. This project will utilise 20% of West Cliff's available mine ventilation air to generate 6 MW of electricity from a steam turbine, achieving a reduction in greenhouse gas emissions of 200 000 t/y of CO_2-equivalent.

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. After minimal treatment involving compression and cleaning, an extraction plant at the colliery feeds waste coalmine methane 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/d or 1.3 million scf/d of methane equivalent per day) as of early 2003. In order to increase capacity, construction commenced in 2002 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/y (9.1 BCF/y) for 10 years. This amount will account for up to 7% of total primary gas consumption in New South Wales in 2004. The stage 1 development comprises 11 producing wells.

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 pipeline 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 95–98% methane. Camden wells are generally dewatered in two months. Water production is less intense here than in typical wells in Queensland. The daily average production from the stage 1 development was about 2.5 TJ/d (2.3 million scf/d; as of June 2004). Much of the gas is produced from seven better-performing wells. The Ray Beddoe treatment plant operates at 95% of maximum running time capacity.

A total of about additional 20 wells were drilled during stage 2 of the Camden project, up to June 2003, and 70 new wells will have been drilled by the end of 2004. Development Consent for stage 2 was given by the New South Wales Government in February 2004, enabling the operator to commence construction of a new gas plant, which is designed to supply 40 TJ/d (14.5 PJ/y) of gas to the Moomba–Sydney trunkline, and to apply for a third Petroleum Production Lease. The expected production will represent about 10% of the gas market in New South Wales in 2004.

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 is 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 commenced 5-well pilot production operations in late 2003 as the first phase of the 300-well Hunter gas project, which is scheduled to start later in 2004.

Wyong (pilot production)

The Wyong gas production pilot project area is located to the south-west of Newcastle in PELs 5 and 441 and is operated by Sydney Gas. After drilling two exploration wells in 2003, the operator started a production-well drilling program in April 2004. This project targets seams in the Newcastle Coal Measures of Late Permian age.

Bohena (pilot production)

In the Gunnedah Basin, coalbed methane is explored within coal seams of Permian age. Eastern Star Gas began the Bohena coalbed methane pilot project in PEL 238 in July 2004, with the commencement of drilling of eight exploration and production wells. Within this coalbed pilot project area, the Bohena conventional natural gas accumulation was discovered in Lower Triassic sandstone in the course of a coalbed methane drilling program in 1998. This area is situated near the Coonarah conventional natural gas field and the 10-MW Wilga Park gas-fired power station, both of which were commissioned in July 2004. On confirmation of coalbed methane reserves at the Bohena pilot project area, the capacity of the power station could be increased in a short time frame.

Stratford (pilot production)

AJ Lucas Coal Technology, as project operator, drilled three wells at the Stratford pilot production area in 2004. The wells comprise one vertical production well intersected by a pair of horizontal drainage wells. Located 100 km north of Newcastle, the area is situated in the Gloucester Basin, which is wholly contained in PEL 285. Previously, nine core holes were drilled in the 1990s to explore the coalbed methane potential of Permian coal seams in the project area. A 6 to 12 month production test will begin later in 2004.

Teralba colliery

The waste coalmine methane project at the Teralba colliery on the Central Coast, which is operated by Enex Resources, 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 was supposed to be fully operational by June 2004.

Bellambi colliery

Gas engine power generators will be installed and operated by Envirogen at Allied Coal's 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. The 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. The pilot site is located 18 km south of Bacchus Marsh and 45 km west of Melbourne, in close proximity to existing gas pipeline infrastructure. Unlike all commercial production in Queensland or New South Wales, this project is aiming at brown coal seams at very shallow depths (less than 100 m below the surface). Also in contrast to 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 drilled into the Maddingly brown coal seam of Paleogene 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. A 6-month production test will commence later in 2004. The aim of the pilot production is to establish the viability of biogenic coalbed methane production from the extensive brown coals that occur at shallow depths. Biogenic coalbed methane was formed through natural bacterial activity associated with meteoric water recharge in thermally immature coals.

6: Current production

6.1 Crude oil and condensate production in 2003

Crude oil and condensate production in 2003 was 33.0 GL or 90.3 ML/d (567 kbbl/d). Crude oil production data include all production from the JPDA with Timor Leste in the Bonaparte Basin, of which Australia's share is 10% of production. The 2003 production shows a decline of 13.0% compared with the figure of 37.8 GL or 103.8 ML/d (652 kbbl/d) for 2002.

Crude oil production by basin is listed in Appendix I. Production relative to reserves is shown in Figure 2.4.

6.2 Gas production in 2003

Gas production in 2003, inclusive of on-site fuel use and flaring, was 35.5 BCM or 97.2 million m^3/d (3.4 BCF/d). Annual gas production by basin is listed in Appendix I.

7: Crude oil and condensate forecasts

7.1 Crude oil and condensate forecast for 2004–2025

The forecast of production given in this chapter is based on current estimates of production both from identified and from 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 of, 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 both the production of crude oil and condensate from 1975 to 2003, and forecast production from 2004 to 2025. Table 7.1 shows forecast production. The forecast includes production of crude oil and condensate from accumulations that had been discovered by the end of June 2004, plus production of crude oil and condensate from undiscovered accumulations. The 2004 forecast includes 10% of production from the JPDA.

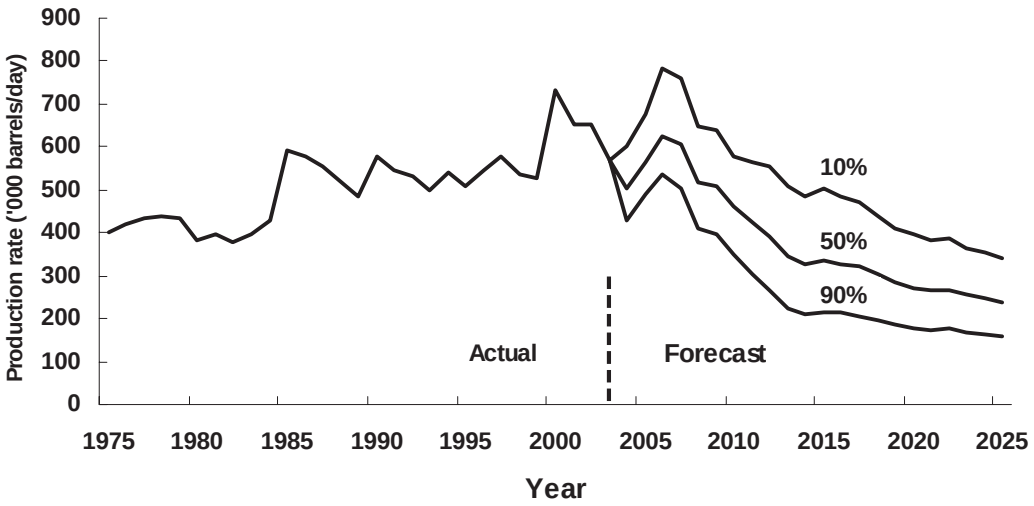

Figure 7.1 Australia's annual production of crude oil and condensate 1975–2003 and forecast annual production at 90%, 50% and 10% cumulative probability 2004–2025

Table 7.1 Forecast for 2004–2025 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, Base, offshore Otway and offshore Perth Basins, as at July 2004 ('000 bbl/d)

	Identified			Undiscovered			Both		
Year	P90	P50	P10	P90	P50	P10	P90	P50	P10
2004	431	501	601	0	0	1	429	501	601
2005	491	559	671	0	1	1	491	562	675
2006	536	625	781	0	1	2	535	623	784
2007	503	607	759	0	2	7	505	608	761
2008	405	511	639	1	3	17	409	516	648
2009	384	499	624	1	5	31	394	509	638
2010	336	446	558	2	11	47	352	462	579
2011	284	398	531	3	20	69	305	425	565
2012	237	353	511	6	30	86	268	393	555
2013	188	295	452	10	40	105	226	346	509
2014	162	264	420	14	50	124	208	326	486
2015	160	264	427	19	59	138	215	337	505
2016	151	247	403	25	71	153	215	328	486
2017	140	229	372	31	79	164	207	320	471
2018	125	205	335	35	85	172	197	302	439
2019	109	179	292	39	93	182	185	284	409
2020	101	165	269	43	98	187	179	273	394
2021	94	153	250	46	103	193	174	266	383
2022	93	152	247	49	106	195	175	267	385
2023	83	135	220	50	110	199	167	255	364
2024	75	123	201	52	112	200	162	247	352
2025	67	109	178	52	113	200	157	239	341

7.2 Crude oil forecast for 2004–2025

Figure 7.2 shows crude oil production from 1975 to 2003, and Figure 7.2 and Table 7.2 show a forecast of crude oil production from 2004 to 2025. 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 2004 (identified accumulations), and partly on estimates of crude oil production from undiscovered accumulations. The forecast includes 10% of production from the JPDA.

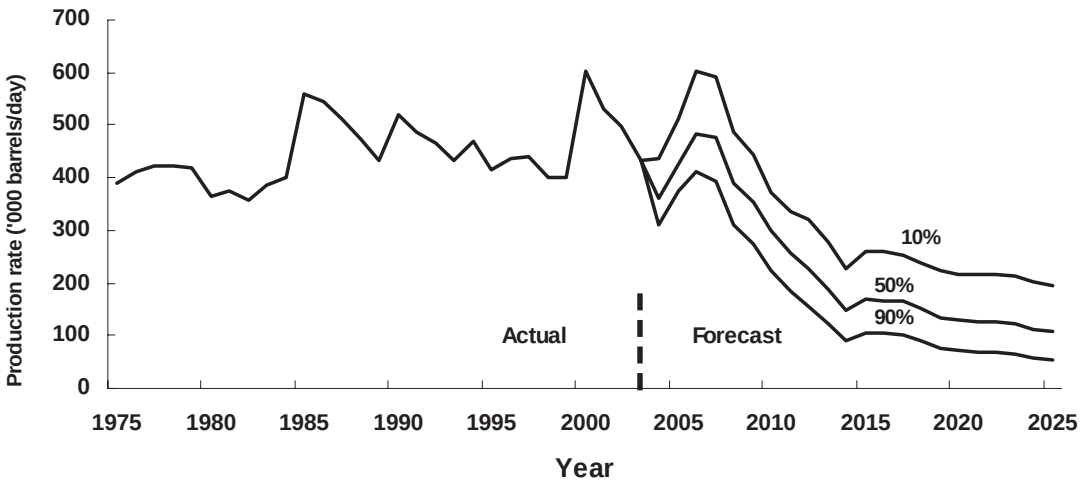

Figure 7.2 Australia's annual production of crude oil 1975–2003 and forecast annual production at 90%, 50% and 10% cumulative probability 2004–2025

Table 7.2 Forecast for 2004–2025 of crude oil production from Australia's identified accumulations, and from undiscovered accumulations, in the Bonaparte, Carnarvon, Eromanga, Cooper, Gippsland, Browse, Base, offshore Otway and offshore Perth Basins, as at July 2004 ('000 bbl/d)

	Identified			Undiscovered			Both		
Year	P90	P50	P10	P90	P50	P10	P90	P50	P10
2004	310	360	432	0	0	1	310	360	436
2005	374	426	511	0	1	1	374	427	512
2006	412	480	600	0	1	2	412	482	604
2007	390	471	588	0	2	7	393	475	592
2008	305	384	480	1	3	17	309	391	489
2009	266	346	432	1	5	31	273	355	445
2010	211	280	350	2	11	47	226	298	372
2011	162	228	304	3	20	69	183	255	335
2012	128	190	275	6	30	86	155	227	319
2013	89	141	216	10	40	105	122	189	277
2014	54	89	141	14	50	124	90	147	229
2015	61	100	162	19	59	138	104	170	260
2016	55	90	146	25	71	153	104	168	259
2017	49	80	130	31	79	164	100	164	253
2018	38	62	100	35	85	172	92	152	239
2019	24	39	63	39	93	182	77	135	224
2020	17	28	46	43	98	187	71	129	215
2021	14	22	36	46	103	193	69	126	215
2022	12	19	31	49	106	195	69	128	217
2023	8	13	21	50	110	199	64	124	212
2024	6	10	16	52	112	200	57	114	201
2025	5	7	12	52	113	200	53	109	196

7.3 Condensate forecast for 2004–2025

Figure 7.3 shows production of condensate from 1975 to 2003, and Figure 7.3 and Table 7.3 show a forecast of condensate production from 2004 to 2025. The forecast is based on company and Geoscience Australia estimates of production from accumulations that had been discovered by June 2004 and for which some production planning has been carried out. The forecast includes 10% of production from the JPDA.

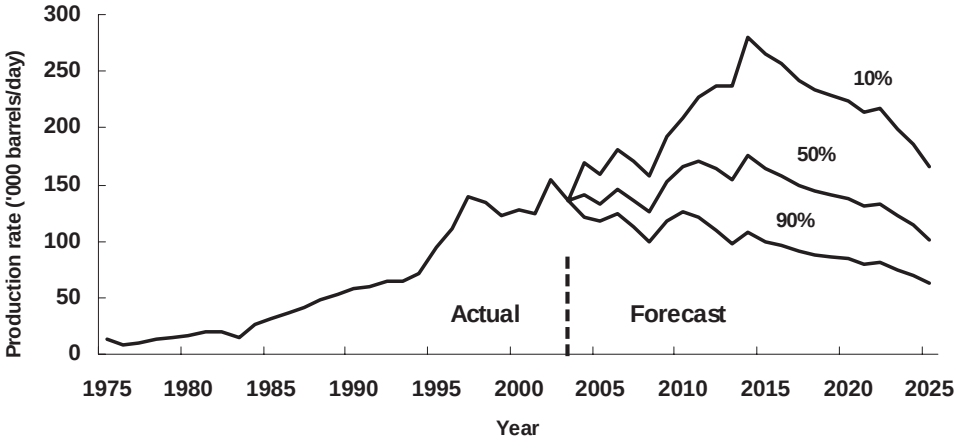

Figure 7.3 Australia's annual production of condensate 1975–2003 and forecast annual production at 90%, 50% and 10% cumulative probability 2004–2025

Table 7.3 Forecast for 2004–2025 of condensate production from Australia's identified accumulations, as at July 2004 ('000 bbl/d)

		Identified	
Year	P90	P50	P10
2004	121	141	169
2005	117	133	160
2006	124	145	181
2007	113	137	171
2008	100	127	158
2009	118	153	192
2010	125	166	208
2011	121	170	227
2012	110	163	236
2013	98	154	237
2014	108	176	279
2015	99	163	265
2016	96	157	256
2017	91	149	242
2018	88	144	235
2019	86	141	229
2020	84	137	224
2021	80	131	213
2022	81	133	216
2023	75	122	199
2024	70	114	185
2025	62	102	166

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 may not 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 (EDR) to production are shown in Figure 8.1.

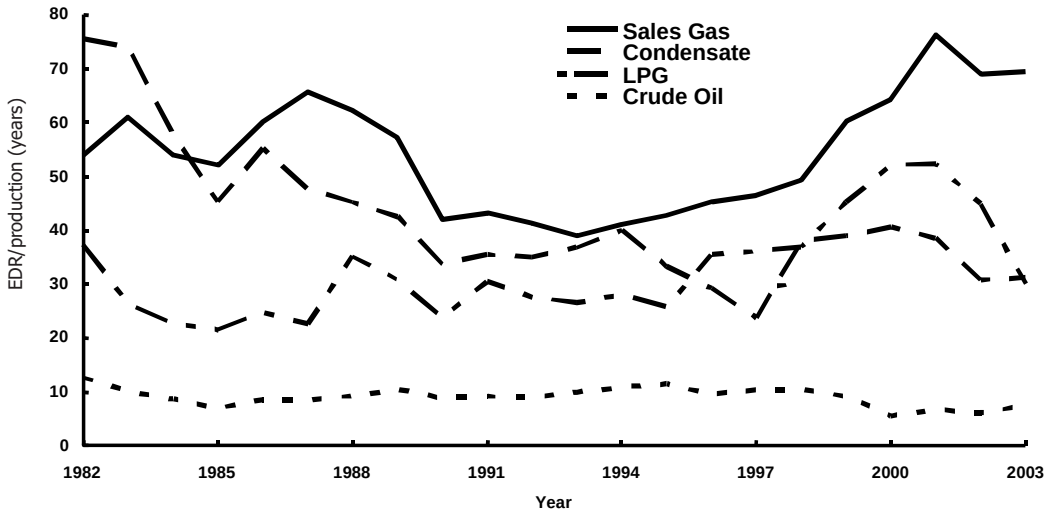

Figure 8.1 Annual R/P ratios for crude oil, condensate, LPG and sales gas

Table 8.1 Australia's economic demonstrated resources (EDR) and production of crude oil, condensate, naturally-occurring LPG and natural gas 1982 to 2003 (GL and BCM)

	Crude oil			Condensate			LPG			Gas		
End of year	EDR	Annual prod'n	R/P	EDR	Annual prod'n	R/P	EDR	Annual prod'n	R/P	EDR	Annual prod'n	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
2003	186	25.1	7	247	7.9	31	210	7.1	30	2462	35.5	69

The resources to production ratio (R/P) 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 seven years. This has decreased rapidly since 2000. 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 Timor Leste.

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.

The average crude oil and condensate production from 1993 to 2003 was 33.4 GL/y, while remaining economic demonstrated resources in 2003 were 433 GL. This means that in 2003 average crude oil and condensate production could be sustained for 13 years.

A better indicator of sustainability might be the ratio of crude oil and condensate production to consumption. The consumption figures are projected by Australian Bureau of Agricultural Resource Economics (ABARE, 2004). The ratios of forecast crude oil and condensate production to consumption from 2004 to 2019 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, increases from 63% in 2004 to 76% in 2006 and then decreases to 27% in 2019. The consumption of crude oil and condensate in 2004, 46.4 GL, could be sustained by the economic demonstrated resources remaining at end of 2003, 433 GL, for only 9.3 years.

Table 8.2 Australia's production and demand for crude oil and condensate ('000 bbl/d)

Year	Production	Consumption	Ratio
2004	501	799	63%
2005	562	809	69%
2006	623	820	76%
2007	608	836	73%
2008	516	852	61%
2009	509	867	59%
2010	462	883	52%
2011	425	900	47%
2012	393	917	43%
2013	346	934	37%
2014	326	953	34%
2015	337	971	35%
2016	328	990	33%
2017	320	1010	32%
2018	302	1030	29%
2019	284	1051	27%

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 depend 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 of 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, as the Laminaria–Corallina example clearly illustrates.

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:

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

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 2002–2003 figure was 76% (ABARE 2004). Heavy crude oil suitable for fuel oil, lubricant and bitumen production is imported and light crude oil is exported.

References

ABARE (2004) *Australian Energy: National and State Projections to 2019–20*. Australian Bureau of Agricultural and Resource Economics, Canberra, August 2004.

DPIE (1987) *Forecast of Energy Demand and Supply, Australia 1986–87 to 1999–2000*. Department of Primary Industries and Energy, Australian Government Publishing Service, Canberra.

9: Shale oil development

9.1 Shale oil

Shale oil comes from oil shale, 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. 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 Paleogene lacrustine (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

Up until recently, all 10 of the central Queensland oil shale deposits were held by Southern Pacific Petroleum (SPP), either solely or with joint venture partners. The last systematic review of the in-situ mineralisation for these 10 oil shale deposits was completed by SPP in 2000 to accord with the Joint Ore Resources Code (JORC). Minor revisions were made to these reserve and resource estimates by SPP in 2002 and those results are incorporated in this assessment.

Australia has 4.6 GL (29 million bbl) of shale oil economic demonstrated resources. This could increase significantly if the research and development demonstration-scale processing of shale oil near Gladstone at the Stuart deposit were to lead to a commercial plant. Paramarginal and submarginal demonstrated resources are 202.1 GL (1.3 Bbbl) and 3719 GL (23.4 Bbbl) respectively. The demonstration plant at Stuart has produced over 1.5 million bbl of oil. The shale tonnage processed was 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 2003 calendar year was up 94% to 100 ML (629 kbbl). The oil production rate increased to over 3000 bbl per stream day in 2003.

The demonstration plant design ore grade is 172 litres per tonne at zero moisture (LT0M). The retorting has been tested with a range of input grades from 152 LT0M in July and August 2002 to 189 LT0M. Recovery rates have 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%. Oil product sales in 2003 included 324 000 bbl of ultra-low sulphur naphtha (ULSN) and 261 kbbl of light fuel oil (LFO). 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.

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 at 239 ML and Estonia at 185 ML.

9.5 Industry developments

During 2004, ownership of SPP's oil shale assets passed to Queensland Energy Resources Limited (QERL). QERL has announced that its Stuart Stage 1 demonstration facility near Gladstone is expected to successfully complete its goals by the end of 2004. QERL plans to focus on conducting extensive research and design studies for the next phase of its Queensland oil shale operations based on the lessons learned from the demonstration plant.

Chairman of QERL, Mr Ross Dunning, said that Stage 1 achieved its goal — to demonstrate that large-scale oil extraction from the Stuart deposit can be done. Mr Dunning added that over past years, the testing has shown that there are many potential alternatives and variations to the details of the Stage 1 design, which need to be fully explored if the value of these resources is to be maximized for all stakeholders.

The facility will go onto care and maintenance in an operable condition to allow for any further testing if required while design efforts continue on the next phase of development.

SPP's long-term goal was to achieve, through progressive plant expansion, production of 200 kbbl/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 over $4 billion annually at current oil prices. The Queensland deposits hold about 20 Bbbl of oil equivalent resources while Australia's total known liquid petroleum reserves are less than 4 Bbbl.

Table 9.1 Australian shale oil resources as at 31 Dec 2003

State and Deposit	Demonstrated economic		Subeconomic			
			Paramarginal		Submarginal	
	GL	million bbl	GL	million bbl	GL	million bbl
Queensland						
Alpha	0	0	0	0	14	90
Condor	0	0	0	0	1908	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	1271	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**	**1271**	**3703**	**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
Tasmania 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: Developments in geological sequestration (storage) of carbon dioxide

10.1 Launch of new CRC

In 2003, a major step was taken towards providing scientific certainty in delivering long-term abatement of greenhouse gas emissions. On the 7th of October the Minister for Science, Mr Peter McGauran, officially launched the Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC).

The CO2CRC draws on expertise from research organisations and universities around Australia including: CSIRO, Curtin University, Geoscience Australia, Monash University, and the Universities of Adelaide, Melbourne and New South Wales. It has strong links with leading overseas research institutions in Europe, the United States, Canada, New Zealand, and Japan. Partners in the CO2CRC also extend beyond research bodies and government to the private sector across various areas of industry with participation from ten major petroleum, oil and power companies.

In line with Australia's aim to limit its growth in net emissions of greenhouse gases, the CO2CRC research priorities are to develop carbon dioxide capture and storage technologies. Preliminary gap analysis showed that specific programs within the research centre should focus on five areas:

1. geological sequestration of CO_2 (the storage of CO_2 in geological formations, specifically those with good reservoir and sealing properties);
2. a demonstration program for geological storage (testing the migration and containment of CO_2 in the sub-surface);
3. using CO_2 (investigating the commercial benefits, such as enhanced oil recovery or enhanced coal bed methane);
4. capturing CO_2 through the use of a range of technologies;
5. developing regional strategies for decreasing CO_2 emissions.

The CO2CRC builds on the outcomes of the GEODISC project (1999–2003), which was established within the Australian Petroleum Cooperative Research Centre (APCRC) and showed that Australia has a very significant potential for geological storage of CO_2. The geological analysis assessed over 100 sites around Australia. Sixty-five of these were identified as potential Environmentally Sustainable Sites for CO_2 Injection (ESSCIs) by applying a deterministic risk assessment based on five factors: storage capacity, injectivity potential, site details, containment and natural resources (AIE, 2004). Prior to this, assessment of the nation's emission sources was made, and stationary point sources of potentially sequesterable CO_2 were identified. This information was then used in matching the sources with nearby potential sinks. Results with this method suggest that, at a regional scale, Australia has a CO_2 storage potential in excess of 740 billion tonnes, which equates to 1600 years of emissions at between 100 and 115 million tonnes per year, or up to a quarter of current annual total net emissions (Bradshaw and others, 2002a). This conclusion was pivotal in providing the basis for establishing the CO2CRC.

Geological storage

Research is well underway into advancing the probabilistic analysis of the previously identified ESSCIs. The newly appointed team at Geoscience Australia is engaged in performing fully comprehensive geological site assessments of key focus areas around Australia where high CO_2 emission problems exist. Of highest priority are the storage options within saline reservoir rocks, depleted oil and gas reservoirs, and, to a lesser extent, deep coal seams.

In addition to this research, within the storage program are investigations into:

- transporting and conditioning CO_2;
- safely and efficiently injecting CO_2;
- safely and effectively storing CO_2; and
- monitoring and verification of the stored CO_2.

Because of the work conducted in the GEODISC project, understanding of CO_2 storage is at a somewhat more mature stage than capture technologies. However, the CO2CRC will draw on knowledge and experience developed within other programs and organisations to further improve the underlying skills. For example, the coal CRCs have outstanding expertise in coal analysis composition and properties, and will be essential in research and development of storage projects relating to coal. It is the aim of the CRC to foster such partnerships and continue establishing relationships across industry, government and research (Bradshaw and others 2002b).

Demonstration program

The next step involves pilot demonstration projects to offer scope for addressing specific issues such as CO_2 injectivity, validation of models, testing of monitoring regimes, and assessment of the behaviour of CO_2 and any impacts on the sub-surface environment. Additionally, pilot projects are important in communicating geosequestration issues to the community. This component of the research centre extends internationally, where Australian researchers are working closely with others in the United States to improve understanding from current small-scale pilot projects. Throughout the demonstration and pilot phases, the CO2CRC will place significant effort in the important areas of public education, location (site) selection and formulation of regulatory regimes (Bradshaw and others, 2002b).

Using CO_2

Aside from a reduction of greenhouse gas emissions, there are other benefits to be gained through the successful injection and storage of CO_2. Commercial benefits can be obtained, such as enhanced oil recovery (EOR) or enhanced coal bed methane (ECBM) and the technology exists for such operations. The CO2CRC will undertake research into all these options. Effectively using CO_2 as a commodity, and identifying a successful capture and storage process, may create new investment opportunities in Australia with the added benefit of decreasing CO_2 emissions.

Capturing CO_2 through the use of a range of technologies

Some of the currently available capture technologies are of limited effectiveness and can result in a major increase in the cost of power generation or industrial processes. The CO2CRC researches existing and new capture technologies to reduce the cost of capture and to assess and enhance their suitability for Australian industrial and power generation activities. The Centre will carry out research into CO_2 capture systems, including solvent-based capture systems, innovative membrane and pressure swing adsorption systems, and hydrate and distillation systems. The CO2CRC will also undertake research relevant to the development of new installations and provide advice where process modifications can be incorporated that will enhance CO_2 separation and capture (Bradshaw and others, 2002b).

Developing regional strategies for decreasing CO_2 emissions

The much longer-term objective of the CO2CRC is to make CO_2 capture and storage a part of the developing hydrogen economy. Using what are termed 'zero emission technologies', traditional fossil fuel power generation will be transformed from current practices to new technologies incorporating coal gasification, membrane separation or combined cycle power plants. This improved method will not only produce a pure stream of CO_2 that can be potentially stored rather than released into the atmosphere, but will increase the availability of energy extracted from the fuel in the form of hydrogen (Bradshaw and others, 2003).

Australia has some advantages in the lead-up to the hydrogen economy, notably its large coal and gas resources and abundant CO_2 storage capacity. However, much of the technology and market pull will come from the larger OECD countries, and the USA in particular. Therefore, Australia will work closely with other countries in the development of a transitional pathway to renewable energy (Bradshaw and others, 2002b).

10.2 International activity

In December 2003, the CO2CRC hosted a special meeting of the Intergovernmental Panel on Climate Change (IPCC). The IPCC is the international organisation whose role is to conduct assessments of scientific, technical and socio-economic information relating to climate change. The IPCC is preparing a special report on CO_2 capture and storage, as part of the United Nations Framework Convention on Climate Change. Researchers within the CO2CRC are actively involved with the production of the report, which comprises advice from 100 international scientists and will be released publicly in late 2005 (see http://arch.rivm.nl/env/int/ipcc/pages_media/ccs-report.html).

The Canberra meeting was the second in a series of gatherings of the report's lead authors, with further meetings planned for 2004 and 2005. The report will undergo an extensive review process by IPCC member governments and the scientific community to ensure the integrity of the final report (Bradshaw and others, 2003).

Other international activity at the government level is occurring within the Carbon Sequestration Leadership Forum (http://www.cslforum.org) which comprises 14 nations

that are focused on development of improved cost-effective technologies for the separation and capture of carbon dioxide for its transport and long-term safe storage. One of the aims of the CSLF is to provide a mechanism by which international collaboration can be coordinated on major infrastructure projects for carbon capture and storage. The 2nd Ministerial Meeting of the CSLF, involving both the Policy and Technical Groups, occurred in Melbourne in September 2004.

10.3 Geosequestration costs

The economics of storage of CO_2 in underground reservoirs in Australia has been studied for several years by the Cooperative Research Centre for Petroleum (Bradshaw and others, 2002a). Relevant details have been summarised by Allinson and others (2003) but more specific evaluation is now being undertaken by the CO2CRC (CO2CRC, 2004b).

The CO2CRC is researching the logistics of capture and separation of carbon as well as the technical, financial and environmental issues of storing industrial carbon dioxide emissions in deep geological formations. If implemented, the complete sequestering system would comprise the capturing, processing (dehydration and compressing), transportation (pipeline) and storage (drilling, well completion and injection) processes. The costs for each of these elements reflects the partial cost of a linked chain from the source to the ultimate disposal point (AIE, 2004).

Allinson and others (2003) suggest that the volume of carbon dioxide which could be sequestered economically in Australia depends very much upon the level of any future carbon credit scheme and how it might operate. The same authors suggest that 50–180 million tonnes of CO_2 could be stored in Australia if a credit for doing so ranged from US$20–$40 per tonne (A$29–$59/t; Allinson and others, 2003). These figures provide insight into the underlying costs for stand-alone projects. A brief outline of the major elements which impact on geosequestration costs, is as follows.

For potential geological sites to be suitable for geosequestration they require certain minimum technical qualities, including: vertical thickness of storage reservoir, subsurface depth and sealing potential, storage and injectivity characteristics, and an absence of active seismic zones. Major technical hurdles are the existing chemistry of groundwater at depth, and geochemical evaluation of the reaction of storage formation minerals, groundwater and compressed CO_2. Site specific feasibility studies must evaluate these issues before economic evaluation of costs can logically be undertaken.

In addition to these technical and geological criteria, optimal storage locations should be as close as possible to CO_2 sources to minimise pipeline costs (a major capital item). On the processing and capital side of the sequestration process, the capture costs are notable but can be minimised if only large-volume, point sources of CO_2 are taken into consideration. The major capital items required at such a point in the scheme are gathering, processing and pressurisation equipment. Each part of this must be of a scale sufficient to handle all operations in a cost-efficient manner (Simshauser, 2004).

The largest capital item is typically that associated with the size (diameter) and length of pipeline used to transport processed CO_2 from a collection and processing site to an

injection and storage site. Issues such as pipeline flow rate (diameter) and injection rate influence costs. The bulk of costs associated with geosequestration are capital expenditures. These costs are notably increased by the length (and diameter) of pipeline required, the depth and complexity of subsurface well fittings, and the complexity of processing and compression required at the source location. Operating costs are likely to be less than one-third of the necessary capital costs, but as they are spread over the life (20–25 years) of a project, their real value will depend on fluctuating economic variables over this time period.

All of the above technical and geological issues are currently the subject of investigation by the CO2CRC, its component partners and associated parties (Simshauser, 2004). Under the program identified for the remaining term of the CRC's life (CO2CRC, 2004b), it is anticipated that some of the uncertainty with regard to technology, geological and economic uncertainties will be resolved.

At present, it is anticipated that the following range of cost estimates for technically feasible geosequestration projects in Australia apply. At the low probability end of the spectrum (P10), it is anticipated that the lowest cost settings will be able to technically handle 5 million tonnes of CO_2 at a cost of up to $25/t for upwards of 20 years of project life. At the other end of the probability spectrum (P90), between 50 and 100 million tonnes of CO_2 could be accommodated, at a cost of up to $120/t over the same time period. In the mid range of the probability spectrum (P50), some 35 million tonnes is expected to be accommodated at up to $45/t. The actual costs of any economically viable project are likely to fall within and possibly well below these postulated limits and in the range currently covered in the low probability range of these estimates.

This range of costs is based on a Delphic assessment of the available published data. It is the aim of much of the CO2CRC program to generate more specific information and reduce uncertainties sufficiently to improve the reliability of such estimates, and to generate ones with direct connection to actual sites and capital expenditures. At the same time it should be possible, with additional technical information, to refine the cost estimates associated with technically feasible geosequestration projects and identify cost estimates with a much higher level of certainty (P95) than is currently the case.

Comparisons with other geosequestration projects around the world can improve our understanding of the likely cost structure of the geosequestration process in Australia. For example, options for CO_2 storage in the Midwestern US (Gupta and others, 2004) have identified costs of US$20/t for dehydration, compression, transport and injection, excluding capture costs from regional major industrial facilities.

Other recent studies investigated the storage capacity of geological formations in Ontario, Canada, and identified storage capacities of between approximately 290 and 440 million tonnes (Shafen and others, 2004a). Costs of storage for these technically attractive proposals are estimated at between US$7.5 and $14/t of CO_2 stored (Shafen and others, 2004b). While such recent studies are for programs with a high degree of technical and geological certainty, our current experience in Australia is at a wider range or certainties. The CO2CRC program will be critical to improving knowledge and decreasing uncertainties.

Further CO2CRC research recently outlined by Stevens (2004) notes that, globally, CO_2 capture costs are likely to vary greatly, according to the scale and technology of the CO_2 source facilities. His observations provide an indication of the range of capture costs for CO_2 source facilities in a diverse range of settings with cost estimates of US$5 to $60/t CO_2. He also notes that the potential target capture costs for feasible sequestration projects would range from US$5 to $20/t CO_2. In preparing the range of cost and probability estimates outlined here, it is anticipated that capture costs for technically feasible geosequestration projects in Australia are likely to match if not greatly undercut the estimates noted by Stevens (2004).

References

AIE (2004) Geosequestration — are we burying our problems?, *The Australian Institute of Energy*, http://www.aie.org.au/syd/downloads/geoseq.pdf (accessed 25 August 2004).

Allinson, W.G., Nguyen, D.N. and Bradshaw, J. (2003) The economics of geological storage of CO_2 in Australia. *The APPEA Journal*, 43(1), 623–635.

Bradshaw, J., Bradshaw, B.E., Allinson, G., Rigg, A.J., Nguyen, V. and Spencer, L. (2002a) The potential for geological sequestration of CO_2 in Australia: preliminary findings and implications for new gas field development. *The APPEA Journal* 42(1), 25–46.

Bradshaw, J., Allinson, G., Bradshaw, B.E., Nguyen, V., Rigg, A.J., Spencer, L. and Wilson, P., (2002b) Australia's CO_2 geological storage potential and matching of emission sources to potential sinks. *Proceedings of the 6th International Conference on Green House Gas Control Technologies*, Kyoto, Japan, pp. 370–375.

Bradshaw, J., Dance, T., and Lewis, A. (2003) A review of geological sequestration of carbon dioxide in Australia. In Petrie, E. and others. *Oil and Gas Resources of Australia 2002*. Geoscience Australia, Canberra. Part 10, 97–104.

CO2CRC (2004a) *Carbon Dioxide Capture and Storage: Research and Development & Demonstration in Australia — A Technology Roadmap, 2004*. Cooperative Research Centre for Greenhouse Gas Technologies, Canberra, Publication No 2004/01, January 2004. p. 60.

CO2CRC (2004b) The Cooperative Research Centre for Greenhouse Gas Technologies http://www.CO2CRC.com.au/ (accessed 25 August 2004)

Gupta, N.., Sass, B., Chattopadhyay, S., Sminchak, J., Wang, P. and Espie, T. (2004) Geologic storage of CO2 from refining and chemical facilities in the Midwestern US. *Energy* 29, 1599–1609. http://www.CO2CRC.com.au, various media releases.

Shafen, A., Croiste, E., Douglas, P.L. and Chatis, I. (2004a) CO_2 sequestration in Ontario, Canada. Part I: Storage evaluation of potential reservoirs. *Energy Conversion and Management* 45, 2645–2659.

Shafen, A., Croiste, E., Douglas, P.L. and Chatis, I. (2004b) CO_2 sequestration in Ontario, Canada. Part II: cost estimation. *Energy Conversion and Management*. (http://www.elsevier.com/locate/enconman — accessed 30 August 2004).

Simshauser, P. (2004) The economic and environmental impact of scale-efficient IGCC plant in the NEM — A discussion paper by Stanwell Corporation Limited provided to the CO2CRC May 2004. http://www.CO2CRC.com.au (accessed 30 August 2004).

Stevens, G.. (2004) CO2 Capture and Separation Technologies (8 August 2004), The University of Melbourne/CO2CRC (2.15MB). http://www.co2crc.com.au/PUBFILES/PPOINT/capture%20and%20separation_august2004.ppt, accessed 10 September 2004

11: Petroleum data and information

Public access to existing petroleum exploration data reduces financial and exploration risks for explorers, particularly when exploring frontier areas. State and Commonwealth governments have had a long-standing policy requiring the lodgement of exploration data and their public release after a confidentiality period, to encourage further exploration.

The lodgement of petroleum exploration and development data is a requirement under the arrangements of the *Petroleum (Submerged Lands) Act 1967*, and the Petroleum (Submerged Land) (Data Management) Regulations 2004 and Data Guidelines which may be viewed on the web at www.ga.gov.au/oceans/projects/20011022_22.jsp .

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). This Act 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 that data available for subsequent exploration. The arrangement continues to this day.

The Commonwealth makes 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 new 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. All petroleum data are available at cost of transfer. The digital data can be provided on media of choice, and physical data are available for viewing and analyses at Geoscience Australia's Data Repository. Data availability can also be viewed at the Geoscience Australia web-site address given above.

11.1 Data access July 2003 – June 2004

In the past year data from 299 seismic surveys —— 22.47 terabytes (22 470 gigabytes) have been accessed by the petroleum industry. The data comprised:

- raw field
- processed
- re-processed
- navigation

Table 11.1 Number of surveys loaned, by basin

State	Basin	Data type	Surveys
New South Wales	Sydney	Processed	1
Northern Territory	Arafura	Field	2
		Processed	1
	Bonaparte	Field	8
		Processed	23
		Re-Processed	11
	Browse	Field	2
		Processed	3
		Re-Processed	6
Northern Territory / Western Australia	Bonaparte	Field	4
		Processed	4
		Re-Processed	5
	Browse	Processed	1
		Re-Processed	5
Queensland	Carpentaria	Field	2
South Australia	Bight	Field	7
		Processed	2
	Otway	Field	1
		Processed	1
		Re-Processed	1
Tasmania	Bass	Field	3
	Sorrel	Field	2
		Processed	1
	Tasmania	Field	1
Victoria	Bass	Processed	1
	Gippsland	Field	10
		Processed	2
	Otway	Field	5
		Re-Processed	10
Western Australia	Bonaparte	Field	13
		Processed	34
		Re-Processed	12
	Browse	Field	8
		Processed	15
	Canning	Field	2
		Processed	3
		Re-Processed	4
	Carnarvon	Field	23
		Processed	82
		Re-Processed	26
	Eucla	Field	1
		Re-Processed	1
	Perth	Field	19
		Processed	9
		Re-Processed	1
JPDA	Bonaparte	Field	6
		Processed	12
		Re-Processed	5

- velocities
- acquisition, processing and interpretative reports

Table 11.1 shows the number of distinct surveys and the three main data types borrowed per basin.

11.2 Remastering project

The Commonwealth Government Budget of May 2003 has allocated resources to be used for the copying and concatenation onto high density media, of older technology tapes held in the Geoscience Australia Repository. The media being transcribed are 9 and 21 track tapes as well as 3480 cartridges.

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.

All transcription, quality control and physical disposal are carried out in by companies in Perth. The transcription contracts were awarded to Guardian Data and Spectrum Data. All quality control is being carried out by GeoCom Services Australia. At the completion of copying and QC the tapes are disposed of in Perth and are recycled into plastic products. The Remastering Project has been in operation since January, 2004. Table 11.2 refers to completed surveys (July 2004).

11.3 Lodgement of data

The *Petroleum Submerged Lands Act 1967* (P(SL)A) is administered in each State/Territory by a Designated Authority (DA) on behalf of the Commonwealth. The DA has the responsibility under the Act for determination of matters relating to the operation of the Act in offshore areas. 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 core 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.

Table 11.2 Remastered surveys, by basin

Survey	Vintage	Basin/Sub-basin and State/Territory
C81A Marine	1981	Barrow Sub-basin WA
C81B Marine	1982	Barrow Sub-basin/ Exmouth Plateau WA
Donna Marine	1995	Barrow Sub-basin / Carnarvon WA
Hummock Marine	1996	Bass Basin Tasmania
Rocky Cape Marine	1994	Bass Basin Tasmania
Mahakam Marine	1992	Carnarvon Basin WA
Mohaku Marine	1993	Carnarvon Basin WA
Helvetius Marine	1992	Bonaparte Basin WA
Andromeda Marine	1996	Bonaparte Basin NT
Van Dieman Rise	1969	Bonaparte Basin NT / WA
SPA 4SL / 95-96	1996	Browse Basin WA
Calliance Reef Marine	1983	Browse Basin WA
C94A Marine	1994	Canning Basin WA
Cuvier 1992 Marine	1992	Carnarvon Basin / Gascoyne Basin WA
HH88 Marine	1988	Carnarvon Basin WA
Parker 3D	1991	Carnarvon Basin WA
Chrysaor 3D	1995	Carnarvon Basin WA
Rundle Marine	1994	Carnarvon Basin / Gascoyne Basin WA
X95A Marine	1995	Carnarvon Basin WA
NT/P32 1980 Marine	1980	Carpentaria Basin NT
Carpentaria Basin 1980 (CC80)	1980	Carpentaria Basin NT
Dampier Beagle	1975	Dampier / Beagle Basin WA
Denman Basin Marine	1972	Denman Basin SA
Offshore Twilight Cove	1970	Eucla Basin WA
X78A	1978	Carnarvon Basin WA
GS81A Marine	1981	Gippsland Basin Tasmania
GUT-83A Marine	1983	Gippsland Basin Victoria
G89A Marine	1990	Gippsland Basin Victoria
Blackback 3D	1990	Gippsland Basin Victoria
GS95A (Basker Manta 3D)	1995	Gippsland Basin Victoria
OH91B Marine	1991	Otway Basin Victoria
Geelvink Channel	1970	Perth Basin WA

11.4 Data availability

Digital seismic exploration and well log data

Geoscience Australia's collection is made up of over 549 000 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, including:

- 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 are 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 5731 petroleum wells and stratigraphic holes;
- over 150 000 m of down-hole core samples;
- over 3 022 000 m of down-hill drill cuttings;
- over 3250 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.

11.5 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 Commonwealth legislation. This database is accessible through the Geoscience Australia website at www.ga.gov.au/oceans/projects/20011022_22.jsp .

11.6 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
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Data Repository Manager	Paula Cronin
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Physical Collections Manager	Eddie Resiak
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Seismic Collections Manager	Andrew McMahon
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Appendices

Appendix A
2003

Wells drilled for exploration, development and production by State, 2003

APPENDIX A: WELLS DRILLED FOR EXPLORATION, DEVELOPMENT AND PRODUCTION BY STATE, 2003

Standard Definitions for Petroleum Statistics (American Petroleum Institute) used for these statistics.

Operator Well Permit	Basin	Location	Eleva-tion	Spudded TD reached	Final TD (m)	Well remark	Classi-fication
QUEENSLAND							
BEACH Bargie 4 ATP269P	Eromanga	-26° 27' 24" 143° 45' 1"	RT 193.8 GL 189.8	27-Oct-03 03-Nov-03	1 669 1 669	Plugged and abandoned, dry.	DEV DEV
BEACH Kenmore 28 PL32	Eromanga	-26° 39' 56" 143° 25' 56"	RT 165.7 GL 162	25-Sep-03 05-Oct-03	1 548 1 548	Completed as an oil producer.	DEV DEV
BEACH Kenmore 29 PL32	Eromanga	-26° 39' 45" 143° 25' 40"	RT 167.6 GL 163.6	06-Nov-03 18-Nov-03	1 450 1 450	Cased and suspended as an oil producer.	DEV DEV
BEACH Kenmore 30 PL32	Eromanga	-26° 40' 6" 143° 25' 48"	RT 164.8 GL 160.2	20-Nov-03 28-Nov-03	1 448 1 448	Cased and suspended as an oil producer.	DEV DEV
BEACH Kenmore North 2 PL32	Cooper	-26° 38' 5" 143° 26' 2"	RT 181.3 GL 177.3	11-Oct-03 20-Oct-03	1 597 1 597	Cased and suspended as an oil producer.	DEV DEV
MAGELLAN Callisto 1 ATP267P	Eromanga	-27° 21' 52" 142° 31' 41"	RT 38 GL 145	06-Nov-03 13-Nov-03	1 877 1 877	Plugged and abandoned, dry.	NFW NFW
MAGELLAN Gregory River 3 ATP613P	Maryborough	-25° 8' 10" 152° 28' 57"	RT 16.5 GL 12	26-Mar-03 22-Apr-03	2 599 2 599	Plugged and abandoned, dry.	EXT EXT
MAGELLAN Gregory River 3 ST1 ATP613P	Maryborough	-25° 8' 10" 152° 28' 57"	RT 16.5 GL 12	01-May-03 16-May-03	3 050 529	Plugged and abandoned, dry.	EXT EXT
MOSAIC Churchie 4 PL192	Surat	-27° 5' 15" 149° 12' 32"	RT 251.2 GL 246.2	12-Dec-03 —	2 123 2 123	Cased and suspended as a gas producer.	EXT EXT
OCA Horseshoe 3 PL174	Surat	-27° 0' 37" 149° 11' 33"	RT 247.7 GL 242.7	30-Nov-03 07-Dec-03	1 732 1 732	Cased and suspended.	EXT EXT
OCA Myall Creek 6 PL174	Surat	-27° 4' 46" 149° 12' 9"	RT 250 GL 245	10-Nov-03 —	2 037 2 037	Cased and suspended as a gas producer.	DEV DEV
OCA Myall Creek 7 PL174	Bowen	-27° 4' 38" 149° 12' 39"	RT 250 GL 245	25-Oct-03 06-Nov-03	2 075 2 075	Cased and suspended as a gas producer.	DEV DEV
OCA Myall Creek 8 PL174	Bowen/Surat	-27° 3' 42" 149° 13' 12"	RT 6 GL 245	22-Mar-03 05-Apr-03	2 077 2 077	Cased and suspended as a gas producer.	DEV DEV
OCA Myall Creek East 1 ATP647P	Surat	-27° 2' 53" 149° 15' 8"	RT 248.1 GL 242.9	23-Sep-03 19-Oct-03	2 238 2 238	Cased and suspended as a gas producer.	NFW NFD
SANTOS Chinook 1 (Santos) ATP259P	Cooper/Eromanga	-27° 14' 59" 141° 54' 45"	RT 81 GL 76	03-Dec-03 15-Dec-03	2 554 2 554	Completed as a gas producer.	NFW NFD
SANTOS Heliose 1 ATP259P	Cooper	-27° 59' 20" 141° 51' 48"	RT 71.2 GL 65.2	18-Dec-03 29-Dec-03	2 353 2 353	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
QUEENSLAND							
SANTOS Hurricane 1 ATP259P	Cooper	-27° 24' 9" 141° 14' 12"	RT 97 GL 91.9	23-Dec-03 —	2 302 2 302	Plugged and abandoned, dry.	NFW NFW
SANTOS Kinta 1 ATP259P	Cooper/Eromanga	-27° 57' 45" 141° 2' 60"	RT 102 GL 92	15-Oct-03 04-Nov-03	3 176 3 176	Cased and suspended as a gas producer.	NFW NFD
SANTOS Merula 1 ATP299P	Cooper	-26° 50' 43" 143° 21' 20"	RT 171.6 GL 167.6	20-Dec-03 28-Dec-03	1 439 1 439	Plugged and abandoned, dry.	NFW NFW
SANTOS Moon 3 PL140	Cooper/Eromanga	-28° 13' 36" 141° 1' 60"	RT 97 GL 92	26-Feb-03 16-Mar-03	2 859 2 859	Cased and suspended as a gas producer.	DEV DEV
SANTOS Moonie 40 PL 1	Surat	-27° 44' 5" 150° 16' 16"	RT 273 GL 268	13-Jun-03 20-Jun-03	1 832 1 832	Plugged and abandoned, dry.	EXT EXT
SANTOS Moonie 41 PL 1	Surat	-27° 44' 45" 150° 14' 40"	RT 270 GL 264	29-May-03 09-Jun-03	1 844 1 844	Plugged and abandoned, dry.	EXT EXT
SANTOS Mulberry 1 PL39	Cooper/Eromanga	-26° 53' 31" 143° 24' 6"	RT 180.5 GL 176.5	08-Dec-03 18-Dec-03	1 427 1 427	Cased and suspended as an oil producer.	NFW NFD
SANTOS Roseneath 2 PL63	Cooper/Eromanga	-28° 10' 11" 141° 13' 34"	RT 138.5 GL 133	06-Feb-03 19-Feb-03	2 231 2 231	Cased and suspended as an oil and gas producer.	DEV DEV
SANTOS Roseneath 3 PL63	Cooper/Eromanga	-28° 11' 49" 140° 11' 23"	RT 58 GL 52	03-Apr-03 08-Apr-03	1 687 1 687	Plugged and abandoned, dry.	EXT EXT
SANTOS Sunnybank 6 ATP259P	Bowen/Surat	-26° 56' 40" 149° 13' 27"	RT 255 GL 251.3	14-Nov-03 28-Nov-03	2 192 2 192	Cased and suspended as an oil and gas producer.	DEV DEV
SANTOS Surlow 1 ATP259P	Cooper/Eromanga	-27° 20' 14" 141° 57' 51"	RT 79 GL 74.7	13-Nov-03 29-Nov-03	2 425 2 425	Cased and suspended as a gas producer.	NFW NFD
SANTOS Talgeberry 8 ATP299P	Eromanga	-26° 56' 60" 143° 25' 60"	RT 191.4 GL 187.4	20-Nov-03 26-Nov-03	1 331 1 331	Cased and suspended as an oil producer.	DEV DEV
SANTOS Talgeberry North 1 PL39	Cooper	-26° 55' 2" 143° 24' 22"	RT 194.8 GL 190.8	29-Nov-03 04-Dec-03	1 337 1 337	Plugged and abandoned, dry.	NFW NFW
SANTOS Thungo 8 PL51	Cooper/Eromanga	-27° 43' 9" 142° 35' 7"	RT 113.6 GL 109	29-Oct-03 01-Nov-03	1 118 1 118	Cased and suspended as an oil producer.	DEV DEV
SANTOS Wellington 2 PL131	Cooper	-27° 42' 59" 141° 51' 50"	RT 73 GL 68	23-Oct-03 08-Nov-03	2 773 2 773	Cased and suspended as a gas producer.	DEV DEV
SANTOS Wolgolla 3 PL88	Cooper/Eromanga	-28° 11' 3" 141° 19' 35"	RT 134 GL 129	25-Jan-03 05-Feb-03	2 121 2 121	Cased and suspended as a gas producer.	DEV DEV

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD (m)	Well remark	Classification
QUEENSLAND							
SUNSHINE Overston 1 ATP645P	Bowen	-27° 4' 30" 149° 27' 8"	RT 265 GL 260	09-Jan-03 26-Jan-03	2 987 2 987	Cased and suspended as a gas producer.	NFW NFD

METRES DRILLED — QUEENSLAND

Wells	Onshore	Offshore	Total
Exploration	36 461	—	36 461
Development	28 526	—	28 526
Total	64 987	—	64 987

VICTORIA							
BHP BILLITON Megamouth 1 VIC/P45	Gippsland	-38° 35' 44" 148° 16' 31"	RT 22 WD -80	16-Nov-03 26-Nov-03	2 545 2 545	Plugged and abandoned, dry. Remedial sidetrack undertaken.	NFW NFW
ESSENTIAL Koroit West 1 PEP152	Otway	-38° 16' 42" 142° 17' 54"	RT 47 GL 45	16-Jan-03 22-Jan-03	850 850	Plugged and abandoned, dry.	NFW NFW
ESSO Flounder A 2A VIC/L11	Gippsland	-38° 18' 39" 148° 26' 22"	KB 34 WD -94	02-Sep-03 16-Sep-03	2 803 1 441	Completed as an oil producer.	DEV DEV
ESSO Flounder A 12A VIC/L11	Gippsland	-38° 18' 39" 148° 26' 22"	KB 34 WD -94	28-Mar-03 11-Apr-03	2 920 2 055	Completed as an oil producer.	DEV DEV
ESSO Flounder A 17A VIC/L11	Gippsland	-38° 18' 39" 148° 26' 22"	RT 34.2 WD -94	10-Aug-03 21-Aug-03	3 660 377	Cased and suspended as an oil producer.	DEV DEV
ESSO Flounder A 18A VIC/L11	Gippsland	-38° 18' 39" 148° 26' 22"	KB 34.2 WD -94	07-Jun-03 30-Jun-03	3 736 3 736	Plugged and abandoned, dry.	DEV DEV
ESSO Flounder A 20A VIC/L11	Gippsland	-38° 18' 39" 148° 26' 22"	KB 32.9 WD -94	08-Feb-03 19-Feb-03	2 789 1 977	Completed as an oil producer.	DEV DEV
ESSO Flounder A 24A VIC/L11	Gippsland	-38° 18' 39" 148° 26' 22"	KB 32.9 WD -94	03-Mar-03 15-Mar-03	3 193 2 588	Completed as an oil producer.	DEV DEV
ESSO Halibut A 1A VIC/L 5	Gippsland	-38° 24' 22" 148° 19' 16"	RT 28.6 WD -72	20-Nov-03 30-Nov-03	2 952 2 334	Completed as an oil producer.	DEV DEV
ESSO Halibut A 6A VIC/L 5	Gippsland	-38° 24' 22" 148° 19' 16"	RT 28.6 WD -72	15-Dec-03 25-Dec-03	3 473 2 900	Completed as an oil producer.	DEV DEV
ESSO Scallop 1 VIC/RL2	Gippsland	-38° 12' 49" 148° 35' 29"	RT 26 WD -110	02-Feb-03 23-Feb-03	3 174 3 174	Plugged and abandoned, dry.	NFW NFD

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Elevation	Spudded TD reached	Final TD (m)	Well remark	Classification
VICTORIA							
LAKES Bunga Creek 2 PEP155	Gippsland	-37° 51' 0" 148° 2' 12"	RT 61 GL 60	27-Feb-03 17-Mar-03	348 348	Plugged and abandoned, dry.	STR STR
LAKES Patties Pies 1 PEP156	Gippsland	-37° 51' 8" 147° 40' 28"	RT 5.5 GL 4	14-Mar-03 22-Mar-03	441 441	Plugged and abandoned, dry.	NFW NFW
LAKES Wombat 1 PEP157	Gippsland	-38° 21' 16" 147° 9' 32"	RT 14.6 GL 11	05-Dec-03 —	1 990 1 990	Completed as a gas producer.	NFW NFD
ORIGIN Banganna 1 PEP159	Otway	-38° 12' 27" 142° 10' 53"	RT 55 GL 52	05-Feb-03 15-Feb-03	2 125 2 125	Plugged and abandoned, dry.	NFW NFW
SANTOS Casino 3 VIC/P44	Otway	-38° 56' 34" 142° 49' 6"	RT 22 WD -68	14-Oct-03 30-Oct-03	2 136 2 136	Plugged and abandoned, dry.	EXT EXT
SANTOS Hill 1 VIC/P51	Otway	-38° 48' 50" 141° 50' 40"	KB 25 WD -210	08-Dec-03 22-Dec-03	2 575 2 575	Plugged and abandoned, dry.	NFW NFW
SANTOS Melba 1 PEP154	Otway	-38° 28' 17" 142° 49' 24"	RT 76.2 GL 71.2	22-Mar-03 29-Mar-03	1 668 1 668	Plugged and abandoned, dry.	NFW NFW
SANTOS Minerva 4 VIC/L22	Otway	-38° 43' 13" 142° 57' 39"	RT 26 WD -59.25	19-Dec-02 02-Jan-03	1 857 1 857	Cased and suspended as a gas producer.	DEV DEV

METRES DRILLED — VICTORIA

Wells	Onshore	Offshore	Total
Exploration	7 074	10 670	17 744
Development	—	19 265	19 265
Total	7 074	29 935	37 009

SOUTH AUSTRALIA							
BEACH Brighton 1 PEL 92	Cooper	-28° 3' 26" 139° 19' 27"	RT 22.9 GL 17.6	03-Sep-03 15-Sep-03	2 087 2 087	Plugged and abandoned, dry.	NFW NFW
BEACH Carrickalinga 1 PEL 91	Cooper/Eromanga	-27° 57' 13" 139° 38' 13"	RT 26.1 GL 20.7	04-Aug-03 28-Aug-03	2 716 2 716	Plugged and abandoned, dry.	NFW NFD
BEACH Christies 1 PEL 92	Cooper/Eromanga	-27° 58' 47" 139° 22' 23"	RT 24 GL 20	23-Jun-03 14-Jul-03	1 957 1 957	Completed as an oil producer.	NFW NFD
BEACH Moana 1 PEL 107	Cooper/Eromanga	-28° 5' 11" 139° 29' 31"	RT 22.6 GL 18.4	15-Jul-03 28-Jul-03	2 265 2 265	Plugged and abandoned, dry.	NFW NFW
BEACH Seacliff 1 PEL 94	Cooper/Eromanga	-28° 55' 25" 140° 10' 31"	RT 30.9 GL 25.6	28-Nov-03 08-Dec-03	1 684 1 684	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
SOUTH AUSTRALIA							
BEACH Waitpinga 1 PEL 94	Cooper/Eromanga	-28° 50' 23" 139° 55' 9"	RT 21.9 GL 17.7	07-Nov-03 18-Nov-03	1 740 1 740	Plugged and abandoned, dry.	NFW NFW
COOPER Eucalyptus 1 PEL 88	Cooper/Eromanga	-26° 46' 50" 140° 59' 29"	RT 85.2 GL 81	20-Sep-03 13-Oct-03	2 626 2 626	Plugged and abandoned, dry.	NFW NFW
INNA PET Sprigg South 1 PEL 103	Cooper/Eromanga	-27° 15' 38" 140° 57' 27"	RT 135 GL 130	18-Nov-03 01-Dec-03	2 465 2 465	Plugged and abandoned, dry.	NFW NFW
INNA PET Yarrow 1 PEL 103	Cooper/Eromanga	-27° 20' 1" 140° 47' 52"	RT 89.1 GL 84.4	10-Dec-03 —	2 785 2 785	Cased and suspended as a gas producer.	NFW NFD
SANTOS Alwyn 6 PPL36	Cooper/Eromanga	-28° 29' 50" 140° 19' 33"	RT 34.6 GL 30.6	03-Jul-03 10-Jul-03	1 317 1 317	Cased and suspended as an oil producer.	DEV DEV
SANTOS Biala 10 PPL30	Cooper/Eromanga	-28° 32' 9" 140° 22' 55"	RT 53.7 GL 49.7	20-Jul-03 24-Jul-03	1 338 1 338	Cased and suspended as an oil producer.	EXT EXT
SANTOS Biala 11 PPL30	Cooper/Eromanga	-28° 31' 23" 140° 22' 40"	RT 38.1 GL 34.1	12-Oct-03 16-Oct-03	1 300 1 300	Cased and suspended as an oil producer.	DEV DEV
SANTOS Biala 12 PPL30	Cooper/Eromanga	-28° 32' 30" 140° 21' 5"	RT 50.8 GL 46.8	05-Oct-03 11-Oct-03	1 325 1 325	Cased and suspended as an oil producer.	DEV DEV
SANTOS Big Lake 71 PPL11	Cooper/Eromanga	-28° 12' 53" 140° 18' 34"	RT 40 GL 34	08-Feb-03 28-Feb-03	2 999 2 999	Completed as a gas producer. Remedial sidetrack undertaken.	DEV DEV
SANTOS Big Lake 72 PPL 11	Cooper/Eromanga	-28° 13' 5" 140° 18' 58"	RT 50.9 GL 45	06-May-03 27-May-03	3 088 3 088	Cased and suspended as a gas producer.	DEV DEV
SANTOS Big Lake 75 PPL 11	Cooper/Eromanga	-28° 18' 29" 140° 14' 43"	RT 41.5 GL 35.7	14-Jul-03 04-Aug-03	3 228 3 228	Cased and suspended as a gas producer.	DEV DEV
SANTOS Caladan 3 PPL81	Cooper/Eromanga	-28° 12' 12" 139° 56' 17"	RT 34.4 GL 28.3	24-Apr-03 30-Apr-03	2 225 2 225	Cased and suspended as a gas producer.	DEV DEV
SANTOS Cowralli 6 PPL91	Cooper/Eromanga	-27° 52' 58" 140° 0' 49"	RT 36.2 GL 30.4	02-Jun-03 19-Jun-03	3 205 3 205	Cased and suspended as a gas producer.	DEV DEV
SANTOS Cowralli 7 PPL91	Cooper/Eromanga	-27° 53' 31" 140° 0' 32"	RT 40.3 GL 34.5	24-Jun-03 09-Jul-03	3 234 3 234	Completed as a gas producer.	DEV DEV

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
SOUTH AUSTRALIA							
SANTOS Crowsnest 3 PPL141	Cooper/Eromanga	-28° 1' 22" 140° 54' 28"	RT 92 GL 86.1	29-Dec-02 21-Jan-03	2 762 2 762	Cased and suspended as a gas producer.	EXT EXT
SANTOS Della 23 PPL15	Cooper/Eromanga	-28° 12' 28" 142° 10' 51"	RT 41 GL 41	13-Feb-03 26-Feb-03	2 106 2 106	Cased and suspended as a gas producer.	DEV DEV
SANTOS Della 24 PPL15	Cooper/Eromanga	-28° 5' 42" 140° 38' 60"	RT 61 GL 56	05-Mar-03 16-Mar-03	2 103 2 103	Cased and suspended as a gas producer.	DEV DEV
SANTOS Dorodillo 4 PPL143	Cooper/Eromanga	-28° 9' 7" 139° 37' 53"	RT 35 GL 29	07-Apr-03 21-Apr-03	2 655 2 655	Completed as a gas producer.	DEV DEV
SANTOS Dullingari 57 PPL 12	Cooper	-28° 5' 10" 140° 54' 35"	RT 88.3 GL 83	22-Sep-03 09-Oct-03	2 502 2 502	Cased and suspended as an oil producer.	DEV DEV
SANTOS Dullingari North 19 PPL141	Cooper/Eromanga	-28° 2' 35" 140° 53' 7"	RT 94.5 GL 89.3	25-Aug-03 16-Sep-03	2 636 2 636	Cased and suspended as a gas producer.	DEV DEV
SANTOS Goyder 4 PPL135	Cooper/Eromanga	-28° 22' 54" 140° 26' 15"	RT 41.3 GL 36	05-Jul-03 16-Jul-03	2 115 2 115	Cased and suspended as a gas producer.	DEV DEV
SANTOS Jena 15 PPL149	Cooper/Eromanga	-28° 30' 32" 140° 17' 10"	RT 34 GL 30.2	12-Jun-03 21-Jun-03	1 317 1 317	Cased and suspended as an oil producer.	DEV DEV
SANTOS Jena 16 PPL149	Cooper	-28° 31' 3" 140° 17' 41"	RT 33.8 GL 29.8	23-Jun-03 02-Jul-03	1 324 1 324	Cased and suspended as an oil producer.	DEV DEV
SANTOS Jena 17 PPL149	Cooper	-28° 31' 21" 140° 17' 37"	RT 124.7 GL 111.5	10-Sep-03 16-Sep-03	1 319 1 319	Cased and suspended as an oil producer.	DEV DEV
SANTOS Jena 18 PPL149	Cooper	-28° 30' 24" 140° 18' 47"	RT 35.9 GL 31.3	17-Sep-03 25-Sep-03	1 314 1 314	Cased and suspended as an oil producer.	DEV DEV
SANTOS Jena 19 PPL149	Cooper	-28° 30' 39" 140° 18' 55"	RT 34 GL 32	29-Sep-03 04-Oct-03	1 313 1 313	Completed as an oil producer.	DEV DEV
SANTOS Korma 1 PPL15	Eromanga	-27° 32' 29" 141° 36' 0"	RT 59.1 GL 53	15-Nov-03 11-Dec-03	2 797 2 797	Plugged and abandoned, dry.	NFW NFW
SANTOS Marabooka East 1 PPL22	Cooper	-28° 11' 50" 140° 38' 23"	RT 58 GL 52	19-Mar-03 27-Mar-03	2 215 2 215	Plugged and abandoned, dry.	EXT EXT
SANTOS Merrimelia 43 PPL17	Cooper	-27° 44' 47" 140° 9' 31"	RT 45 GL 39.7	22-Sep-03 09-Oct-03	2 442 2 442	Cased and suspended as an oil producer.	DEV DEV
SANTOS Moomba 166 PPL 8	Cooper/Eromanga	-28° 8' 32" 140° 9' 52"	RT 36.8 GL 31.7	12-Jul-03 05-Aug-03	2 533 2 533	Plugged and abandoned, dry.	DEV DEV

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
SOUTH AUSTRALIA							
SANTOS Moomba 169 PPL 7	Cooper/Eromanga	-28° 1' 53" 140° 9' 5"	RT 55.5 GL 50.7	21-Mar-03 02-Apr-03	2 166 2 166	Completed as a gas producer. Remedial sidetrack undertaken	DEV DEV
SANTOS Moomba 170 PPL7	Cooper/Eromanga	-28° 2' 13" 140° 9' 25"	RT 46.5 GL 41.7	19-Apr-03 01-May-03	2 605 2 605	Cased and suspended as a gas producer.	DEV DEV
SANTOS Moomba 171 PPL7	Cooper/Eromanga	-28° 2' 29" 140° 9' 14"	RT 38.4 GL 33.7	05-May-03 21-May-03	2 589 2 589	Cased and suspended as a gas producer.	DEV DEV
SANTOS Moomba 172 PPL 7	Cooper/Eromanga	-28° 3' 5" 140° 9' 9"	RT 45 GL 41	30-May-03 12-Jun-03	2 626 2 626	Cased and suspended as a gas producer.	DEV DEV
SANTOS Moomba 173 PPL 7	Cooper/Eromanga	-28° 2' 56" 140° 8' 33"	RT 60 GL 55.2	16-Jun-03 29-Jun-03	2 606 2 606	Cased and suspended as a gas producer.	DEV DEV
SANTOS Moomba 174 PPL 9	Cooper/Eromanga	-28° 13' 58" 140° 14' 12"	RT 35.6 GL 30.4	12-Aug-03 21-Aug-03	2 106 2 106	Plugged and abandoned, dry.	DEV DEV
SANTOS Packsaddle 6 PPL90	Cooper/Eromanga	-27° 31' 46" 140° 41' 4"	RT 138 GL 133	10-Aug-03 20-Aug-03	2 233 2 233	Plugged and abandoned, dry.	DEV DEV
SANTOS Pelican 8 PPL17	Cooper/Eromanga	-27° 48' 16" 140° 4' 49"	RT 39.5 GL 34.4	14-Jun-03 02-Jul-03	2 772 2 772	Cased and suspended as an oil producer.	DEV DEV
SANTOS Pelican 9 PPL17	Cooper/Eromanga	-27° 48' 20" 140° 5' 18"	RT 40 GL 34	20-Apr-03 30-Apr-03	2 724 2 724	Cased and suspended as a gas producer.	DEV DEV
SANTOS Pelican 10 PPL17	Cooper/Eromanga	-27° 48' 35" 140° 4' 60"	RT 39.8 GL 34.8	08-May-03 21-May-03	2 742 2 742	Cased and suspended as a gas producer.	DEV DEV
SANTOS Pelican 11 PPL17	Cooper/Eromanga	-27° 48' 21" 140° 5' 18"	RT 40 GL 35	28-May-03 05-Jun-03	2 075 2 075	Cased and suspended as an oil producer.	DEV DEV
SANTOS Pelican 12 PPL17	Cooper	-27° 48' 26" 140° 5' 25"	RT 40.5 GL 34.6	05-Sep-03 16-Sep-03	2 025 2 025	Cased and suspended as an oil producer.	DEV DEV
SANTOS Ulandi 7 PPL149	Cooper/Eromanga	-28° 32' 42" 140° 18' 58"	RT 38 GL 34	28-Jul-03 02-Aug-03	1 315 1 315	Cased and suspended as an oil producer.	DEV DEV
SANTOS Ulandi 8 PPL149	Cooper/Eromanga	-28° 32' 19" 140° 18' 37"	RT 38 GL 29.8	02-Aug-03 06-Aug-03	1 309 1 309	Cased and suspended as an oil producer.	DEV DEV
SANTOS Ulandi 9 PPL149	Cooper/Eromanga	-28° 32' 4" 140° 18' 50"	RT 35.6 —	08-Aug-03 13-Aug-03	1 321 1 321	Cased and suspended as an oil producer.	DEV DEV

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
SOUTH AUSTRALIA							
SANTOS Ulandi 10 PPL149	Cooper/Eromanga	-28° 32' 19" 140° 19' 3"	RT 41.5 GL 37.4	29-Aug-03 03-Sep-03	1 316 1 316	Cased and suspended as an oil producer.	DEV DEV
SANTOS Ulandi 12 PPL149	Cooper/Eromanga	-28° 32' 12" 140° 19' 19"	RT 36.4 GL 32.3	16-Aug-03 21-Aug-03	1 321 1 321	Cased and suspended as an oil producer.	DEV DEV
SANTOS Ulandi 13 PPL149	Cooper/Eromanga	-28° 31' 56" 140° 19' 2"	RT 36.4 GL 32.4	22-Aug-03 27-Aug-03	1 319 1 319	Cased and suspended as an oil producer.	DEV DEV
SANTOS Ulandi 14 PPL149	Cooper/Eromanga	-28° 32' 27" 140° 19' 11"	RT 41.5 GL 37.4	05-Sep-03 09-Sep-03	1 305 1 305	Cased and suspended as an oil producer.	DEV DEV
SANTOS Verona 2 PPL158	Cooper/Eromanga	-27° 12' 34" 140° 28' 2"	RT 41 GL 35.2	17-Jan-03 29-Jan-03	3 002 3 002	Plugged and abandoned, dry.	EXT EXT
SANTOS Verona 3 PPL158	Cooper/Eromanga	-27° 11' 56" 140° 26' 50"	RT 42.7 GL 30.6	25-Dec-02 08-Jan-03	3 066 3 066	Cased and suspended as a gas producer.	DEV DEV
STUART PETROLEUM Kiwi 1 PEL 90	Cooper/Eromanga	-27° 2' 13" 140° 43' 43"	RT 51 GL 45.6	15-Oct-03 07-Nov-03	2 908 2 908	Cased and suspended as a gas producer.	NFW NFD
STUART PETROLEUM Worrior 1 PEL 93	Cooper/Eromanga	-28° 25' 7" 139° 48' 43"	RT 37 GL 32	13-Sep-03 29-Sep-03	1 859 1 859	Completed as an oil producer.	NFW NFD
WOODSIDE Gnarlyknots 1 EPP29	Great Australian Bight	-34° 17' 40" 131° 23' 5"	RT 25.1 WD -1300	15-Apr-03 19-Apr-03	1 824 1 824	Plugged and abandoned, dry.	NFW NFW
WOODSIDE Gnarlyknots 1A EPP29	Great Australian Bight	-34° 17' 40" 131° 23' 5"	RT 25.1 WD -1300	20-Apr-03 11-May-03	4 736 4 736	Plugged and abandoned, dry.	NFW NFW

METRES DRILLED — SOUTH AUSTRALIA

Wells	Onshore	Offshore	Total
Exploration	37 206	6 560	43 766
Development	90 744	—	90 744
Total	127 950	6 560	134 510

WESTERN AUSTRALIA							
AMITY Whicher Range 5 EP 408	Perth	-33° 50' 54" 115° 21' 37"	RT 134.3 GL 124.8	11-Oct-03	4 307 4 307	Cased and suspended as a gas producer. Remedial sidetrack undertaken.	DEV DEV
APACHE Ajax 1 WA-1-P R6	Carnarvon	-19° 36' 60" 116° 41' 59"	RT 32 WD -55	27-Dec-03 —	3 350 3 350	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
WESTERN AUSTRALIA							
APACHE Bandera 1 WA-256-P	Carnarvon	-20° 21' 59" 115° 50' 4"	RT 32 WD -47	08-Jan-03 11-Jan-03	2 185 2 185	Plugged and abandoned, dry.	NFW NFW
APACHE Bob 1 EP 363 R2	Carnarvon	-20° 43' 7" 115° 40' 30"	RT 31.7 WD -23	14-Jan-03 25-Jan-03	3 140 3 140	Plugged and abandoned, dry.	NFW NFW
APACHE Campbell 6 TL/5	Carnarvon	-20° 24' 50" 115° 43' 48"	RT 32 WD -41	03-Sep-03 10-Sep-03	3 234 3 234	Plugged and abandoned, dry.	DEV DEV
APACHE Cerberus 1 WA-202-P R2	Carnarvon	-19° 47' 54" 116° 45' 50"	RT 25 WD -72	25-Sep-03 30-Sep-03	2 182 2 182	Plugged and abandoned, dry.	NFW NFW
APACHE Chiru 1 WA-209-P R2	Carnarvon	-20° 10' 6" 116° 17' 33"	RT 16.76 WD -56	22-Jul-03 31-Jul-03	1 779 1 779	Plugged and abandoned, dry.	NFW NFW
APACHE Dawn 1 TL/1	Carnarvon	-20° 31' 15" 115° 43' 23"	RT 31.4 WD -38.6	20-Dec-02 01-Jan-03	2 711 2 711	Plugged and abandoned, dry.	NFW NFW
APACHE East Spar 6 WA-13-L	Carnarvon	-20° 43' 28" 114° 59' 7"	RT 30 WD -92	28-Jul-03 13-Aug-03	3 002 3 002	Plugged and abandoned, dry.	DEV DEV
APACHE East Spar 6 ST1 WA-13-L	Carnarvon	-20° 43' 28" 114° 59' 7"	RT 30 WD -92	03-Sep-03 10-Sep-03	3 150 882	Completed as a gas producer.	DEV DEV
APACHE Gibson 2H TL/6	Carnarvon	-20° 41' 57" 115° 33' 52"	RT 32 WD -8	16-Feb-03 18-Feb-03	2 469 2 469	Completed as an oil producer.	DEV DEV
APACHE Ginger 1 TL/1	Carnarvon	-20° 39' 57" 115° 39' 1"	RT 30 WD -26	20-Jul-03 26-Aug-03	2 597 2 597	Plugged and abandoned, dry.	NFW NFD
APACHE Gipsy 3 TL/1	Carnarvon	-20° 38' 56" 115° 43' 20"	RT 25 WD -28	03-Aug-03 09-Aug-03	2 483 2 483	Completed as an oil and gas producer.	DEV DEV
APACHE Hoover 2 TL/6	Carnarvon	-20° 44' 22" 115° 34' 18"	RT 34 WD -7.7	11-Aug-03 23-Aug-03	3 604 3 604	Completed as an oil producer.	EXT EXT
APACHE Karangi 1 TP/ 8 R2	Carnarvon	-20° 39' 17" 115° 25' 39"	RT 25 WD -11	16-Sep-03 21-Sep-03	2 800 2 800	Plugged and abandoned, dry.	NFW NFW
APACHE Kilauea 1 WA-257-P	Carnarvon	-20° 14' 6" 115° 57' 22"	RT 32 WD -53	02-Jul-03 15-Jul-03	3 426 3 426	Plugged and abandoned, dry.	NFW NFW
APACHE Legendre North 4H WA-20-L	Carnarvon	-19° 42' 19" 116° 42' 27"	RT 44.85 WD -51	05-May-03 22-May-03	3 112 3 112	Completed as an oil producer. Remedial sidetrack undertaken.	DEV DEV

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
WESTERN AUSTRALIA							
APACHE Montgomery 1 WA-149-P R2	Carnarvon	-20° 31' 18" 115° 15' 7"	RT 31.73 WD -59.8	01-Apr-03 22-Apr-03	2 964 2 964	Plugged and abandoned, dry.	NFW NFW
APACHE Mosman 1 TL/2	Carnarvon	-21° 7' 29" 115° 14' 38"	RT 25 WD -19	29-Aug-03 09-Sep-03	2 705 2 705	Plugged and abandoned, dry.	NFW NFW
APACHE North Pedirka 1 TL/6	Carnarvon	-20° 44' 22" 115° 34' 18"	RT 32 WD -7.7	13-Aug-03 17-Aug-03	2 927 2 927	Completed as an oil producer.	DEV DEV
APACHE Simpson 6 TL/1	Carnarvon	-20° 40' 39" 115° 35' 21"	RT 32 WD -8	04-Dec-03 05-Dec-03	2 220 2 220	Completed as an oil producer.	DEV DEV
APACHE Simpson 7 TL/1	Carnarvon	-20° 40' 38" 115° 35' 7"	RT 28 WD -8	28-Feb-03 08-Mar-03	2 044 2 044	Completed as an oil producer.	DEV DEV
APACHE Simpson 8 TL/1	Carnarvon	-20° 40' 39" 115° 35' 21"	RT 32 WD -8	29-Nov-03 01-Dec-03	2 080 2 080	Plugged and abandoned, dry.	DEV DEV
APACHE South Plato 3H TL/6	Carnarvon	-20° 41' 58" 115° 33' 52"	RT 30.2 WD -8.35	01-Feb-03 05-Feb-03	2 356 2 356	Plugged and abandoned, dry.	DEV DEV
APACHE South Plato 3H ST1 TL/6	Carnarvon	-20° 41' 58" 115° 33' 52"	RT 30.2 WD -8.35	05-Feb-03 12-Feb-03	2 315 644	Completed as an oil producer.	DEV DEV
APACHE South Simpson 2 TL/1	Carnarvon	-20° 40' 28" 115° 35' 25"	RT 32 WD -8.5	16-Nov-03 18-Nov-03	3 221 3 221	Completed as an oil producer.	DEV DEV
APACHE Stag 25H WA-15-L	Carnarvon	-20° 17' 24" 116° 16' 31"	RT 49 WD -49	22-Jun-03 30-Jun-03	1 285 1 285	Completed as an oil producer.	DEV DEV
APACHE Tanami 7 TL/1	Carnarvon	-20° 40' 39" 115° 35' 21"	RT 32 WD -8	03-Dec-03 04-Dec-03	2 739 2 739	Plugged and abandoned, dry.	DEV DEV
APACHE Taunton 3 TL/2	Carnarvon	-21° 19' 8" 115° 6' 51"	RT 25 WD -15	16-Aug-03 20-Aug-03	1 534 1 534	Plugged and abandoned, dry.	DEV DEV
APACHE Thomas Bright 2 WA-214-P R1	Carnarvon	-20° 27' 14" 115° 4' 11"	RT 32 WD -82	12-Dec-03 22-Dec-03	3 091 3 091	Plugged and abandoned, dry.	EXT EXT
APACHE Toobada 1 WA-192-P R3	Carnarvon	-20° 21' 14" 115° 24' 58"	RT 30 WD -35	19-Sep-03 01-Oct-03	3 090 3 090	Plugged and abandoned, dry.	NFW NFW
APACHE Twickenham 1 TL/1	Carnarvon	-20° 44' 24" 115° 34' 5"	RT 32 WD -8	03-Oct-03 12-Oct-03	3 410 3 410	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
WESTERN AUSTRALIA							
APACHE West Simpson 1 TL/6	Carnarvon	-20° 40' 7" 115° 34' 38"	RT 27 WD -8	27-Feb-03 11-Mar-03	2 200 2 200	Completed as an oil producer.	DEV DEV
ARC ENERGY Eremia 1 L 1 R1	Perth	-29° 18' 37" 115° 0' 60"	RT 34.8 GL 26.9	06-Mar-03 27-Mar-03	2 550 2 550	Cased and suspended as an oil producer.	NFW NFD
ARC ENERGY Eremia 2 L 1 R1	Perth	-29° 18' 36" 115° 1' 38"	RT 38.1 GL 31	20-Nov-03 01-Dec-03	2 385 2 385	Completed as an oil producer. Remedial sidetrack undertaken.	EXT EXT
ARC ENERGY Hovea 5 L 2 R1	Perth	-29° 19' 13" 115° 2' 23"	RT 57.5 GL 59	30-Jan-03 10-Feb-03	1 183 1 183	Plugged and abandoned, dry.	DEV DEV
ARC ENERGY Hovea 5 ST1 (Hovea 6) L 2 R1	Perth	-29° 19' 13" 115° 2' 23"	RT 66.9 GL 59	10-Feb-03 17-Feb-03	1 810 627	Plugged and abandoned, dry.	DEV DEV
ARC ENERGY Hovea 5 ST2 (Hovea 7) L 2 R1	Perth	-29° 19' 13" 115° 2' 23"	RT 66.9 GL 59	18-Feb-03 24-Feb-03	2 245 217	Completed as an oil producer.	DEV DEV
ARC ENERGY Hovea 8 L 1 R1	Perth	-29° 19' 10" 115° 2' 31"	RT 65 GL 57	19-Jul-03 13-Aug-03	2 353 2 353	Completed as an oil producer.	DEV DEV
ARC ENERGY Hovea 9 EP 413 R1	Perth	-29° 19' 44" 115° 2' 40"	RT 63.2 GL 60	10-Oct-03 20-Oct-03	1 440 1 440	Plugged and abandoned, dry.	DEV DEV
ARC ENERGY Hovea 9 ST1 L 1 R1	Perth	-29° 19' 44" 115° 2' 40"	RT 63.2 GL 55.1	20-Oct-03 26-Oct-03	2 102 662	Plugged and abandoned, dry.	DEV DEV
ARC ENERGY Hovea 9 ST2 (Hovea 10) L 1 R1	Perth	-29° 19' 44" 115° 2' 40"	RT 63.2 GL 55.1	27-Oct-03 06-Nov-03	2 232 1 228	Completed as a water injector.	DEV SRV
BHP BILLITON Crosby 1 WA-12-R	Carnarvon	-21° 31' 47" 114° 6' 8"	RT 26 WD -200	03-Oct-03 09-Oct-03	1 266 1 266	Plugged and abandoned, dry.	NFW NFD
BHP BILLITON Eskdale 1 WA-255-P R1	Carnarvon	-21° 21' 49" 113° 49' 37"	RT 23.5 WD -821.5	14-Mar-03 02-Apr-03	3 127 3 127	Plugged and abandoned, dry.	NFW NFW
BHP BILLITON Maginnis 1 WA-302-P	Browse	-13° 42' 18" 121° 43' 54"	RT 25.2 WD -1300	24-Jan-03 27-Jan-03	1 415 1 415	Plugged and abandoned, dry.	NFW NFW
BHP BILLITON Maginnis 1A WA-302-P	Browse	-13° 42' 18" 121° 43' 54"	RT 25.2 WD -1304	28-Jan-03 20-Feb-03	3 883 3 883	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
WESTERN AUSTRALIA							
BHP BILLITON Ravensworth 1 WA-155-P R3	Carnarvon	-21° 31' 39" 114° 5' 2"	RT 26 WD -205	15-Jul-03 22-Jul-03	1 432 1 432	Plugged and abandoned, dry.	NFW NFD
BHP BILLITON Ravensworth 1 ST1 WA-155-P R3	Carnarvon	-21° 31' 39" 114° 5' 2"	RT 26 WD -205	22-Jul-03 25-Jul-03	1 173 92	Plugged and abandoned, dry.	NFW NFW
BHP BILLITON Skiddaw 1 WA-255-P R1	Carnarvon	-21° 26' 50" 113° 52' 19"	RT 22.3 WD -778	08-May-03 14-May-03	2 192 2 192	Plugged and abandoned, dry.	NFW NFW
BHP BILLITON Skiddaw 2 WA-255-P R1	Carnarvon	-21° 26' 50" 113° 52' 19"	RT 22.3 WD -778	20-May-03 26-May-03	2 248 708	Plugged and abandoned, dry.	NFW NFD
BHP BILLITON Stybarrow 1 WA-255-P R1	Carnarvon	-21° 28' 40" 113° 50' 4"	RT 22 WD -825	12-Feb-03 20-Feb-03	2 477 2 477	Plugged and abandoned, dry.	NFW NFW
BHP BILLITON Stybarrow 1 ST1 WA-255-P R1	Carnarvon	-21° 28' 40" 113° 50' 4"	RT 22 WD -825	10-Feb-03 27-Feb-03	2 265 89	Plugged and abandoned, dry.	NFW NFD
BHP BILLITON Stybarrow 2 WA-255-P R1	Carnarvon	-21° 29' 33" 113° 49' 20"	RT 22 WD -873	06-Jun-03 15-Jun-03	2 380 2 380	Plugged and abandoned, dry.	EXT EXT
BHP BILLITON Van Gogh 1 WA-155-P R3	Carnarvon	-21° 23' 23" 114° 4' 57"	RT 30 WD -354	16-Sep-03 02-Oct-03	1 526 1 526	Plugged and abandoned, dry. Remedial sidetrack undertaken.	NFW NFW
EMPIRE Eclipse 1 (Empire) EP 389 R1	Perth	-30° 25' 57" 115° 52' 34"	RT 77.9 GL 70	03-Jul-02 10-May-03	3 660 3 660	Plugged and abandoned, dry.	NFW NFW
ESSO Jansz 3 WA-268-P	Carnarvon	-19° 49' 13" 114° 34' 39"	RT 25.1 WD -1340	03-Jun-03 18-Jun-03	2 966 2 966	Plugged and abandoned, dry.	EXT EXT
EXXONMOBIL Thomas Bright 1 WA-214-P R1	Carnarvon	-20° 27' 3" 115° 5' 58"	RT 32 WD -72	21-Mar-03 31-Mar-03	3 044 3 044	Plugged and abandoned, dry.	EXT EXT
HARDMAN Leafcutter 1 L 4	Carnarvon	-29° 51' 8" 115° 3' 15"	RT 24.8 GL 20	01-Sep-03 17-Sep-03	1 330 1 330	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
WESTERN AUSTRALIA							
INPEX Ichthys 1 WA-285-P	Browse	-13° 56' 60" 123° 12' 0"	RT 25 WD -271	19-Jun-03 26-Jun-03	2 436 2 436	Plugged and abandoned, dry.	NFW NFW
INPEX Ichthys 1A WA-285-P	Browse	-13° 56' 60" 123° 12' 0"	RT 25 WD -271	12-Jul-03 05-Sep-03	4 826 4 826	Plugged and abandoned, dry.	NFW NFW
INPEX Ichthys 2 WA-285-P	Browse	-13° 54' 0" 123° 9' 30"	RT 25 WD -270.5	29-Nov-03 02-Dec-03	1 513 1 513	Plugged and abandoned, dry.	EXT EXT
INPEX Ichthys 2A WA-285-P	Browse	-13° 54' 0" 123° 9' 30"	RT 25 WD -269	07-Dec-03 11-Dec-03	1 751 1 751	Plugged and abandoned, dry.	EXT EXT
INPEX Ichthys 2A ST1 WA-285-P	Browse	-13° 54' 0" 123° 9' 30"	RT 25 WD -270.5	16-Dec-03 —	4 177 2 662	Plugged and abandoned, dry. Remedial sidetrack undertaken.	EXT EXT
INPEX Ichthys Deep 1 WA-285-P	Browse	-13° 51' 47" 123° 13' 56"	RT 25 WD -249.2	08-Oct-03 22-Nov-03	4 956 4 956	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 13-Jan-03	5 394 5 394	Plugged and abandoned, dry.	NFW NFW
MAGELLAN Strumbo 1 WA-288-P	Browse	-13° 13' 46" 125° 29' 48"	RT 22 WD -58.5	24-Jan-03 30-Jan-03	728 728	Plugged and abandoned, dry.	NFW NFW
ORIGIN Jingemia 2 EP 413 R1	Perth	-28° 20' 21" 114° 59' 23"	RT 14.1 GL 6.2	24-Aug-03 26-Sep-03	2 781 2 781	Plugged and abandoned, dry.	DEV DEV
ORIGIN Jingemia 2 ST1 (Jingemia 3) EP 415	Perth	-29° 20' 21" 114° 59' 23"	RT 14.1 GL 6.2	24-Aug-03 26-Sep-03	2 625 1 885	Service well	DEV DEV
ROC Cliff Head 3 WA-286-P	Perth	-29° 26' 50" 114° 51' 42"	RT 25 WD -18	06-Jan-03 12-Jan-03	1 408 1 408	Plugged and abandoned, dry.	EXT EXT
ROC Cliff Head 3 CH1 WA-286-P	Perth	-29° 26' 50" 114° 51' 42"	RT 25 WD -18	06-Jan-03 20-Jan-03	1 375 87	Plugged and abandoned, dry.	EXT EXT
ROC Cliff Head 4 WA-286-P	Perth	-29° 26' 45" 114° 51' 47"	RT 25 WD -18	03-Mar-03 12-Mar-03	1 598 1 598	Plugged and abandoned, dry.	EXT EXT
ROC Mentelle 1 WA-286-P	Perth	-29° 26' 9" 114° 53' 21"	RT 25 WD -14	11-Feb-03 17-Feb-03	1 509 1 509	Plugged and abandoned, dry.	NFW NFW
ROC Twin Lions 1 TP/15	Perth	-29° 22' 15" 114° 53' 6"	RT 25 WD -14	01-Feb-03 10-Feb-03	1 570 1 570	Plugged and abandoned, dry.	NFW NFW
ROC Vindara 1 WA-286-P	Perth	-29° 29' 53" 114° 56' 9"	RT 25 WD -11	19-Feb-03 27-Feb-03	1 756 1 756	Plugged and abandoned, dry.	NFW NFW
TAP Banjo 1 EP 397	Carnarvon	-21° 3' 36" 115° 35' 55"	RT 25 WD -15	30-Mar-03 02-Apr-03	971 971	Plugged and abandoned, dry.	NFW NFW

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
WESTERN AUSTRALIA							
TAP Crackling South 1 EP 341 R2	Carnarvon	-21° 12' 26" 115° 33' 8"	RT 25 WD -12	27-Mar-03 28-Mar-03	504 504	Plugged and abandoned, dry.	NFW NFD
TAP Cyrano 1 EP 364 R1	Carnarvon	-21° 21' 34" 115° 17' 10"	RT 25 WD -15	21-Mar-03 23-Mar-03	769 769	Plugged and abandoned, dry.	NFW NFD
WOODSIDE Carteret 1 WA-4-L	Carnarvon	-19° 20' 1" 116° 32' 56"	RT 27.3 WD -141	26-Jun-03 06-Jul-03	3 515 3 515	Plugged and abandoned, dry.	NFW NFW
WOODSIDE Egret 3 WA-10-R R1	Carnarvon	-19° 29' 59" 116° 21' 23"	RT 26.4 WD -119.1	26-Mar-03 20-May-03	4 881 4 881	Plugged and abandoned, dry.	EXT EXT
WOODSIDE Guilford 1 WA-269-P	Carnarvon	-19° 39' 18" 115° 15' 18"	RT 22.3 WD -1032	17-Apr-03 27-Apr-03	4 272 4 272	Plugged and abandoned, dry.	NFW NFW
WOODSIDE Herdsman 1 WA-299-P	Carnarvon	-22° 52' 18" 113° 17' 24"	RT 22.3 WD -557.1	28-Jan-03 04-Feb-03	2 010 2 010	Plugged and abandoned, dry.	NFW NFW
WOODSIDE Nickol 1 WA-1-P R6	Carnarvon	-19° 53' 58" 116° 27' 16"	RT 30.3 WD -47	06-Jun-03 12-Jun-03	2 690 2 690	Plugged and abandoned, dry.	NFW NFW
WOODSIDE Tigger 1 WA-248-P	Carnarvon	-19° 21' 0" 116° 23' 48"	RT 26.4 WD -142	30-May-03 20-Jun-03	3 650 3 650	Plugged and abandoned, dry.	NFW NFW
WOODSIDE Weasel 1 WA-279-P	Bonaparte	-14° 13' 30" 128° 28' 42"	RT 29 WD -38.4	09-Mar-03 16-Mar-03	1 776 1 776	Plugged and abandoned, dry.	NFW NFW
WOODSIDE Whitetail 1 WA-296-P	Carnarvon	-17° 39' 13" 118° 15' 1"	RT 23 WD -953	31-Dec-02 08-Jan-03	2 504 2 504	Plugged and abandoned, dry.	NFW NFW

METRES DRILLED — WESTERN AUSTRALIA

Wells	Onshore	Offshore	Total
Exploration	11 406	128 476	139 882
Development	16 876	41 220	58 096
Total	28 282	1 69 696	197 978

NORTHERN TERRITORY							
OMV Audacious 3 AC/P17	Bonaparte	-11° 44' 33" 125° 4' 50"	RT 25 WD -172	27-May-03 06-Jun-03	2 023 2 023	Plugged and abandoned, dry.	EXT EXT
OMV Audacious 3 ST 1 AC/P17	Bonaparte	-11° 44' 33" 125° 4' 50"	RT 25 WD -172	09-Jun-03 12-Jun-03	2 070 553	Plugged and abandoned, dry.	EXT EXT
WOODSIDE Shakespeare 1 NT/P57	Bonaparte	-13° 56' 60" 129° 7' 60"	RT 62.7 WD -28	21-Feb-03 03-Mar-03	2 182 2 182	Plugged and abandoned, dry.	NFW NFW

METRES DRILLED — NORTHERN TERRITORY

Wells	Onshore	Offshore	Total
Exploration	—	4 758	4 758
Development	—	—	—
Total	—	4 758	4 758

APPENDIX A (cont'd)

Operator Well Permit	Basin	Location	Eleva- tion	Spudded TD reached	Final TD (m)	Well remark	Classi- fication
JOINT PETROLEUM DEVELOPMENT AREA							
CONOCOPHILLIPS Bayu Undan D04 JPDA 91-12	Bonaparte	-11° 4' 51" 126° 37' 51"	RT 45.7 WD -78.3	22-Sep-03	4 419 4 419	Drilling ahead.	DEV DEV
CONOCOPHILLIPS Bayu Undan D05 JPDA 91-12	Bonaparte	-11° 4' 51" 126° 37' 51"	RT 45.7 WD -78.3	14-Sep-03	1 931 1 931		DEV
CONOCOPHILLIPS Bayu Undan D06 JPDA 91-12	Bonaparte	-11° 4' 51" 126° 37' 51"	RT* 45.7 WD -78.3	19-Sep-03 29-Sep-03	3 208 3 208	Plugged and abandoned, dry.	DEV
CONOCOPHILLIPS Bayu Undan D07 JPDA 91-12	Bonaparte	-11° 4' 51" 126° 37' 51"	RT* 45.7 WD -78.3	21-Sep-03	831 831	Drilling ahead.	DEV
CONOCOPHILLIPS Bayu Undan D08 JPDA 91-12	Bonaparte	-11° 4' 51" 126° 37' 51"	RT 45.7 WD -78.3	16-Sep-03	4 573 4 573	Drilling ahead.	DEV DEV
CONOCOPHILLIPS Bayu Undan D09 JPDA 91-12	Bonaparte	-11° 4' 51" 126° 37' 51"	RT 45.7 WD -78.3	22-Sep-03 —	4 277 4 277	Completed as a gas producer.	DEV DEV
CONOCOPHILLIPS Bayu Undan D11 JPDA 91-12	Bonaparte	-11° 4' 51" 126° 37' 51"	RT* 45.7 WD -78.3	17-Sep-03	837 837	Drilling ahead.	DEV
CONOCOPHILLIPS Bayu Undan D13 JPDA 91-12	Bonaparte	-11° 4' 51" 126° 37' 51"	RT* 45.7 WD -78.3	18-Sep-03	837 837	Drilling ahead.	DEV
CONOCOPHILLIPS Bayu Undan D14 JPDA 91-12	Bonaparte	-11° 4' 51" 126° 37' 51"	RT 45.7 WD -78.3	20-Sep-03 —	2 254 2 254		DEV DEV
CONOCOPHILLIPS Bayu Undan D15 JPDA 91-12	Bonaparte	-11° 4' 51" 126° 37' 51"	RT* 45.7 WD -78.3	25-Jul-03 —	4 373 4 373	Completed as a gas producer.	DEV
CONOCOPHILLIPS Bayu Undan W05 JPDA 91-13	Bonaparte	-11° 4' 30" 126° 40' 50"	RT 45.7 WD -78.3	20-May-02 03-Apr-03	3 255 3 255	Plugged and abandoned, dry.	DEV DEV
CONOCOPHILLIPS Bayu Undan W05A JPDA 91-13	Bonaparte	-11° 4' 30" 126° 40' 50"	RT 45.7 WD -78.3	06-May-03 05-Jun-03	3 557 2 733	Completed as a gas producer.	DEV DEV
CONOCOPHILLIPS Bayu Undan W11 JPDA 91-13	Bonaparte	-11° 4' 30" 126° 40' 50"	RT 45.7 WD -78.3	24-May-02 16-Feb-03	4 327 4 327	Completed as a gas producer.	DEV DEV
CONOCOPHILLIPS Kuda Tasi 2 JPDA 03-01	Bonaparte	-10° 32' 24" 126° 10' 6"	RT 30 WD -325	18-Oct-03 19-Nov-03	3 550 3 550	Cased and suspended as an oil producer.	EXT EXT

METRES DRILLED — JOINT PETROLEUM DEVELOPMENT AREA

Wells	Onshore	Offshore	Total
Exploration	—	3 550	3 550
Development	—	42 685	42 685
Total	—	46 235	46 235

*Assumed reference point

Abbreviations (Amercian Petroleum Institute standard definitions for petroleum statistics)

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

Appendix B
2003

Seismic survey activity by State, 2003

APPENDIX B: SEISMIC SURVEY ACTIVITY BY STATE, 2003

Operator	Contractor	Basin	Survey name	Type	Title	Km shot (sq. km)	Status
			OFFSHORE				
VICTORIA							
BHP Billiton (Australia) Pty Ltd	WesternGeco	Gippsland	TUSKFISH	3D	VIC/P45, VIC/P49	(1 500)	Completed
Santos Ltd	PGS Exploration	Otway	OS 03	2D	VIC/P44	470	Completed
Santos Ltd	Petroleum Geoservices Asia Pacific	Otway	OS 03 B	2D	VIC/P44	484	Completed
Woodside Offshore Petroleum	PGS Exploration	Otway	ANTARES	3D	VIC/P44, VIC/P37(V)	(209)	Completed
TASMANIA							
Santos Ltd	PGS Exploration	Sorell	SS 03 2D	2D	T/35P	1 336	Completed
SOUTH AUSTRALIA							
Santos Ltd	PGS Exploration	Duntroon Ltd	DS 03	2D	EPP32	507	Completed
WESTERN AUSTRALIA							
Apache Energy Limited	WesternGeco	Perth	MACALLAN	3D	WA-226-P R1	(521)	Completed
Apache Energy Limited	WesternGeco	Carnarvon	VIPER 3D	3D	WA-335-P	(647)	Completed
Apache Northwest Pty Ltd	Multiwave Geophysical	Carnarvon	CHIMAERA 2D	2D	WA-335-P	1 100	Completed
BHP Billiton Petroleum (North West Shelf) Pty Ltd	WesternGeco	Browse	HBR03A SEISMIC SURVEY	3D	WA-303-P, WA-304-	(510)	Completed
Chevron Texaco Aust Ltd	Veritas DGC	Carnarvon	WA 253 P	2D	WA-253-P R1	3 325	Completed
Chevron Texaco Australia Pty Ltd	Veritas DGC	Carnarvon	POSIEDON 2D MSS	2D	WA-2-R R1	58	Completed
ChevronTexaco Australia Pty Ltd	Veritas DGC	Carnarvon	CHAMPAGNE	2D	WA-268-P	2 546	Completed
ChevronTexaco Australia Pty Ltd	Veritas DGC	Carnarvon	WHEATSTONE	2D	WA-253-P R1	725	Completed

APPENDIX B (cont'd)

Operator	Contractor	Basin	Survey name	Type	Title	Km shot (sq. km)	Status
ConocoPhillips Petroleum (91-12) Pty Ltd	Veritas DGC	Perth	WA 336 P	2D	WA-336-P	2 149	Completed
Kerr McGee NW Shelf Energy Australia Pty Ltd	Veritas DGC	Perth	JOVIAN	2D	WA-337-P	1 368	Completed
Magellan Petroleum	Veritas DGC	Browse	WA 305 OUTER BROWSE	2D	WA-306-P, WA-307-	1 040	Completed
Magellan Petroleum (WA) Pty Ltd	Veritas DGC	Browse	FLOREANA	2D	WA-306-P	532	Completed
OMV Timor Sea Pty Ltd	Veritas DGC	Carnarvon	KLAMMER 2D SEISMIC SURVEY	2D	WA-320-P	768	Completed
OMV Timor Sea Pty Ltd	Multiwave Geophysical	Carnarvon	MUNMORAH	2D	WA-308-P, WA-309-	838	Completed
Petroz NL	Veritas DGC	Perth	FULFILLMENT	2D	WA-336-P	2 005	Completed
ROC Oil Company Ltd	Veritas DGC	Perth	CLIFF HEAD	3D	WA-286-P	(32)	Completed
ROC Oil WA Pty Ltd	Veritas DGC	Perth	LILIAN	2D	WA-286-P	700	Completed
ROC Oil WA Pty Ltd	Veritas DGC	Perth	MARYANN	2D	WA-325-P	820	Completed
ROC Oil WA Pty Ltd	PGS Exploration	Perth	VICKI ANGELA	3D	WA-325-P, WA-327-	(693)	Completed
Santos Offshore Pty Ltd	Veritas DGC	Perth	2003 RAMSGATE	2D	WA-339-P	1 459	Completed
Woodside Energy Ltd	WesternGeco	Carnarvon	DEMETER 3D MSS	3D	WA-28-P R6, WA-208-P R2, WA-248 P, WA-303-P, WA-1 6, WA-9,11,16,17,23, WA-24-L, WA-10-R R1	(2 988)	Continuing
JOINT PETROLEUM DEVELOPMENT AREA							
Woodside Energy Ltd	Veritas DGC	Bonaparte	SEAHORSE MARINE SEISMIC SURVEY	2D	JPDA 91 01	678	Completed

APPENDIX B (cont'd)

Operator	Contractor	Basin	Survey name	Type	Title	Km shot (sq. km)	Status
			ONSHORE				
QUEENSLAND							
Beach Petroleum	Trace Energy	Cooper/ Erom.	CONUS	2D	ATP269P	130	Completed
Santos Ltd	Trace Energy	Bowen	SCARAB	2D	ATP337P	23	Completed
Mosaic Oil NL	Velseis Pty Ltd	Surat	MOS 2003	2D	ATP709P, ATP471P,PL46	90	Completed
Santos Ltd	Trace Energy	Bowen	COOLTONG	2D	ATP337P	20	Completed
Santos Ltd	Trace Energy	Bowen	GLENTULLOCH	2D	PL45	27	Completed
Santos Ltd	Trace Energy	Cooper	NE MURTEREE HORST	3D	PL114	(168)	Continuing
Santos Ltd	Trace Energy	Bowen	YAMELA	2D	ATP553P	53	Completed
BNG (Surat)	Trace Energy	Surat	OVERSTON 3D	3D	ATP645P	(226)	Completed
NEW SOUTH WALES							
NSW Dept. of Mines	Trace Energy	Darling	WILCANNIA 2003	2D	—	175	Completed
VICTORIA							
Essential Petroleum Resources Ltd	Trace Energy	Otway	NELSON	2D	PEP151	284	Completed
SOUTH AUSTRALIA							
Beach Petroleum	Trace Energy	Cooper/Erom.	2003 COOPER BASIN	2D	PEL 107	702	Completed
Beach Petroleum	Trace Energy	Cooper	CHRISTIES 3D	3D	PEL 92	(30)	Completed

APPENDIX B (cont'd)

SEISMIC SURVEY ACTIVITY 2000–2003

	Onshore		Offshore		2D	3D
	2D (line km)	3D (sq km)	2D (line km)	3D (sq km)	Total	Total
2000						
Queensland	1 759	619	—	—	1 759	619
Victoria	171	84	31	845	202	929
Tasmania	—	—	—	562	—	562
South Australia	188	878	2 142	—	2 330	878
Western Australia	142	—	21 273	15 654	21 415	15 654
Northern Territory	—	—	1 771	2 621	1 771	2 621
JPDA	—	—	—	1 836	—	1 836
Total	**2 260**	**1 581**	**25 217**	**21 518**	**27 478**	**23 099**
2001						
Queensland	171	811	—	—	171	811
New South Wales	176	—	—	—	176	—
Victoria	63	195	1 477	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	38 073	15 903	38 133	16 083
Northern Territory	—	—	5 489	171	5 489	171
Total	**1 230**	**3 250**	**62 672**	**18 537**	**63 902**	**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	12 659	2 110	12 659	2 167
Northern Territory	—	—	6 485	—	6 485	—
Total	**3 387**	**1 237**	**23 572**	**6 294**	**26 959**	**7 532**
2003						
Queensland	343	424	—	—	343	424
New South Wales	175	—	—	—	175	—
Victoria	284	—	954	1 709	1 238	1 709
Tasmania	—	—	1 336	—	1 336	—
South Australia	702	30	507	—	1 209	30
Western Australia	—	—	19433	5 391	19 433	5 391
Joint Petroleum Development Area	—	—	678	—	678	—
Total	**1 504**	**454**	**22 908**	**7 100**	**24 412**	**7 554**

Appendix C
2003

Discoveries of petroleum in 2003

APPENDIX C: DISCOVERIES OF PETROLEUM IN 2003

Basin and well name	Operator Recovery	State	Producing formation	Discovery Remarks	Classification
			OFFSHORE		
CARNARVON					
CRACKLING SOUTH 1*	Tap Logs detected oil in the Mardie Greensand.	WA		Oil Plugged and abandoned	NFD.
CROSBY 1*	BHP Billiton Encountered a 34.7m oil column	WA		Oil Plugged and abandoned.	NFD
CYRANO 1*	Tap Wireline logs and fluid samples indicate a 19m gross gas column and a 10m gross oil column.	WA		Oil and Gas Plugged and abandoned.	NFD
GINGER 1*	Apache Ginger 1 logs detected gas in the Biggada Sandstone.	WA		Gas Plugged and abandoned.	NFD
RAVENSWORTH 1*	BHP Billiton Encountered a 37m gross oil column and a 7m gross gas column.	WA		Oil and Gas Plugged and abandoned.	NFD
STYBARROW 1*	BHP Billiton Encountered a 23m gross oil column.	WA		Oil Plugged and abandoned.	NFD
GIPPSLAND					
SCALLOP 1*	Esso Wireline logs indicate a 35m gross gas column and 10m of gross oil columns.	Vic		Oil and Gas Plugged and abandoned.	NFD
			ONSHORE		
BOWEN					
OVERSTON 1	Sunshine Wireline logs indicate a 38.4m gross gas pay interval and flowed 7,079 cu m/d (250,000 scf/d of gas).	Qld		Gas Cased and suspended.	NFD
COOPER/EROMANGA					
CARRICKALINGA 1	Beach Tests recovered gas from the Patchawarra Formation.	SA		Gas Plugged and abandoned.	NFD
CHINOOK 1 (SANTOS)*	Santos Tests recovered gas from the Toolachee Formation.	Qld		Gas Completed as a gas producer.	NFD
CHRISTIES 1	Beach Tests recovered mud and oil from the Birkhead Formation.	SA		Oil Completed as an oil producer.	NFD
KINTA 1*	Santos Logs detected gas in the Epsilon Formation, gas in the Patchawarra Formation and gas in the Toolachee Formation.	Qld		Gas Cased and suspended as a gas producer.	NFD
KIWI 1	Stuart Flowed 271 842 cu m/d (9.6 million scf/d) of gas through a 1/2" choke at a flowing wellhead pressure of 1556 psi over the interval 2752m to 2764.5m.	SA		Gas Cased and suspended as a gas producer.	NFD

APPENDIX C (cont'd)

Basin and well name	Operator Recovery	State	Producing formation	Discovery Remarks	Classification
MULBERRY 1	Santos Flowed 45 kL/d (280 bbl/d) of 45.8 degree API oil over the interval 1241m to 1254m.	Qld		Oil Cased and suspended as an oil producer.	NFD
PELICAN 9	Santos Tests recovered oil from the Hutton Formation.	SA		Gas Cased and suspended as a gas producer.	DEV
SURLOW 1*	Santos Logs detected gas in the Nappamerri Group, gas in the Patchawarra Formation and gas in the Toolachee Formation.	Qld		Gas Cased and suspended as a gas producer.	NFD
WORRIOR 1	Stuart Flowed 254 kL/d (1600 bbl/d) of 50 degree API oil over the interval 1321m to 1335m. Flowed 64 kL/d (400 bbl/d) of 52.5 degree API oil over the interval 1553m to 1569m. Flowed 458 kL/d (2880 bbl/d) of 52.5 degree API oil over the interval 1579m to 1585m. Flowed 206,713 kL/d (7.3 million scf/d) of gas with 8.9 kL/d of condensate through a 5/8" choke over the interval 1712m to 1719m.	SA		Oil Completed as an oil producer.	NFD
PERTH					
EREMIA 1	Arc Energy Wireline logs indicate a 15m - 18m oil column. Flowed 254 kL/d (1600 bbl/d) of oil.	WA		Oil Cased and suspended as an oil producer.	NFD
SURAT					
MYALL CREEK EAST 1*	OCA Logs detected gas in the Black Alley Shale, gas in the Rewan Group and gas in the Tinowon Formation.	Qld		Gas Cased and suspended as a gas producer.	NFD

* Accumulation inferred from logs.

Appendix D
2003

Summary of wells drilled

APPENDIX D : SUMMARY OF WELLS DRILLED

SUMMARY OF ONSHORE AND OFFSHORE WELLS DRILLED IN 2003

Status at 31 December 2003

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	0	15	1	5	0	0	0	9	0	0	0	0	2
Victoria	0	8	0	0	0	0	0	6	0	2	0	0	1
South Australia	1	16	3	2	0	0	0	10	0	2	0	0	1
Western Australia	4	47	2	0	0	0	0	34	6	6	3	0	1
Northern Territory	0	2	0	0	0	0	0	2	0	0	0	0	0
Joint Petroleum Development Area	0	1	1	0	0	0	0	0	0	0	0	0	0
TOTAL	**5**	**89**	**7**	**7**	**0**	**0**	**0**	**61**	**6**	**10**	**3**	**0**	**5**
Development													
Queensland	0	14	6	5	2	0	0	1	0	0	0	0	1
Victoria	1	8	7	1	0	0	0	1	0	0	0	0	0
South Australia	1	41	20	17	0	0	0	5	0	0	0	0	0
Western Australia	0	20	8	0	1	0	0	9	2	0	0	0	1
Joint Petroleum Development Area	3	2	0	2	0	0	0	3	0	0	0	0	3
TOTAL	**5**	**85**	**41**	**25**	**3**	**0**	**0**	**19**	**2**	**0**	**0**	**0**	**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 D (cont'd)

SUMMARY OF ONSHORE WELLS DRILLED 2003

Status at 31 December 2003

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													
Western Australia	1	3	1	0	0	0	0	3	0	0	0	0	0
Victoria	0	4	0	0	0	0	0	4	0	0	0	0	1
South Australia	1	14	3	2	0	0	0	8	0	2	0	0	1
Queensland	0	15	1	4	0	0	0	10	0	0	0	0	2
TOTAL	**2**	**36**	**5**	**6**	**0**	**0**	**0**	**25**	**0**	**2**	**0**	**0**	**4**
Development													
Western Australia	0	4	1	0	0	0	0	3	0	0	0	0	1
South Australia	1	41	20	17	0	0	0	5	0	0	0	0	0
Queensland	0	14	6	5	2	0	0	1	0	0	0	0	1
TOTAL	**1**	**59**	**27**	**22**	**2**	**0**	**0**	**9**	**0**	**0**	**0**	**0**	**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 2003

Status at 31 December 2003

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													
Western Australia	3	44	1	0	0	0	0	31	6	6	3	0	1
Victoria	0	4	0	0	0	0	0	2	0	2	0	0	0
South Australia	0	2	0	0	0	0	0	2	0	0	0	0	0
Northern Territory	0	2	0	0	0	0	0	2	0	0	0	0	0
Joint Petroleum Development Area	0	1	1	0	0	0	0	0	0	0	0	0	0
TOTAL	**3**	**53**	**2**	**0**	**0**	**0**	**0**	**37**	**6**	**8**	**3**	**0**	**1**
Development													
Western Australia	0	16	7	0	1	0	0	6	2	0	0	0	0
Victoria	1	8	7	1	0	0	0	1	0	0	0	0	0
Joint Petroleum Development Area	3	2	0	2	0	0	0	3	0	0	0	0	3
TOTAL	**4**	**26**	**14**	**3**	**1**	**0**	**0**	**10**	**2**	**0**	**0**	**0**	**3**

*	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
2003

Petroleum expenditure and activity

APPENDIX E: PETROLEUM EXPENDITURE AND ACTIVITY

PETROLEUM EXPLORATION EXPENDITURE ($A'000) — OPERATORS, 2003

State	Exploration Drilling	Geological	Regional	Seismic (2D)	Seismic (3D)	Other	Total
Onshore							
Queensland	46 313	12 197	0	1 493	60	16 588	76 651
New South Wales	71	68	0	0	0	0	139
Victoria	4 022	742	0	1 110	1 000	139	7 013
Tasmania	835	0	0	99	0	422	1 356
South Australia	30 514	5 543	0	0	2 992	259	39 308
Western Australia	6 905	2 117	0	0	0	6 935	15 957
Northern Territory	0	76	0	0	0	0	76
TOTAL	**88 660**	**20 743**	**0**	**2 702**	**4 052**	**24 343**	**140 500**
Offshore							
Queensland	0	0	0	0	0	0	0
New South Wales	0	0	0	0	0	0	0
Victoria	42 401	25 902	0	1 405	23 750	1 162	94 620
Tasmania	416	2 530	0	1 485	0	0	4 431
South Australia	16 230	2 257	0	1 048	0	250	19 785
Western Australia	398 380	41 831	0	10 285	22 587	9 549	482 632
Northern Territory[1]	10 965	1 670	0	0	0	648	13 283
JPDA	0	460	0	0	0	0	460
TOTAL	**468 392**	**74 650**	**0**	**14 223**	**46 337**	**11 609**	**615 211**
Total exploration	**557 052**	**95 393**	**0**	**16 925**	**50 389**	**35 952**	**755 711**

[1]Includes Territory of Ashmore and Cartier Islands.
JPDA is the Joint Petroleum Development Area (formerly Zone of Cooperation Area A)

APPENDIX E cont'd

PETROLEUM EXPLORATION, DEVELOPMENT AND PRODUCTION EXPENDITURE ($A'000) — OPERATORS, 2003

State	Drilling Explora-tion	Develop-ment	Produc-tion	Geo-logical	Region-al	Seismic 2D	Seismic 3D	Other	Total
Queensland	46 313	60 900	97 716	12 197	0	1 493	60	16 588	235 267
New South Wales	71	0	0	68	0	0	0	0	139
Victoria	46 423	62 047	338 325	26 644	0	2 515	24 750	1 301	502 005
Tasmania	1 251	0	0	2 530	0	1 584	0	422	5 787
South Australia	46 744	99 750	104 345	7 800	0	1 048	2 992	509	263 188
Western Australia	405 285	94 951	868 605	43 948	0	10 285	22 587	16 484	1 462 145
Northern Territory	10 965	501	43 303	1 746	0	0	0	648	57 163
JPDA	0	175 063	992	460	0	0	0	0	176 515
TOTAL	**557 052**	**493 212**	**1 453 286**	**95 393**	**0**	**16 925**	**50 389**	**35 952**	**2 702 209**

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, 2003 ($A'000)

	Onshore operations	Offshore operations	Total
Australian funds	626 451	1 059 363	1 685 814
Reinvestment	182 228	982 425	1 164 653
North American funds	1 624	868 066	869 690
Other	6 801	99 908	106 709
Total	**817 103**	**3 009 762**	**3 826 865**

APPENDIX E cont'd

PETROLEUM DEVELOPMENT AND PRODUCTION EXPENDITURE ($A000) - OPERATORS, 2003

State	Development drilling	Production	Other	Total
Onshore				
Queensland	60 900	97 716	134 599	293 215
New South Wales	0	0	0	0
Victoria	0	958	0	958
Tasmania	0	0	0	0
South Australia	99 750	104 345	30 663	234 758
Western Australia	35 372	106 815	0	142 187
Northern Territory	0	5 485	0	5 485
TOTAL	**196 022**	**315 319**	**165 262**	**676 603**
Offshore				
Queensland	0	0	0	0
New South Wales	0	0	0	0
Victoria	62 047	337 367	10 663	410 077
Tasmania	0	0	253 718	253 718
South Australia	0	0	0	0
Western Australia	59 579	761 790	2 710	824 079
Northern Territory	501	37 818	0	38 319
JPDA	175 063	992	692 303	868 358
TOTAL	**297 190**	**1 137 967**	**959 394**	**2 394 551**
TOTAL DEVELOPMENT AND PRODUCTION	**493 212**	**1 453 286**	**1 124 656**	**3 071 154**

Northern Territory includes Territory of Ashmore and Cartier Islands.
JPDA is the Joint Petroleum Cooperation Area (formerly Zone of Cooperation Area)

APPENDIX E cont'd

SUMMARY OF PRIVATE ENTERPRISE PETROLEUM EXPLORATION AND DEVELOPMENT EXPENDITURE AND ACTIVITY 1979–2003

Year	Exploration expenditure ($ million)	Development expenditure (including production) ($ million)	Seismic surveys (line km)	Seismic surveys (sq 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	1065	90 169		270	94
1986	424	936	47 353		138	37
1987	346	2 068	42 527		225	57
1988	503	1 049	51492		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 a	89 a
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 a	81
2000	874	1 813	135 828	15 178	99 a	103 a
2001	* 1 050	* 1 614	65 024	21 779	127 a	87 a
2002	790	1 726	15 442	15 653	83	84
2003	755	3 071	15 837	7 305	106	98

* Estimate
a. Revised

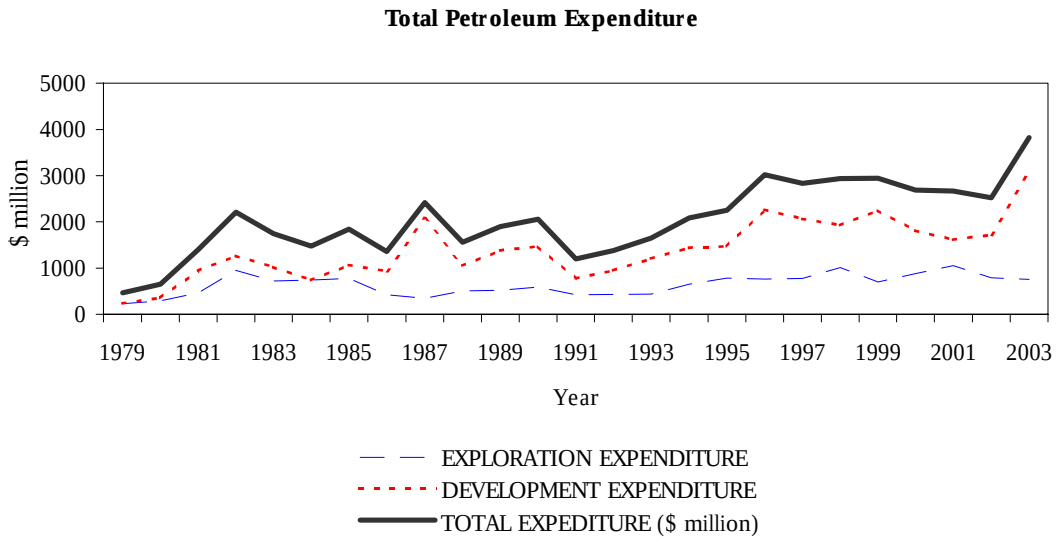

Figure E.1 Total petroleum expenditure, 1979-2003 ($ million) (note: 2001 data estimated)

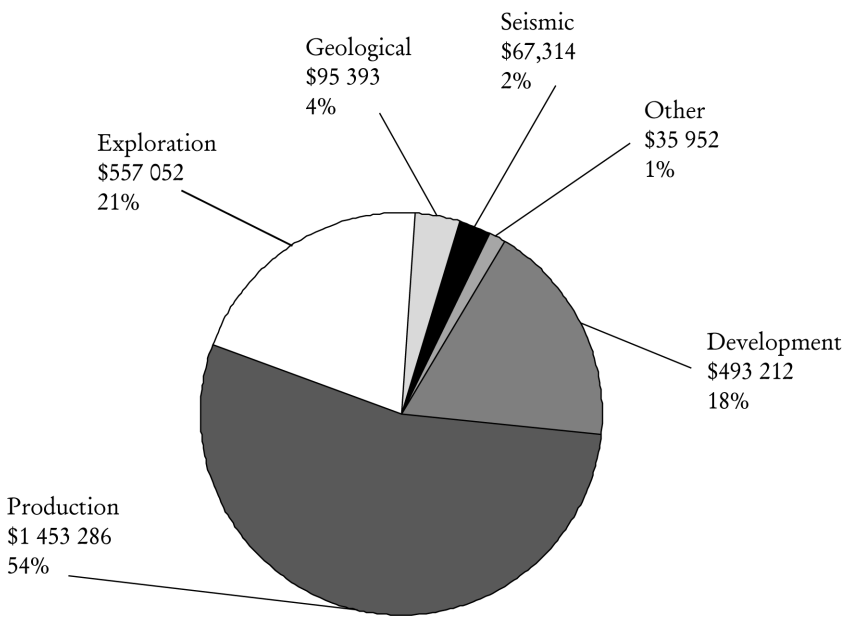

Figure E.2 Total petroleum expenditure in 2003 ($ million)

Appendix F
2003

Wells and metres drilled, 1984–2003

APPENDIX F: WELLS AND METRES DRILLED 1984–2003

WELLS DRILLED

Year	Exploration		Development		Total		Total
	Onshore	Offshore	Onshore	Offshore	Exploration	Development	
1984	192	42	80	42	234	122	356
1985	227	39	75	22	266	97	363
1986	110	27	17	22	137	39	176
1987	211	15	37	20	226	57	283
1988	199	32	35	15	231	50	281
1989	107	41	46	25	148	71	219
1990	105	65	57	16	170	73	243
1991	110	39	65	18	149	83	232
1992	76	42	39	12	118	51	169
1993	75	50	35	18	125	53	178
1994	85	46	19	22	131	41	172
1995	99	56	31	34	155	65	220
1996	99	48	65	21	147	86	233
1997	121	56	78	76	177	154	331
1998	89	73	49	45	162	94	256
1999	45	51	40	40	96	80	176
2000	40	62	80	24	102	104	206
2001	82	59	69	22	141	91	232
2002	42	46	57	27	88	84	172
2003	43	63	67	31	106	98	204

METRES DRILLED

Year	Exploration		Development		Total		Total
	Onshore	Offshore	Onshore	Offshore	Exploration	Development	
1984	216 192	84 380	160 800	130 036	300 572	290 836	591 408
1985	282 536	74 567	121 559	67 504	357 103	189 063	546 166
1986	170 470	43 440	31 162	77 006	213 910	108 168	322 078
1987	306 302	24 479	65 491	56 909	330 781	122 400	453 181
1988	221 734	68 699	59 500	40 848	290 433	100 348	390 781
1989	101 547	103 384	79 051	67 355	204 931	146 406	351 337
1990	130 769	121 512	91 060	51 830	252 281	142 890	395 171
1991	126 396	81 039	99 927	54 595	207 435	154 522	361 957
1992	93 285	69 862	72 773	35 659	163 147	108 432	271 579
1993	77 052	84 217	61 109	46 074	161 269	107 182	268 451
1994	128 177	72 638	35 234	62 165	200 815	97 399	298 214
1995	125 552	85 801	46 293	111 175	211 353	157 468	368 821
1996	156 383	83 328	93 673	70 738	239 711	164 411	404 122
1997	174 076	84 006	138 338	215 828	258 082	354 166	612 248
1998	172 599	139 694	101 126	121 178	312 293	222 304	534 596
1999	65 479	99 056	82 297	139 321	164 535	221 618	386 153
2000	51 740	150 403	180 452	57 247	202 143	237 698	439 841
2001	108 403	129 294	153 020	76 843	237 697	229 863	467 560
2002	48 950	74 618	134 029	74 556	123 568	208 585	332 153
2003	40 735	114 817	124 755	64 205	155 552	188 960	344 512

Appendix G
2003

Offshore and onshore drilling activity by State, 1993–2003

APPENDIX G: OFFSHORE AND ONSHORE DRILLING ACTIVITY BY STATE, 1993-2003

Side track wells drilled for remedial purposes not included in well count. Note: This method has been applied to 2003 data only.

OFFSHORE

New-field wildcat wells drilled

State	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Queensland	—	—	—	—	—	—	—	—	—	—	—
Victoria	5	—	6	—	2	1	2	—	4	2	3
Tasmania	—	—	—	—	—	1	1	—	1	—	—
South Australia	4	—	1	—	—	2	—	—	—	—	2
Western Australia	19	11	20	26	24	40	35	48	34	21	42
Northern Territory	5	5	4	2	3	9	5	7	9	7	1
Joint Petroleum Development Area	3	10	3	2	4	3	1	1	1	—	—
TOTAL	**36**	**26**	**34**	**30**	**33**	**56**	**44**	**56**	**49**	**30**	**48**

Extension/Appraisal wells drilled

State	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Victoria	2	2	3	—	—	—	1	—	1	3	1
Tasmania	—	—	—	—	—	1	—	—	1	—	—
Western Australia	12	16	9	11	17	12	6	6	6	12	11
Northern Territory	—	1	4	1	1	3	—	—	2	1	2
Joint Petroleum Development Area	—	1	6	6	5	1	—	—	—	—	1
TOTAL	**14**	**20**	**22**	**18**	**23**	**17**	**7**	**6**	**10**	**16**	**15**

Development wells drilled

State	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Victoria	11	9	19	12	51	32	26	6	9	12	9
Tasmania	—	—	—	—	—	—	—	—	—	—	—
Western Australia	7	10	15	9	22	9	13	14	13	8	16
Northern Territory	—	3	—	—	2	4	1	3	—	3	—
Joint Petroleum Development Area	—	—	—	—	1	—	—	1	—	4	6
TOTAL	**18**	**22**	**34**	**21**	**76**	**45**	**40**	**24**	**22**	**27**	**31**

APPENDIX G (cont'd)

ONSHORE

New-field wildcat wells drilled

State	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Queensland	29	27	41	32	41	29	13	12	21	9	11
New South Wales	2	—	—	1	1	—	1	1	—	—	—
Victoria	1	5	3	3	7	2	3	2	8	5	5
Tasmania	—	—	—	—	5	—	—	—	—	—	—
South Australia	8	11	13	30	27	33	10	5	11	8	12
Western Australia	6	17	5	6	4	7	2	6	9	2	3
Northern Territory	3	—	—	1	—	1	—	—	—	—	—
TOTAL	**49**	**60**	**62**	**73**	**85**	**72**	**29**	**26**	**49**	**24**	**31**

Extension/Appraisal wells drilled

State	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Queensland	12	11	24	13	26	8	11	9	19	7	7
New South Wales	—	—	1	—	—	—	—	—	1	—	—
Victoria	—	—	1	—	—	—	—	1	2	—	—
South Australia	11	10	8	9	8	9	5	4	9	8	4
Western Australia	3	2	3	4	1	—	—	—	2	3	1
Northern Territory	—	2	—	—	1	—	—	—	—	—	—
TOTAL	**26**	**25**	**37**	**26**	**36**	**17**	**16**	**14**	**33**	**18**	**12**

Development wells drilled

State	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Queensland	12	7	9	28	28	18	18	22	23	17	15
New South Wales	—	—	—	—	—	—	—	1	2	—	—
Victoria	—	1	—	—	—	—	2	—	—	—	—
South Australia	6	4	4	12	28	24	10	48	35	38	42
Western Australia	8	5	14	22	19	7	8	6	9	2	10
Northern Territory	9	2	4	3	3	—	2	3	—	—	—
TOTAL	**35**	**19**	**31**	**65**	**78**	**49**	**40**	**80**	**69**	**57**	**67**

Appendix H
2003

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						
Buffalo Venture		BHP	Floating facility	Oil	Offtake tanker	December-99
Buffalo WHP	Buffalo*	BHP	Mini-platform	Oil	Buffalo Venture	December-99
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
CARNARVON						
Acqua Blu (ab. Jul-92)	Talisman*	Marathon	Floating facility	Oil	Offtake tanker	January-89
Agincourt	Agincourt	Apache	Minipod	Oil and Gas	Varanus Island	August-97
Campbell A	Campbell	Apache	Monopod	Gas	Sinbad A	October-92
Chervil	Chervil	Apache	Monopod	Oil	Airlie Island	August-89
Cossack Pioneer	Wanaea*, Lambert*, Cossack*	Woodside North Rankin	Floating facility	Oil	Offtake tanker (oil); (solution gas)	November-95
Cowle A	Cowle	Chevron	Monopod	Oil	Thevenard Island	April-91
East Spar	East Spar*	Apache	Subsea with telemetry buoy	Gas	Varanus Island	October-96
Four Vanguard	Woollybutt*	Eni Australia	Floating facility	Oil	Offtake tanker	April-03
Gibson	Gibson	Apache	Minipod	Oil	Varanus Island	June-02
Goodwyn A	Rankin*, Goodwyn	Woodside	Conventional steel	Gas	North Rankin	February-95
Griffin Venture	Griffin*, Chinook/Scindian*	BHP	Floating facility	Oil and Gas	Offtake tanker (oil); Onslow plant (gas)	January-94
Harriet A	Harriet	Apache	Conventional steel	Oil and Gas	Varanus Island	January-86
Harriet B	Harriet	Apache	Monopod	Oil	Harriet C	January-86
Harriet C	Harriet	Apache	Monopod	Oil	Harriet A	January-86
Karratha Spirit		Woodside	FSO	Oil	Offtake tanker	May-01
North Herald (ab. Nov-97)	North Herald	WMC	Monopod	Oil	South Pepper	December-87
North Rankin A	North Rankin	Woodside	Conventional steel	Gas	Withnell Bay	July-84
Ocean Legend	Legendre	Woodside	Conventional steel	Oil	Karratha Spirit	May-01
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
Saladin A	Saladin	Chevron	Mini-platform	Oil	Thevenard Island	November-89
Saladin B	Saladin	Chevron	Mini-platform	Oil	Thevenard Island	November-89
Saladin C	Saladin	Chevron	Mini-platform	Oil	Thevenard Island	November-89
Simpson A	Simpson	Apache	Minipod	Oil	Varanus Island	December-01
Simpson B	Simpson	Apache	Minipod	Oil	Varanus Island	December-01
Sinbad A	Sinbad	Apache	Monopod	Gas	Varanus Island	October-92
Skate	Skate	Chevron	Monopod	Oil	Thevenard Island	March-94
South Pepper (ab. Nov-97)	South Pepper	WMC	Tripod	Oil	Vicksburg jackup rig to Airlie Island	January-88
South Plato	South Plato	Apache	Minipod	Oil	Varanus Island	June-02

* = Subsea wells

APPENDIX H (cont'd)

Basin/Facility	Accumulation(s)	Operator	Platform type	Product	Producing to	Start-up date
Stag	Stag	Apache	Conventional steel	Oil	Storage tanker	May-98
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
Wonnich	Wonnich	Apache	Tripod	Oil and Gas	Varanus Island	July-99
Yammaderry A	Saladin	Chevron	Monopod	Oil	Saladin C	April-91
GIPPSLAND						
Barracouta	Barracouta, Seahorse*, Tarwhine*	Esso	Conventional steel	Oil and Gas	Longford	March-69
Bream	Bream	Esso	Conventional steel	Oil and Gas	West Kingfish (oil), Longford (gas)	March-88
Bream B	Bream	Esso	Concrete gravity	Oil and Gas	Bream	January-97
Cobia	Halibut	Esso	Conventional steel	Oil	Halibut	April-83
Dolphin	Dolphin	Esso	Monotower	Oil	Longford	January-90
Flounder	Flounder	Esso	Conventional steel	Oil and Gas	Tuna	December-84
Fortescue	Halibut	Esso	Conventional steel	Oil	Halibut	September-83
Halibut	Halibut	Esso	Conventional steel	Oil	Longford	March-70
Kingfish A	Kingfish	Esso	Conventional steel	Oil	Kingfish B	April-71
Kingfish B	Kingfish	Esso	Conventional steel	Oil	Halibut	November-71
Mackerel	Mackerel, Blackback*	Esso	Conventional steel	Oil	Halibut	December-77
Marlin	Marlin	Esso	Conventional steel	Oil and Gas	Longford (gas); Halibut (oil)	November-69
Perch	Perch	Esso	Monotower	Oil	Dolphin	January-90
Snapper	Snapper, Moonfish	Esso	Conventional steel	Oil and Gas	Longford (gas); Marlin (oil)	July-81
Tuna	Tuna	Esso	Conventional steel	Oil and Gas	Marlin	May-79
West Kingfish	Kingfish	Esso	Conventional steel	Oil	Kingfish A	December-82
West Tuna	Tuna	Esso	Concrete gravity	Oil and Gas	Tuna	December-96
Whiting	Whiting	Esso	Mini-platform	Oil and Gas	Snapper	October-89

* = Subsea wells

Appendix I
2003

Crude oil and gas production by basin, pre-1994 and 1994 to 2003

APPENDIX I: CRUDE OIL AND GAS PRODUCTION BY BASIN, pre-1994 and 1994 to 2003 (GL and BCM)

Basin	pre-1994	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	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	1.097	0.143	0.143	0.143	0.141	0.145	0.080	0.079	0.080	0.064	0.080	2.195
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	20.439	1.835	1.486	1.165	0.988	1.256	3.018	11.648	8.359	6.678	3.494	60.366
Bowen/Surat	4.614	0.053	0.071	0.032	0.095	0.085	0.050	0.024	0.037	0.019	0.031	5.111
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	0.346	0.049	0.001	0.005	0.005	0.005	0.008	0.004	0.007	0.003	0.004	0.437
Carnarvon	60.495	8.722	8.656	11.246	10.136	11.116	8.263	12.892	13.382	14.320	14.033	173.261
Cooper/Eromanga	26.588	1.597	1.382	1.796	1.489	1.205	1.116	0.915	1.059	0.821	0.936	38.904
Gippsland	471.800	14.800	12.300	10.900	12.600	9.400	10.800	9.500	7.800	6.900	6.200	573.000
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	0.384	0.035	0.025	0.021	0.016	0.010	0.008	0.003	0.008	0.034	0.279	0.823
Total	**585.763**	**27.234**	**24.064**	**25.308**	**25.470**	**23.222**	**23.343**	**35.065**	**30.732**	**28.839**	**25.057**	**854.097**
GAS												
Adavale	0.000	0.000	0.044	0.053	0.052	0.034	0.023	0.013	0.004	0.002	0.000	0.225
Amadeus	2.726	0.427	0.400	0.456	0.502	0.484	0.478	0.458	0.592	0.639	0.518	7.680
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	1.607	0.191	0.149	0.096	0.067	0.095	0.180	0.143	0.105	0.100	0.037	2.770
Bowen/Surat	11.291	1.090	1.193	1.058	0.855	0.672	0.642	0.620	0.605	0.798	0.854	19.678
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
Carnarvon	62.755	15.020	15.919	16.862	18.371	21.422	18.783	18.846	18.353	19.821	20.482	246.634
Cooper/Eromanga	78.917	7.123	4.809	5.201	5.787	11.065	6.888	7.521	7.962	8.420	7.274	150.967
Gippsland	108.300	7.000	6.600	5.800	6.300	5.900	5.500	6.000	6.700	6.200	5.800	170.100
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	0.179	0.117	0.131	0.138	0.141	0.155	0.232	0.408	0.420	0.568	0.323	2.812
Perth	14.014	0.422	0.317	0.390	0.152	0.487	0.258	0.264	0.237	0.189	0.196	16.926
Total	**279.789**	**31.390**	**29.562**	**30.054**	**32.227**	**40.314**	**32.984**	**34.273**	**34.978**	**36.737**	**35.484**	**617.792**

APPENDIX I (cont'd) (million barrels and billion cubic feet)

Basin	pre-1994	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	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	6.900	0.899	0.899	0.899	0.887	0.912	0.503	0.497	0.503	0.403	0.503	13.806
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	128.557	11.542	9.347	7.328	6.214	7.900	18.983	73.264	52.576	42.003	21.977	379.690
Bowen/Surat	29.021	0.333	0.447	0.201	0.598	0.535	0.317	0.151	0.233	0.120	0.195	32.149
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	2.176	0.308	0.006	0.031	0.031	0.031	0.050	0.025	0.044	0.019	0.025	2.749
Carnarvon	380.501	54.860	54.445	70.735	63.753	69.917	51.973	81.088	84.170	90.070	88.265	1 089.777
Cooper/Eromanga	167.233	10.045	8.693	11.296	9.366	7.579	7.019	5.755	6.661	5.164	5.887	244.698
Gippsland	2 967.528	93.089	77.365	68.559	79.251	59.124	67.930	59.753	49.060	43.400	38.997	3 604.055
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	2.415	0.220	0.157	0.132	0.101	0.063	0.050	0.019	0.050	0.214	1.755	5.177
Total	**3 684.332**	**171.296**	**151.358**	**159.182**	**160.201**	**146.062**	**146.825**	**220.552**	**193.298**	**181.392**	**157.604**	**5 372.102**
GAS												
Adavale	0.000	0.000	1.554	1.872	1.836	1.201	0.812	0.459	0.141	0.071	0.000	7.946
Amadeus	96.269	15.080	14.126	16.104	17.728	17.092	16.881	16.174	20.906	22.566	18.293	271.219
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	56.751	6.745	5.262	3.390	2.366	3.355	6.357	5.050	3.708	3.532	1.307	97.823
Bowen/Surat	398.742	38.493	42.131	37.363	30.194	23.732	22.667	21.895	21.366	28.181	30.159	694.924
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
Carnarvon	2 216.193	530.431	562.179	595.482	648.772	756.518	663.322	665.546	648.136	699.979	723.322	8 709.880
Cooper/Eromanga	2 786.954	251.549	169.830	183.673	204.368	390.760	243.250	265.604	281.178	297.352	256.881	5 331.400
Gippsland	3 824.615	247.205	233.079	204.827	222.485	208.359	194.232	211.890	236.610	218.953	204.827	6 007.082
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	6.321	4.132	4.626	4.873	4.979	5.474	8.193	14.409	14.832	20.059	11.407	99.306
Perth	494.904	14.903	11.195	13.773	5.368	17.198	9.111	9.323	8.370	6.675	6.922	597.742
Total	**9 880.749**	**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**	**1 253.117**	**21 817.319**

Appendix J
2003

Australian petroleum pipelines, 2003

APPENDIX J: AUSTRALIAN PETROLEUM PIPELINES, 2003

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period con-structed
		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 con-struction
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 con-structed
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 con-struction
48	Wolgolla to Epsilon	Santos Limited	Gas	16	250	Under con-struction
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 con-struction
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 con-struction
69	Okotoko East No. 1 wellhead to Okotoko pipeline riser	Santos Ltd	Gas	3.3	100 to 150	Under con-struction
70	Wippo South No. 1 wellhead to Judga North No. 1 wellhead	Santos Ltd	Gas	6.5	100 to 200	Under con-struction
71	Chiron Field manifold to Stokes Field manifold	Santos Ltd	Gas	10.5	150 to 250	Under con-struction
		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 con-structed
24	Vic/NSW border to Culcairn (from Barnawatha)	Transmission Pipelines Australia	Gas	57	457	Under con-struction
25	Marsden to Dubbo	AGL Pipelines (NSW) Pty Ltd	Gas	255	168, 219	Under con-struction
26	Vic/NSW to Wilton	Duke Energy	Gas	467	450	Under con-struction
		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 Hydrocarbons	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 con-structed
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 Kingfish 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	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 (White Oil)	Shell Company of Australia Ltd	Liquids	53.13	200	1968
8	Shell Geelong to Shell Newport (Black Oil)	Shell Company of Australia Ltd	Liquids	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	Derimut 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 con-structed
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 con-structed
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 Waurn 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 Geelon	Pivot Ltd	Sulphuric	0.38	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 con-structed
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 con-structed
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 construction	Duke Energy	Gas	277	450	Under
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	Yarrawonga, 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 con-structed
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 con-structed
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 Autralia Ltd	Hydrogen	1.2	50	1975
89	Hastings	BOC Gases Autralia 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 con-structed
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 (10 km loop incl.)	660, 864	1974

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period con-structed
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 Ltd	BHP Petroleum (Australia) Pty	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
TPL14	Wonnich platform to Varanus Island	Apache Energy Ltd	Gas/condensate/ water	31	219	1998–99

APPENDIX J (cont'd)

Pipeline licence	Location/Route	Operator	Product	Length (km)	Pipe diameter (mm)	Period con-structed
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 con-structed
PL29	Lowendal Island	Apache East Spar Pty Ltd	Gas/Oil/wat er	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	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 con-structed
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
19	Mt Todd Mine lateral	NT Gas Pty Ltd	Gas	10	219	1996

Appendix K
2003

Key to petroleum exploration and development titles

Petroleum Titles by Companies

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

This list is cross-referenced with the 'Key to Petroleum Exploration and Development Titles' which includes all petroleum exploration permits, retention leases and production licenses that were in force at 1 April 2004.

Adenmere Pty Ltd
Queensland ATP587P

AGIP Australia Ltd
Northern Territory NT/P57
Territory of Ashmore and Cartier Islands Adjacent Area AC/P21

Air Liquide Australia Ltd
South Australia PPL21

Allender J F
South Australia PEL 82

Alliance Minerals Australia NL
Queensland PL21, PL22, PL27, PL64
Western Australia WA-6-R

Alliance Petroleum Australia Pty Ltd
South Australia PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, 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, PPL169

Alpha Oil & Gas PL
Western Australia WA-332-P, WA-333-P

Alpha Oil & Natural Gas Pty Ltd
Western Australia WA-342-P, WA-341-P

Alvin Hosking
South Australia PEL 82

Amity Oil NL
Northern Territory RL 1

Ampolex (PPL) Pty Ltd
Western Australia TL/2, TP/ 7 R2

Anadarko Australia Company Pty Ltd
South Australia EPP31, EPP28, EPP29, EPP30
Territory of Ashmore and Cartier Islands Adjacent Area AC/L1, AC/L2, AC/L3

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

Antrim Energy Australia Inc.
Western Australia WA-306-P

Antrim Energy Australia P/L
Western Australia WA-307-P

Apache Airlie Pty Ltd
Western Australia TL/2

Apache East Spar Pty Ltd
Western Australia WA-13-L

Apache Harriet Pty Ltd
Western Australia TL/9, EP 358 R1, TL/1, TL/5, TL/6, TL/8, TP/ 8 R2, WA-192-P R3, EP 307 R3, TR/1, TR/2

Apache Kersail Pty Ltd
Western Australia WA-13-L

Apache Lowendal Pty Ltd
Western Australia TL/9, EP 358 R1, TL/1, TL/5, TL/6, TL/8, TP/ 8 R2, WA-192-P R3, EP 307 R3, TR/1, TR/2

Apache Miladin Pty Ltd
Western Australia TL/9, EP 358 R1, TL/1, TL/5, TL/6, TL/8, TP/ 8 R2, WA-192-P R3, EP 307 R3, TR/1, TR/2

Apache Nasmah Pty Ltd
Western Australia TL/9, EP 358 R1, TL/1, TL/5, TL/6, TL/8, TP/ 8 R2, WA-192-P R3, EP 307 R3, TR/1, TR/2

Apache Northwest Pty Ltd
Western Australia TL/9, WA-254-P R1, WA-335-P, WA-325-P, WA-327-P, WA-214-P R2, EP 358 R1, EP 395 R1, TL/1, TL/5, TL/6, TP/ 6 R2, WA-15-L, WA-1-P R6, WA-256-P R1, WA-261-P R1, TL/8, EP 342 R2, TP/ 8 R2, WA-192-P R3, WA-20-L, WA-202-P R2, EP 307 R3, TR/1, TR/2, EP 363 R2, EP 403 R1, WA-209-P R2, WA-246-P R1, TR/3, TP/ 9 R2, WA-334-P, WA-155-P R4, WA-226-P R2, WA-257-P R1

Apache Oil Australia Pty Ltd
Western Australia EP 409, TL/2, WA-13-L, WA-149-P R3, TP/ 7 R2

Apex Energy NL
New South Wales PEL442, PEL444

Arc Energy NL
Western Australia L 1 R1, L 2 R1, TP/15, EP 413 R1

Arrow Energy NL
New South Wales PEL432
Queensland ATP683P, ATP679P, ATP686P, ATP700P, ATP716P

Ashmore Oil Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P22, AC/RL1
Western Australia WA-316-P

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

Ausam Resources NL
Queensland ATP754P
Victoria PEP166
Western Australia EP 23 R6, EP 321 R2, EP 407, EP 414 R1

Ausoil Exploration Pty Ltd
Western Australia EP 422

Aust Wandoo Petroleum Ltd
Tasmania T/18P R3

Australian Coalbed Methane Pty Ltd
New South Wales PEL1, PEL10, PEL12, PEL286, PEL435, PEL436
Queensland ATP574P, ATP689P, ATP676P

Australian Crude Oil Co. Inc
Victoria VIC/P53

Australian Gasfields Ltd
Queensland PL189, ATP269P, ATP549P, PL23, PL24, PL25, PL26, PL35, PL36, PL62, PL65, PL76, PL77, PL78, PL79, PL82, PL87, PL105, PL107, PL115, PL116, PL109, PL149, PL133, PL175, PL181, PL182, PL184

Australian Natural Gas PL
Northern Territory NT/P62, NT/P63, NT/P64

Australian Natural Gas Pty Ltd
Northern Territory NT/P65

Australian-Canadian Oil Royalties Ltd
South Australia PEL 108, PEL 109, PEL 112

AWE (Perth Basin) Ltd
Western Australia EP 320 R3, L 11, TP/15, EP 413 R1

AWE Oil (WA) NL
Western Australia WA-286-P

AWE Petroleum Ltd
Tasmania T/L1, T/RL1 R2, T/18P R3
Western Australia EP 368 R2, WA-202-P R2

Azeeza Pty Ltd
Queensland ATP593P

Basin Oil NL
Northern Territory NT/RL3
South Australia PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, 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, PPL169
Victoria VIC/RL1(V)
Western Australia WA-13-R

Basin Oil Pty Ltd
Victoria VIC/L21, VIC/RL3, VIC/P55

Bass Strait Oil Company Pty Ltd
Victoria VIC/P41, VIC/P42, VIC/P47

Batavia Oil & Gas Pty Ltd
Western Australia WA-332-P, WA-333-P, WA-342-P, WA-341-P

Beach Oil & Gas Pty Ltd
South Australia PEL 83

Beach Petroleum Ltd
Queensland PL32, PL47
South Australia PEL 91, PEL 107, PEL 110, PPL204
Victoria PRL1

Beach Petroleum NL
Queensland ATP269P, PL31, PL32, PL47, PL184
South Australia PEL 92, PEL 94, PEL 95, PEL 136, PEL 66
Victoria PPL 11, PEP154, PPL6, PPL9, PPL 10
Western Australia WA-281-P

Beaconsfield Energy Development Pty Ltd
Queensland ATP529P

Benaris International NV
Tasmania T/30P
Victoria VIC/P43, VIC/P38(V)

BHP Billiton (Australia) Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P30
Western Australia WA-10-L, WA-12-L, WA-12-R, WA-155-P R4

BHP Billiton Petroleum (Australia) Pty Ltd
Western Australia WA-294-P

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 R1

BHP Billiton Petroleum (North West Shelf) Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/L5
Western Australia WA-2-L R1, WA-6-L R1, WA-5-L R1, WA-3-L R1, WA-7-R R1, WA-9-R R1, WA-10-R R1, WA-11-L, WA-16-L, WA-1-L R1, WA-255-P R1, WA-28-P R6, WA-33-P R3, WA-4-L R1, WA-9-L, WA-296-P, WA-297-P, WA-275-P, WA-1-R R2, WA-18-L, WA-301-P, WA-302-P, WA-303-P, WA-304-P, WA-305-P, WA-23-L, WA-346-P, TR/5, WA-351-P, R 2, WA-28-R, WA-29-R, WA-30-R, WA-31-R, WA-32-R

BHP Billiton Petroleum (Victoria) Pty Ltd
Victoria VIC/RL1, VIC/RL2, VIC/RL7, VIC/P45, VIC/L22

BHP Coal Pty Ltd
Queensland PL191, ATP364P

BHP Petroleum (North West Shelf) Pty Ltd
Western Australia WA-24-L

Black Rock Resources Australia NL
Western Australia EP 419

Bligh Oil and Minerals NL
Queensland ATP552P

BNG (Surat) Pty Ltd
Queensland ATP722P, ATP645P, ATP684P, ATP693P, ATP688P

BNG Pty Ltd
Queensland ATP641P, ATP643P, ATP644P

Bobwyns Pty Ltd
Queensland ATP621P

Boggy Creek Pty Ltd
Victoria PPL3

Bonaparte Gas & Oil Pty Ltd
Northern Territory NT/RL1
Western Australia WA-18-P R5, WA-6-R, WA-27-R

Bonaparte Gulf Oil & Gas Pty Ltd
Western Australia EP 325 R2

Bonnerwell Pty Ltd
Queensland ATP619P

Bounty Oil & Gas NL
New South Wales PEP 11
Territory of Ashmore and Cartier Islands Adjacent Area AC/P25, AC/P27
Western Australia WA-325-P, WA-327-P, L 4, L 5, TP/15, EP 412, WA-310-P

BP Developments Australia Pty Ltd
Western Australia WA-2-L R1, WA-6-L R1, WA-5-L R1, WA-3-L R1, WA-7-R R1, WA-9-R R1, WA-10-R R1, WA-11-L, WA-16-L, WA-1-L R1, WA-28-P R6, WA-33-P R3, WA-4-L R1, WA-9-L, WA-23-L, WA-24-L, TR/5, R 2

BP Exploration (Alpha) Ltd
Western Australia WA-267-P, WA-294-P, WA-296-P, WA-297-P, WA-22-R, WA-23-R, WA-24-R, WA-25-R, WA-26-R

BP Petroleum Developments (NWS) Pty Ltd
Western Australia WA-275-P, WA-28-R, WA-29-R, WA-30-R, WA-31-R, WA-32-R

Bridge Oil Developments Pty Ltd
South Australia PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, 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, PPL169

Bridge Oil Exploration Pty Ltd
Queensland ATP212P, PL30, PL56, PL74

Brisbane Petroleum NL
Queensland PL18, PL40

Burns, Alan Robert
Western Australia EP 414 R1

CalEnergy Gas (Aust) Ltd
Tasmania T/L1, T/30P, T/RL1 R2, T/18P R3
Victoria VIC/P43

Canso Resources Ltd
Northern Territory L3, L4, L5, RL 2

Capital Consultant Services Pty Ltd
Western Australia EP 321 R2, EP 407

Capricorn Energy Pty Ltd
Queensland ATP529P

Carnarvon Petroleum NL
Western Australia EP 110 R4

CH4 Pty Ltd
Queensland PL191, ATP364P

ChevronTexaco Australia Pty Ltd
Western Australia L 12, L 13, TR/4, EP 357 R2, WA-2-L R1, WA-6-L R1, WA-5-L R1, WA-3-L R1, WA-7-R R1, WA-9-R R1, EP 62 R6, WA-16-R, WA-17-R, EP 61 R6, L 10, L 1H R1, TL/3, TL/4, TL/7, TP/ 2 R2, WA-10-R R1, WA-11-L, WA-16-L, WA-1-L R1, WA-253-P R1, WA-267-P, WA-28-P R6, WA-33-P R3, WA-4-L R1, WA-5-R R1, WA-7-L, WA-9-L, WA-294-P, WA-296-P, WA-297-P, WA-275-P, WA-14-R, WA-205-P R2, WA-15-R, WA-23-L, WA-24-L, WA-2-R R2, WA-3-R R2, TR/5, WA-4-R R2, WA-19-R, WA-20-R, WA-21-R, WA-22-R, WA-23-R, WA-24-R, WA-25-R, WA-26-R, R 2, WA-28-R, WA-29-R, WA-30-R, WA-31-R, WA-32-R

Cieco Browse Inc
Western Australia WA-286-P

Coastal Oil & Gas Australia 20 Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P20

Coastal Oil & Gas Australia 21 Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P21

ConocoPhillips (03-13) Pty Ltd
Joint Petroleum Development Area JPDA 03-13

ConocoPhillips (03-21) Pty Ltd
Joint Petroleum Development Area JPDA 03-21

ConocoPhillips JPDA Pty Ltd
Joint Petroleum Development Area JPDA 03-13

ConocoPhillips Petroleum (03-12) Pty Ltd
Joint Petroleum Development Area JPDA 03-12

ConocoPhillips Petroleum (03-20) Pty Ltd
Joint Petroleum Development Area JPDA 03-20

ConocoPhillips (03-16) Pty Ltd
Joint Petroleum Development Area JPDA 03-16

ConocoPhillips (03-19) Pty Ltd
Joint Petroleum Development Area JPDA 03-19

Coogee Resources (AC) Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/RL3

Coogee Resources Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/L1, AC/L2, AC/L3, AC/RL3

Cooper Energy NL
South Australia PEL 92, PEL 93, PEL 100, PEL 110, PPL204

Cooper-Eromanga Oil Inc.
Queensland ATP582P

Cosmo Oil Ashmore Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P17

CPC Energy Pty Ltd
Queensland ATP299P, PL29, PL38, PL39, PL52, PL57, PL95, PL169, PL170

Crusader (Victoria) Pty Ltd
Victoria VIC/RL2

Crux S.A.
Territory of Ashmore and Cartier Islands Adjacent Area AC/P23

Dana Petroleum (E&P) Ltd
Western Australia WA-226-P R2

Dana Petroleum (WA) LLC
Western Australia WA-226-P R2

David M. Schuette
South Australia PEL 73

Daytona Energy Corporation
Territory of Ashmore and Cartier Islands Adjacent Area AC/P32
Western Australia WA-324-P

Delbaere Associates Pty Ltd
Queensland PL18, PL40

Delhi Petroleum Pty Ltd
Queensland PL187, PL188, PL189, PL151, PL152, PL155, PL156, ATP259P, PL23, PL24, PL25, PL26, PL34, PL35, PL36, PL37, PL55, PL58, PL59, PL60, PL61, PL62, PL63, PL68, PL75, PL76, PL77, PL78, PL79, PL80, PL81, PL82, PL83, PL84, PL85, PL86, PL87, PL88, PL105, PL106, PL107, PL108, PL109, PL110, PL111, PL113, PL114, PL97, PL130, PL131, PL132, PL135, PL136, PL139, PL149, PL150, PL112, PL129, PL133, PL134, PL137, PL138, PL140, PL141, PL142, PL146, PL147, PL143, PL144, PL145, PL148, PL153, PL154, PL157, PL158, PL159, PL168, PL175, PL181, PL182, PL177, PL178, PL186, PL193
South Australia PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL182, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL26, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL118, PPL119, PPL120, PPL121, PPL122, PPL123, PPL124, PPL125, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, PPL135, PPL136, PPL137, PPL138, PPL139, PPL140, PPL141, PPL142, PPL143, PPL144, PPL145, PPL146, PPL147, PPL148, PPL149, PPL150, PPL151, PPL152, PPL153, PPL154, PPL155, PPL156, PPL157, PPL158, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL167, PPL131, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL187, PPL191, PPL194, PPL197, PPL169

Diamond Gas Resources Pty Ltd
Victoria VIC/P55

Drillsearch Energy NL
Queensland PL189, ATP299P, PL23, PL24, PL25, PL26, PL29, PL35, PL36, PL38, PL39, PL52, PL57, PL62, PL76, PL77, PL78, PL79, PL82, PL87, PL105, PL107, PL109, PL95, PL149, PL133, PL169, PL170, PL175, PL181, PL182
Western Australia WA-317-P, WA-318-P, WA-319-P

Dyad-Australia Inc.
Queensland ATP554P

Eagle Bay Resources NL
Territory of Ashmore and Cartier Islands Adjacent Area AC/P32
Victoria VIC/P41, VIC/P47
Western Australia WA-331-P, EP 423, TP/21

Eastern Energy Australia Pty Ltd
New South Wales PEL6, PEL422

Eastern Star Gas Ltd
New South Wales PEL434, PEL238, PEL8, PEL424, PEL433

Elcos Pty Ltd
South Australia PEL 104

Ely Sakhai
South Australia PEL 108, PEL 109, PEL 112

Emet Pty Ltd
Joint Petroleum Development Area JPDA 03-12

Empire Oil Company (WA) Ltd
Western Australia EP 411, EP 414 R1, EP 415, EP 416, EP 389 R1

EnCana Corporation
South Australia EPP31, EPP28, EPP29, EPP30
Victoria VIC/P48, VIC/P49
Western Australia WA-278-P

EnCana International (Australia) Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P24, AC/P30

Eni (Australia) Pty Ltd
Western Australia WA-279-P, WA-280-P, WA-208-P R2, WA-22-L

Eni Australia BV
Western Australia WA-328-P, TP/22, WA-326-P, WA-313-P

Eni Australia Ltd
Western Australia WA-25-L

Eni JPDA 03-13 Ltd
Joint Petroleum Development Area JPDA 03-13

Eni JPDA 03-21 BV
Joint Petroleum Development Area JPDA 03-21

Essential Petroleum Resources Ltd
South Australia PEL 72
Victoria VIC/P50, PEP159, PEP152, PEP151, VIC/P46

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 R1
Western Australia WA-1-R R2

Euro Pacific Energy Pty Ltd
Western Australia EP 406, EP 414 R1, EP 110 R4

Farmout Drillers NL
Northern Territory L3, L4

Farmout Drillers Pty Ltd
Northern Territory L5, RL 2

First Australian Resources Limited
Western Australia EP 395 R1, EP 397 R1, R 1

First Australian Resources NL
Western Australia WA-254-P R1, EP 104 R4

Frontier Bonaparte Pty Ltd
Northern Territory NT/RL3

Frontier Exploration Ltd
Western Australia WA-13-R

G C Graham
Queensland ATP713P, ATP719P, ATP741P

Geary, John Kevin
Western Australia EP 413 R1, EP 414 R1

Geopetro Resources Company
Western Australia EP 381 R1, EP 408 R1

Global Petroleum Limited
Queensland ATP728P, ATP729P, ATP731P

Globex Far East Pty Ltd
Western Australia WA-15-L, WA-209-P R2, WA-246-P R1

Go Resources (Aust) Pty Ltd
New South Wales PEL419, PEL420

Goldborough Energy Pty Ltd
Western Australia WA-332-P, WA-333-P, WA-342-P, WA-341-P

Golden West Hydrocarbons Pty Ltd
Queensland PL17

Goodrich Petroleum Company
Western Australia EP 395 R1, EP 397 R1

Great Artesian Oil & Gas Ltd
Queensland ATP539P, ATP552P
South Australia PEL 91, PEL 107, EPP27

Great Southland Minerals Pty Ltd
Tasmania EL13/98

Gulf Energy Pty Ltd
Queensland Q/23P

Gulliver Productions Pty Ltd
Western Australia EP 104 R4, R 1

Hamilbent Pty Ltd
Queensland ATP688P

Hardman Oil and Gas Pty Ltd
Western Australia EP 368 R2, L 4, L 5, TP/15, EP 413 R1, EP 110 R4

Harlow Australia Pty Ltd
New South Wales PEL443
Queensland ATP618P

Hawkestone Oil Pty Ltd
Western Australia WA-332-P, WA-333-P, WA-342-P, WA-341-P

Helm Energy Australia LLC
Queensland ATP564P, ATP602P

Hughes and Hughes Australia Pty Ltd
South Australia PEL 105

Hughes, Dan Allen
Western Australia EP 414 R1

Hughes, Dudley Joe
Western Australia EP 414 R1

Hyland Bay Pty Ltd
Queensland ATP552P

Icon Energy Ltd
Queensland ATP594P, ATP649P
Western Australia WA-331-P, EP 423, TP/21

Idemitsu Oil Exploration (Barrow) Pty Ltd
Western Australia WA-264-P, WA-264-P R1

Indigo Oil Pty Ltd
Western Australia EP 104 R4, R 1

Indo-Pacific Energy Australia Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P19, AC/P26, AC/P31

Inland Oil (Production) Pty Ltd
Queensland PL189, ATP269P, PL23, PL24, PL25, PL26, PL35, PL36, PL62, PL76, PL77, PL78, PL79, PL82, PL87, PL98, PL105, PL107, PL109, PL149, PL133, PL175, PL181, PL182, PL184

Innamincka Petroleum Ltd
South Australia PEL 103

Innovative Technological Geo-Exploration Pty Ltd
Northern Territory EP 69
Queensland PL98

Inpex Alpha Ltd
Tasmania T/33P
Victoria VIC/P51, VIC/P52, VIC/P42, VIC/P45
Western Australia WA-10-L, WA-311-P, WA-155-P R4

Inpex Browse Ltd
Western Australia WA-285-P, WA-288-P

Inpex Sahul Ltd
Joint Petroleum Development Area JPDA 03-12

Inpex Timor Sea Ltd
Joint Petroleum Development Area JPDA 03-01

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

IOR Exploration (NT) Pty Ltd
Northern Territory EP 69

IOR Exploration Pty Ltd
Queensland ATP548P, PL98

Jakabar Pty Ltd
Queensland ATP626P

Japan Australia LNG (MIMI) Pty Ltd
Western Australia WA-2-L R1, WA-6-L R1, WA-5-L R1, WA-3-L R1, WA-7-R R1, WA-9-R R1, WA-10-R R1, WA-11-L, WA-16-L, WA-1-L R1, WA-28-P R6, WA-4-L R1, WA-9-L, WA-294-P, WA-296-P, WA-297-P, WA-23-L, WA-24-L

JED North West Shelf Pty Ltd
Western Australia EP 137 R4

Karoon Gas Pty Ltd
Victoria PEP162

Kerr-McGee NW Shelf Energy Australia Pty Ltd
South Australia EPP33
Western Australia WA-337-P, WA-339-P

Kerr-McGee Exploration and Production Australia Pty Ltd
Western Australia WA-302-P

Kerr-McGee NW Shelf Australia Energy Pty Ltd
Western Australia WA-278-P, WA-301-P, WA-303-P, WA-304-P, WA-305-P

Kimberley Energy Group Pty Ltd
Northern Territory RL 1
Western Australia EP 386 R1

Kimberley Oil NL
Western Australia EP 104 R4, EP 371 R1, EP 390 R1, EP 391 R1, R 1

Kingston Petroleum Pty Ltd
Queensland ATP682P

Knight Industries Pty Ltd
Victoria PEP165, PEP161

Korea National Oil Corporation
Western Australia EP 408 R1

Kreznel, Jan
Queensland ATP723P

Kufpec Australia Pty Ltd
Western Australia TL/9, WA-335-P, EP 358 R1, TL/1, TL/5, TL/6, WA-191-P R3, WA-8-L, TL/8, TP/8 R2, WA-192-P R3, EP 307 R3, TR/1, TR/2, EP 363 R2, WA-246-P R1, WA-248-P R1, WA-257-P R1

Lakes Oil NL
South Australia PEL 57
Victoria PEP152

Lansvale Oil and Gas Pty Ltd
Western Australia EP 359 R1, EP 41 R6

Liberty Petroleum Corporation
Queensland ATP616P
South Australia PEL 88, PEL 100
Western Australia WA-314-P, WA-315-P

Lion Energy Ltd
South Australia PEL 86, PEL 87, PEL 89, PEL 104, PEL 111, PEL 115

Longreach Oil Ltd
Western Australia EP 369 R1, EP 405, EP 410

Lowell Petroleum NL
Queensland ATP564P, ATP602P

Magellan Petroleum (Eastern) Pty Ltd
Queensland ATP267P, ATP613P, PL33, PL50, PL51

Magellan Petroleum (NT) Pty Ltd
Northern Territory L3, L4, L5, RL 2
South Australia PEL 94, PEL 95

Magellan Petroleum (Southern) Pty Ltd
South Australia PEL 110

Magellan Petroleum (WA) Pty Ltd
Western Australia WA-287-P, WA-288-P, WA-291-P, WA-306-P, WA-307-P, WA-311-P

Magnum Gold NL
New South Wales PEL440, PEL439

Maneroo Oil Company Ltd
Queensland ATP556P, ATP566P

Maple Oil NL
Queensland ATP552P

Mawson Petroleum NL
Queensland PL189, PL23, PL24, PL25, PL26, PL31, PL31, PL32, PL32, PL35, PL36, PL47, PL47, PL149

Mawson Petroleum Pty Ltd
Queensland PL62, PL76, PL77, PL78, PL79, PL82, PL87, PL105, PL107, PL109, PL133, PL175, PL181, PL182
South Australia PEL 90, PPL203

Metgasco Pty Ltd
New South Wales PEL16

Millennium Resources Qld Pty Ltd
Queensland ATP587P

Mirboo Ridge Pty Ltd
South Australia PEL 57
Victoria PEP163, PEP164

Mobil (Legendre) Pty Ltd
Western Australia WA-14-L

Mobil Australia Resources Company Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/L1, AC/L2, AC/L3
Western Australia L 12, L 13, TR/4, EP 357 R2, EP 62 R6, WA-16-R, WA-25-L, EP 61 R6, L 10, L 1H R1, TL/3, TL/4, TL/7, TP/ 2 R2, WA-12-L, WA-267-P, WA-5-R R1, WA-7-L, WA-8-L, WA-12-R, WA-17-L, WA-22-L, WA-14-R, WA-205-P R2, WA-2-R R2, WA-3-R R2, WA-4-R R2, WA-22-R, WA-23-R, WA-24-R, WA-25-R, WA-26-R

Mobil Exploration and Producing Australia Pty Ltd
Western Australia WA-18-R, WA-10-L

Molopo Australia NL
New South Wales PEL13, PEL285, PEL426

Moonie Oil Co Ltd
Northern Territory L4

Moonie Oil Pty Ltd
Northern Territory RL 2

Moroil Pty Ltd
Northern Territory EP 69
Queensland PL98

Mosaic Oil NL
Queensland ATP212P, PL30, PL46, PL56, PL74, PL119
Western Australia WA-208-P R2

Mosaic Oil QLD Pty Ltd
Queensland ATP212P, ATP471P, PL48, PL49, PL56, PL66, PL74, PL15, PL16, ATP709P, PL192

Narrabri Power Ltd
New South Wales PPL 3

National Oil & Gas Pty Ltd
Northern Territory NT/P62, NT/P63, NT/P64, NT/P65
Western Australia WA-343-P, WA-344-P

Nations Natural Gas Pty Ltd
Northern Territory NT/P62, NT/P63, NT/P64, NT/P65

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 (Cartier) Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P20

Nexen Petroleum Australia Pty Ltd
Northern Territory NT/P59
Western Australia WA-19-L, WA-21-L, WA-239-P R1

Nexus Energy (Aust.) NL
Northern Territory NT/P66
Victoria VIC/P54, VIC/P56

Nippon Oil Exploration (Dampier) Pty Ltd
Western Australia WA-191-P R3

Northwest Energy NL
Western Australia WA-226-P R2

Norwest Energy NL
Western Australia EP 413 R1

Novus Australia Resources NL
South Australia PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL182, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL26, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL118, PPL119, PPL120, PPL121, PPL122, PPL123, PPL124, PPL125, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, PPL135, PPL136, PPL137, PPL138, PPL139, PPL140, PPL141, PPL142, PPL143, PPL144, PPL145, PPL146, PPL147, PPL148, PPL149, PPL150, PPL151, PPL152, PPL153, PPL154, PPL155, PPL156, PPL157, PPL158, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL167, PPL131, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL187, PPL191, PPL194, PPL197, PPL169

NWE (ZOCA 96-16) Pty Ltd
Joint Petroleum Development Area JPDA 03-16

Octanex NL
Western Australia WA-329-P, WA-330-P, WA-321-P, WA-322-P, WA-323-P

Odyssey International Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P19, AC/P31

OG ZOCA (95-19) Pty Ltd
Joint Petroleum Development Area JPDA 03-19

OG ZOCA (96-20) Pty Ltd
Joint Petroleum Development Area JPDA 03-20

Oil Company of Australia (Moura) Pty Ltd
Queensland ATP564P, ATP602P, PL101, PL94

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

Oilmin NT Resources Pty Ltd
Northern Territory L5

Omega Oil NL
South Australia PEL 32, PPL62, PPL168, PPL202

OMV Barrow Pty Ltd
Western Australia WA-290-P, EP 409

OMV Petroleum Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/L1, AC/L2, AC/L3
Western Australia WA-13-R, WA-308-P, WA-309-P, WA-320-P, WA-345-P

OMV Timor Sea Pty Ltd
Northern Territory NT/RL3
Territory of Ashmore and Cartier Islands Adjacent Area AC/P17, AC/P4 R4, AC/P24
Victoria VIC/L21
Western Australia WA-13-R, WA-308-P, WA-309-P, WA-320-P, WA-345-P

Origin Energy Amadeus NL
Western Australia L 9

Origin Energy Bonaparte Pty Ltd
Northern Territory NT/RL1
Western Australia WA-6-R

Origin Energy CSG Ltd
Queensland PL189, ATP663P, ATP212P, ATP337P, ATP375P, ATP470P, ATP553P, ATP584P, ATP592P, ATP606P, ATP623P, PL101, PL14, PL21, PL22, PL27, PL28, PL30, PL41, PL42, PL43, PL44, PL45, PL53, PL54, PL56, PL64, PL67, PL69, PL70, PL71, PL74, PL89, PL173, PL174, ATP692P, ATP680P, PL183, ATP631P, ATP698, ATP701P, ATP702P, PL204, PL195
South Australia PEL 27

Origin Energy CSG Marketing Pty Ltd
Queensland ATP701P

Origin Energy Developments Pty Ltd
Western Australia EP 320 R3, EP 368 R2, L 1 R1, L 11, L 2 R1, EP 413 R1, WA-226-P R2

Origin Energy Northwest Ltd
Tasmania T/L1, T/RL1 R2

Origin Energy Petroleum Pty Ltd
Victoria PEP159, PEP152, PEP160, PPL8
Western Australia L 9

Origin Energy Resources Ltd
Queensland PL187, PL188, PL151, PL152, PL155, PL59, PL60, PL61, PL81, PL83, PL85, PL86, PL106, PL108, PL111, PL113, PL114, PL97, PL131, PL132, PL135, PL139, PL112, PL138, PL141, PL146, PL147, PL145, PL148, PL153, PL154, PL157, PL158, PL177
South Australia PEL 83, PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL182, PEL 27, PEL 32, PEL 57, PEL 66, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL26, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL118, PPL119, PPL120, PPL121, PPL122, PPL123, PPL124, PPL125, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, PPL135, PPL136, PPL137, PPL138, PPL139, PPL140, PPL141, PPL142, PPL143, PPL144, PPL145, PPL146, PPL147, PPL148, PPL149, PPL150, PPL151, PPL152, PPL153, PPL154, PPL155, PPL156, PPL157, PPL158, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL167, PPL168, PPL131, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL187, PPL191, PPL194, PPL197, PPL169, PPL202
Tasmania T/L1, T/30P, T/RL1 R2, T/18P R3, T/34P
Victoria VIC/P43, VIC/P37(V)

Osaka Gas Australia Pty Ltd
Northern Territory NT/P48, NT/P55, NT/RL2 R1

Oz-Exoil NL
Northern Territory NT/P60, NT/P68

Pace Petroleum Pty Ltd
Western Australia EP 359 R1, EP 41 R6

Pacific Power
New South Wales PEL4

Pagehurst Pty Ltd
Queensland ATP567P

Pan Canadian Petroleum Ltd
Western Australia WA-22-L

Pan Continental Oil and Gas NL
Western Australia WA-340-P, 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 WA-254-P R1, L 9

Pancontinental Oil & Gas NL
Western Australia EP 104 R4, R 1

Pangaea Oil and Gas Pty Ltd
New South Wales PEL437
Queensland ATP610P, ATP620P, ATP648P

Pannonian International Ltd
New South Wales PEL438

Pelsoil Ltd
Western Australia EP 104 R4, R 1

Permian Oil Pty Ltd
South Australia PEL 86, PEL 87, PEL 89, PEL 104, PEL 111, PEL 115

Petro Energy Pty Ltd
Western Australia L 7

Petromin NL
Northern Territory L4
Queensland ATP269P

Petromin Pty Ltd
Northern Territory L5, RL 2
Queensland PL184

Petrotech Pty Ltd
Victoria PEP166, PEP155, PEP156, PEP157, PEP158

Petroz (Timor Sea) Pty Ltd
Joint Petroleum Development Area JPDA 03-12

Petroz NL
Western Australia WA-336-P

Phillips Oil Company Australia
Western Australia WA-17-L

Phillips STL Pty Ltd
Northern Territory NT/P55, NT/RL2 R1

Phoenix Energy Pty Ltd
Western Australia L 4, L 5

Planet Resources Pty Ltd
Western Australia WA-226-P R2

Queensland Gas Company Ltd
Queensland ATP465P, ATP620P, ATP621P, ATP651P, ATP632P, ATP695P

Queensland Gas Pty Ltd
Queensland ATP610P, ATP648P

Radford, Roy Antony
Western Australia EP 110 R4

Rawson Resources NL

Northern Territory EP 97
South Australia PEL 154, PEL 155
Western Australia WA-331-P, EP 423, TP/21, WA-306-P, WA-307-P

Reef Oil NL

South Australia PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, 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, PPL169

ROC Oil WA Pty Ltd

Western Australia WA-325-P, WA-327-P, WA-286-P, TP/15, EP 413 R1

Rocky Mountain Minerals

Western Australia WA-329-P

Roma Petroleum Company Pty Ltd

Queensland ATP545P

Roma Petroleum NL

Queensland ATP465P, ATP695P

Rough Range Oil Pty Ltd

Western Australia WA-331-P, EP 423, TP/21, EP 359 R1, EP 412, EP 41 R6

Rudkowski, Bogdan

Queensland ATP723P

Sagasco South East Inc.

South Australia PEL 32, PPL62, PPL168, PPL202
Western Australia L 9

Samson-International (Australia) Pty Ltd

Queensland ATP722P, ATP688P

Santos (299) Pty Ltd

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

Santos (BOL) Pty Ltd

Queensland ATP212P, PL30, PL56, PL74, PL119, PL192
South Australia PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, 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, PPL169
Victoria PPL 11, PPL 12, VIC/RL7, PPL4, PPL5, PEP153, PEP154, PPL6, PPL7, PPL9, PPL 10, VIC/L22, PRL1
Western Australia WA-214-P R2, TL/2, WA-13-L, WA-149-P R3, WA-242-P R1, TP/ 7 R2

Santos (JPDA 91-01) Pty Ltd

Joint Petroleum Development Area JPDA 03-01

Santos (JPDA 91-12) Pty Ltd

Joint Petroleum Development Area JPDA 03-12

Santos (NGA) Pty Ltd

Northern Territory NT/P48

Santos Australian Hydrocarbons Pty Ltd

Queensland PL187, PL188, PL156, PL58, PL80, PL113, PL114, PL136, PL137, PL141, PL145, PL148, PL153, PL157, PL158, PL159

Santos Exploration Pty Ltd

Northern Territory L3, L4, L5, RL 2
Queensland PL71, PL192

Santos Gnuco Pty Ltd

Queensland ATP267P, PL33, PL50, PL51, PL57

Santos Ltd

Northern Territory L3, NT/RL1, RL 2
Queensland PL187, PL188, PL189, PL151, PL152, PL155, PL156, ATP259P, PL23, PL24, PL25, PL26, PL34, PL35, PL36, PL37, PL55, PL58, PL59, PL60, PL61, PL62, PL63, PL68, PL75, PL76, PL77, PL78, PL79, PL80, PL81, PL82, PL83, PL84, PL85, PL86, PL87, PL88, PL105, PL106, PL107, PL108, PL109, PL110, PL111, PL113, PL114, PL97, PL130, PL131, PL132, PL135, PL136, PL139, PL149, PL150, PL112, PL129, PL133, PL134, PL137, PL138, PL140, PL141, PL142, PL146, PL147, PL143, PL144, PL145, PL148, PL153, PL154, PL157, PL158, PL159, PL168, PL175, PL181, PL182, PL177, PL178, PL186, PL193
South Australia PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL182, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL26, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL118, PPL119, PPL120, PPL121, PPL122, PPL123, PPL124, PPL125, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, PPL135, PPL136, PPL137, PPL138, PPL139, PPL140, PPL141, PPL142, PPL143, PPL144, PPL145, PPL146, PPL147, PPL148, PPL149, PPL150, PPL151, PPL152, PPL153, PPL154, PPL155, PPL156, PPL157, PPL158, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL167, PPL131, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL187, PPL191, PPL194, PPL197, PEL 114, PPL169
Tasmania T/RL1 R2
Victoria VIC/P51, VIC/P52, VIC/RL3, VIC/P44
Western Australia WA-18-P R5, WA-191-P R3, WA-1-P R6, WA-264-P R1, WA-274-P, WA-6-R, WA-8-L, WA-20-L, WA-209-P R2, WA-27-R

Santos Offshore Pty Ltd

Northern Territory NT/RL1, NT/P61, NT/P67
South Australia EPP32
Tasmania T/32P, T/33P, T/35P, T/36P
Territory of Ashmore and Cartier Islands Adjacent Area AC/L1, AC/L2, AC/L3
Victoria VIC/RL1(V), VIC/RL2, VIC/P55
Western Australia WA-328-P, L 12, L 13, TR/4, EP 357 R2, WA-339-P, WA-338-P, WA-264-P, EP 62 R6, WA-281-P, EP 61 R6, L 10, L 1H R1, TL/3, TL/4, TL/7, TP/ 2 R2, WA-15-L, WA-18-P R5, WA-208-P R2, WA-6-R, WA-27-R

Santos Petroleum Operations Pty Ltd

Queensland ATP337P, ATP553P, PL41, PL42, PL43, PL44, PL45, PL54, PL67, PL173, PL183

Santos Petroleum Pty Ltd

Queensland PL151, PL152, PL155, PL34, PL37, PL59, PL60, PL61, PL63, PL68, PL75, PL81, PL83, PL84, PL85, PL86, PL88, PL106, PL108, PL110, PL111, PL97, PL130, PL131, PL132, PL135, PL139, PL150, PL112, PL129, PL134, PL140, PL142, PL146, PL147, PL143, PL144, PL168, PL177, PL178, PL186, PL193
South Australia PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL119, PPL120, PPL124, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, 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, PPL169

Santos QNT Pty Ltd

Queensland ATP267P, ATP299P, PL 1, PL 2, PL17, PL29, PL33, PL38, PL39, PL50, PL51, PL52, PL57, PL95, PL169, PL170, ATP685P, PL176

SCGAU Pty Ltd

Western Australia EP 408 R1

Seqoil Pty Ltd

Queensland ATP574P, ATP589P, ATP593P, ATP608P, ATP654P

Shebandowan Investments Pty Ltd

Western Australia WA-7-L

Shell Dev (PSC 9) P/L

Western Australia WA-1-L R1

Shell Development (03-20) Pty Ltd

Joint Petroleum Development Area JPDA 03-20

Shell Development (Australia) Pty Ltd
Northern Territory NT/P48, NT/P55, NT/P57, NT/RL2 R1
Territory of Ashmore and Cartier Islands Adjacent Area AC/L5, AC/P8 R4
Western Australia WA-2-L R1, WA-6-L R1, WA-5-L R1, WA-3-L R1, WA-7-R R1, WA-9-R R1, WA-16-R, WA-10-R R1, WA-11-L, WA-16-L, WA-267-P, WA-28-P R6, WA-33-P R3, WA-4-L R1, WA-5-R R1, WA-9-L, WA-294-P, WA-296-P, WA-297-P, WA-275-P, WA-14-R, WA-205-P R2, WA-313-P, WA-23-L, WA-24-L, WA-2-R R2, WA-3-R R2, WA-4-R R2, WA-22-R, WA-23-R, WA-24-R, WA-25-R, WA-26-R, R 2, WA-28-R, WA-29-R, WA-30-R, WA-31-R, WA-32-R

Shell Development (PSC 19) Pty Ltd
Joint Petroleum Development Area JPDA 03-19

Shogoil Australia Pty Ltd
Queensland ATP578P

SK Corporation
Western Australia WA-338-P, WA-278-P

Southern Amity Inc
Western Australia EP 381 R1, EP 408 R1

Springfield Oil & Gas Ltd
South Australia PEL 86, PEL 87, PEL 89, PEL 104, PEL 111, PEL 115
Western Australia EP 414 R1

Starzap Pty Ltd
Queensland ATP647P

Strata Resources NL
Western Australia WA-329-P, WA-330-P, WA-321-P, WA-322-P, WA-323-P

Strike Oil NL
New South Wales PEL427, PEL428
Victoria VIC/P44
Western Australia EP 421, TP/19, WA-340-P, WA-261-P R1, TP/17, EP 341 R2, WA-312-P, EP 420, TP/18

Stuart Petroleum Ltd
South Australia PEL 90, PEL 113, PPL203

Stuart Petroleum NL
South Australia PEL 102, PEL 93

Sun Resources NL
New South Wales PEL444
Western Australia WA-340-P, WA-254-P R1, EP 325 R2, EP 359 R1, EP 395 R1, WA-261-P R1, WA-312-P, WA-257-P R1

Sweetpea Corporation Pty Ltd
Northern Territory EP 98, EP 76, EP 99

Sydney Gas (Camden) Operations Pty Ltd
New South Wales PPL 1, PPL 2

Sydney Gas Operations Pty Ltd
New South Wales PEL2, PEL267, PEL4, PEL5, PEL441

Sykes Ian Grant
Queensland PL72, PL73

Tacnas Pty Ltd
South Australia PEL 86, PEL 87, PEL 89, PEL 104, PEL 111, PEL 115

Tap (Harriet) Pty Ltd
Western Australia TL/9, EP 358 R1, TL/1, TL/5, TL/6, TL/8, TP/ 8 R2, WA-192-P R3, EP 307 R3, TR/1, TR/2, EP 363 R2, WA-246-P R1, WA-334-P

TAP (SHELFAL) Pty Ltd
Western Australia TP/20, EP 364 R1, EP 395 R1, WA-8-L, WA-291-P, WA-149-P R3, EP 137 R4, EP 341 R2, EP 403 R1, EP 397 R1

TAP Oil Limited
Western Australia EP 420, TP/18

Tap Oil NL
Western Australia WA-278-P

Tap West Pty Ltd
Western Australia WA-25-L, WA-22-L

Terratek Drilling Tools Pty Ltd
Western Australia L 6, L 8, EP 129 R4

Texaco Australia Pty Ltd
Western Australia WA-18-R, L 12, L 13, TR/4, EP 357 R2, EP 62 R6, WA-16-R, WA-17-R, EP 61 R6, L 10, L 1H R1, TL/3, TL/4, TL/7, TP/ 2 R2, WA-253-P R1, WA-267-P, WA-268-P, WA-5-R R1, WA-192-P R3, WA-205-P R2, WA-2-R R2, WA-3-R R2, WA-19-R, WA-20-R, WA-21-R, WA-22-R, WA-23-R, WA-24-R, WA-25-R, WA-26-R

Texaco Barcoo Pty Ltd
Western Australia WA-303-P, WA-305-P

Texaco Copernicus P/L
Western Australia WA-302-P

Timor Oil Ltd
Queensland PL17

Tipperary Oil & Gas (Australia) Pty Ltd
Queensland ATP554P, ATP655P, ATP675P

TMOC Exploration Pty Ltd
Victoria PEP160

Todd Petroleum Australia Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P20

Tokyo Timor Sea Resources Pty Ltd
Joint Petroleum Development Area JPDA 03-13

Trans-Orient Petroleum Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P26

Transoil (NT) Pty Ltd
Northern Territory L5

Transoil Pty Ltd
Northern Territory L4, RL 2

Tri-C Resources Inc.
South Australia PEL 105

Tri-Star Petroleum Company
Queensland ATP653P, ATP703P, ATP526P, PL90, PL91, PL92, PL99, PL100, ATP664P, ATP665P, ATP706P, ATP707P, ATP708P, ATP735P, ATP745P

Trinity Gas Resources Pty Ltd
Victoria VIC/L21, VIC/RL3

Triple J Resources Pty Ltd
Queensland ATP594P

TSP Arafura Petroleum Pty Ltd
Northern Territory NT/P60, NT/P68

Tubridgi Petroleum Pty Ltd
Western Australia L 9

TXU Gas Storage Pty Ltd
Victoria PPL1, PPL2

Uncol South Asean Ltd
Tasmania T/32P
Victoria VIC/P52

United Oil & Gas Co (NT) Pty Ltd
Northern Territory L4

Unocal South Australia Ltd
Tasmania T/35P, T/36P

Vamgas Pty Ltd
Queensland PL187, PL188, PL189, PL151, PL152, PL155, PL156, ATP552P, PL23, PL24, PL25, PL26, PL34, PL35, PL36, PL37, PL55, PL58, PL59, PL60, PL61, PL62, PL63, PL68, PL75, PL76, PL77, PL78, PL79, PL80, PL81, PL82, PL83, PL84, PL85, PL86, PL87, PL88, PL105, PL106, PL107, PL108, PL109, PL110, PL111, PL113, PL114, PL97, PL130, PL131, PL132, PL135, PL136, PL139, PL149, PL150, PL112, PL129, PL133, PL134, PL137, PL138, PL140, PL141, PL142, PL146, PL147, PL143, PL144, PL145, PL148, PL153, PL154, PL157, PL158, PL159, PL168, PL175, PL176, PL181, PL182, PL177, PL178, PL186, PL193
South Australia PPL170, PPL171, PPL172, PPL173, PPL174, PPL175, PPL176, PPL177, PPL178, PPL179, PPL180, PPL181, PPL182, PPL44, PPL 6, PPL 7, PPL 8, PPL 9, PPL10, PPL101, PPL102, PPL103, PPL104, PPL105, PPL106, PPL107, PPL108, PPL109, PPL11, PPL110, PPL111, PPL112, PPL113, PPL114, PPL115, PPL116, PPL117, PPL12, PPL13, PPL14, PPL15, PPL16, PPL17, PPL18, PPL19, PPL20, PPL22, PPL23, PPL24, PPL25, PPL26, PPL27, PPL28, PPL29, PPL30, PPL31, PPL32, PPL33, PPL34, PPL35, PPL37, PPL38, PPL39, PPL40, PPL41, PPL42, PPL43, 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, PPL92, PPL94, PPL96, PPL36, PPL91, PPL93, PPL95, PPL97, PPL98, PPL99, PPL100, PPL118, PPL119, PPL120, PPL121, PPL122, PPL123, PPL124, PPL125, PPL126, PPL127, PPL128, PPL132, PPL133, PPL134, PPL90, PPL130, PPL129, PPL135, PPL136, PPL137, PPL138, PPL139, PPL140, PPL141, PPL142, PPL143, PPL144, PPL145, PPL146, PPL147, PPL148, PPL149, PPL150, PPL151, PPL152, PPL153, PPL154, PPL155, PPL156, PPL157, PPL158, PPL159, PPL160, PPL161, PPL162, PPL163, PPL164, PPL165, PPL166, PPL167, PPL131, PPL183, PPL184, PPL185, PPL186, PPL188, PPL189, PPL190, PPL192, PPL193, PPL195, PPL196, PPL198, PPL199, PPL187, PPL191, PPL194, PPL197, PPL169

Vernon E Faulconer Australia Inc
Queensland ATP543P, PL117
South Australia PEL 101, PEL 103

Victoria Diamond Exploration Pty Ltd
Western Australia EP 406

Victoria International Petroleum NL
Queensland ATP333P

Victoria Oil Exploration (1977) Pty Ltd
Queensland ATP589P
South Australia PEL 86, PEL 87, PEL 89, PEL 111, PEL 115

Victoria Oil Pty Ltd
Queensland ATP333P

Victoria Petroleum (Middle East) Pty Ltd
Western Australia EP 423, TP/21

Victoria Petroleum (WA-209-P) Pty Ltd
Western Australia WA-340-P, WA-312-P

Victoria Petroleum Ltd
Queensland ATP654P

Victoria Petroleum NL
Queensland ATP465P, ATP574P, ATP608P, ATP695P
South Australia PEL 57, PEL 104
Western Australia WA-254-P R1, EP 325 R2, WA-261-P R1

Victoria Petroleum Offshore Pty Ltd
Western Australia EP 413 R1

Voyager (PB) Ltd
Western Australia WA-325-P, WA-327-P, EP 104 R4, EP 368 R2, TP/15, EP 413 R1, WA-349-P, R 1

Voyager Ltd
Western Australia WA-286-P

Wandoo Petroleum Pty Ltd
Tasmania T/L1
Territory of Ashmore and Cartier Islands Adjacent Area AC/P24
Western Australia WA-286-P, WA-14-L, WA-256-P R1, WA-202-P R2, WA-257-P R1

Wenk, Andrew
South Australia PEL 82

West Oil NL
Territory of Ashmore and Cartier Islands Adjacent Area AC/P26, AC/P32
Western Australia EP 341 R2, WA-310-P

Westranch Holdings Pty Ltd
Territory of Ashmore and Cartier Islands Adjacent Area AC/P22, AC/P32
Western Australia EP 364 R1, EP 368 R2, TP/15

Woodside Eastern Energy Pty Ltd
Victoria VIC/RL2, VIC/RL6, VIC/RL9, VIC/RL10
Western Australia WA-23-L, WA-24-L

Woodside Energy Ltd
Northern Territory NT/P55, NT/P57, NT/RL2 R1
South Australia EPP31, EPP28, EPP29, EPP30
Tasmania T/30P, T/34P
Territory of Ashmore and Cartier Islands Adjacent Area AC/L5, AC/P17, AC/P4 R4, AC/P8 R4
Victoria VIC/P43, VIC/P37(V)
Western Australia WA-254-P R1, WA-2-L R1, WA-6-L R1, WA-5-L R1, WA-3-L R1, WA-7-R R1, WA-9-R R1, WA-279-P, WA-280-P, WA-10-R R1, WA-11-L, WA-16-L, WA-1-L R1, WA-1-P R6, WA-208-P R2, WA-255-P R1, WA-269-P, WA-28-P R6, WA-33-P R3, WA-4-L R1, WA-9-L, WA-293-P, WA-294-P, WA-296-P, WA-297-P, WA-275-P, WA-20-L, WA-242-P R1, WA-248-P R1, WA-313-P, WA-271-P R1, TR/5, WA-347-P, WA-348-P, WA-350-P, R 2, WA-28-R, WA-29-R, WA-30-R, WA-31-R, WA-32-R

Woodside Oil Ltd
Western Australia WA-191-P R3

Woodside Petroleum (Timor Sea 1) Pty Ltd
Joint Petroleum Development Area JPDA 03-01

Woodside Petroleum (Timor Sea 19) Pty Ltd
Joint Petroleum Development Area JPDA 03-19

Woodside Petroleum (Timor Sea 20) Pty Ltd
Joint Petroleum Development Area JPDA 03-20

ZOCA 96-16 Pty Ltd
Joint Petroleum Development Area JPDA 03-16

ZOCA Pty Ltd
Joint Petroleum Development Area JPDA 03-16

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title
Accumulation
Company (Operator*) **Equity** **Expiry Date**

Queensland
Onshore
Exploration Permit
Legislation Group: Territorial

Sq km approximate

ATP212P	Bowen/Surat Basin	Blocks: 5	Sq Km: 371	31/07/2005
Angari Pty Ltd*			49.00	
Bridge Oil Exploration Pty Ltd			7.50	
Mosaic Oil NL			10.00	
Mosaic Oil QLD Pty Ltd			6.00	
Origin Energy CSG Ltd			20.00	
Santos (BOL) Pty Ltd			7.50	
ATP259P	Cooper/Eromanga Basin	Blocks: 378	Sq Km: 28 106	31/12/2006
				Renewal Pending
Santos Ltd*			50.00	
Delhi Petroleum Pty Ltd			50.00	
ATP267P	Cooper/Eromanga Basin	Blocks: 12	Sq Km: 740	30/11/2007
				Renewal Pending
Santos QNT Pty Ltd*			51.30	
Magellan Petroleum (Eastern) Pty Ltd			40.94	
Santos Gnuco Pty Ltd			7.77	
ATP269P	Cooper/Eromanga Basin	Blocks: 18	Sq Km: 2 404	31/12/2003
				Renewal Pending
Beach Petroleum NL*			68.29	
Australian Gasfields Ltd			19.24	
Inland Oil (Production) Pty Ltd			4.91	
Petromin NL	7.57			
ATP299P	Cooper/Eromanga Basin	Blocks: 24	Sq Km: 1 858	31/12/2004
Santos QNT Pty Ltd*			77.00	
CPC Energy Pty Ltd			1.00	
Drillsearch Energy NL			10.00	
Santos (299) Pty Ltd			12.00	
ATP333P	Bowen/Surat Basin	Blocks: 5	Sq Km: 415	31/05/2005
Victoria International Petroleum NL*			64.00	
Victoria Oil Pty Ltd	36.00			
ATP336P	Bowen/Surat Basin	Blocks: 28	Sq Km: 2 318	30/09/2003
				Renewal Pending
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
ATP337P	Bowen/Surat Basin	Blocks: 100	Sq Km: 7 744	30/09/2003
				Renewal Pending
Santos Petroleum Operations Pty Ltd*			50.00	
Origin Energy CSG Ltd			50.00	
ATP364P	Bowen Basin	Blocks: 92	Sq Km: 8 467	28/02/2006
BHP Coal Pty Ltd*			99.00	
CH4 Pty Ltd			1.00	
ATP375P	Bowen/Surat Basin	Blocks: 3	Sq Km: 249	30/09/2006
Origin Energy CSG Ltd*			100.00	
ATP465P	Bowen/Surat Basin	Blocks: 2	Sq Km: 155	31/08/2001
				Renewal Pending
Queensland Gas Company Ltd*			75.00	
Roma Petroleum NL			5.00	
Victoria Petroleum NL			20.00	
ATP470P	Bowen/Surat Basin	Blocks: 12	Sq Km: 892	28/02/2007
				Renewal Pending
Origin Energy CSG Ltd*			100.00	
ATP471P	Bowen/Surat Basin	Blocks: 22	Sq Km: 1 633	28/02/2007
				Renewal Pending
Mosaic Oil QLD Pty Ltd*			100.00	
ATP526P	Bowen/Surat Basin	Blocks: 37	Sq Km: 3 177	31/10/2004
Tri-Star Petroleum Company*			100.00	
ATP529P	Eromanga/Galilee Basin	Blocks: 181	30/11/2004	
Capricorn Energy Pty Ltd*			50.00	
Beaconsfield Energy Development Pty Ltd			50.00	
ATP539P	Eromanga Basin	Blocks: 77	Sq Km: 6 392	31/01/2005
				Renewal Pending
Great Artesian Oil & Gas Ltd*			100.00	
ATP543P	Cooper/Eromanga Basin	Blocks: 52	Sq Km: 5 562	31/01/2005
Vernon E Faulconer Australia Inc*			100.00	
ATP545P	Cooper/Eromanga Basin	Blocks: 25	Sq Km: 4 151	31/01/2005
				Renewal Pending
Roma Petroleum Company Pty Ltd*			100.00	
ATP548P	Cooper/Eromanga Basin	Blocks: 35	Sq Km: 2 906	31/03/2005
IOR Exploration Pty Ltd*			100.00	
ATP549P	Cooper/Eromanga Basin	Blocks: 99	Sq Km: 9 464	30/04/2005
Australian Gasfields Ltd*			100.00	

Title
Accumulation
Company (Operator*) **Equity** **Expiry Date**

ATP552P	Bowen/Surat Basin	Blocks: 6	Sq Km: 515	30/06/2001
				Renewal Pending
Great Artesian Oil & Gas Ltd*			25.45	
Bligh Oil and Minerals NL			44.39	
Hyland Bay Pty Ltd			2.12	
Maple Oil NL			6.06	
Vamgas Pty Ltd			21.97	
ATP553P	Bowen/Surat Basin	Blocks: 14	Sq Km: 1 162	30/11/2005
Santos Petroleum Operations Pty Ltd*			50.00	
Origin Energy CSG Ltd			50.00	
ATP554P	Eromanga Basin	Blocks: 6	Sq Km: 498	30/11/2001
				Renewal Pending
Dyad-Australia Inc.*			75.00	
Tipperary Oil & Gas (Australia) Pty Ltd			25.00	
ATP556P	Eromanga Basin	Blocks: 41	Sq Km: 3 404	30/11/2001
				Renewal Pending
Maneroo Oil Company Ltd*			100.00	
ATP560P	Cooper/Eromanga Basin	Blocks: 23	Sq Km: 2 633	30/11/2005
Oil Wells of Kentucky Inc.*			100.00	
ATP564P	Bowen/Surat Basin	Blocks: 44	Sq Km: 3 778	30/04/2006
Oil Company of Australia (Moura) Pty Ltd*			50.00	
Helm Energy Australia LLC			25.00	
Lowell Petroleum NL			25.00	
ATP566P	Eromanga Basin	Blocks: 7	Sq Km: 542	31/05/1998
				Renewal Pending
Maneroo Oil Company Ltd*			100.00	
ATP567P	Eromanga Basin	Blocks: 154	Sq Km: 17 888	30/04/2006
Pagehurst Pty Ltd*			100.00	
ATP574P	Bowen/Surat Basin	Blocks: 4	Sq Km: 429	30/04/2006
Victoria Petroleum NL*			75.00	
Australian Coalbed Methane Pty Ltd			6.25	
Seqoil Pty Ltd			18.75	
ATP578P	Eromanga Basin	Blocks: 65	Sq Km: 5 033	30/06/1998
				Renewal Pending
Shogoil Australia Pty Ltd*			100.00	
ATP582P	Eromanga Basin	Blocks: 365	Sq Km: 28 264	31/07/1998
				Renewal Pending
Cooper-Eromanga Oil Inc.*			100.00	
ATP584P	Bowen/Surat Basin	Blocks: 12	Sq Km: 915	31/07/2006
Origin Energy CSG Ltd*			100.00	
ATP587P	Eromanga Basin	Blocks: 12	Sq Km: 996	31/07/1998
				Renewal Pending
Millennium Resources Qld Pty Ltd*			50.00	
Adenmere Pty Ltd			50.00	
ATP589P	Cooper/Eromanga Basin	Blocks: 197	Sq Km: 14 945	31/08/1998
				Renewal Pending
Victoria Oil Exploration (1977) Pty Ltd*			60.00	
Seqoil Pty Ltd			40.00	
ATP592P	Bowen/Surat Basin	Blocks: 33	Sq Km: 3 520	31/08/2002
				Renewal Pending
Origin Energy CSG Ltd*			100.00	
ATP593P	Bowen/Surat Basin	Blocks: 15	Sq Km: 2 232	30/09/2006
Azeeza Pty Ltd*			60.00	
Seqoil Pty Ltd			40.00	
ATP594P	Cooper/Eromanga Basin	Blocks: 20	Sq Km: 1 549	30/09/1998
				Renewal Pending
Icon Energy Ltd*			50.00	
Triple J Resources Pty Ltd			50.00	
ATP602P	Bowen/Surat Basin	Blocks: 8	Sq Km: 1 030	31/12/2006
Helm Energy Australia LLC*			25.00	
Lowell Petroleum NL			25.00	
Oil Company of Australia (Moura) Pty Ltd			50.00	
ATP606P	Bowen/Surat Basin	Blocks: 38	Sq Km: 3 263	31/10/2006
Origin Energy CSG Ltd*			100.00	
ATP608P	Bowen/Surat Basin	Blocks: 53	Sq Km: 4 551	30/11/2006
Victoria Petroleum NL*			60.00	
Seqoil Pty Ltd			40.00	
ATP610P	Bowen/Surat Basin	Blocks: 3	Sq Km: 387	31/12/2004
Pangaea Oil and Gas Pty Ltd*			36.25	
Queensland Gas Pty Ltd			63.75	
ATP613P	Maryborough Basin	Blocks: 15	Sq Km: 1 546	31/03/2007
Magellan Petroleum (Eastern) Pty Ltd*			100.00	
ATP616P	Cooper/Eromanga Basin	Blocks: 8	Sq Km: 619	31/10/1999
				Renewal Pending
Liberty Petroleum Corporation*			100.00	
ATP618P	Eromanga Basin	Blocks: 151	Sq Km: 11 693	07/01/2000
				Renewal Pending
Harlow Australia Pty Ltd*			100.00	
ATP619P	Eromanga Basin	Blocks: 34	Sq Km: 2 633	29/02/2004
				Renewal Pending
Bonnerwell Pty Ltd*			100.00	

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Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
ATP620P	Surat Basin	Blocks: 6	Sq Km: 515	28/02/2004 Renewal Pending
Pangaea Oil And Gas Pty Ltd*			43.75	
Queensland Gas Company Ltd			56.25	
ATP621P	Bowen/Surat Basin	Blocks: 7	Sq Km: 601	29/02/2004 Renewal Pending
Bobwyns Pty Ltd*			95.00	
Queensland Gas Company Ltd			5.00	
ATP623P	Bowen/Surat Basin	Blocks: 2	Sq Km: 172	29/02/2004 Renewal Pending
Origin Energy CSG Ltd*			100.00	
ATP626P	Bowen/Surat Basin	Blocks: 30	Sq Km: 2 323	31/08/1999 Renewal Pending
Jakabar Pty Ltd*			100.00	
ATP631P	Bowen/Surat Basin	Blocks: 21	Sq Km: 2 092	31/08/2005
Origin Energy CSG Ltd*			100.00	
ATP632P	Bowen/Surat Basin	Blocks: 53	Sq Km: 3 719	31/03/2005
Queensland Gas Company Ltd*			100.00	
ATP641P	Clarence/Moreton Basin	Blocks: 122	Sq Km: 9 447	31/03/2006
BNG Pty Ltd*			100.00	
ATP643P	Clarence/Moreton Basin	Blocks: 9	Sq Km: 3 177	31/10/2003 Renewal Pending
BNG Pty Ltd*			100.00	
ATP644P	Clarence/Moreton Basin	Blocks: 26	Sq Km: 3 177	31/10/2003 Renewal Pending
BNG Pty Ltd*			100.00	
ATP645P	Bowen/Surat Basin	Blocks: 24	Sq Km: 2 400	31/12/2003 Renewal Pending
BNG (Surat) Pty Ltd*			100.00	
ATP647P	Bowen/Surat Basin	Blocks: 11	Sq Km: 944	31/07/2005
Starzap Pty Ltd*			100.00	
ATP648P	Bowen/Surat Basin	Blocks: 18	Sq Km: 2 710	31/10/2004
Queensland Gas Pty Ltd*			62.50	
Pangaea Oil and Gas Pty Ltd			37.50	
ATP649P	Bowen/Surat Basin	Blocks: 8	Sq Km: 619	30/11/2004
Icon Energy Ltd*			100.00	
ATP651P	Bowen/Surat Basin	Blocks: 19	Sq Km: 1 936	31/10/2004
Queensland Gas Company Ltd*			100.00	
ATP653P	Bowen/Surat Basin	Blocks: 5		30/09/2006
Tri-Star Petroleum Company*			100.00	
ATP654P	Bowen/Surat Basin	Blocks: 12	Sq Km: 929	31/12/2004
Victoria Petroleum Ltd*			60.00	
Seqoil Pty Ltd			40.00	
ATP655P	Bowen/Surat Basin	Blocks: 4	Sq Km: 1 549	31/10/2007
Tipperary Oil & Gas (Australia) Pty Ltd*			100.00	
ATP663P	Surat Basin	Blocks: 33		30/09/2006
Origin Energy CSG Ltd*			100.00	
ATP664P	Surat Basin	Blocks: 17		31/08/2007
Tri-Star Petroleum Company*			100.00	
ATP665P	Bowen/Surat Basin	Blocks: 18		31/10/2007
Tri-Star Petroleum Company*			100.00	
ATP675P	Bowen/Surat Basin	Blocks: 11	Sq Km: 3 562	29/02/2004
Tipperary Oil & Gas (Australia) Pty Ltd*			100.00	
ATP676P	Bowen/Surat Basin	Blocks: 69	Sq Km: 5 343	30/09/2004
Australian Coalbed Methane Pty Ltd*			100.00	
ATP679P	unknown Basin	Blocks: 11	Sq Km: 852	28/02/2005
Arrow Energy NL*			100.00	
ATP680P	Bowen/Surat Basin	Blocks: 23	Sq Km: 2 323	30/11/2004
Origin Energy CSG Ltd*			100.00	
ATP682P	Bowen/Surat Basin	Blocks: 1	Sq Km: 77	29/02/2004 Renewal Pending
Kingston Petroleum Pty Ltd*			100.00	
ATP683P	Clarence/Moreton Basin	Blocks: 72	Sq Km: 8 307	29/02/2004 Renewal Pending
Arrow Energy NL*			100.00	
ATP684P	Bowen Basin	Blocks: 35	Sq Km: 2 689	31/07/2005
BNG (Surat) Pty Ltd*			100.00	
ATP685P	Bowen/Surat Basin	Blocks: 12	Sq Km: 1 162	30/04/2004
Santos QNT Pty Ltd*			100.00	
ATP686P	Clarence/Moreton Basin	Blocks: 34	Sq Km: 2 600	30/11/2005
Arrow Energy NL*			100.00	
ATP688P	Bowen Basin	Blocks: 100		28/02/2007
Samson-International (Australia) Pty Ltd*			60.00	
BNG (Surat) Pty Ltd			20.00	
Hamilbent Pty Ltd			20.00	
ATP689P	Bowen/Surat Basin	Blocks: 59	Sq Km: 4 374	30/11/2004
Australian Coalbed Methane Pty Ltd*			100.00	
ATP692P	Bowen/Surat Basin	Blocks: 15	Sq Km: 1 549	30/11/2004
Origin Energy CSG Ltd*			100.00	
ATP693P	Bowen Basin	Blocks: 38	Sq Km: 2 925	30/11/2005
BNG (Surat) Pty Ltd*			100.00	

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
ATP695P	Bowen/Surat Basin	Blocks: 1	Sq Km: 75	28/02/2002 Renewal Pending
Queensland Gas Company Ltd*			60.00	
Roma Petroleum NL			32.00	
Victoria Petroleum NL			8.00	
ATP698	Bowen/Surat Basin	Blocks: 6		30/09/2006
Origin Energy CSG Ltd*			100.00	
ATP700P	New England Fold Belt Basin Arrow Energy NL*	Blocks: 29	100.00	31/03/2007
ATP701P	Bowen/Surat Basin	Blocks: 6		30/11/2004
Origin Energy CSG Ltd*			50.00	
Origin Energy CSG Marketing Pty Ltd			50.00	
ATP702P	Bowen/Surat Basin	Blocks: 9		28/02/2007
Origin Energy CSG Ltd*			100.00	
ATP703P	Bowen/Surat Basin	Blocks: 15		30/09/2006
Tri-Star Petroleum Company*			100.00	
ATP706P	Surat Basin	Blocks: 11		05/10/2007
Tri-Star Petroleum Company*			100.00	
ATP707P	Surat Basin	Blocks: 22		06/10/2007
Tri-Star Petroleum Company*			100.00	
ATP708P	Bowen/Surat Basin	Blocks: 12		30/09/2007
Tri-Star Petroleum Company*			100.00	
ATP709P	Bowen/Surat Basin	Blocks: 8	Sq Km: 859	31/08/2005
Mosaic Oil QLD Pty Ltd*			100.00	
ATP713P	Surat Basin	Blocks: 20		31/12/2007
G C Graham*			100.00	
ATP716P	New England Fold Belt Basin Arrow Energy NL*	Blocks: 95	100.00	31/10/2007
ATP719P	Eromanga Basin	Blocks: 11		31/12/2007
G C Graham*			100.00	
ATP722P	Bowen Basin	Blocks: 18		20/11/2006
Samson-International (Australia) Pty Ltd*			60.00	
BNG (Surat) Pty Ltd			40.00	
ATP723P	Bowen/Surat Basin	Blocks: 9		11/05/2007
Rudkowski, Bogdan*			50.00	
Kreznel, Jan			50.00	
ATP728P	Bowen/Surat Basin	Blocks: 6		07/08/2006
Global Petroleum Limited*			100.00	
ATP729P	Bowen/Surat Basin	Blocks: 37		03/08/2006
Global Petroleum Limited*			100.00	
ATP731P	Bowen/Surat Basin	Blocks: 5		03/08/2006
Global Petroleum Limited*			100.00	
ATP735P	Bowen Basin	Blocks: 19		27/08/2007
Tri-Star Petroleum Company*			100.00	
ATP741P	Eromanga Basin	Blocks: 10		31/12/2007
G C Graham*			100.00	
ATP745P	Bowen Basin	Blocks: 8		12/10/2007
Tri-Star Petroleum Company*			100.00	
ATP754P	Bowen/Surat Basin	Blocks: 80		03/08/2007
Ausam Resources NL*			100.00	
Production Licence				
Legislation Group: Territorial			Sq km approximate	
PL 1	Bowen/Surat Basin		Sq Km: 258	31/12/2006
Cabawin, Moonie				
Santos QNT Pty Ltd*			100.00	
PL 2	Bowen/Surat Basin		Sq Km: 258	31/12/2008
Alton				
Santos QNT Pty Ltd*			100.00	
PL 3	Bowen/Surat Basin		Sq Km: 257	28/02/2011
Timbury Hills				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
PL 4	Bowen/Surat Basin		Sq Km: 257	28/02/2011
Pine Ridge				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
PL 5	Bowen/Surat Basin		Sq Km: 257	28/02/2011
Raslie, Yanalah				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
PL 6	Bowen/Surat Basin		Sq Km: 257	28/02/2011
Pringle Downs, Roma				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
PL 7	Bowen/Surat Basin		Sq Km: 257	28/02/2011
Blyth Creek, Richmond				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
PL 8	Bowen/Surat Basin		Sq Km: 257	28/02/2011
Wallumbilla South				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
PL 9	Bowen/Surat Basin		Sq Km: 257	28/02/2011
Anabranch, Maffra				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
PL10	Bowen/Surat Basin		Sq Km: 257	28/02/2011
Bony Creek, Tarrawonga				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
PL11	Bowen/Surat Basin		Sq Km: 257	28/02/2011
Back Creek, Tarrawonga				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
PL12	Bowen/Surat Basin		Sq Km: 257	28/02/2011
Oberina, Trinidad				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
PL13	Bowen/Surat Basin		Sq Km: 100	31/10/1992
Pleasant Hills				
Associated Petroleum Pty Ltd*			85.00	
Interstate Pipelines Pty Ltd			15.00	
PL14	Bowen/Surat Basin		Sq Km: 252	31/05/2007
Kincora				
Origin Energy CSG Ltd*			100.00	
PL15	Bowen/Surat Basin		Sq Km: 259	29/04/2019
Boxleigh				
Mosaic Oil QLD Pty Ltd*			100.00	
PL16	Bowen/Surat Basin		Sq Km: 259	29/04/2019
Silver Springs				
Mosaic Oil QLD Pty Ltd*			100.00	
PL17	Bowen/Surat Basin	Blocks: 88	Sq Km: 104	28/02/1999
Bennett				
Santos QNT Pty Ltd*			70.00	
Golden West Hydrocarbons Pty Ltd			3.30	
Timor Oil Ltd			26.70	
PL18	Bowen/Surat Basin		Sq Km: 184	31/08/2003
Yellowbank Creek				
Brisbane Petroleum NL*			50.00	
Delbaere Associates Pty Ltd			50.00	
PL21	Bowen/Surat Basin		Sq Km: 260	18/04/2004
Beldene, Royston				
Origin Energy CSG Ltd*			64.00	
Alliance Minerals Australia NL			12.50	
Angari Pty Ltd			4.50	
Oil Investments Ltd			19.00	
PL22	Bowen/Surat Basin		Sq Km: 230	31/05/2004
Waratah				
Origin Energy CSG Ltd*			64.00	
Alliance Minerals Australia NL			12.50	
Angari Pty Ltd			4.50	
Oil Investments Ltd			19.00	
PL23	Cooper/Eromanga Basin		Sq Km: 234	31/08/2004
Jackson				
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum NL			6.50	
Vamgas Pty Ltd			15.50	
PL24	Cooper/Eromanga Basin		Sq Km: 201	14/12/2003
Jackson South				
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum NL			6.50	
Vamgas Pty Ltd			15.50	
PL25	Cooper/Eromanga Basin		Sq Km: 257	28/02/2005
Naccowlah South				
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum NL			6.50	
Vamgas Pty Ltd			15.50	
PL26	Cooper/Eromanga Basin		Sq Km: 257	28/02/2005
Chookoo				
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum NL			6.50	
Vamgas Pty Ltd			15.50	
PL27	Bowen/Surat Basin		Sq Km: 255	31/08/2005
Newstead, Yarrabend				
Origin Energy CSG Ltd*			64.00	
Alliance Minerals Australia NL			12.50	
Angari Pty Ltd			4.50	
Oil Investments Ltd			19.00	
PL28	Bowen/Surat Basin		Sq Km: 251	30/11/2005
Avondale				
Associated Petroleum Pty Ltd*			46.25	
Interstate Pipelines Pty Ltd			7.50	
Oil Investments Ltd			35.51	
Origin Energy CSG Ltd			10.74	
PL29	Cooper/Eromanga Basin		Sq Km: 13	19/12/2005
Tintaburra				
Santos QNT Pty Ltd*			77.00	
CPC Energy Pty Ltd			1.00	
Drillsearch Energy NL			10.00	
Santos (299) Pty Ltd			12.00	
PL30	Bowen/Surat Basin		Sq Km: 37	08/07/2006
Riverslea, Yapunyah				
Angari Pty Ltd*			55.00	
Bridge Oil Exploration Pty Ltd			7.50	
Mosaic Oil NL			10.00	
Origin Energy CSG Ltd			20.00	
Santos (BOL) Pty Ltd7.50				
PL31	Cooper/Eromanga Basin		Sq Km: 260	26/05/2006
Bodalla South				
Beach Petroleum NL*			80.00	
Mawson Petroleum NL			14.75	
Mawson Petroleum NL			5.25	
PL32	Cooper/Eromanga Basin		Sq Km: 260	31/12/2006
Kenmore				
Beach Petroleum NL*			22.00	
Beach Petroleum Ltd			58.00	
Mawson Petroleum NL			14.75	
Mawson Petroleum NL			5.25	
PL33	Cooper/Eromanga Basin		Sq Km: 257	14/04/2007
Koora, Nockatunga, Winna				
Santos QNT Pty Ltd*			51.30	
Magellan Petroleum (Eastern) Pty Ltd			40.94	
Santos Gnuco Pty Ltd			7.77	
PL34	Cooper/Eromanga Basin		Sq Km: 239	10/07/2007
Sigma, Tickalara				
Santos Ltd*			37.50	
Delhi Petroleum Pty Ltd			30.00	
Santos Petroleum Pty Ltd			25.00	
Vamgas Pty Ltd			7.50	
PL35	Cooper/Eromanga Basin		Sq Km: 136	10/07/2007
Watson, Watson South				
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum NL			6.50	
Vamgas Pty Ltd			15.50	
PL36	Cooper/Eromanga Basin		Sq Km: 61	07/04/2008
Naccowlah				
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum NL			6.50	
Vamgas Pty Ltd			15.50	
PL37	Cooper/Eromanga Basin		Sq Km: 12	18/09/2007
Brumby				
Santos Ltd*			37.50	
Delhi Petroleum Pty Ltd			30.00	
Santos Petroleum Pty Ltd			25.00	
Vamgas Pty Ltd			7.50	

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Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
PL38	Cooper/Eromanga Basin		Sq Km: 135	16/06/2008
Toobunyah				
Santos QNT Pty Ltd*			77.00	
CPC Energy Pty Ltd			1.00	
Drillsearch Energy NL			10.00	
Santos (299) Pty Ltd			12.00	
PL39	Cooper/Eromanga Basin		Sq Km: 107	13/08/2008
Talgeberry				
CPC Energy Pty Ltd			1.00	
Drillsearch Energy NL			10.00	
Santos (299) Pty Ltd			12.00	
Santos QNT Pty Ltd			77.00	
PL40	Bowen/Surat Basin		Sq Km: 76	13/09/2008
Louise				
Brisbane Petroleum NL*			50.00	
Delbaere Associates Pty Ltd			50.00	
PL41	Bowen/Surat Basin		Sq Km: 157	25/05/2010
Arcturus				
Santos Petroleum Operations Pty Ltd*			50.00	
Origin Energy CSG Ltd			50.00	
PL42	Bowen/Surat Basin		Sq Km: 150	25/05/2010
Rolleston				
Santos Petroleum Operations Pty Ltd*			50.00	
Origin Energy CSG Ltd			50.00	
PL43	Bowen/Surat Basin		Sq Km: 179	25/05/2010
Yellowbank				
Santos Petroleum Operations Pty Ltd*			50.00	
Origin Energy CSG Ltd			50.00	
PL44	Bowen/Surat Basin		Sq Km: 201	25/05/2010
Merivale				
Santos Petroleum Operations Pty Ltd*			50.00	
Origin Energy CSG Ltd			50.00	
PL45	Bowen/Surat Basin		Sq Km: 108	25/05/2010
Glentulloch				
Santos Petroleum Operations Pty Ltd*			50.00	
Origin Energy CSG Ltd			50.00	
PL46	Bowen/Surat Basin		Sq Km: 34	23/02/2010
Fairymount				
Mosaic Oil NL*			100.00	
PL47	Cooper/Eromanga Basin		Sq Km: 28	22/08/2010
Blackstump				
Mawson Petroleum NL*			14.75	
Beach Petroleum Ltd			58.00	
Beach Petroleum NL			22.00	
Mawson Petroleum NL			5.25	
PL48	Bowen/Surat Basin		Sq Km: 7	31/01/2011
Noona Block				
Mosaic Oil QLD Pty Ltd*			100.00	
PL49	Bowen/Surat Basin		Sq Km: 22	31/01/2011
Taylor				
Mosaic Oil QLD Pty Ltd*			100.00	
PL50	Cooper/Eromanga Basin		Sq Km: 49	27/06/2011
Maxwell, Maxwell South				
Santos QNT Pty Ltd*			51.30	
Magellan Petroleum (Eastern) Pty Ltd			40.94	
Santos Gnuco Pty Ltd			7.77	
PL51	Cooper/Eromanga Basin		Sq Km: 55	27/06/2011
Dilkera, Muthero, Thungo				
Santos QNT Pty Ltd*			51.30	
Magellan Petroleum (Eastern) Pty Ltd			40.94	
Santos Gnuco Pty Ltd			7.77	
PL52	Cooper/Eromanga Basin		Sq Km: 70	27/06/2011
Ipundu, Ipundu North, Tarbut				
Santos QNT Pty Ltd*			77.00	
CPC Energy Pty Ltd			1.00	
Drillsearch Energy NL			10.00	
Santos (299) Pty Ltd			12.00	
PL53	Bowen/Surat Basin		Sq Km: 46	10/09/2011
Yambugle				
Origin Energy CSG Ltd*			100.00	
PL54	Bowen/Surat Basin		Sq Km: 34	27/03/2012
Moorooloo				
Santos Petroleum Operations Pty Ltd*			50.00	
Origin Energy CSG Ltd			50.00	
PL55	Cooper/Eromanga Basin		Sq Km: 19	12/06/2012
Munro				
Santos Ltd*			52.00	
Delhi Petroleum Pty Ltd			40.00	
Vamgas Pty Ltd			8.00	
PL56	Bowen/Surat Basin		Sq Km: 19	29/01/2011
Broadway				
Angari Pty Ltd*			49.00	
Bridge Oil Exploration Pty Ltd			7.50	
Mosaic Oil NL			10.00	
Mosaic Oil QLD Pty Ltd			6.00	
Origin Energy CSG Ltd			20.00	
Santos (BOL) Pty Ltd			7.50	
PL57	Cooper/Eromanga Basin		Sq Km: 19	15/04/2013
Endeavour				
Santos QNT Pty Ltd*			77.00	
CPC Energy Pty Ltd			1.00	
Drillsearch Energy NL			10.00	
Santos Gnuco Pty Ltd			12.00	
PL58	Cooper/Eromanga Basin		Sq Km: 62	15/04/2034
Challum				
Santos Ltd*			57.50	
Delhi Petroleum Pty Ltd			30.00	
Santos Australian Hydrocarbons Pty Ltd			5.00	
Vamgas Pty Ltd			7.50	
PL59	Cooper/Eromanga Basin		Sq Km: 97	15/04/2034
Challum				
Santos Ltd*			25.00	
Delhi Petroleum Pty Ltd			20.00	
Origin Energy Resources Ltd			25.00	
Santos Petroleum Pty Ltd			25.00	
Vamgas Pty Ltd			5.00	
PL60	Cooper/Eromanga Basin		Sq Km: 70	15/04/2019
Munkah				
Santos Ltd*			25.00	
Delhi Petroleum Pty Ltd			20.00	
Origin Energy Resources Ltd			25.00	
Santos Petroleum Pty Ltd			25.00	
Vamgas Pty Ltd			5.00	
PL61	Cooper/Eromanga Basin		Sq Km: 159	15/04/2019
Ballera, Ballera West, Yanda				
Santos Ltd*			25.00	
Delhi Petroleum Pty Ltd			20.00	
Origin Energy Resources Ltd			25.00	
Santos Petroleum Pty Ltd			25.00	
Vamgas Pty Ltd			5.00	
PL62	Cooper/Eromanga Basin		Sq Km: 65	01/03/2004
Judga				
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum Pty Ltd			6.50	
Vamgas Pty Ltd			15.50	
PL63	Cooper/Eromanga Basin		Sq Km: 145	24/06/2017
Epsilon				
Santos Ltd*			37.50	
Delhi Petroleum Pty Ltd			30.00	
Santos Petroleum Pty Ltd			25.00	
Vamgas Pty Ltd			7.50	
PL64	Bowen/Surat Basin		Sq Km: 48	19/08/2013
Cogoon				
Origin Energy CSG Ltd*			83.00	
Alliance Minerals Australia NL			12.50	
Angari Pty Ltd			4.50	
PL65	Adavale Basin		Sq Km: 59	15/12/2014
Gilmore				
Australian Gasfields Ltd*			100.00	
PL66	Bowen/Surat Basin		Sq Km: 125	23/02/2007
Roswin				
Mosaic Oil QLD Pty Ltd*			100.00	
PL67	Bowen/Surat Basin		Sq Km: 113	23/06/2011
Turkey Creek				
Origin Energy CSG Ltd*			50.00	
Santos Petroleum Operations Pty Ltd			50.00	
PL68	Cooper/Eromanga Basin		Sq Km: 25	08/12/2001
Coopers Creek				
Santos Ltd*			37.50	
Delhi Petroleum Pty Ltd			30.00	
Santos Petroleum Pty Ltd			25.00	
Vamgas Pty Ltd			7.50	
PL69	Bowen/Surat Basin	Blocks: 4	Sq Km: 303	08/12/2005
Associated Petroleum Pty Ltd*			46.25	
Interstate Pipelines Pty Ltd			7.50	
Oil Investments Ltd			35.51	
Origin Energy CSG Ltd			10.74	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PL70	Cooper/Eromanga Basin	Sq Km: 3	06/07/2000
Berwick			
Origin Energy CSG Ltd*		100.00	
PL71	Bowen/Surat Basin	Sq Km: 134	15/12/2014
Namarah, Parknook			
Angari Pty Ltd*		67.50	
Origin Energy CSG Ltd		22.50	
Santos Exploration Pty Ltd		10.00	
PL72	Bowen/Surat Basin	Sq Km: 19	26/04/2000
Xyloleum			
Sykes Ian Grant*		100.00	
PL73	Bowen/Surat Basin	Sq Km: 7	26/04/2000
Xylex			
Sykes Ian Grant*		100.00	
PL74	Bowen/Surat Basin	Sq Km: 19	14/12/2004
Major			
Origin Energy CSG Ltd*		20.00	
Angari Pty Ltd		49.00	
Bridge Oil Exploration Pty Ltd		7.50	
Mosaic Oil NL		10.00	
Mosaic Oil QLD Pty Ltd		6.00	
Santos (BOL) Pty Ltd		7.50	
PL75	Cooper/Eromanga Basin	Sq Km: 13	23/11/2008
Orientos			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL76	Cooper/Eromanga Basin	Sq Km: 40	23/11/2008
Bolan, Corella, Echuburra, Natan			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum Pty Ltd		6.50	
Vamgas Pty Ltd		15.50	
PL77	Cooper/Eromanga Basin	Sq Km: 13	23/11/2004
Jarrar			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum Pty Ltd		6.50	
Vamgas Pty Ltd		15.50	
PL78	Cooper/Eromanga Basin	Sq Km: 13	23/11/2008
Bowen			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum Pty Ltd		6.50	
Vamgas Pty Ltd		15.50	
PL79	Cooper/Eromanga Basin	Sq Km: 7	06/09/2020
Costa			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum Pty Ltd		6.50	
Vamgas Pty Ltd		15.50	
PL80	Cooper/Eromanga Basin	Sq Km: 92	06/09/2032
Durham Downs			
Santos Ltd*		57.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Australian Hydrocarbons Pty Ltd		5.00	
Vamgas Pty Ltd		7.50	
PL81	Cooper/Eromanga Basin	Sq Km: 40	06/09/2020
Karmona			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL82	Cooper/Eromanga Basin	Sq Km: 11	06/09/2020
Okotoko East			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum Pty Ltd		6.50	
Vamgas Pty Ltd		15.50	
PL83	Cooper/Eromanga Basin	Sq Km: 14	06/09/2020
Okotoko West			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL84	Cooper/Eromanga Basin	Sq Km: 49	06/09/2020
Stokes			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL85	Cooper/Eromanga Basin	Sq Km: 18	06/09/2032
Wackett			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL86	Cooper/Eromanga Basin	Sq Km: 12	06/09/2032
Wackett			
Santos Ltd*		28.13	
Delhi Petroleum Pty Ltd		22.50	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		18.75	
Vamgas Pty Ltd		5.63	
PL87	Cooper/Eromanga Basin	Sq Km: 28	06/09/2020
Wippo			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum Pty Ltd		6.50	
Vamgas Pty Ltd		15.50	
PL88	Cooper/Eromanga Basin	Sq Km: 46	06/09/2020
Wolgolla			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL89	Bowen/Surat Basin	Sq Km: 59	06/12/2002
Blackbutt, Bloodwood			
Associated Petroleum Pty Ltd*		46.25	
Interstate Pipelines Pty Ltd		7.50	
Oil Investments Ltd		35.51	
Origin Energy CSG Ltd		10.74	
PL90	Bowen/Surat Basin	Sq Km: 232	29/11/2029
Fairview			
Tri-Star Petroleum Company*		100.00	
PL91	Bowen/Surat Basin	Sq Km: 232	29/11/2029
Fairview			
Tri-Star Petroleum Company*		100.00	
PL92	Bowen/Surat Basin	Sq Km: 232	29/11/2029
Fairview			
Tri-Star Petroleum Company*		100.00	
PL93	Bowen/Surat Basin	Sq Km: 7	06/12/2002
Stakeyard			
Associated Petroleum Pty Ltd*		85.00	
Interstate Pipelines Pty Ltd		15.00	
PL94	Bowen/Surat Basin	Sq Km: 209	17/04/2032
Moura			
Oil Company of Australia (Moura) Pty Ltd*		100.00	
PL95	Cooper/Eromanga Basin	Sq Km: 13	25/08/2019
Monler			
Santos QNT Pty Ltd*		77.00	
CPC Energy Pty Ltd		1.00	
Drillsearch Energy NL		10.00	
Santos (299) Pty Ltd		12.00	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PL97	Cooper/Eromanga Basin	Sq Km: 28	25/08/2014
Cook			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL98	Cooper/Eromanga Basin	Sq Km: 40	23/10/2021
Inland			
IOR Exploration Pty Ltd*		29.38	
Inland Oil (Production) Pty Ltd		20.00	
Innovative Technological Geo-Exploration Pty Ltd		28.22	
Moroil Pty Ltd		22.40	
PL99	Bowen/Surat Basin	Sq Km: 232	15/12/2033
Fairview			
Tri-Star Petroleum Company*		100.00	
PL100	Bowen/Surat Basin	Sq Km: 232	15/12/2033
Fairview			
Tri-Star Petroleum Company*		100.00	
PL101	Bowen/Surat Basin	Sq Km: 240	20/11/2031
Peat			
Origin Energy CSG Ltd*		50.00	
Oil Company of Australia (Moura) Pty Ltd		50.00	
PL105	Cooper/Eromanga Basin	Sq Km: 13	28/10/2008
Roti			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum Pty Ltd		6.50	
Vamgas Pty Ltd		15.50	
PL106	Cooper/Eromanga Basin	Sq Km: 6	28/10/2006
Okotoko West			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL107	Cooper/Eromanga Basin	Sq Km: 13	28/10/2008
Okotoko East			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum Pty Ltd		6.50	
Vamgas Pty Ltd		15.50	
PL108	Cooper/Eromanga Basin	Sq Km: 6	28/10/2028
Costa South			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL109	Cooper/Eromanga Basin	Sq Km: 10	29/10/2013
Judga North			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum Pty Ltd		6.50	
Vamgas Pty Ltd		15.50	
PL110	Cooper/Eromanga Basin	Sq Km: 19	29/10/2013
Stokes North			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL111	Cooper/Eromanga Basin	Sq Km: 19	28/10/2016
Yawa			
Santos Petroleum Pty Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL112	Cooper/Eromanga Basin	Sq Km: 92	10/03/2047
Barrolka			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL113	Cooper/Eromanga Basin	Sq Km: 74	28/10/2018
Tartulla			
Santos Ltd*		52.00	
Delhi Petroleum Pty Ltd		28.80	
Origin Energy Resources Ltd		10.00	
Santos Australian Hydrocarbons Pty Ltd		2.00	
Vamgas Pty Ltd		7.20	
PL114	Cooper/Eromanga Basin	Sq Km: 55	29/10/2021
Wareena			
Santos Ltd*		52.00	
Delhi Petroleum Pty Ltd		28.80	
Origin Energy Resources Ltd		10.00	
Santos Australian Hydrocarbons Pty Ltd		2.00	
Vamgas Pty Ltd		7.20	
PL115	Cooper/Eromanga Basin	Sq Km: 52	28/09/2019
Bunya			
Australian Gasfields Ltd*		100.00	
PL116	Cooper/Eromanga Basin	Sq Km: 34	28/09/2019
Cocos			
Australian Gasfields Ltd*		100.00	
PL117	Cooper/Eromanga Basin	Sq Km: 49	28/09/2019
Vernon			
Vernon E Faulconer Australia Inc*		100.00	
PL119	Bowen/Surat Basin	Sq Km: 22	11/11/2010
Downlands			
Mosaic Oil NL*		83.33	
Santos (BOL) Pty Ltd		16.67	
PL129	Cooper/Eromanga Basin	Sq Km: 46	15/12/2037
Ashby, Ashby North			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL130	Cooper/Eromanga Basin	Sq Km: 31	23/06/2024
Chiron			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL131	Cooper/Eromanga Basin	Sq Km: 225	23/06/2050
Baryulah, Baryulah East, Hera, Juno, Vega			
Santos Ltd*		28.13	
Delhi Petroleum Pty Ltd		22.50	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		18.75	
Vamgas Pty Ltd		5.63	
PL132	Cooper/Eromanga Basin	Sq Km: 16	23/06/2021
Costa Central			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL133	Cooper/Eromanga Basin	Sq Km: 13	12/12/2019
Goora			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum Pty Ltd		6.50	
Vamgas Pty Ltd		15.50	
PL134	Cooper/Eromanga Basin	Sq Km: 27	20/12/2058
Kappa			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL135	Cooper/Eromanga Basin	Sq Km: 20	23/06/2053
Keilor			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL136	Cooper/Eromanga Basin	Sq Km: 54	23/06/2052
Keilor			
Santos Ltd*		57.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Australian Hydrocarbons Pty Ltd		5.00	
Vamgas Pty Ltd		7.50	

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Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PL137	Cooper/Eromanga Basin	Sq Km: 88	15/12/2052
Macadama			
Santos Ltd*		57.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Australian Hydrocarbons Pty Ltd		5.00	
Vamgas Pty Ltd		7.50	
PL138	Cooper/Eromanga Basin	Sq Km: 77	15/12/2030
Marengo			
Santos Ltd*		31.50	
Delhi Petroleum Pty Ltd		25.20	
Origin Energy Resources Ltd		27.00	
Vamgas Pty Ltd		16.30	
PL139	Cooper/Eromanga Basin	Sq Km: 26	23/06/2017
Monte			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL140	Cooper/Eromanga Basin	Sq Km: 37	15/12/2053
Moon			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL141	Cooper/Eromanga Basin	Sq Km: 46	15/12/2025
Mount Howitt			
Santos Ltd*		52.00	
Delhi Petroleum Pty Ltd		28.80	
Origin Energy Resources Ltd		10.00	
Santos Australian Hydrocarbons Pty Ltd		2.00	
Vamgas Pty Ltd		7.20	
PL142	Cooper/Eromanga Basin	Sq Km: 13	15/12/2024
Raffle			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL143	Cooper/Eromanga Basin	Sq Km: 28	15/12/2018
Ruby			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL144	Cooper/Eromanga Basin	Sq Km: 34	15/12/2039
Thoar			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL145	Cooper/Eromanga Basin	Sq Km: 28	15/12/2048
Toby			
Santos Ltd*		52.00	
Delhi Petroleum Pty Ltd		28.80	
Origin Energy Resources Ltd		10.00	
Santos Australian Hydrocarbons Pty Ltd		2.00	
Vamgas Pty Ltd		7.20	
PL146	Cooper/Eromanga Basin	Sq Km: 61	23/06/2025
Wackett			
Santos Ltd*		28.13	
Delhi Petroleum Pty Ltd		22.50	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		18.75	
Vamgas Pty Ltd		5.63	
PL147	Cooper/Eromanga Basin	Sq Km: 58	23/06/2019
Wackett			
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL148	Cooper/Eromanga Basin	Sq Km: 37	15/12/2029
Whanto			
Santos Ltd*		52.00	
Delhi Petroleum Pty Ltd		28.80	
Origin Energy Resources Ltd		10.00	
Santos Australian Hydrocarbons Pty Ltd		2.00	
Vamgas Pty Ltd		7.20	
PL149	Cooper/Eromanga Basin	Sq Km: 13	23/06/2049
Wippo South			
Santos Ltd*		40.00	
Australian Gasfields Ltd		2.00	
Delhi Petroleum Pty Ltd		32.00	
Drillsearch Energy NL		2.00	
Inland Oil (Production) Pty Ltd		2.00	
Mawson Petroleum NL		6.50	
Vamgas Pty Ltd		15.50	
PL150	Cooper/Eromanga Basin	Sq Km: 158	23/06/2042
Dingera, Psyche, Winninia			
Santos Ltd*		37.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		7.50	
PL151	Cooper/Eromanga Basin	Blocks: 156	24/07/2032
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL152	Cooper/Eromanga Basin	Sq Km: 147	24/07/2032
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL153	Cooper/Eromanga Basin	Sq Km: 103	15/12/2046
Clinton			
Santos Ltd*		52.00	
Delhi Petroleum Pty Ltd		28.80	
Origin Energy Resources Ltd		10.00	
Santos Australian Hydrocarbons Pty Ltd		2.00	
Vamgas Pty Ltd		7.20	
PL154	Cooper/Eromanga Basin	Sq Km: 18	15/12/2046
Clinton			
Santos Ltd*		31.50	
Delhi Petroleum Pty Ltd		25.20	
Origin Energy Resources Ltd		27.00	
Vamgas Pty Ltd		16.30	
PL155	Cooper/Eromanga Basin	Sq Km: 175	24/07/2032
Santos Ltd*		25.00	
Delhi Petroleum Pty Ltd		20.00	
Origin Energy Resources Ltd		25.00	
Santos Petroleum Pty Ltd		25.00	
Vamgas Pty Ltd		5.00	
PL156	Cooper/Eromanga Basin	Sq Km: 31	24/07/2032
Santos Ltd*		57.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Australian Hydrocarbons Pty Ltd		5.00	
Vamgas Pty Ltd		7.50	
PL157	Cooper/Eromanga Basin	Sq Km: 40	15/12/2020
Ghina			
Santos Ltd*		52.00	
Delhi Petroleum Pty Ltd		28.80	
Origin Energy Resources Ltd		10.00	
Santos Australian Hydrocarbons Pty Ltd		2.00	
Vamgas Pty Ltd		7.20	
PL158	Cooper/Eromanga Basin	Sq Km: 188	15/12/2020
Marama			
Santos Ltd*		52.00	
Delhi Petroleum Pty Ltd		28.80	
Origin Energy Resources Ltd		10.00	
Santos Australian Hydrocarbons Pty Ltd		2.00	
Vamgas Pty Ltd		7.20	
PL159	Cooper/Eromanga Basin	Sq Km: 28	15/12/2052
Tallalia			
Santos Ltd*		57.50	
Delhi Petroleum Pty Ltd		30.00	
Santos Australian Hydrocarbons Pty Ltd		5.00	
Vamgas Pty Ltd		7.50	
PL168	Cooper/Eromanga Basin	Sq Km: 13	12/02/2014
Tennaperra			
Santos Petroleum Pty Ltd*		25.00	
Delhi Petroleum Pty Ltd		30.00	
Santos Ltd		37.50	
Vamgas Pty Ltd		7.50	
PL169	Eromanga Basin	Sq Km: 19	12/04/2017
Gimboola			
CPC Energy Pty Ltd		1.00	
Drillsearch Energy NL		10.00	
Santos (299) Pty Ltd		12.00	
Santos QNT Pty Ltd		77.00	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
PL170	Eromanga Basin		Sq Km: 92	12/04/2017
Kooroopa				
Santos QNT Pty Ltd*			77.00	
CPC Energy Pty Ltd			1.00	
Drillsearch Energy NL			10.00	
Santos (299) Pty Ltd			12.00	
PL173	Bowen/Surat Basin		Sq Km: 85	15/12/2019
Yandina				
Origin Energy CSG Ltd*			50.00	
Santos Petroleum Operations Pty Ltd			50.00	
PL174	Bowen/Surat Basin		Sq Km: 43	15/12/2014
Myall Creek				
Origin Energy CSG Ltd*			100.00	
PL175	Cooper/Eromanga Basin		Sq Km: 28	19/04/2025
Windigo				
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum Pty Ltd			6.50	
Vamgas Pty Ltd			15.50	
PL176	Bowen/Surat Basin		Sq Km: 213	07/06/2021
Scotia				
Santos QNT Pty Ltd*			84.38	
Vamgas Pty Ltd			15.63	
PL177	Cooper/Eromanga Basin		Sq Km: 55	12/09/2035
Winninia				
Santos Ltd*			28.13	
Delhi Petroleum Pty Ltd			22.50	
Origin Energy Resources Ltd			25.00	
Santos Petroleum Pty Ltd			18.75	
Vamgas Pty Ltd			5.63	
PL178	Cooper/Eromanga Basin		Sq Km: 10	12/09/2035
Santos Ltd*			37.50	
Delhi Petroleum Pty Ltd			30.00	
Santos Petroleum Pty Ltd			25.00	
Vamgas Pty Ltd			7.50	
PL181	Cooper/Eromanga Basin		Sq Km: 19	12/09/2024
Roti West				
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum Pty Ltd			6.50	
Vamgas Pty Ltd			15.50	
PL182	Cooper/Eromanga Basin		Sq Km: 28	12/09/2024
Wippo East				
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum Pty Ltd			6.50	
Vamgas Pty Ltd			15.50	
PL183	Bowen/Surat Basin		Sq Km: 19	12/09/2021
Punchbowl Gully				
Origin Energy CSG Ltd*			50.00	
Santos Petroleum Operations Pty Ltd			50.00	
PL184	Cooper/Eromanga Basin		Sq Km: 77	12/09/2021
Thylungra				
Beach Petroleum NL*			69.59	
Australian Gasfields Ltd			19.60	
Inland Oil (Production) Pty Ltd			5.00	
Petromin Pty Ltd			5.81	
PL186	Cooper/Eromanga Basin		Sq Km: 62	06/02/2026
Quasar South				
Santos Ltd*			37.50	
Delhi Petroleum Pty Ltd			30.00	
Santos Petroleum Pty Ltd			25.00	
Vamgas Pty Ltd			7.50	
PL187	Cooper/Eromanga Basin		Sq Km: 34	06/03/2029
Santos Ltd*			52.00	
Delhi Petroleum Pty Ltd			28.80	
Origin Energy Resources Ltd			10.00	
Santos Australian Hydrocarbons Pty Ltd			2.00	
Vamgas Pty Ltd			7.20	
PL188	Cooper/Eromanga Basin		Sq Km: 62	06/03/2028
Santos Ltd*			52.00	
Delhi Petroleum Pty Ltd			28.80	
Origin Energy Resources Ltd			10.00	
Santos Australian Hydrocarbons Pty Ltd			2.00	
Vamgas Pty Ltd			7.20	
PL189	Cooper/Eromanga Basin		Sq Km: 19	06/03/2017
Santos Ltd*			40.00	
Australian Gasfields Ltd			2.00	
Delhi Petroleum Pty Ltd			32.00	
Drillsearch Energy NL			2.00	
Inland Oil (Production) Pty Ltd			2.00	
Mawson Petroleum NL			6.00	
Origin Energy CSG Ltd			0.50	
Vamgas Pty Ltd			15.50	
PL191	Bowen Basin		Sq Km: 220	20/03/2032
CH4 Pty Ltd*			50.00	
BHP Coal Pty Ltd			50.00	
PL192	Bowen/Surat Basin		Sq Km: 92	07/11/2025
Mosaic Oil QLD Pty Ltd*			49.00	
Santos (BOL) Pty Ltd			27.78	
Santos Exploration Pty Ltd			23.22	
PL193	Cooper/Eromanga Basin		Sq Km: 31	20/03/2015
Santos Ltd*			37.50	
Delhi Petroleum Pty Ltd			30.00	
Santos Petroleum Pty Ltd			25.00	
Vamgas Pty Ltd			7.50	
PL195	Bowen/Surat Basin		Sq Km: 256	26/03/2037
Origin Energy CSG Ltd*			100.00	
PL204	Bowen/Surat Basin		Sq Km: 219	18/12/2004
Origin Energy CSG Ltd*			100.00	
Offshore				
Exploration Permit				
Legislation Group: PSLA			Sq km approximate	
Q/23P	Carpentaria Basin	Blocks: 180	Sq Km: 62	20/05/2009
Gulf Energy Pty Ltd*			100.00	
New South Wales				
Onshore				
Exploration Permit				
Legislation Group: Territorial			Sq km approximate	
PEL1	Gunnedah Basin	Blocks: 96	Sq Km: 7 043	10/02/2005
Australian Coalbed Methane Pty Ltd*			100.00	
PEL2	Sydney Basin	Blocks: 108	Sq Km: 8 100	28/03/2005
Sydney Gas Operations Pty Ltd*			100.00	
PEL4	Gunnedah Basin	Blocks: 96	Sq Km: 6 955	10/11/2005 Renewal Pending
Sydney Gas Operations Pty Ltd*				
Pacific Power				
PEL5	Sydney Basin	Blocks: 30	Sq Km: 2 026	10/11/2005
Sydney Gas Operations Pty Ltd*			100.00	
PEL6	Gunnedah Basin	Blocks: 82	Sq Km: 5 867	08/12/2005
Eastern Energy Australia Pty Ltd*			100.00	
PEL8	Murray/Darling Basin	Blocks: 101	Sq Km: 9 112	24/06/2007
Eastern Star Gas Ltd 100.00				
PEL10	Gunnedah Basin	Blocks: 6	Sq Km: 436	10/02/2005
Australian Coalbed Methane Pty Ltd*			100.00	
PEL12	Gunnedah Basin	Blocks: 31	Sq Km: 2 274	26/09/2007
Australian Coalbed Methane Pty Ltd*			100.00	
PEL13	Clarence/Moreton Basin	Blocks: 29	Sq Km: 2 174	26/11/2001
Renewal Pending Molopo Australia NL*			100.00	
PEL16	Clarence/Moreton Basin	Blocks: 11	Sq Km: 826	12/11/2005
Metgasco Pty Ltd*			100.00	
PEL238	Gunnedah Basin	Blocks: 123	Sq Km: 9 093	02/08/2007 Renewal Pending
Eastern Star Gas Ltd*			100.00	
PEL267	Sydney Basin	Blocks: 92	Sq Km: 6 138	19/01/2004
Sydney Gas Operations Pty Ltd*			100.00	
PEL285	Sydney Basin	Blocks: 18	Sq Km: 1 306	15/04/2005
Molopo Australia NL*				
PEL286	Gunnedah Basin	Blocks: 24	Sq Km: 1 749	10/02/2005
Australian Coalbed Methane Pty Ltd*			100.00	
PEL419	Murray/Darling Basin	Blocks: 140	Sq Km: 9 450	19/12/2003
Go Resources (Aust) Pty Ltd*			100.00	
PEL420	Murray/Darling Basin	Blocks: 122	Sq Km: 8 864	19/12/2003
Go Resources (Aust) Pty Ltd*			100.00	
PEL422	Murray/Darling Basin	Blocks: 59	Sq Km: 4 335	01/02/2004
Eastern Energy Australia Pty Ltd*			100.00	
PEL424	Murray/Darling Basin	Blocks: 82	Sq Km: 5 892	01/02/2004
Eastern Star Gas Ltd*			100.00	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title *Accumulation* Company (Operator*)			Equity	Expiry Date
PEL426	Clarence/Moreton Basin	Blocks: 83	Sq Km: 5 896	20/04/2004
Molopo Australia NL*			100.00	
PEL427	Gunnedah Basin	Blocks: 97	Sq Km: 6 829	20/05/2004
Strike Oil NL*			100.00	
PEL428	Gunnedah Basin	Blocks: 108	Sq Km: 7 816	14/09/2004
Strike Oil NL*			100.00	
PEL432	Clarence/Moreton Basin	Blocks: 6	Sq Km: 234	21/12/2006
Arrow Energy NL*			100.00	
PEL433	Gunnedah Basin	Blocks: 140	Sq Km: 10 216	13/02/2007
Eastern Star Gas Ltd*			100.00	
PEL434	Gunnedah Basin	Blocks: 140	Sq Km: 10 108	13/02/2007
Eastern Star Gas Ltd			100.00	
PEL435	Murray/Darling Basin	Blocks: 140	Sq Km: 10 108	18/03/2004
Australian Coalbed Methane Pty Ltd*			100.00	
PEL436	Murray/Darling Basin	Blocks: 132	Sq Km: 9 263	18/03/2004
Australian Coalbed Methane Pty Ltd*			100.00	
PEL437	Surat Basin	Blocks: 140	Sq Km: 9 632	06/05/2007
Pangaea Oil and Gas Pty Ltd*			100.00	
PEL438	Murray/Darling Basin	Blocks: 98	Sq Km: 6 799	20/08/2007
Pannonian International Ltd*				
PEL439	Murray/Darling Basin	Blocks: 73	Sq Km: 5 155	23/10/2004
Magnum Gold NL*			100.00	
PEL440	Murray/Darling Basin	Blocks: 133	Sq Km: 9 248	23/10/2004
Magnum Gold NL*			100.00	
PEL441	Sydney Basin	Blocks: 1	Sq Km: 71	10/11/2005
Sydney Gas Operations Pty Ltd*			100.00	
PEL442	Sydney Basin	Blocks: 10	Sq Km: 502	26/02/2208
Apex Energy NL*			100.00	
PEL443	Eromanga Basin	Blocks: 71	Sq Km: 5 190	23/01/2009
Harlow Australia Pty Ltd*			100.00	
PEL444	Sydney Basin	Blocks: 5	Sq Km: 65	03/04/2009
Apex Energy NL*			80.00	
Sun Resources NL			20.00	
Production Licence				
Legislation Group: Territorial			Sq km approximate	
PPL 1	Sydney Basin		Sq Km: 47	09/01/2023
Sydney Gas (Camden) Operations Pty Ltd*			100.00	
PPL 2	Sydney Basin		Sq Km: 1	10/09/2023
Sydney Gas (Camden) Operations Pty Ltd*			100.00	
PPL 3	Gunnedah Basin		Sq Km: 26	14/12/2024
Narrabri Power Ltd*			100.00	
Offshore				
Exploration Permit				
Legislation Group: PSLA			Sq km approximate	
PEP 11	Sydney Basin	Blocks: 129	Sq Km: 8 185	23/03/2007
Bounty Oil & Gas NL*			100.00	
Victoria				
Onshore				
Exploration Permit				
Legislation Group: Territorial			Sq km approximate	
PEP151	Otway Basin		Sq Km: 1 718	15/05/2007
Essential Petroleum Resources Ltd*			100.00	
PEP152	Otway Basin		Sq Km: 755	03/02/2005
Origin Energy Petroleum Pty Ltd*			50.51	
Essential Petroleum Resources Ltd			33.90	
Lakes Oil NL			15.59	
PEP153	Otway Basin		Sq Km: 1 061	27/02/2005
Santos (BOL) Pty Ltd*			100.00	
PEP154	Otway Basin		Sq Km: 832	30/03/2005
Santos (BOL) Pty Ltd*			90.00	
Beach Petroleum NL			10.00	
PEP155	Gippsland Basin		Sq Km: 1 578	16/08/2005
Petrotech Pty Ltd*			100.00	
PEP156	Gippsland Basin		Sq Km: 3 207	16/08/2005
Petrotech Pty Ltd*			100.00	
PEP157	Gippsland Basin		Sq Km: 1 889	16/08/2005
Petrotech Pty Ltd*			100.00	
PEP158	Gippsland Basin		Sq Km: 799	16/08/2005
Petrotech Pty Ltd*			100.00	
PEP159	Otway Basin		Sq Km: 2 280	11/03/2006
Origin Energy Petroleum Pty Ltd*			50.00	
Essential Petroleum Resources Ltd			50.00	
PEP160	Otway Basin		Sq Km: 3 660	13/11/2005
TMOC Exploration Pty Ltd*			60.00	
Origin Energy Petroleum Pty Ltd			40.00	
PEP161	Murray/Darling Basin		Sq Km: 2 923	18/02/2005
Knight Industries Pty Ltd*			100.00	
PEP162	Gippsland Basin		Sq Km: 2 950	15/05/2006
Karoon Gas Pty Ltd*			100.00	

Title *Accumulation* Company (Operator*)			Equity	Expiry Date
PEP163	Otway Basin		Sq Km: 2 923	18/07/2007
Mirboo Ridge Pty Ltd*			100.00	
PEP164	Otway Basin		Sq Km: 2 827	09/10/2007
Mirboo Ridge Pty Ltd*			100.00	
PEP165	Murray/Darling Basin		Sq Km: 6 081	09/10/2007
Knight Industries Pty Ltd*			100.00	
PEP166	Gippland Basin		Sq Km: 3 551	02/01/2008
Petrotech Pty Ltd*			50.00	
Ausam Resources NL			50.00	
Production Licence				
Legislation Group: Territorial			Sq km approximate	
PPL1	Otway Basin		Sq Km: 7	01/03/2000
Dunbar, Grumby, Langley, North Paaratte, Port Campbell 1, Port Campbell 3, Port Campbell 4, Skull Creek, Vaughan, Wallaby Creek				
TXU Gas Storage Pty Ltd*			100.00	
PPL2	Otway Basin		Sq Km: 8	31/12/2005
Iona				
TXU Gas Storage Pty Ltd*			100.00	
PPL3	Otway Basin		Sq Km: 2	09/05/2008
Boggy Creek				
Boggy Creek Pty Ltd*			100.00	
PPL4	Otway Basin		Sq Km: 6	06/04/2014
Fenton Creek, Tregony				
Santos (BOL) Pty Ltd*			100.00	
PPL5	Otway Basin		Sq Km: 6	
Penryn				
Santos (BOL) Pty Ltd*			100.00	
PPL6	Otway Basin		Sq Km: 4	
McIntee, Tregony				
Santos (BOL) Pty Ltd*			90.00	
Beach Petroleum NL			10.00	
PPL7	Otway Basin		Sq Km: 2	
Santos (BOL) Pty Ltd*			100.00	
PPL8	Otway Basin		Sq Km: 69	31/12/2099
Dunbar, Port Campbell				
Origin Energy Petroleum Pty Ltd*			100.00	
PPL9	Otway Basin		Sq Km: 1	06/12/2099
Lavers				
Santos (BOL) Pty Ltd*			90.00	
Beach Petroleum NL			10.00	
PPL 10	Otway Basin		Sq Km: 7	06/12/2099
Croft, Naylor				
Santos (BOL) Pty Ltd*			90.00	
Beach Petroleum NL			10.00	
PPL 11	Otway Basin		Sq Km: 3	13/05/2099
Santos (BOL) Pty Ltd*			90.00	
Beach Petroleum NL 10.00				
PPL 12	Otway Basin		Sq Km: 3	03/02/2099
Santos (BOL) Pty Ltd*			100.00	
Retention Lease				
Legislation Group: Territorial			Sq km approximate	
PRL1	Otway Basin		Sq Km: 5	27/09/2017
Santos (BOL) Pty Ltd*			90.00	
Beach Petroleum Ltd			10.00	
Offshore				
Exploration Permit				
Legislation Group: PSLA			Sq km approximate	
VIC/P41	Gippsland Basin	Blocks: 32	Sq Km: 2 160	13/02/2005
Bass Strait Oil Company Pty Ltd*			75.00	
Eagle Bay Resources NL			25.00	
VIC/P42	Gippsland Basin	Blocks: 28	Sq Km: 1 890	13/08/2006
Omeo				
Bass Strait Oil Company Pty Ltd*			50.00	
Inpex Alpha Ltd			50.00	
VIC/P43	Otway Basin	Blocks: 54	Sq Km: 3 645	10/08/2005
Woodside Energy Ltd*			51.55	
Benaris International NV			12.70	
CalEnergy Gas (Aust) Ltd			6.00	
Origin Energy Resources Ltd			29.75	
VIC/P44	Otway Basin	Blocks: 45	Sq Km: 3 037	10/08/2005
Strike Oil NL*			50.00	
Santos Ltd			50.00	
VIC/P45	Gippsland Basin	Blocks: 13	Sq Km: 877	15/05/2008
BHP Billiton Petroleum (Victoria) Pty Ltd*			60.00	
Inpex Alpha Ltd			40.00	
VIC/P46	Otway Basin	Blocks: 35	Sq Km: 1 864	27/05/2007
Essential Petroleum Resources Ltd*			100.00	
VIC/P47	Gippsland Basin	Blocks: 12	Sq Km: 742	27/02/2008
Bass Strait Oil Company Pty Ltd*			75.00	
Eagle Bay Resources NL			25.00	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / Accumulation / Company (Operator*)			Equity	Expiry Date
VIC/P48	Gippsland Basin	Blocks: 48	Sq Km: 2 919	15/10/2007
EnCana Corporation*			100.00	
VIC/P49	Gippsland Basin	Blocks: 35	Sq Km: 2 375	15/10/2007
EnCana Corporation*			100.00	
VIC/P50	Otway Basin	Blocks: 58		16/09/2008
Essential Petroleum Resources Ltd*			100.00	
VIC/P51	Otway Basin	Blocks: 46		26/08/2008
Santos Ltd*			80.00	
Inpex Alpha Ltd			20.00	
VIC/P52	Otway Basin	Blocks: 87		26/08/2008
Santos Ltd*			33.33	
Inpex Alpha Ltd			33.33	
Uncol South Asean Ltd			33.34	
VIC/P53	Gippsland Basin	Blocks: 11		15/10/2009
Australian Crude Oil Co. Inc*			100.00	
VIC/P54	Gippsland Basin	Blocks: 11		07/04/2009
Nexus Energy (Aust.) NL*			100.00	
VIC/P55	Gippsland Basin	Blocks: 10		07/04/2009
Basin Oil Pty Ltd*			33.33	
Diamond Gas Resources Pty Ltd			33.33	
Santos Offshore Pty Ltd			33.33	
VIC/P56	Gippsland Basin	Blocks: 2		27/08/2009
Nexus Energy (Aust.) NL*			100.00	
Legislation Group: Territorial		Sq km approximate		
VIC/P37(V)	Otway Basin	Blocks: 21	Sq Km: 515	16/04/2009
Origin Energy Resources Ltd*			37.50	
Woodside Energy Ltd			62.50	
VIC/P38(V)	Otway Basin	Blocks: 14	Sq Km: 368	11/05/2009
Benaris International NV*			100.00	
Production Licence				
Legislation Group: PSLA		Sq km approximate		
VIC/L 1	Gippsland Basin	Blocks: 4	Sq Km: 260	24/08/2009
Barracouta, Tarwhine, Whiptail				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L 2	Gippsland Basin	Blocks: 5	Sq Km: 325	24/08/2009
Barracouta, Whiting, Wirrah				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L 3	Gippsland Basin	Blocks: 5	Sq Km: 325	24/08/2009
Marlin				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L 4	Gippsland Basin	Blocks: 4	Sq Km: 260	24/08/2009
Angelfish, Batfish, Marlin				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L 5	Gippsland Basin	Blocks: 5	Sq Km: 325	19/09/2010
Halibut, Mackerel, Trumpeter, Yellowtail				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L 6	Gippsland Basin	Blocks: 4	Sq Km: 260	19/09/2010
Gudgeon, Halibut				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L 7	Gippsland Basin	Blocks: 5	Sq Km: 325	19/09/2010
Kingfish				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L 8	Gippsland Basin	Blocks: 4	Sq Km: 260	19/09/2010
Kingfish				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L 9 R1	Gippsland Basin	Blocks: 4	Sq Km: 260	12/07/2016
Tuna				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L10	Gippsland Basin	Blocks: 4	Sq Km: 260	28/05/2018
Emperor, Moonfish, Snapper, Sweetlips				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L11	Gippsland Basin	Blocks: 2	Sq Km: 130	28/05/2018
Flounder, Grunter, Stonefish				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L13	Gippsland Basin	Blocks: 3	Sq Km: 202	15/12/2006
Bream, Luderick				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	

Title / Accumulation / Company (Operator*)			Equity	Expiry Date
VIC/L14	Gippsland Basin	Blocks: 3	Sq Km: 202	15/12/2006
Bream				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L15	Gippsland Basin	Blocks: 2	Sq Km: 130	13/06/2010
Dolphin				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L16	Gippsland Basin	Blocks: 2	Sq Km: 130	13/06/2010
Torsk				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L17	Gippsland Basin	Blocks: 1	Sq Km: 65	13/06/2010
Perch				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L18	Gippsland Basin	Blocks: 2	Sq Km: 130	13/06/2010
Seahorse				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L19	Gippsland Basin	Blocks: 1	Sq Km: 65	12/07/2016
Halibut				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L20	Gippsland Basin	Blocks: 3	Sq Km: 195	01/01/2019
Blackback, Volador				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/L21	Gippsland Basin	Blocks: 2	Sq Km: 137	26/12/2022
Patricia/Baleen				
OMV Timor Sea Pty Ltd*			5.00	
Basin Oil Pty Ltd			55.00	
Trinity Gas Resources Pty Ltd			40.00	
VIC/L22	Otway Basin	Blocks: 1		31/10/2023
BHP Billiton Petroleum (Victoria) Pty Ltd*			90.00	
Santos (BOL) Pty Ltd			10.00	
Retention Lease				
Legislation Group: PSLA		Sq km approximate		
VIC/RL1	Gippsland Basin	Blocks: 1	Sq Km: 67	13/04/2005
Mulloway				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Victoria) Pty Ltd			50.00	
VIC/RL2	Gippsland Basin	Blocks: 1	Sq Km: 67	14/12/2003
Kipper				
Esso Australia Resources Ltd*			25.00	
BHP Billiton Petroleum (Victoria) Pty Ltd			25.00	
Crusader (Victoria) Pty Ltd			12.95	
Santos Offshore Pty Ltd			7.05	
Woodside Eastern Energy Pty Ltd			30.00	
VIC/RL3	Gippsland Basin	Blocks: 3	Sq Km: 202	13/04/2005
Sole				
Basin Oil Pty Ltd*			35.00	
Santos Ltd			35.00	
Trinity Gas Resources Pty Ltd			30.00	
VIC/RL4 R1	Gippsland Basin	Blocks: 1	Sq Km: 67	27/02/2006
Remora, Sunfish				
Esso Australia Resources Ltd*			50.00	
BHP Billiton Petroleum (Bass Strait) Pty Ltd			50.00	
VIC/RL6	Gippsland Basin	Blocks: 1	Sq Km: 67	29/10/2005
Basker, Manta				
Woodside Eastern Energy Pty Ltd*			100.00	
VIC/RL7	Otway Basin	Blocks: 3	Sq Km: 202	19/12/2008
La Bella				
BHP Billiton Petroleum (Victoria) Pty Ltd*			90.00	
Santos (BOL) Pty Ltd			10.00	
VIC/RL9	Gippsland Basin	Blocks: 1	Sq Km: 68	21/03/2006
Manta				
Woodside Eastern Energy Pty Ltd*			100.00	
VIC/RL10	Gippsland Basin	Blocks: 1	Sq Km: 68	21/03/2006
Gummy				
Woodside Eastern Energy Pty Ltd*			100.00	
Legislation Group: Territorial		Sq km approximate		
VIC/RL1(V)	Gippsland Basin	Blocks: 4	Sq Km: 90	27/08/2007
Golden Beach				
Santos Offshore Pty Ltd*			66.67	
Basin Oil NL			33.33	
Tasmania				
Onshore				
Exploration Permit				
Legislation Group: Territorial		Sq km approximate		
EL13/98	Tasmania Basin		Sq Km: 32 576	18/05/2004
Great Southland Minerals Pty Ltd*			100.00	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
Offshore				
Exploration Permit				
Legislation Group: PSLA		Sq km approximate		
T/18P R3	Bass Basin	Blocks: 16	Sq Km: 1 080	22/09/2004
Origin Energy Resources Ltd*			41.40	
Aust Wandoo Petroleum Ltd			12.50	
AWE Petroleum Ltd			22.60	
CalEnergy Gas (Aust) Ltd			23.50	
T/30P	Otway Basin	Blocks: 101	Sq Km: 6 817	09/07/2003
Benaris International NV*			12.70	
CalEnergy Gas (Aust) Ltd			6.00	
Origin Energy Resources Ltd			29.75	
Woodside Energy Ltd			51.55	
T/32P	Otway Basin	Blocks: 79		21/08/2008
Santos Offshore Pty Ltd*			50.00	
Uncol South Asean Ltd			50.00	
T/33P	Sorell Basin	Blocks: 77		21/08/2008
Santos Offshore Pty Ltd*			80.00	
Inpex Alpha Ltd			20.00	
T/34P	Otway Basin	Blocks: 60		16/07/2009
Woodside Energy Ltd*			62.50	
Origin Energy Resources Ltd			37.50	
T/35P	Otway Basin	Blocks: 50	Sq Km: 3 335	29/07/2009
Santos Offshore Pty Ltd*			50.00	
Unocal South Australia Ltd			50.00	
T/36P	Otway Basin	Blocks: 82		26/11/2009
Santos Offshore Pty Ltd*			50.00	
Unocal South Australia Ltd			50.00	
Production Licence				
Legislation Group: PSLA		Sq km approximate		
T/L1	Bass Basin	Blocks: 4	Sq Km: 27	17/04/2033
Origin Energy Resources Ltd*			32.50	
AWE Petroleum Ltd			30.00	
CalEnergy Gas (Aust) Ltd			20.00	
Origin Energy Northwest Ltd			5.00	
Wandoo Petroleum Pty Ltd			12.50	
Retention Lease				
Legislation Group: PSLA		Sq km approximate		
T/RL1 R2	Bass Basin	Blocks: 5	Sq Km: 337	14/10/2006
Yolla				
Origin Energy Resources Ltd*			32.50	
AWE Petroleum Ltd			37.50	
CalEnergy Gas (Aust) Ltd			20.00	
Origin Energy Northwest Ltd			5.00	
Santos Ltd			5.00	
South Australia				
Onshore				
Exploration Permit				
Legislation Group: Territorial		Sq km approximate		
PEL 27	Otway Basin		Sq Km: 240	30/07/2004
Sawpit				
Origin Energy CSG Ltd*			67.00	
Origin Energy Resources Ltd			33.00	
PEL 32	Otway Basin		Sq Km: 530	18/02/2005
Wynn				
Sagasco South East Inc.*			56.00	
Omega Oil NL			24.00	
Origin Energy Resources Ltd			20.00	
PEL 57	Otway Basin		Sq Km: 408	17/11/2006
Origin Energy Resources Ltd*			50.00	
Lakes Oil NL			30.00	
Mirboo Ridge Pty Ltd			10.00	
Victoria Petroleum NL			10.00	
PEL 66	Otway Basin		Sq Km: 376	17/06/2006
Kalangadoo				
Origin Energy Resources Ltd*			70.00	
Beach Petroleum NL			30.00	
PEL 72	Otway Basin		Sq Km: 504	25/03/2007
Essential Petroleum Resources Ltd*			100.00	
PEL 73	Stansbury Basin		Sq Km: 625	26/06/2005
David M. Schuette*			100.00	
PEL 82	Otway Basin		Sq Km: 275	21/03/2007
Allender J F			38.30	
Alvin Hosking			38.30	
Wenk, Andrew			23.30	
PEL 83	Otway Basin		Sq Km: 413	14/03/2006
Origin Energy Resources Ltd*			60.00	
Beach Oil & Gas Pty Ltd			40.00	

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
PEL 86	Cooper/Eromanga Basin		Sq Km: 4 316	07/01/2007
Victoria Oil Exploration (1977) Pty Ltd*			40.00	
Lion Energy Ltd			12.50	
Permian Oil Pty Ltd			20.00	
Springfield Oil & Gas Ltd			15.00	
Tacnas Pty Ltd			12.50	
PEL 87	Cooper/Eromanga Basin		Sq Km: 4 315	15/11/2006
Victoria Oil Exploration (1977) Pty Ltd*			40.00	
Lion Energy Ltd			12.50	
Permian Oil Pty Ltd			20.00	
Springfield Oil & Gas Ltd			15.00	
Tacnas Pty Ltd			12.50	
PEL 88	Cooper/Eromanga Basin		Sq Km: 4 987	15/11/2006
Liberty Petroleum Corporation*			100.00	
PEL 89	Cooper/Eromanga Basin		Sq Km: 4 891	07/01/2007
Victoria Oil Exploration (1977) Pty Ltd*			40.00	
Lion Energy Ltd			12.50	
Permian Oil Pty Ltd			20.00	
Springfield Oil & Gas Ltd			15.00	
Tacnas Pty Ltd			12.50	
PEL 90	Cooper/Eromanga Basin		Sq Km: 1 365	29/10/2006
Stuart Petroleum Ltd*			75.00	
Mawson Petroleum Pty Ltd			25.00	
PEL 91	Cooper/Eromanga Basin		Sq Km: 2 964	07/01/2007
Great Artesian Oil & Gas Ltd*			60.00	
Beach Petroleum Ltd			40.00	
PEL 92	Cooper/Eromanga Basin		Sq Km: 2 868	04/11/2006
Beach Petroleum NL*			75.00	
Cooper Energy NL			25.00	
PEL 93	Cooper/Eromanga Basin		Sq Km: 1 884	04/11/2006
Stuart Petroleum NL*			70.00	
Cooper Energy NL			30.00	
PEL 94	Cooper/Eromanga Basin		Sq Km: 2 703	04/11/2006
Beach Petroleum NL*			50.00	
Magellan Petroleum (NT) Pty Ltd			50.00	
PEL 95	Cooper/Eromanga Basin		Sq Km: 3 893	29/10/2006
Beach Petroleum NL*			50.00	
Magellan Petroleum (NT) Pty Ltd			50.00	
PEL 100	Cooper/Eromanga Basin		Sq Km: 594	05/03/2008
Cooper Energy NL*			0.00	
Liberty Petroleum Corporation			100.00	
PEL 101	Cooper/Eromanga Basin		Sq Km: 617	29/07/2008
Vernon E Faulconer Australia Inc*			100.00	
PEL 102	Cooper/Eromanga Basin		Sq Km: 650	23/10/2007
Stuart Petroleum NL*			100.00	
PEL 103	Cooper/Eromanga Basin		Sq Km: 767	29/01/2008
Vernon E Faulconer Australia Inc*			100.00	
Innamincka Petroleum Ltd				
PEL 104	Cooper/Eromanga Basin		Sq Km: 1 065	27/03/2008
Victoria Petroleum NL*			40.00	
Elcos Pty Ltd			2.50	
Lion Energy Ltd			12.50	
Permian Oil Pty Ltd			20.00	
Springfield Oil & Gas Ltd			12.50	
Tacnas Pty Ltd			12.50	
PEL 105	Cooper/Eromanga Basin		Sq Km: 437	23/04/2008
Hughes and Hughes Australia Pty Ltd*			66.67	
Tri-C Resources Inc.			33.33	
PEL 107	Cooper/Eromanga Basin		Sq Km: 814	01/04/2008
Great Artesian Oil & Gas Ltd*			60.00	
Beach Petroleum Ltd			40.00	
PEL 108	Cooper/Eromanga Basin		Sq Km: 2 047	16/04/2008
Australian-Canadian Oil Royalties Ltd*			50.00	
Ely Sakhai			50.00	
PEL 109	Cooper/Eromanga Basin		Sq Km: 1 515	16/04/2008
Australian-Canadian Oil Royalties Ltd*			50.00	
Ely Sakhai			50.00	
PEL 110	Cooper/Eromanga Basin		Sq Km: 1 458	04/02/2008
Beach Petroleum Ltd*			37.50	
Cooper Energy NL			25.00	
Magellan Petroleum (Southern) Pty Ltd			37.50	
PEL 111	Cooper/Eromanga Basin		Sq Km: 1 174	15/05/2008
Victoria Oil Exploration (1977) Pty Ltd*			40.00	
Lion Energy Ltd			12.50	
Permian Oil Pty Ltd			20.00	
Springfield Oil & Gas Ltd			15.00	
Tacnas Pty Ltd			12.50	
PEL 112	Cooper/Eromanga Basin		Sq Km: 3 326	16/04/2008
Australian-Canadian Oil Royalties Ltd*			50.00	
Ely Sakhai			50.00	
PEL 113	Cooper/Eromanga Basin		Sq Km: 1 163	30/04/2008
Stuart Petroleum Ltd*			100.00	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title *Accumulation* Company (Operator*)		Equity	Expiry Date
PEL 114	Cooper/Eromanga Basin	Sq Km: 958	21/05/2008
Santos Ltd*		100.00	
PEL 115	Cooper/Eromanga Basin	Sq Km: 1 106	15/05/2008
Victoria Oil Exploration (1977) Pty Ltd*		40.00	
Lion Energy Ltd		12.50	
Permian Oil Pty Ltd		20.00	
Springfield Oil & Gas Ltd		15.00	
Tacnas Pty Ltd		12.50	
PEL 136	Otway Basin	Sq Km: 3 371	07/05/2007
Beach Petroleum NL*		100.00	
PEL 154	Otway Basin	Sq Km: 1 404	29/07/2008
Rawson Resources NL*		100.00	
PEL 155	Otway Basin	Sq Km: 905	29/07/2008
Rawson Resources NL*		100.00	
Production Licence			
Legislation Group: Territorial		Sq km approximate	
PPL 6	Cooper/Eromanga Basin	Sq Km: 257	31/12/2005
Gidgealpa, Mawson			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL 7	Cooper/Eromanga Basin	Sq Km: 254	31/12/2005
Moomba, Moomba North			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL 8	Cooper/Eromanga Basin	Sq Km: 254	31/12/2005
Moomba, Moomba South			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL 9	Cooper/Eromanga Basin	Sq Km: 133	31/12/2005
Moomba, Moomba South			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL10	Cooper/Eromanga Basin	Sq Km: 226	31/12/2005
Cowan, Daralingie, Deina, Yapeni			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

Title *Accumulation* Company (Operator*)		Equity	Expiry Date
PPL11	Cooper/Eromanga Basin	Sq Km: 160	31/12/2005
Big Lake			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL12	Cooper/Eromanga Basin	Sq Km: 157	31/12/2005
Burke, Dullingari, Dullingari North			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL13	Cooper/Eromanga Basin	Sq Km: 56	31/12/2005
Amyema, Brumby, Marsilea			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL14	Cooper/Eromanga Basin	Sq Km: 233	31/12/2005
Toolachee			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL15	Cooper/Eromanga Basin	Sq Km: 154	31/12/2005
Della			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL16	Cooper/Eromanga Basin	Sq Km: 127	31/12/2005
Big Lake, Namur			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL17	Cooper/Eromanga Basin	Sq Km: 141	31/12/2005
Merrimelia, Pelican (Santos)			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL18	Cooper/Eromanga Basin	Sq Km: 109	31/12/2005
Fly Lake/Brolga			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL19	Cooper/Eromanga Basin	Sq Km: 37	31/12/2005
Moorari			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL20	Cooper/Eromanga Basin	Sq Km: 130	31/12/2005
Gooranie, Tirrawarra			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL21	Otway Basin	Sq Km: 145	30/04/2021
Caroline			
Air Liquide Australia Ltd*		100.00	
PPL22	Cooper/Eromanga Basin	Sq Km: 234	31/12/2006
Marabooka, Mina, Mudera, Nanima, Strzelecki, Wanara			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL23	Cooper/Eromanga Basin	Sq Km: 80	31/12/2006
Munkarie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL24	Cooper/Eromanga Basin	Sq Km: 168	31/12/2006
Boongala, Caraka, Coochilara, Dieri, Kidman, Marana			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL25	Cooper/Eromanga Basin	Sq Km: 20	31/12/2006
Narcoonowie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL26	Cooper/Eromanga Basin	Sq Km: 4	10/06/2007
Cuttapirrie			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL27	Cooper/Eromanga Basin	Sq Km: 23	31/12/2006
Mudrangie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL28	Cooper/Eromanga Basin	Sq Km: 16	06/05/2007
Kanowana			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL29	Cooper/Eromanga Basin	Sq Km: 3	31/12/2008
Rakoona			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL30	Cooper/Eromanga Basin	Sq Km: 49	31/12/2006
Limestone Creek/Biala			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

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Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL31	Cooper/Eromanga Basin	Sq Km: 6	06/05/2007
Wancoocha			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL32	Cooper/Eromanga Basin	Sq Km: 6	06/05/2007
Muteroo			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL33	Cooper/Eromanga Basin	Sq Km: 15	31/12/2006
Bookabourdie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL34	Cooper/Eromanga Basin	Sq Km: 9	31/12/2006
McKinlay			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL35	Cooper/Eromanga Basin	Sq Km: 21	31/12/2006
Meranji			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL36	Cooper/Eromanga Basin	Sq Km: 47	31/12/2006
Alwyn, Jena, Ulandi			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL37	Cooper/Eromanga Basin	Sq Km: 8	06/10/2007
Spencer			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL38	Cooper/Eromanga Basin	Sq Km: 10	06/10/2007
Dirkala, Dirkala South, Dirkala West			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL39	Cooper/Eromanga Basin	Sq Km: 2	31/12/2006
Nungeroo			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL40	Cooper/Eromanga Basin	Sq Km: 11	31/12/2007
Lepena			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL41	Cooper/Eromanga Basin	Sq Km: 20	31/12/2011
Kapinka, Mundi			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL42	Cooper/Eromanga Basin	Sq Km: 7	31/12/2008
Bookabourdie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

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Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL43	Cooper/Eromanga Basin	Sq Km: 3	31/12/2008
Taylor South			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL44	Cooper/Eromanga Basin	Sq Km: 5	31/12/2008
Bimbaya			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL45	Cooper/Eromanga Basin	Sq Km: 1	29/03/2010
Taloola			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL46	Cooper/Eromanga Basin	Sq Km: 2	20/12/2009
Tantanna			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL47	Cooper/Eromanga Basin	Sq Km: 4	20/12/2009
Sturt, Sturt East			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL48	Cooper/Eromanga Basin	Sq Km: 2	31/12/2010
Kurunda			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL49	Cooper/Eromanga Basin	Sq Km: 8	31/12/2010
Andree/Leleptian			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL50	Cooper/Eromanga Basin	Sq Km: 17	31/12/2009
Andree/Leleptian			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL51	Cooper/Eromanga Basin	Sq Km: 7	31/12/2011
Kirralee			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL52	Cooper/Eromanga Basin	Sq Km: 2	31/12/2009
Gooranie South			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL53	Cooper/Eromanga Basin	Sq Km: 2	04/12/2010
Spencer West			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL54	Cooper/Eromanga Basin	Sq Km: 1	15/06/2010
Pintari North			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

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Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL55	Cooper/Eromanga Basin	Sq Km: 10	31/12/2011
Varanus			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL56	Cooper/Eromanga Basin	Sq Km: 4	31/12/2013
Varanus, Varanus South			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL57	Cooper/Eromanga Basin	Sq Km: 10	16/07/2011
Thurakinna			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL58	Cooper/Eromanga Basin	Sq Km: 15	31/12/2010
Mettika			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL59	Cooper/Eromanga Basin	Sq Km: 10	16/07/2011
Garanjanie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL60	Cooper/Eromanga Basin	Sq Km: 7	25/05/2014
Wirrarie, Wirrarie North			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL61	Cooper/Eromanga Basin	Sq Km: 12	17/10/2011
Arrakis/Murta			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL62	Otway Basin	Sq Km: 29	26/11/2011
Haselgrove, Katnook, Ladbroke Grove			
Origin Energy Resources Ltd*		20.00	
Omega Oil NL		24.29	
Sagasco South East Inc.		55.71	
PPL63	Cooper/Eromanga Basin	Sq Km: 1	23/05/2012
Malgoona			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL64	Cooper/Eromanga Basin	Sq Km: 2	23/05/2012
Malgoona			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL65	Cooper/Eromanga Basin	Sq Km: 6	17/07/2012
Kujani			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL66	Cooper/Eromanga Basin	Sq Km: 11	24/11/2012
Jack Lake			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL67	Cooper/Eromanga Basin	Sq Km: 11	17/07/2012
Keena			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL68	Cooper/Eromanga Basin	Sq Km: 14	31/12/2011
Cooba			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL69	Cooper/Eromanga Basin	Sq Km: 12	31/12/2011
Tarwonga			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL70	Cooper/Eromanga Basin	Sq Km: 6	25/05/2014
Farina			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL71	Cooper/Eromanga Basin	Sq Km: 16	31/12/2013
Kerna			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL72	Cooper/Eromanga Basin	Sq Km: 17	31/12/2013
Dilchee, Pira			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL73	Cooper/Eromanga Basin	Sq Km: 1	31/12/2015
Mudlalee			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL74	Cooper/Eromanga Basin	Sq Km: 5	31/12/2015
Allambi			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL75	Cooper/Eromanga Basin	Sq Km: 6	26/10/2016
Caladan			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL76	Cooper/Eromanga Basin	Sq Km: 3	26/10/2016
Telopea			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL77	Cooper/Eromanga Basin	Sq Km: 10	26/10/2016
Keleary			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL78	Cooper/Eromanga Basin	Sq Km: 6	31/12/2016
Baratta			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL79	Cooper/Eromanga Basin	Sq Km: 2	31/12/2016
Gahnia			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL80	Cooper/Eromanga Basin	Sq Km: 3	31/12/2016
Correa			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL81	Cooper/Eromanga Basin	Sq Km: 4	31/10/2017
Caladan, Caladan North East			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL82	Cooper/Eromanga Basin	Sq Km: 6	31/12/2016
Waukatanna			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL83	Cooper/Eromanga Basin	Sq Km: 3	31/12/2016
Pogona			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL84	Cooper/Eromanga Basin	Sq Km: 28	06/06/2018
Barina			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL85	Cooper/Eromanga Basin	Sq Km: 3	31/12/2017
Alisma			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL86	Cooper/Eromanga Basin	Sq Km: 2	31/12/2017
Carmina			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL87	Cooper/Eromanga Basin	Sq Km: 5	31/12/2017
Boobook			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL88	Cooper/Eromanga Basin	Sq Km: 2	31/12/2017
Lycosa			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL89	Cooper/Eromanga Basin	Sq Km: 6	31/12/2017
Bobs Well			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL90	Cooper/Eromanga Basin	Sq Km: 61	31/12/2017
Packsaddle, Pondrinie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL91	Cooper/Eromanga Basin	Sq Km: 9	31/12/2017
Cowralli			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL92	Cooper/Eromanga Basin	Sq Km: 2	31/12/2017
Plantago			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL93	Cooper/Eromanga Basin	Sq Km: 7	31/12/2017
Wilpinnie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL94	Cooper/Eromanga Basin	Sq Km: 7	08/01/2019
Atreides			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL95	Cooper/Eromanga Basin	Sq Km: 12	21/05/2019
Nephrite			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL96	Cooper/Eromanga Basin	Sq Km: 3	31/12/2017
Beckler			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL97	Cooper/Eromanga Basin	Sq Km: 2	31/12/2017
Beckler South			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL98	Cooper/Eromanga Basin	Sq Km: 7	31/12/2017
Merupa			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL99	Cooper/Eromanga Basin	Sq Km: 7	31/12/2017
Merindal			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL100	Cooper/Eromanga Basin	Sq Km: 5	31/12/2017
Nappacoongee, Nappacoongee East			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL101	Cooper/Eromanga Basin	Sq Km: 214	02/11/2018
Nappameri Trough, Swan Lake			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL102	Cooper/Eromanga Basin	Sq Km: 231	02/11/2018
Nappameri Trough, Wantana			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL103	Cooper/Eromanga Basin	Sq Km: 258	02/11/2018
Wantana			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL104	Cooper/Eromanga Basin	Sq Km: 259	02/11/2018
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL105	Cooper/Eromanga Basin	Sq Km: 256	02/11/2018
Kirby			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL106	Cooper/Eromanga Basin	Sq Km: 254	02/11/2018
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL107	Cooper/Eromanga Basin	Sq Km: 217	02/11/2018
Davren			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL108	Cooper/Eromanga Basin	Sq Km: 254	02/11/2018
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL109	Cooper/Eromanga Basin	Sq Km: 248	02/11/2018
Bulyeroo			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL110	Cooper/Eromanga Basin	Sq Km: 228	02/11/2018
Burley			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL111	Cooper/Eromanga Basin	Sq Km: 254	02/11/2018
McLeod			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL112	Cooper/Eromanga Basin	Sq Km: 255	02/11/2018
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL113	Cooper/Eromanga Basin	Sq Km: 232	02/11/2018
Moomba			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL114	Cooper/Eromanga Basin	Sq Km: 242	02/11/2018
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL115	Cooper/Eromanga Basin	Sq Km: 251	02/11/2018
Three Queens			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL116	Cooper/Eromanga Basin	Sq Km: 249	02/11/2018
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL117	Cooper/Eromanga Basin	Sq Km: 239	02/11/2018
Wilpinnie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL118	Cooper/Eromanga Basin	Sq Km: 1	26/05/2019
Kudrieke North			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL119	Cooper/Eromanga Basin	Sq Km: 7	31/12/2017
Kudrieke, Mitchie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL120	Cooper/Eromanga Basin	Sq Km: 4	31/12/2017
Lake MacMillan			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL121	Cooper/Eromanga Basin	Sq Km: 5	26/05/2019
Tarragon			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL122	Cooper/Eromanga Basin	Sq Km: 6	23/09/2019
Tallerangie			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL123	Cooper/Eromanga Basin	Sq Km: 5	23/09/2019
Pennie			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL124	Cooper/Eromanga Basin	Sq Km: 5	31/12/2018
Bindah			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL125	Cooper/Eromanga Basin	Sq Km: 9	11/02/2020
Gudi			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL126	Cooper/Eromanga Basin	Sq Km: 1	21/02/2020
Daralingie North			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL127	Cooper/Eromanga Basin	Sq Km: 4	21/02/2020
Nulla			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL128	Cooper/Eromanga Basin	Sq Km: 1	21/02/2020
Garanjanie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL129	Cooper/Eromanga Basin	Sq Km: 1	20/04/2020
Thurakinna			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL130	Cooper/Eromanga Basin	Sq Km: 1	20/04/2020
Thurakinna			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL131	Cooper/Eromanga Basin	Sq Km: 40	20/04/2020
Coonatie			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL132	Cooper/Eromanga Basin	Sq Km: 1	31/12/2019
Packsaddle, Pondrinie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL133	Cooper/Eromanga Basin	Sq Km: 1	31/12/2019
Packsaddle, Pondrinie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL134	Cooper/Eromanga Basin	Sq Km: 1	31/12/2019
Packsaddle, Pondrinie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL135	Cooper/Eromanga Basin	Sq Km: 11	31/12/2019
Goyder			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL136	Cooper/Eromanga Basin	Sq Km: 33	17/06/2020
Cuttapirrie			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL137	Cooper/Eromanga Basin	Sq Km: 7	25/05/2020
Moonanga			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL138	Cooper/Eromanga Basin	Sq Km: 25	10/08/2020
Cabernet			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL139	Cooper/Eromanga Basin	Sq Km: 16	31/12/2019
Milluna			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL140	Cooper/Eromanga Basin	Sq Km: 162	31/12/2019
Nephrite South			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL141	Cooper/Eromanga Basin	Sq Km: 125	31/12/2019
Beckler			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL142	Cooper/Eromanga Basin	Sq Km: 28	10/08/2020
Moolion			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL143	Cooper/Eromanga Basin	Sq Km: 93	31/12/2019
Dorodillo			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL144	Cooper/Eromanga Basin	Sq Km: 7	10/08/2020
Keena			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL145	Cooper/Eromanga Basin	Sq Km: 18	10/08/2020
Koree, Koree South			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL146	Cooper/Eromanga Basin	Sq Km: 10	31/12/2019
Balcaminga			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL147	Cooper/Eromanga Basin	Sq Km: 3	10/08/2020
Balcaminga			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL148	Cooper/Eromanga Basin	Sq Km: 8	10/08/2020
Welcome Lake East			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL149	Cooper/Eromanga Basin	Sq Km: 33	31/12/2019
Jalbu West			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL150	Cooper/Eromanga Basin	Sq Km: 22	10/08/2020
Raven			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL151	Cooper/Eromanga Basin	Sq Km: 66	31/12/2019
Napowie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL152	Cooper/Eromanga Basin	Sq Km: 4	10/08/2020
Napowie			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL153	Cooper/Eromanga Basin	Sq Km: 43	31/12/2019
Shiraz			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL154	Cooper/Eromanga Basin	Sq Km: 4	31/12/2019
Ficus			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL155	Cooper/Eromanga Basin	Sq Km: 9	10/08/2020
Bungee			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL156	Cooper/Eromanga Basin	Sq Km: 35	10/08/2020
Beanbush			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL157	Cooper/Eromanga Basin	Sq Km: 3	10/08/2020
Muscat			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL158	Cooper/Eromanga Basin	Sq Km: 67	08/08/2020
Verona			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL159	Cooper/Eromanga Basin	Sq Km: 4	22/07/2020
Touriga			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL160	Cooper/Eromanga Basin	Sq Km: 3	22/07/2020
Mica			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL161	Cooper/Eromanga Basin	Sq Km: 7	08/08/2020
Malgoona			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL162	Cooper/Eromanga Basin	Sq Km: 3	08/08/2020
Sturt			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL163	Cooper/Eromanga Basin	Sq Km: 1	31/12/2019
Brumby			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL164	Cooper/Eromanga Basin	Sq Km: 3	31/12/2019
Packsaddle			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL165	Cooper/Eromanga Basin	Sq Km: 4	26/08/2020
Malgoona			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL166	Cooper/Eromanga Basin	Sq Km: 1	31/12/2019
Taylor South			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL167	Cooper/Eromanga Basin	Sq Km: 7	02/09/2020
Moolion			
Santos Ltd*		25.60	
Delhi Petroleum Pty Ltd		17.14	
Novus Australia Resources NL		2.97	
Origin Energy Resources Ltd		10.54	
Vamgas Pty Ltd		43.75	
PPL168	Otway Basin	Sq Km: 9	25/06/2020
Redman			
Origin Energy Resources Ltd*		20.00	
Omega Oil NL		24.29	
Sagasco South East Inc.		55.71	
PPL169	Cooper/Eromanga Basin	Sq Km: 14	
Allambi			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL170	Cooper/Eromanga Basin	Sq Km: 10	
Andree/Leleptian, Reglet			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL171	Cooper/Eromanga Basin	Sq Km: 24	
Atreides			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL172	Cooper/Eromanga Basin	Sq Km: 127	
Yalcumma			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL173	Cooper/Eromanga Basin	Sq Km: 135	
Boongala, Kerna Ridge			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL174	Cooper/Eromanga Basin	Sq Km: 13	
Cactus, Deparanie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL175	Cooper/Eromanga Basin	Sq Km: 46	
Caladan North			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL176	Cooper/Eromanga Basin	Sq Km: 8	
Callabonna			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL177	Cooper/Eromanga Basin	Sq Km: 12	
Charo			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL178	Cooper/Eromanga Basin	Sq Km: 9	
Davren North			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL179	Cooper/Eromanga Basin	Sq Km: 6	
Fortanna			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL180	Cooper/Eromanga Basin	Sq Km: 4	
Gooranie East			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL181	Cooper/Eromanga Basin	Sq Km: 18	
Grenache			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL182	Cooper/Eromanga Basin	Sq Km: 3	
James			
Santos Ltd*		25.70	
Delhi Petroleum Pty Ltd		17.10	
Novus Australia Resources NL		3.00	
Origin Energy Resources Ltd		10.50	
Vamgas Pty Ltd		43.70	
PPL183	Cooper/Eromanga Basin	Sq Km: 15	
Kanowana			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL184	Cooper/Eromanga Basin	Sq Km: 2	
Kerinna			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)		Equity	Expiry Date
PPL185	Cooper/Eromanga Basin	Sq Km: 34	
Kirralee			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL186	Cooper/Eromanga Basin	Sq Km: 21	
Kobari			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL187	Cooper/Eromanga Basin	Sq Km: 17	
Lamdina			
Santos Ltd*		25.70	
Delhi Petroleum Pty Ltd		17.10	
Novus Australia Resources NL		3.00	
Origin Energy Resources Ltd		10.50	
Vamgas Pty Ltd		43.70	
PPL188	Cooper/Eromanga Basin	Sq Km: 16	
McKinlay			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL189	Cooper/Eromanga Basin	Sq Km: 260	
Allunga, Bauhaus			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL190	Cooper/Eromanga Basin	Sq Km: 232	
Big Lake, Boobook, Merlot			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL191	Cooper/Eromanga Basin	Sq Km: 10	
Moondie			
Santos Ltd*		25.70	
Delhi Petroleum Pty Ltd		17.10	
Novus Australia Resources NL		3.00	
Origin Energy Resources Ltd		10.50	
Vamgas Pty Ltd		43.70	
PPL192	Cooper/Eromanga Basin	Sq Km: 23	
Haloragis, Pirraminta			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL193	Cooper/Eromanga Basin	Sq Km: 10	
Quartpot			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL194	Cooper/Eromanga Basin	Sq Km: 6	
Reg Sprigg			
Santos Ltd*		25.70	
Delhi Petroleum Pty Ltd		17.10	
Novus Australia Resources NL		3.00	
Origin Energy Resources Ltd		10.50	
Vamgas Pty Ltd		43.70	
PPL195	Cooper/Eromanga Basin	Sq Km: 8	
Scrubby Creek			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL196	Cooper/Eromanga Basin	Sq Km: 111	
Moorari, Tirrawarra, Woolkina			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	
PPL197	Cooper/Eromanga Basin	Sq Km: 3	
Moorari, Tirrawarra, Woolkina			
Santos Ltd*		25.70	
Delhi Petroleum Pty Ltd		17.10	
Novus Australia Resources NL		3.00	
Origin Energy Resources Ltd		10.50	
Vamgas Pty Ltd		43.70	
PPL198	Cooper/Eromanga Basin	Sq Km: 25	
Wilpinnie			
Santos Ltd*		40.70	
Alliance Petroleum Australia Pty Ltd		3.97	
Basin Oil NL		2.10	
Bridge Oil Developments Pty Ltd		3.99	
Delhi Petroleum Pty Ltd		20.21	
Novus Australia Resources NL		4.75	
Origin Energy Resources Ltd		13.19	
Reef Oil NL		1.97	
Santos (BOL) Pty Ltd		0.21	
Santos Petroleum Pty Ltd		0.40	
Vamgas Pty Ltd		8.51	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
PPL199	Cooper/Eromanga Basin		Sq Km: 13	
Wooloo				
Santos Ltd*			40.70	
Alliance Petroleum Australia Pty Ltd			3.97	
Basin Oil NL			2.10	
Bridge Oil Developments Pty Ltd			3.99	
Delhi Petroleum Pty Ltd			20.21	
Novus Australia Resources NL			4.75	
Origin Energy Resources Ltd			13.19	
Reef Oil NL			1.97	
Santos (BOL) Pty Ltd			0.21	
Santos Petroleum Pty Ltd			0.40	
Vamgas Pty Ltd			8.51	
PPL202	Otway Basin		Sq Km: 2	
Haselgrove, Ladbroke Grove				
Origin Energy Resources Ltd*			20.00	
Omega Oil NL			24.29	
Sagasco South East Inc.			55.71	
PPL203	Cooper/Eromanga Basin		Sq Km: 2	
Acrasia				
Stuart Petroleum Ltd*			75.00	
Mawson Petroleum Pty Ltd			25.00	
PPL204	Cooper/Eromanga Basin		Sq Km: 2	
Sellicks				
Beach Petroleum Ltd*			75.00	
Cooper Energy NL			25.00	
Offshore				
Exploration Permit				
Legislation Group: PSLA			Sq km approximate	
EPP33	Great Australian Bight Basin	Blocks: 80		18/12/2009
Kerr-McGee NW Shelf Energy Australia Pty Ltd*			100.00	
EPP27	Otway Basin	Blocks: 67	Sq Km: 3 962	24/02/2006
Great Artesian Oil & Gas Ltd*			100.00	
EPP28	Great Australian Bight Basin	Blocks: 225	Sq Km: 15 896	11/10/2006
Woodside Energy Ltd*			40.00	
Anadarko Australia Company Pty Ltd			30.00	
EnCana Corporation			30.00	
EPP29	Great Australian Bight Basin	Blocks: 268	Sq Km: 18 763	11/04/2007
Woodside Energy Ltd*			40.00	
Anadarko Australia Company Pty Ltd			30.00	
EnCana Corporation			30.00	
EPP30	Great Australian Bight Basin	Blocks: 318	Sq Km: 22 225	11/04/2007
Woodside Energy Ltd*			40.00	
Anadarko Australia Company Pty Ltd			30.00	
EnCana Corporation			30.00	
EPP31	Great Australian Bight Basin	Blocks: 80		26/06/2008
Woodside Energy Ltd*			40.00	
Anadarko Australia Company Pty Ltd			30.00	
EnCana Corporation			30.00	
EPP32	Great Australian Bight Basin	Blocks: 76		12/12/2008
Santos Offshore Pty Ltd*			100.00	
Western Australia				
Onshore				
Exploration Permit				
Legislation Group: Territorial			Sq km approximate	
EP 23 R6	Perth Basin	Blocks: 9	Sq Km: 697	09/06/2007
Ausam Resources NL*			100.00	
EP 41 R6	Carnarvon Basin	Blocks: 9	Sq Km: 697	13/05/2008
Lansvale Oil and Gas Pty Ltd*				
Pace Petroleum Pty Ltd				
Rough Range Oil Pty Ltd				
EP 61 R6	Carnarvon Basin	Blocks: 4	Sq Km: 310	11/12/2007
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos Offshore Pty Ltd				
Texaco Australia Pty Ltd				
EP 62 R6	Carnarvon Basin	Blocks: 1	Sq Km: 77	12/10/2008
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos Offshore Pty Ltd				
Texaco Australia Pty Ltd				
EP 104 R4	Canning Basin	Blocks: 12	Sq Km: 996	09/11/2004
				Renewal Pending
Gulliver Productions Pty Ltd*				
First Australian Resources NL				
Indigo Oil Pty Ltd				
Kimberley Oil NL				
Pancontinental Oil & Gas NL				
Pelsoil Ltd				
Voyager (PB) Ltd				

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
EP 110 R4	Carnarvon Basin	Blocks: 9	Sq Km: 691	23/01/2006
Carnarvon Petroleum NL*				
Euro Pacific Energy Pty Ltd				
Hardman Oil and Gas Pty Ltd				
Pan Pacific Petroleum (South Aust) Pty Ltd				
Radford, Roy Antony				
EP 129 R4	Canning Basin	Blocks: 9	Sq Km: 735	08/07/2006
Terratek Drilling Tools Pty Ltd*				
EP 137 R4	Carnarvon Basin	Blocks: 9	Sq Km: 1 360	22/05/2005
TAP (SHELFAL) Pty Ltd*				
JED North West Shelf Pty Ltd				
EP 307 R3	Carnarvon Basin	Blocks: 4	Sq Km: 161	17/09/2005
Apache Northwest Pty Ltd*				
Apache Harriet Pty Ltd				
Apache Lowendal Pty Ltd				
Apache Miladin Pty Ltd				
Apache Nasmah Pty Ltd				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
EP 320 R3	Perth Basin	Blocks: 16	Sq Km: 1 316	23/07/2007
Origin Energy Developments Pty Ltd*				
AWE (Perth Basin) Ltd				
EP 321 R2	Perth Basin	Blocks: 26	Sq Km: 1 755	01/07/2003
				Renewal Pending
Ausam Resources NL*				
Capital Consultant Services Pty Ltd				
EP 357 R2	Carnarvon Basin	Blocks: 3		29/04/2007
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos Offshore Pty Ltd				
Texaco Australia Pty Ltd				
EP 358 R1	Carnarvon Basin	Blocks: 5	Sq Km: 387	14/11/2004
Apache Northwest Pty Ltd*				
Apache Harriet Pty Ltd				
Apache Lowendal Pty Ltd				
Apache Miladin Pty Ltd				
Apache Nasmah Pty Ltd				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
EP 359 R1	Carnarvon Basin	Blocks: 21	Sq Km: 1 626	06/04/2004
				Renewal Pending
Lansvale Oil and Gas Pty Ltd*				
Pace Petroleum Pty Ltd				
Rough Range Oil Pty Ltd				
Sun Resources NL				
EP 363 R2	Carnarvon Basin	Blocks: 4	Sq Km: 310	11/08/2007
Apache Northwest Pty Ltd*				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
EP 364 R1	Carnarvon Basin	Blocks: 1	Sq Km: 77	14/11/2004
TAP (SHELFAL) PTY LTD*				
Westranch Holdings Pty Ltd				
EP 368 R2	Perth Basin	Blocks: 8	Sq Km: 619	10/02/2008
AWE Petroleum Ltd*				
Hardman Oil and Gas Pty Ltd				
Origin Energy Developments Pty Ltd				
Voyager (PB) Ltd				
Westranch Holdings Pty Ltd				
EP 369 R1	Carnarvon Basin	Blocks: 31	Sq Km: 2 400	12/10/2003
				Renewal Pending
Longreach Oil Ltd*			100.00	
EP 371 R1	Canning Basin	Blocks: 45	Sq Km: 3 675	04/05/2005
Kimberley Oil NL*				
EP 374 R1	Canning Basin	Blocks: 100	Sq Km: 7 744	22/03/2004
Nerdlihc Company Inc*			100.00	
EP 375 R1	Canning Basin	Blocks: 100	Sq Km: 7 744	22/03/2004
Nerdlihc Company Inc*			100.00	
EP 376 R1	Canning Basin	Blocks: 100	Sq Km: 7 744	22/03/2004
Nerdlihc Company Inc*			100.00	
EP 381 R1	Perth Basin	Blocks: 21	Sq Km: 1 417	10/12/2003
				Renewal Pending
Southern Amity Inc*				
Geopetro Resources Company				
EP 386 R1	Bonaparte Basin	Blocks: 91	Sq Km: 7 554	11/07/2004
Bonaparte, Garimala, Ningbing, Waggon Creek				
Kimberley Energy Group Pty Ltd*			100.00	
EP 389 R1	Perth Basin	Blocks: 28	Sq Km: 2 052	24/09/2005
Empire Oil Company (WA) Ltd*				
EP 390 R1	Canning Basin	Blocks: 65	Sq Km: 10 792	28/06/2006
Kimberley Oil NL*	100.00			

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
EP 391 R1	Canning Basin	Blocks: 59	Sq Km: 9 796	28/06/2006
Kimberley Oil NL*			100.00	
EP 405	Carnarvon Basin	Blocks: 113	Sq Km: 8 750	12/10/2003
				Renewal Pending
Longreach Oil Ltd*			100.00	
EP 407	Perth Basin	Blocks: 26	Sq Km: 1 755	04/03/2003
				Renewal Pending
Ausam Resources NL*				
Capital Consultant Services Pty Ltd				
EP 408 R1	Perth Basin	Blocks: 13	Sq Km: 878	27/07/2008
Southern Amity Inc*				
Geopetro Resources Company				
Korea National Oil Corporation				
SCGAU Pty Ltd				
EP 410	Carnarvon Basin	Blocks: 20	Sq Km: 1 549	29/09/2003
				Renewal Pending
Longreach Oil Ltd*			100.00	
EP 411	Perth Basin	Blocks: 17	Sq Km: 1 147	26/08/2004
Empire Oil Company (WA) Ltd*			100.00	
EP 412	Carnarvon Basin	Blocks: 69	Sq Km: 5 343	18/03/2004
Rough Range Oil Pty Ltd*				
Bounty Oil & Gas NL				
EP 413 R1	Perth Basin	Blocks: 11	Sq Km: 852	25/08/2004
Origin Energy Developments Pty Ltd*				
Arc Energy NL				
AWE (Perth Basin) Ltd				
Geary, John Kevin				
Hardman Oil and Gas Pty Ltd				
Norwest Energy NL				
ROC Oil WA Pty Ltd				
Victoria Petroleum Offshore Pty Ltd				
Voyager (PB) Ltd				
EP 414 R1	Perth Basin	Blocks: 15	Sq Km: 1 012	25/08/2004
Ausam Resources NL*				
Burns, Alan Robert				
Empire Oil Company (WA) Ltd				
Euro Pacific Energy Pty Ltd				
Geary, John Kevin				
Hughes, Dan Allen				
Hughes, Dudley Joe				
Springfield Oil & Gas Ltd				
EP 415	Perth Basin	Blocks: 21	Sq Km: 1 417	25/08/2005
Empire Oil Company (WA) Ltd*			100.00	
EP 416	Perth Basin	Blocks: 57	Sq Km: 3 847	25/08/2005
Empire Oil Company (WA) Ltd*			100.00	
EP 417	Canning Basin	Blocks: 78	Sq Km: 6 475	21/02/2006
New Standard Exploration NL*			100.00	
EP 419	Perth Basin	Blocks: 9	Sq Km: 607	18/10/2006
Black Rock Resources Australia NL*			100.00	
EP 422	Canning Basin	Blocks: 147		21/03/2008
Ausoil Exploration Pty Ltd*			100.00	
Production Licence				
Legislation Group: Territorial			Sq km approximate	
L 1H R1	Carnarvon Basin	Blocks: 9	Sq Km: 697	09/02/2009
Barrow Island				
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos Offshore Pty Ltd				
Texaco Australia Pty Ltd				
L 1 R1	Perth Basin	Blocks: 5	Sq Km: 387	17/05/2014
Dongara				
Arc Energy NL*				
Origin Energy Developments Pty Ltd				
L 2 R1	Perth Basin	Blocks: 4	Sq Km: 310	17/05/2014
Dongara				
Arc Energy NL*				
Origin Energy Developments Pty Ltd				
L 4	Perth Basin	Blocks: 5	Sq Km: 387	24/03/2004
Woodada				
Phoenix Energy Pty Ltd*				
Bounty Oil & Gas NL				
Hardman Oil and Gas Pty Ltd				
L 5	Perth Basin	Blocks: 4	Sq Km: 310	28/12/2004
Woodada				
Phoenix Energy Pty Ltd*				
Bounty Oil & Gas NL				
Hardman Oil and Gas Pty Ltd				
L 6	Canning Basin	Blocks: 5	Sq Km: 415	22/09/2004
Blina				
Terratek Drilling Tools Pty Ltd*			100.00	

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
L 7	Perth Basin	Blocks: 2	Sq Km: 155	13/05/2005
Mount Horner				
Petro Energy Pty Ltd*			100.00	
L 8	Canning Basin	Blocks: 4	Sq Km: 332	21/10/2005
Sundown, West Terrace				
Terratek Drilling Tools Pty Ltd*			100.00	
L 9	Carnarvon Basin	Blocks: 3	Sq Km: 232	03/06/2008
Tubridgi				
Sagasco South East Inc.*				
Origin Energy Amadeus NL				
Origin Energy Petroleum Pty Ltd				
Pan Pacific Petroleum NL				
Tubridgi Petroleum Pty Ltd				
L 10	Carnarvon Basin	Blocks: 8	Sq Km: 619	03/02/2009
Barrow Island				
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos Offshore Pty Ltd				
Texaco Australia Pty Ltd				
L 11	Perth Basin	Blocks: 1	Sq Km: 77	14/05/2013
Beharra Springs				
Origin Energy Developments Pty Ltd*				
AWE (Perth Basin) Ltd				
L 12	Carnarvon Basin	Blocks: 1		28/07/2023
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos Offshore Pty Ltd				
Texaco Australia Pty Ltd				
L 13	Carnarvon Basin	Blocks: 1		28/07/2023
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos Offshore Pty Ltd				
Texaco Australia Pty Ltd				
Retention Lease				
Legislation Group: Territorial			Sq km approximate	
R 1	Canning Basin	Blocks: 3		28/08/2008
Gulliver Productions Pty Ltd*				
First Australian Resources Limited				
Indigo Oil Pty Ltd				
Kimberley Oil NL				
Pancontinental Oil & Gas NL				
Pelsoil Ltd				
Voyager (PB) Ltd				
R 2	Browse Basin	Blocks: 1		29/12/2008
Woodside Energy Ltd*				
BHP Billiton Petroleum (North West Shelf) Pty Ltd				
BP Developments Australia Pty Ltd				
ChevronTexaco Australia Pty Ltd				
Shell Development (Australia) Pty Ltd				
Offshore				
Exploration Permit				
Legislation Group: PSLA			Sq km approximate	
WA-1-P R6	Carnarvon Basin	Blocks: 15	Sq Km: 1 328	16/11/2007
Santos Ltd*		22.56		
Apache Northwest Pty Ltd			31.50	
Woodside Energy Ltd			45.94	
WA-18-P R5	Bonaparte Basin	Blocks: 8	Sq Km: 664	01/06/2004
Tern				
Santos Ltd*			62.50	
Bonaparte Gas & Oil Pty Ltd			30.00	
Santos offshore Pty Ltd			7.50	
WA-28-P R6	Carnarvon Basin	Blocks: 14	Sq Km: 1 245	13/02/2007
Eaglehawk, Haycock				
Woodside Energy Ltd*			16.67	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	
WA-33-P R3	Browse Basin	Blocks: 48	Sq Km: 3 985	26/02/2004
Brecknock, Scott Reef				
Woodside Energy Ltd*			50.00	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			8.33	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			8.33	
WA-149-P R3	Carnarvon Basin	Blocks: 9	Sq Km: 703	19/05/2005
Apache Oil Australia Pty Ltd*			48.81	
Pan Pacific Petroleum (South Aust) Pty Ltd			10.00	
Santos (BOL) Pty Ltd			18.71	
TAP (SHELFAL) Pty Ltd			22.48	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
WA-155-P R4	Carnarvon Basin	Blocks: 13		23/02/2009
BHP Billiton (Australia) Pty Ltd*			40.00	
Apache Northwest Pty Ltd			31.50	
Inpex Alpha Ltd			28.50	
WA-191-P R3	Carnarvon Basin	Blocks: 16	Sq Km: 1 328	01/06/2004
Kufpec Australia Pty Ltd*			33.40	
Nippon Oil Exploration (Dampier) Pty Ltd			25.00	
Santos Ltd			33.40	
Woodside Oil Ltd			8.20	
WA-192-P R3	Carnarvon Basin	Blocks: 12	Sq Km: 996	08/07/2004
Tap (Harriet) Pty Ltd*			12.22	
Apache Harriet Pty Ltd			25.00	
Apache Lowendal Pty Ltd			12.50	
Apache Miladin Pty Ltd			7.39	
Apache Nasmah Pty Ltd			1.01	
Apache Northwest Pty Ltd			11.35	
Kufpec Australia Pty Ltd			19.28	
New World Oil & Developments Pty Ltd			0.10	
Texaco Australia Pty Ltd			11.25	
WA-202-P R2	Carnarvon Basin	Blocks: 13	Sq Km: 1 079	03/08/2004
Apache Northwest Pty Ltd*			50.00	
AWE Petroleum Ltd			10.00	
Wandoo Petroleum Pty Ltd			40.00	
WA-205-P R2	Carnarvon Basin	Blocks: 14	Sq Km: 945	03/12/2005
ChevronTexaco Australia Pty Ltd*			28.57	
Mobil Australia Resources Company Pty Ltd			14.29	
Shell Development (Australia) Pty Ltd			28.57	
Texaco Australia Pty Ltd			28.57	
WA-208-P R2	Carnarvon Basin	Blocks: 16	Sq Km: 1 328	03/06/2007
Woodside Energy Ltd*			44.03	
Eni (Australia) Pty Ltd			18.66	
Mosaic Oil NL			7.46	
Santos Offshore Pty Ltd			29.85	
WA-209-P R2	Carnarvon Basin	Blocks: 12	Sq Km: 810	09/11/2005
Apache Northwest Pty Ltd*			33.33	
Globex Far East Pty Ltd			12.50	
Santos Ltd			54.17	
WA-214-P R2	Carnarvon Basin Basin	Blocks: 13	Sq Km: 1 079	06/03/2008
Santos (BOL) Pty Ltd*			45.00	
Apache Northwest Pty Ltd			55.00	
WA-226-P R2	Perth Basin	Blocks: 26		05/03/2008
Apache Northwest Pty Ltd			28.75	
Dana Petroleum (E&P) Ltd			12.81	
Dana Petroleum (WA) LLC			12.66	
Northwest Energy NL			7.50	
Origin Energy Developments Pty Ltd			28.75	
Planet Resources Pty Ltd			4.52	
WA-239-P R1	Browse Basin	Blocks: 57	Sq Km: 4 732	24/05/2004
Nexen Petroleum Australia Pty Ltd*			100.00	
WA-242-P R1	Carnarvon Basin	Blocks: 95	Sq Km: 7 886	14/11/2004
Woodside Energy Ltd*			66.66	
Santos (BOL) Pty Ltd			33.33	
WA-246-P R1	Carnarvon Basin	Blocks: 4	Sq Km: 270	23/10/2005
Apache Northwest Pty Ltd*			45.00	
Globex Far East Pty Ltd			15.00	
Kufpec Australia Pty Ltd			20.00	
Pan Pacific Petroleum (South Aust) Pty Ltd			10.00	
Tap (Harriet) Pty Ltd			10.00	
WA-248-P R1	Carnarvon Basin	Blocks: 17	Sq Km: 3 071	11/06/2005
Woodside Energy Ltd*			45.00	
Kufpec Australia Pty Ltd			35.00	
WA-253-P R1	Carnarvon Basin	Blocks: 11	Sq Km: 2 158	21/02/2007
ChevronTexaco Australia Pty Ltd*			50.00	
Texaco Australia Pty Ltd			50.00	
WA-254-P R1	Carnarvon Basin	Blocks: 4	Sq Km: 249	02/05/2006
Apache Northwest Pty Ltd*			47.89	
First Australian Resources NL			10.71	
Pan Pacific Petroleum NL			2.99	
Sun Resources NL			7.86	
Victoria Petroleum NL			6.17	
Woodside Energy Ltd			24.38	
WA-255-P R1	Carnarvon Basin	Blocks: 46	Sq Km: 3 105	01/08/2005
BHP Billiton Petroleum (North West Shelf) Pty Ltd*			50.00	
Woodside Energy Ltd			50.00	
WA-256-P R1	Carnarvon Basin	Blocks: 8	Sq Km: 664	15/10/2007
Apache Northwest Pty Ltd*			81.68	
Wandoo Petroleum Pty Ltd			18.32	
WA-25-P R1	Carnarvon Basin	Blocks: 6		18/01/2009
Apache Northwest Pty Ltd			40.25	
Kufpec Australia Pty Ltd			30.00	
Sun Resources NL			7.50	
Wandoo Petroleum Pty Ltd			22.25	

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
WA-261-P R1	Carnarvon Basin	Blocks: 6	Sq Km: 415	11/07/2007
Apache Northwest Pty Ltd*			45.13	
Strike Oil NL			42.58	
Sun Resources NL			6.15	
Victoria Petroleum NL			6.15	
WA-264-P R1	Carnarvon Basin	Blocks: 8	Sq Km: 664	03/02/2008
Santos Ltd*			66.70	
Santos offshore Pty Ltd*			66.70	
Idemitsu Oil Exploration (Barrow) Pty Ltd			33.30	
Idemitsu Oil Exploration (Barrow) Pty Ltd			33.30	
WA-267-P	Carnarvon Basin	Blocks: 68	Sq Km: 5 645	19/09/2005
ChevronTexaco Australia Pty Ltd*			25.00	
BP Exploration (Alpha) Ltd			12.50	
Mobil Australia Resources Company Pty Ltd			25.00	
Shell Development (Australia) Pty Ltd			12.50	
Texaco Australia Pty Ltd			25.00	
WA-268-P	Carnarvon Basin	Blocks: 176	Sq Km: 14 610	04/12/2004
Texaco Australia Pty Ltd			100.00	
WA-269-P	Carnarvon Basin	Blocks: 126	Sq Km: 10 460	04/09/2003
Woodside Energy Ltd*			100.00	
WA-271-P R1	Carnarvon Basin	Blocks: 41		24/11/2008
Woodside Energy Ltd*			100.00	
WA-274-P	Browse Basin	Blocks: 69	Sq Km: 5 728	18/02/2005
Santos Ltd*			100.00	
WA-275-P	Browse Basin	Blocks: 56	Sq Km: 4 649	18/08/2004
BHP Billiton Petroleum (North West Shelf) Pty Ltd			20.00	
BP Petroleum Developments (NWS) Pty Ltd			20.00	
ChevronTexaco Australia Pty Ltd			20.00	
Shell Development (Australia) Pty Ltd			20.00	
Woodside Energy Ltd			20.00	
WA-278-P	Bonaparte Basin	Blocks: 30	Sq Km: 2 490	18/05/2007
Kerr-McGee NW Shelf Australia Energy Pty Ltd*			39.00	
EnCana Corporation			34.00	
SK Corporation			10.00	
Tap Oil NL			17.00	
WA-279-P	Bonaparte Basin	Blocks: 39	Sq Km: 3 238	18/08/2004
Blacktip				
Woodside Energy Ltd*			53.86	
Eni (Australia) Pty Ltd			46.15	
WA-280-P	Bonaparte Basin	Blocks: 45	Sq Km: 3 736	18/08/2004
Woodside Energy Ltd*			35.00	
Eni (Australia) Pty Ltd			30.00	
WA-281-P	Browse Basin	Blocks: 56	Sq Km: 4 649	18/02/2005
Santos offshore Pty Ltd*			58.97	
Beach Petroleum NL			10.00	
Oil Search (Australia) Pty Ltd			31.03	
WA-285-P	Browse Basin	Blocks: 62	Sq Km: 5 147	18/08/2004
Inpex Browse Ltd*			100.00	
WA-286-P	Perth Basin	Blocks: 210	Sq Km: 17 433	21/02/2005
AWE Oil (WA) NL*			27.50	
Cieco Browse Inc			5.00	
ROC Oil WA Pty Ltd			37.50	
Voyager Ltd			5.00	
Wandoo Petroleum Pty Ltd			25.00	
WA-287-P	Bonaparte Basin	Blocks: 29	Sq Km: 2 075	21/02/2005
Magellan Petroleum (WA) Pty Ltd*			100.00	
WA-288-P	Bonaparte Basin	Blocks: 25	Sq Km: 2 407	21/02/2005
Magellan Petroleum (WA) Pty Ltd*			35.00	
Inpex Browse Ltd			65.00	
WA-290-P	Carnarvon Basin	Blocks: 6	Sq Km: 498	25/07/2005
OMV Barrow Pty Ltd*			100.00	
WA-291-P	Carnarvon Basin	Blocks: 111	Sq Km: 9 214	03/08/2005
Magellan Petroleum (WA) Pty Ltd*			50.00	
TAP (SHELFAL) Pty Ltd			50.00	
WA-293-P	Carnarvon Basin	Blocks: 205	Sq Km: 17 018	03/08/2005
Woodside Energy Ltd*			100.00	
WA-294-P	Carnarvon Basin	Blocks: 117	Sq Km: 9 713	16/08/2005
BP Exploration (Alpha) Ltd*			26.00	
BHP Billiton Petroleum (Australia) Pty Ltd			6.50	
ChevronTexaco Australia Pty Ltd			13.50	
Japan Australia LNG (MIMI) Pty Ltd			20.00	
Shell Development (Australia) Pty Ltd			18.00	
Woodside Energy Ltd			16.00	
WA-296-P	Carnarvon Basin	Blocks: 148	Sq Km: 12 286	16/02/2006
BHP Billiton Petroleum (North West Shelf) Pty Ltd*			16.66	
BP Exploration (Alpha) Ltd			19.00	
ChevronTexaco Australia Pty Ltd			16.66	
Japan Australia LNG (MIMI) Pty Ltd			16.66	
Shell Development (Australia) Pty Ltd			16.66	
Woodside Energy Ltd			14.33	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)				Equity	Expiry Date
WA-297-P	Carnarvon Basin	Blocks: 131	Sq Km: 10 875		16/08/2005
Woodside Energy Ltd*				16.00	
BHP Billiton Petroleum (North West Shelf) Pty Ltd				6.50	
BP Exploration (Alpha) Ltd				26.00	
ChevronTexaco Australia Pty Ltd				13.50	
Japan Australia LNG (MIMI) Pty Ltd				20.00	
Shell Development (Australia) Pty Ltd				18.00	
WA-301-P	Browse Basin	Blocks: 92	Sq Km: 7 665		24/07/2006
BHP Billiton Petroleum (North West Shelf) Pty Ltd*				50.00	
Kerr-McGee NW Shelf Australia Energy Pty Ltd				50.00	
WA-302-P	Browse Basin	Blocks: 53	Sq Km: 4 417		24/07/2006
BHP Billiton Petroleum (North West Shelf) Pty Ltd*				33.33	
Kerr-McGee Exploration and Production Australia Pty Ltd				33.33	
Texaco Copernicus P/L				33.33	
WA-303-P	Browse Basin	Blocks: 63	Sq Km: 5 236		24/07/2006
BHP Billiton Petroleum (North West Shelf) Pty Ltd*				33.33	
Kerr-McGee NW Shelf Australia Energy Pty Ltd				33.33	
Texaco Barcoo Pty Ltd				33.33	
WA-304-P	Browse Basin	Blocks: 42	Sq Km: 3 491		24/07/2006
BHP Billiton Petroleum (North West Shelf) Pty Ltd*				50.00	
Kerr-McGee NW Shelf Australia Energy Pty Ltd				50.00	
WA-305-P	Browse Basin	Blocks: 63	Sq Km: 5 222		24/07/2006
BHP Billiton Petroleum (North West Shelf) Pty Ltd*				33.33	
Kerr-McGee NW Shelf Australia Energy Pty Ltd				33.33	
Texaco Barcoo Pty Ltd				33.33	
WA-306-P	Browse Basin	Blocks: 56	Sq Km: 4 629		24/07/2006
Antrim Energy Australia Inc.*				37.50	
Magellan Petroleum (WA) Pty Ltd				37.50	
Rawson Resources NL				25.00	
WA-307-P	Browse Basin	Blocks: 42	Sq Km: 3 462		22/08/2006
Antrim Energy Australia P/L*				37.50	
Magellan Petroleum (WA) Pty Ltd				37.50	
Rawson Resources NL				25.00	
WA-308-P	Carnarvon Basin	Blocks: 5	Sq Km: 400		11/06/2007
OMV Timor Sea Pty Ltd*				80.00	
OMV Petroleum Pty Ltd				20.00	
WA-309-P	Carnarvon Basin	Blocks: 5	Sq Km: 270		11/06/2007
OMV Timor Sea Pty Ltd*				80.00	
OMV Petroleum Pty Ltd				20.00	
WA-310-P	Carnarvon Basin	Blocks: 23	Sq Km: 1 852		20/08/2007
West Oil NL*				50.00	
Bounty Oil & Gas NL				50.00	
WA-311-P	Browse Basin	Blocks: 24	Sq Km: 1 999		02/09/2007
Inpex Alpha Ltd*				65.00	
Magellan Petroleum (WA) Pty Ltd				35.00	
WA-312-P	Carnarvon Basin	Blocks: 23	Sq Km: 1 849		17/09/2007
Victoria Petroleum (WA-209-P) Pty Ltd*				18.33	
Pan Continental Oil and Gas NL				33.33	
Strike Oil NL				15.00	
Sun Resources NL				33.33	
WA-313-P	Bonaparte Basin	Blocks: 28	Sq Km: 2 040		24/09/2007
Penguin					
Woodside Energy Ltd*				33.34	
Eni Australia BV				33.33	
Shell Development (Australia) Pty Ltd				33.33	
WA-314-P	Browse Basin	Blocks: 24	Sq Km: 1 959		11/11/2007
Liberty Petroleum Corporation*				100.00	
WA-315-P	Browse Basin	Blocks: 24	Sq Km: 1 996		11/11/2007
Liberty Petroleum Corporation*				100.00	
WA-316-P	Bonaparte Basin	Blocks: 27	Sq Km: 1 675		05/12/2001
Ashmore Oil Pty Ltd*				100.00	
WA-317-P	Bonaparte Basin	Blocks: 27	Sq Km: 2 246		12/12/2007
Drillsearch Energy NL*				100.00	
WA-318-P	Bonaparte Basin	Blocks: 40	Sq Km: 3 327		12/12/2007
Drillsearch Energy NL*				100.00	
WA-319-P	Bonaparte Basin	Blocks: 28	Sq Km: 2 323		12/12/2007
Drillsearch Energy NL*				100.00	
WA-320-P	Carnarvon Basin	Blocks: 4	Sq Km: 311		13/03/2008
OMV Timor Sea Pty Ltd*				80.00	
OMV Petroleum Pty Ltd				20.00	
WA-321-P	Carnarvon Basin	Blocks: 7	Sq Km: 563		21/03/2008
Octanex NL*				50.00	
Strata Resources NL				50.00	
WA-322-P	Carnarvon Basin	Blocks: 9	Sq Km: 719		21/03/2008
Octanex NL*				50.00	
Strata Resources NL				50.00	
WA-323-P	Carnarvon Basin	Blocks: 4	Sq Km: 322		21/03/2008
Octanex NL*				50.00	
Strata Resources NL				50.00	
WA-324-P	Bonaparte Basin	Blocks: 30			04/07/2008
Daytona Energy Corporation*				100.00	

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
WA-325-P	Perth Basin	Blocks: 90		23/07/2008
ROC Oil WA Pty Ltd*			37.50	
Apache Northwest Pty Ltd			37.50	
Bounty Oil & Gas NL			10.00	
Voyager (PB) Ltd			15.00	
WA-326-P	Perth Basin	Blocks: 75		23/07/2008
Eni Australia BV*			100.00	
WA-327-P	Perth Basin	Blocks: 85		23/07/2008
Apache Northwest Pty Ltd*			37.50	
Bounty Oil & Gas NL			10.00	
ROC Oil WA Pty Ltd			37.50	
Voyager (PB) Ltd			15.00	
WA-328-P	Perth Basin	Blocks: 69		24/07/2008
Eni Australia BV*			67.00	
Santos Offshore Pty Ltd			33.00	
WA-329-P	Carnarvon Basin	Blocks: 9		04/09/2008
Octanex NL*			37.50	
Rocky Mountain Minerals			25.00	
Strata Resources NL			37.50	
WA-330-P	Carnarvon Basin	Blocks: 4		04/09/2008
Octanex NL*			50.00	
Strata Resources NL			50.00	
WA-331-P	Browse Basin	Blocks: 37		04/09/2008
Rawson Resources NL*			25.00	
Eagle Bay Resources NL			25.00	
Icon Energy Ltd			25.00	
Rough Range Oil Pty Ltd			25.00	
WA-332-P	Browse Basin	Blocks: 38		30/09/2008
Batavia Oil & Gas Pty Ltd*			35.00	
Alpha Oil & Gas PL			20.00	
Goldborough Energy Pty Ltd			10.00	
Hawkestone Oil Pty Ltd			35.00	
WA-333-P	Browse Basin	Blocks: 36		30/09/2008
Batavia Oil & Gas Pty Ltd*			35.00	
Alpha Oil & Gas PL			25.00	
Goldborough Energy Pty Ltd			10.00	
Hawkestone Oil Pty Ltd			35.00	
WA-334-P	Carnarvon Basin	Blocks: 4		16/12/2008
Apache Northwest Pty Ltd*			80.00	
Tap (Harriet) Pty Ltd			20.00	
WA-335-P	Carnarvon Basin	Blocks: 39		16/12/2008
Apache Northwest Pty Ltd*			65.00	
Kufpec Australia Pty Ltd			35.00	
WA-336-P	Perth Basin	Blocks: 83		17/12/2008
Petroz NL*			100.00	
WA-337-P	Perth Basin	Blocks: 49		14/01/2009
Kerr-McGee NW Shelf Energy Australia Pty Ltd*			100.00	
WA-338-P	Browse Basin	Blocks: 33		14/01/2009
Santos Offshore Pty Ltd*			71.50	
SK Corporation			28.50	
WA-339-P	Perth Basin	Blocks: 74		14/01/2009
Santos Offshore Pty Ltd*			50.00	
Kerr-McGee NW Shelf Energy Australia Pty Ltd			50.00	
WA-340-P	Carnarvon Basin	Blocks: 6		05/03/2008
Strike Oil NL*			40.00	
Pan Continental Oil and Gas NL			20.00	
Sun Resources NL			20.00	
Victoria Petroleum (WA-209-P) Pty Ltd			20.00	
WA-341-P	Browse Basin	Blocks: 24		28/05/2009
Batavia Oil & Gas Pty Ltd*			35.00	
Alpha Oil & Natural Gas Pty Ltd			20.00	
Goldborough Energy Pty Ltd			10.00	
Hawkestone Oil Pty Ltd			35.00	
WA-342-P	Browse Basin	Blocks: 42		28/05/2009
Batavia Oil & Gas Pty Ltd*			35.00	
Alpha Oil & Natural Gas Pty Ltd			20.00	
Goldborough Energy Pty Ltd			10.00	
Hawkestone Oil Pty Ltd			35.00	
WA-343-P	Browse Basin	Blocks: 20		10/06/2009
National Oil & Gas Pty Ltd*			100.00	
WA-344-P	Browse Basin	Blocks: 8		10/06/2009
National Oil & Gas Pty Ltd*			100.00	
WA-345-P	Carnarvon Basin	Blocks: 3		10/07/2009
OMV Petroleum Pty Ltd			20.00	
OMV Timor Sea Pty Ltd			80.00	
WA-346-P	Carnarvon Basin	Blocks: 49		15/07/2009
BHP Billiton Petroleum (North West Shelf) Pty Ltd*			100.00	
WA-347-P	Carnarvon Basin	Blocks: 65		25/09/2009
Woodside Energy Ltd*			100.00	
WA-348-P	Carnarvon Basin	Blocks: 67		25/09/2009
Woodside Energy Ltd*			100.00	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
WA-349-P	Perth Basin	Blocks: 15		05/05/2010
Voyager (PB) Ltd*			100.00	
WA-350-P	Carnarvon Basin	Blocks: 10		22/12/2009
Woodside Energy Ltd*			100.00	
WA-351-P	Carnarvon Basin	Blocks: 47		05/01/2010
BHP Billiton Petroleum (North West Shelf) Pty Ltd*			100.00	
Legislation Group: Territorial		Sq km approximate		
TP/ 2 R2	Carnarvon Basin	Blocks: 4	Sq Km: 310	09/05/2003
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos Offshore Pty Ltd Texaco Australia Pty Ltd				
TP/ 6 R2	Carnarvon Basin	Blocks: 15	Sq Km: 1 162	12/10/2003
				Renewal Pending
Apache Northwest Pty Ltd*			100.00	
TP/ 7 R2	Carnarvon Basin	Blocks: 16	Sq Km: 1 247	16/04/2005
Pepper, South Chervil				
Santos (BOL) Pty Ltd*				
Ampolex (PPL) Pty Ltd				
Apache Oil Australia Pty Ltd				
Pan Pacific Petroleum (South Aust) Pty Ltd				
TP/ 8 R2	Carnarvon Basin	Blocks: 16	Sq Km: 1 239	14/11/2004
Cycad				
Apache Northwest Pty Ltd*				
Apache Harriet Pty Ltd				
Apache Lowendal Pty Ltd				
Apache Miladin Pty Ltd				
Apache Nasmah Pty Ltd				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
TP/ 9 R2	Carnarvon Basin	Blocks: 3	Sq Km: 387	09/07/2006
				Renewal Pending
Apache Northwest Pty Ltd*			100.00	
TP/15	Perth Basin	Blocks: 47	Sq Km: 3 902	21/04/2005
AWE (Perth Basin) Ltd*				
Arc Energy NL				
Bounty Oil & Gas NL				
Hardman Oil and Gas Pty Ltd				
ROC Oil WA Pty Ltd				
Voyager (PB) Ltd				
Westranch Holdings Pty Ltd				
TP/17	Carnarvon Basin	Blocks: 6	Sq Km: 498	25/06/2004
Strike Oil NL*			100.00	
TP/18	Carnarvon Basin	Blocks: 1	Sq Km: 70	11/10/2007
Strike Oil NL*				
TAP Oil Limited				
TP/19	Carnarvon Basin	Blocks: 5		20/03/2008
Strike Oil NL*			100.00	
TP/20	Carnarvon Basin	Blocks: 1		02/04/2008
TAP (SHELFAL) Pty Ltd*			100.00	
TP/21	Carnarvon Basin	Blocks: 4		02/04/2008
Rawson Resources NL*				
Eagle Bay Resources NL				
Icon Energy Ltd				
Rough Range Oil Pty Ltd				
Victoria Petroleum (Middle East) Pty Ltd				
TP/22	Bonaparte Basin	Blocks: 38		11/01/2010
Eni Australia BV*			100.00	
EP 325 R2	Carnarvon Basin	Blocks: 21	Sq Km: 1 626	03/08/2004
Victoria Petroleum NL*				
Bonaparte Gulf Oil & Gas Pty Ltd				
Sun Resources NL				
EP 341 R2	Carnarvon Basin	Blocks: 16	Sq Km: 1 239	22/05/2005
TAP (SHELFAL) Pty Ltd*				
Strike Oil NL				
West Oil NL				
EP 342 R2	Carnarvon Basin	Blocks: 7	Sq Km: 1 084	19/04/2005
Apache Northwest Pty Ltd*			100.00	
EP 395 R1	Carnarvon Basin	Blocks: 3	Sq Km: 232	11/02/2007
Apache Northwest Pty Ltd*				
First Australian Resources Limited				
Goodrich Petroleum Company				
Sun Resources NL				
TAP (SHELFAL) Pty Ltd				
EP 397 R1	Carnarvon Basin	Blocks: 2	Sq Km: 135	27/08/2008
TAP (SHELFAL) Pty Ltd*				
First Australian Resources Limited				
Goodrich Petroleum Company				
EP 403 R1	Carnarvon Basin	Blocks: 4	Sq Km: 270	10/12/2007
Apache Northwest Pty Ltd*				
TAP (SHELFAL) Pty Ltd				

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
EP 406	Carnarvon Basin	Blocks: 66	Sq Km: 5 111	28/11/2002
				Renewal Pending
Victoria Diamond Exploration Pty Ltd*				
Euro Pacific Energy Pty Ltd				
EP 409	Carnarvon Basin	Blocks: 2	Sq Km: 155	21/09/2003
				Renewal Pending
Apache Oil Australia Pty Ltd*				
OMV Barrow Pty Ltd				
EP 420	Carnarvon Basin	Blocks: 1	Sq Km: 12	11/10/2007
TAP Oil Limited*				
Strike Oil NL				
EP 421	Carnarvon Basin	Blocks: 8		20/03/2008
Strike Oil NL*			100.00	
EP 423	Carnarvon Basin	Blocks: 6		02/01/2009
Rawson Resources NL*				
Eagle Bay Resources NL				
Icon Energy Ltd				
Rough Range Oil Pty Ltd				
Victoria Petroleum (Middle East) Pty Ltd				
Production Licence				
Legislation Group: PSLA		Sq km approximate		
WA-3-L R1	Carnarvon Basin	Blocks: 5	Sq Km: 415	29/09/2022
Woodside Energy Ltd*			16.67	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	
WA-1-L R1	Carnarvon Basin	Blocks: 5	Sq Km: 415	29/09/2022
Woodside Energy Ltd*			16.67	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Dev (PSC 9) P/L			16.67	
WA-2-L R1	Carnarvon Basin	Blocks: 4	Sq Km: 332	29/09/2022
Woodside Energy Ltd*			16.67	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	
WA-4-L R1	Carnarvon Basin	Blocks: 4	Sq Km: 332	29/09/2022
Woodside Energy Ltd*			16.67	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	
WA-5-L R1	Carnarvon Basin	Blocks: 5	Sq Km: 415	29/09/2022
Woodside Energy Ltd*			16.67	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	
WA-6-L R1	Carnarvon Basin	Blocks: 4	Sq Km: 332	29/09/2022
Woodside Energy Ltd*			23.33	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			15.00	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			13.34	
Shell Development (Australia) Pty Ltd			15.00	
WA-7-L	Carnarvon Basin	Blocks: 2	Sq Km: 155	03/02/2009
Barrow Island				
ChevronTexaco Australia Pty Ltd*			57.14	
Mobil Australia Resources Company Pty Ltd			14.29	
Shebandowan Investments Pty Ltd			28.57	
WA-8-L	Carnarvon Basin	Blocks: 2	Sq Km: 166	16/08/2009
Talisman				
Mobil Australia Resources Company Pty Ltd*			42.63	
Kufpec Australia Pty Ltd			10.00	
Santos Ltd			27.37	
TAP (SHELFAL) Pty Ltd			20.00	
WA-9-L	Carnarvon Basin	Blocks: 1	Sq Km: 83	11/04/2012
Cossack				
Woodside Energy Ltd*			16.66	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
WA-10-L	Carnarvon Basin	Blocks: 4	Sq Km: 310	18/02/2014
Bowers, Chinook/Scindian, Griffin				
BHP Billiton (Australia) Pty Ltd*			45.00	
Inpex Alpha Ltd			20.00	
Mobil Exploration and Producing Australia Pty Ltd			35.00	
WA-11-L	Carnarvon Basin	Blocks: 2	Sq Km: 166	30/09/2014
Wanaea				
Woodside Energy Ltd*			16.66	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	
WA-12-L	Carnarvon Basin	Blocks: 1	Sq Km: 77	13/02/2015
Griffin, Ramilles				
BHP Billiton (Australia) Pty Ltd*			71.43	
Mobil Australia Resources Company Pty Ltd			28.57	
WA-13-L	Carnarvon Basin	Blocks: 3	Sq Km: 232	18/02/2017
East Spar				
Santos (BOL) Pty Ltd*			45.00	
Apache East Spar Pty Ltd			25.00	
Apache Kersail Pty Ltd			5.00	
Apache Oil Australia Pty Ltd			25.00	
WA-14-L	Carnarvon Basin	Blocks: 3	Sq Km: 232	19/03/2017
Wandoo				
Mobil (Legendre) Pty Ltd*			60.00	
Wandoo Petroleum Pty Ltd			40.00	
WA-15-L	Carnarvon Basin	Blocks: 2	Sq Km: 155	25/08/2018
Stag				
Santos Offshore Pty Ltd*			54.17	
Apache Northwest Pty Ltd			33.33	
Globex Far East Pty Ltd			12.50	
WA-16-L	Carnarvon Basin	Blocks: 1	Sq Km: 83	11/09/2018
Hermes, Lambert				
Woodside Energy Ltd*			16.67	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	
WA-17-L	Carnarvon Basin	Blocks: 3	Sq Km: 249	14/01/2020
Athena, North Rankin				
Mobil Australia Resources Company Pty Ltd*			50.00	
Phillips Oil Company Australia			50.00	
WA-18-L	Bonaparte Basin	Blocks: 1	Sq Km: 83	12/05/2020
Laminaria				
BHP Billiton Petroleum (North West Shelf) Pty Ltd*			100.00	
WA-19-L	Carnarvon Basin	Blocks: 2	Sq Km: 166	05/09/2020
Buffalo				
Nexen Petroleum Australia Pty Ltd*			100.00	
WA-20-L	Carnarvon Basin	Blocks: 1	Sq Km: 83	15/11/2020
Legendre				
Woodside Energy Ltd*			45.94	
Apache Northwest Pty Ltd			31.50	
Santos Ltd		22.56		
WA-21-L	Bonaparte Basin	Blocks: 1	Sq Km: 83	25/11/2020
Buffalo				
Nexen Petroleum Australia Pty Ltd*			100.00	
WA-22-L	Carnarvon Basin	Blocks: 1	Sq Km: 77	28/02/2021
East Spar				
Pan Canadian Petroleum Ltd*			40.00	
Eni (Australia) Pty Ltd			30.00	
Mobil Australia Resources Company Pty Ltd			20.00	
Tap West Pty Ltd			10.00	
WA-23-L	Carnarvon Basin	Blocks: 1	Sq Km: 81	12/09/2022
Echo, Yodel				
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	
Woodside Eastern Energy Pty Ltd			16.67	
WA-24-L	Carnarvon Basin	Blocks: 1	Sq Km: 81	12/09/2022
Rankin				
Shell Development (Australia) Pty Ltd*			16.67	
BHP Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Woodside Eastern Energy Pty Ltd			16.67	

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
WA-25-L	Carnarvon Basin	Blocks: 5		20/06/3002
Eni Australia Ltd*			65.00	
Mobil Australia Resources Company Pty Ltd			20.00	
Tap West Pty Ltd			15.00	
Legislation Group: Territorial		Sq km approximate		
TL/1	Carnarvon Basin	Blocks: 5	Sq Km: 387	06/11/2006
Bambra, Harriet, Ulidia				
Apache Northwest Pty Ltd*				
Apache Harriet Pty Ltd				
Apache Lowendal Pty Ltd				
Apache Miladin Pty Ltd				
Apache Nasmah Pty Ltd				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
TL/2	Carnarvon Basin	Blocks: 5	Sq Km: 387	25/11/2008
Chervil, North Herald, South Pepper				
Apache Airlie Pty Ltd*				
Ampolex (PPL) Pty Ltd				
Apache Oil Australia Pty Ltd				
Pan Pacific Petroleum (South Aust) Pty Ltd				
Santos (BOL) Pty Ltd				
TL/3	Carnarvon Basin	Blocks: 7	Sq Km: 542	03/02/2009
Barrow Island				
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos offshore Pty Ltd				
Texaco Australia Pty Ltd				
TL/4	Carnarvon Basin	Blocks: 4	Sq Km: 310	14/11/2010
Cowle, Saladin				
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos offshore Pty Ltd				
Texaco Australia Pty Ltd				
TL/5	Carnarvon Basin	Blocks: 3	Sq Km: 232	03/11/2012
Campbell, Orpheus, Sinbad				
Apache Northwest Pty Ltd*				
Apache Harriet Pty Ltd				
Apache Lowendal Pty Ltd				
Apache Miladin Pty Ltd				
Apache Nasmah Pty Ltd				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
TL/6	Carnarvon Basin		Sq Km: 321	03/11/2012
Agincourt, Alkimos, Rosette				
Apache Northwest Pty Ltd*				
Apache Harriet Pty Ltd				
Apache Lowendal Pty Ltd				
Apache Miladin Pty Ltd				
Apache Nasmah Pty Ltd				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
TL/7	Carnarvon Basin	Blocks: 2	Sq Km: 155	15/12/2014
Roller, Skate				
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos offshore Pty Ltd				
Texaco Australia Pty Ltd				
TL/8	Carnarvon Basin	Blocks: 4	Sq Km: 310	20/09/2019
Wonnich				
Apache Northwest Pty Ltd*				
Apache Harriet Pty Ltd				
Apache Lowendal Pty Ltd				
Apache Miladin Pty Ltd				
Apache Nasmah Pty Ltd				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
TL/9	Carnarvon Basin	Blocks: 1		28/11/2023
Apache Northwest Pty Ltd*				
Apache Harriet Pty Ltd				
Apache Lowendal Pty Ltd				
Apache Miladin Pty Ltd				
Apache Nasmah Pty Ltd				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
Retention Lease				
Legislation Group: PSLA		Sq km approximate		
WA-1-R R2	Carnarvon Basin	Blocks: 9	Sq Km: 727	03/08/2004
Scarborough				
BHP Billiton Petroleum (North West Shelf) Pty Ltd*			50.00	
Esso Australia Resources Ltd			50.00	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
WA-2-R R2	Carnarvon Basin	Blocks: 10	Sq Km: 830	28/05/2008
ChevronTexaco Australia Pty Ltd*			28.60	
Mobil Australia Resources Company Pty Ltd			14.30	
Shell Development (Australia) Pty Ltd			28.60	
Texaco Australia Pty Ltd			28.60	
WA-3-R R2	Carnarvon Basin	Blocks: 1	Sq Km: 83	28/05/2008
ChevronTexaco Australia Pty Ltd*			28.60	
Mobil Australia Resources Company Pty Ltd			14.29	
Shell Development (Australia) Pty Ltd			28.57	
Texaco Australia Pty Ltd			28.60	
WA-4-R R2	Carnarvon Basin	Blocks: 2	Sq Km: 166	28/05/2008
ChevronTexaco Australia Pty Ltd*			57.14	
Mobil Australia Resources Company Pty Ltd			14.29	
Shell Development (Australia) Pty Ltd			28.57	
WA-5-R R1	Carnarvon Basin	Blocks: 3	Sq Km: 249	08/06/2002
West Tryal Rocks				
ChevronTexaco Australia Pty Ltd*			28.60	
Mobil Australia Resources Company Pty Ltd			14.30	
Shell Development (Australia) Pty Ltd			28.60	
Texaco Australia Pty Ltd			28.60	
WA-6-R	Bonaparte Basin	Blocks: 10	Sq Km: 830	31/01/2005
Petrel				
Bonaparte Gas & Oil Pty Ltd*			44.51	
Alliance Minerals Australia NL			15.00	
Origin Energy Bonaparte Pty Ltd			5.00	
Santos Ltd			35.49	
Santos Offshore Pty Ltd				
WA-7-R R1	Carnarvon Basin	Blocks: 3	Sq Km: 249	08/11/2005
Wilcox				
Woodside Energy Ltd*			16.67	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	
WA-9-R R1	Carnarvon Basin	Blocks: 1	Sq Km: 83	05/08/2007
Dixon				
Woodside Energy Ltd*			16.66	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.66	
ChevronTexaco Australia Pty Ltd			16.66	
Japan Australia LNG (MIMI) Pty Ltd			16.66	
Shell Development (Australia) Pty Ltd			16.66	
WA-10-R R1	Carnarvon Basin	Blocks: 2	Sq Km: 166	11/07/2007
Montague				
Woodside Energy Ltd*			16.67	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			16.67	
BP Developments Australia Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Japan Australia LNG (MIMI) Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			16.67	
WA-12-R	Carnarvon Basin	Blocks: 5	Sq Km: 415	12/10/2003
Macedon/Pyrenees				
BHP Billiton (Australia) Pty Ltd*			71.43	
Mobil Australia Resources Company Pty Ltd			28.57	
WA-13-R	Bonaparte Basin	Blocks: 2	Sq Km: 134	18/10/2005
Turtle				
OMV Timor Sea Pty Ltd*			52.90	
Basin Oil NL			23.50	
Frontier Exploration Ltd			5.90	
OMV Petroleum Pty Ltd			17.70	
WA-14-R	Carnarvon Basin	Blocks: 1	Sq Km: 81	08/11/2005
Chrysaor				
ChevronTexaco Australia Pty Ltd*			57.14	
Mobil Australia Resources Company Pty Ltd			14.29	
Shell Development (Australia) Pty Ltd			28.57	
WA-15-R	Carnarvon Basin	Blocks: 4	Sq Km: 322	19/04/2006
Chrysaor				
ChevronTexaco Australia Pty Ltd*			100.00	
WA-16-R	Carnarvon Basin	Blocks: 2		22/08/2007
Iago				
ChevronTexaco Australia Pty Ltd*			28.57	
Mobil Australia Resources Company Pty Ltd			14.29	
Shell Development (Australia) Pty Ltd			28.57	
Texaco Australia Pty Ltd			28.57	
WA-17-R	Carnarvon Basin	Blocks: 2		01/10/2007
Iago				
Texaco Australia Pty Ltd*			50.00	
ChevronTexaco Australia Pty Ltd			50.00	

Title / *Accumulation* / Company (Operator*)			Equity	Expiry Date
WA-18-R	Carnarvon Basin	Blocks: 27		29/10/2007
Jansz				
Mobil Exploration and Producing Australia Pty Ltd*			50.00	
Texaco Australia Pty Ltd			50.00	
WA-19-R	Carnarvon Basin	Blocks: 1		17/08/2008
ChevronTexaco Australia Pty Ltd*			50.00	
Texaco Australia Pty Ltd			50.00	
WA-20-R	Carnarvon Basin	Blocks: 1		17/08/2008
ChevronTexaco Australia Pty Ltd*			50.00	
Texaco Australia Pty Ltd			50.00	
WA-21-R	Carnarvon Basin	Blocks: 1		17/08/2008
ChevronTexaco Australia Pty Ltd*			50.00	
Texaco Australia Pty Ltd			50.00	
WA-22-R	Carnarvon Basin	Blocks: 4		17/08/2003
ChevronTexaco Australia Pty Ltd*			25.00	
BP Exploration (Alpha) Ltd			12.50	
Mobil Australia Resources Company Pty Ltd			25.00	
Shell Development (Australia) Pty Ltd			12.50	
Texaco Australia Pty Ltd			25.00	
WA-23-R	Carnarvon Basin	Blocks: 1		17/08/2008
ChevronTexaco Australia Pty Ltd*			25.00	
BP Exploration (Alpha) Ltd			12.50	
Mobil Australia Resources Company Pty Ltd			25.00	
Shell Development (Australia) Pty Ltd			12.50	
Texaco Australia Pty Ltd			25.00	
WA-24-R	Carnarvon Basin	Blocks: 6		17/08/2008
ChevronTexaco Australia Pty Ltd*			25.00	
BP Exploration (Alpha) Ltd			12.50	
Mobil Australia Resources Company Pty Ltd			25.00	
Shell Development (Australia) Pty Ltd			12.50	
Texaco Australia Pty Ltd			25.00	
WA-25-R	Carnarvon Basin	Blocks: 9		17/08/2008
ChevronTexaco Australia Pty Ltd*			25.00	
BP Exploration (Alpha) Ltd			12.50	
Mobil Australia Resources Company Pty Ltd			25.00	
Shell Development (Australia) Pty Ltd			12.50	
Texaco Australia Pty Ltd			25.00	
WA-26-R	Carnarvon Basin	Blocks: 9		17/08/2003
ChevronTexaco Australia Pty Ltd*			25.00	
BP Exploration (Alpha) Ltd			12.50	
Mobil Australia Resources Company Pty Ltd			25.00	
Shell Development (Australia) Pty Ltd			12.50	
Texaco Australia Pty Ltd			25.00	
WA-27-R	Carnarvon Basin	Blocks: 4		28/10/2008
Santos Ltd*			62.50	
Bonaparte Gas & Oil Pty Ltd			30.00	
Santos Offshore Pty Ltd			7.50	
WA-28-R	Carnarvon Basin	Blocks: 4		29/12/2008
Woodside Energy Ltd*			20.00	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			20.00	
BP Petroleum Developments (NWS) Pty Ltd			20.00	
ChevronTexaco Australia Pty Ltd			20.00	
Shell Development (Australia) Pty Ltd			20.00	
WA-29-R	Carnarvon Basin	Blocks: 2		29/12/2008
Woodside Energy Ltd*			20.00	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			20.00	
BP Petroleum Developments (NWS) Pty Ltd			20.00	
ChevronTexaco Australia Pty Ltd			20.00	
Shell Development (Australia) Pty Ltd			20.00	
WA-30-R	Carnarvon Basin	Blocks: 13		29/12/2008
Woodside Energy Ltd*			50.00	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			8.30	
BP Petroleum Developments (NWS) Pty Ltd			16.60	
ChevronTexaco Australia Pty Ltd			16.60	
Shell Development (Australia) Pty Ltd			8.30	
WA-31-R	Carnarvon Basin	Blocks: 11		29/12/2008
Woodside Energy Ltd*			50.60	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			8.30	
BP Petroleum Developments (NWS) Pty Ltd			16.00	
ChevronTexaco Australia Pty Ltd			16.60	
Shell Development (Australia) Pty Ltd			8.30	
WA-32-R	Carnarvon Basin	Blocks: 6		29/12/2008
Woodside Energy Ltd*			50.00	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			8.33	
BP Petroleum Developments (NWS) Pty Ltd			16.67	
ChevronTexaco Australia Pty Ltd			16.67	
Shell Development (Australia) Pty Ltd			8.30	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / Accumulation / Company (Operator*)			Equity	Expiry Date
Legislation Group: Territorial		Sq km approximate		
TR/1	Carnarvon Basin	Blocks: 2	Sq Km: 160	31/01/2004
Errol				
Apache Northwest Pty Ltd*				
Apache Harriet Pty Ltd				
Apache Lowendal Pty Ltd				
Apache Miladin Pty Ltd				
Apache Nasmah Pty Ltd				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
TR/2	Carnarvon Basin	Blocks: 1	Sq Km: 80	31/01/2004 Renewal Pending
Apache Northwest Pty Ltd*				
Apache Harriet Pty Ltd				
Apache Lowendal Pty Ltd				
Apache Miladin Pty Ltd				
Apache Nasmah Pty Ltd				
Kufpec Australia Pty Ltd				
Tap (Harriet) Pty Ltd				
TR/3	Carnarvon Basin	Blocks: 2	Sq Km: 30	19/11/2006
Blencathra				
Apache Northwest Pty Ltd*			100.00	
TR/4	Carnarvon Basin	Blocks: 1		28/07/2007
Koolinda				
ChevronTexaco Australia Pty Ltd*				
Mobil Australia Resources Company Pty Ltd				
Santos Offshore Pty Ltd				
Texaco Australia Pty Ltd				
TR/5	Browse Basin	Blocks: 13		29/12/2008
Woodside Energy Ltd*				
BHP Billiton Petroleum (North West Shelf) Pty Ltd				
BP Developments Australia Pty Ltd				
ChevronTexaco Australia Pty Ltd				
Northern Territory				
Onshore				
Exploration Permit				
Legislation Group: Territorial		Sq km approximate		
EP 69	Amadeus Basin	Blocks: 18	Sq Km: 1 394	12/07/2006
IOR Exploration (NT) Pty Ltd*			36.72	
Innovative Technological Geo-Exploration Pty Ltd			35.28	
Moroil Pty Ltd			28.00	
EP 76	Georgina Basin	Blocks: 61	Sq Km: 4 986	07/03/2006
Sweetpea Corporation Pty Ltd*			100.00	
EP 97	Eromanga Basin	Blocks: 147	Sq Km: 11 377	20/10/2006
Rawson Resources NL*			100.00	
EP 98	Georgina Basin	Blocks: 139	Sq Km: 11 519	
Sweetpea Corporation Pty Ltd*			100.00	
EP 99	Georgina Basin	Blocks: 32	Sq Km: 2 609	
Sweetpea Corporation Pty Ltd*			100.00	
Production Licence				
Legislation Group: Territorial		Sq km approximate		
L3	Amadeus Basin		Sq Km: 616	08/11/2003
Palm Valley				
Magellan Petroleum (NT) Pty Ltd*			52.02	
Canso Resources Ltd			15.38	
Farmout Drillers NL			9.38	
Santos Exploration Pty Ltd			9.60	
Santos Ltd			13.62	
L4	Amadeus Basin		Sq Km: 123	17/11/2023
Mereenie				
United Oil & Gas Co (NT) Pty Ltd*				
Canso Resources Ltd			15.00	
Farmout Drillers NL			6.25	
Magellan Petroleum (NT) Pty Ltd			35.00	
Moonie Oil Co Ltd			21.00	
Petromin NL			7.50	
Santos Exploration Pty Ltd			6.25	
Transoil Pty Ltd			9.00	
L5	Amadeus Basin		Sq Km: 158	17/11/2023
Mereenie				
Magellan Petroleum (NT) Pty Ltd*			35.00	
Canso Resources Ltd			15.00	
Farmout Drillers Pty Ltd			6.25	
Oilmin NT Resources Pty Ltd			21.00	
Petromin Pty Ltd			7.50	
Santos Exploration Pty Ltd			6.25	
Transoil (NT) Pty Ltd			9.00	

Title / Accumulation / Company (Operator*)			Equity	Expiry Date
Retention Lease				
Legislation Group: Territorial		Sq km approximate		
RL 1	Bonaparte Basin	Blocks: 2	Sq Km: 166	03/06/2006
Weaber				
Amity Oil NL*				
Kimberley Energy Group Pty Ltd			100.00	
RL 2	Amadeus Basin	Blocks: 6	Sq Km: 465	26/10/2003
Dingo				
Santos Ltd*			30.43	
Canso Resources Ltd			5.14	
Farmout Drillers Pty Ltd			5.50	
Magellan Petroleum (NT) Pty Ltd			34.34	
Moonie Oil Pty Ltd			3.56	
Petromin Pty Ltd			0.02	
Santos Exploration Pty Ltd			19.45	
Transoil Pty Ltd			1.53	
Offshore				
Exploration Permit				
Legislation Group: PSLA		Sq km approximate		
NT/P48	Bonaparte Basin	Blocks: 74	Sq Km: 12 369	02/06/2007
Evans Shoal				
Shell Development (Australia) Pty Ltd*			50.00	
Osaka Gas Australia Pty Ltd			10.00	
Santos (NGA) Pty Ltd			40.00	
NT/P55	Bonaparte Basin	Blocks: 3	Sq Km: 7 720	18/01/2005
Sunrise				
Woodside Energy Ltd*			26.66	
Osaka Gas Australia Pty Ltd			10.00	
Phillips STL Pty Ltd			30.00	
Shell Development (Australia) Pty Ltd			33.33	
NT/P57	Bonaparte Basin	Blocks: 51	Sq Km: 4 234	18/01/2005
Woodside Energy Ltd*				
AGIP Australia Ltd				
Shell Development (Australia) Pty Ltd				
NT/P59	Money Shoal Basin	Blocks: 100	Sq Km: 8 301	16/08/2005
Nexen Petroleum Australia Pty Ltd*			100.00	
NT/P60	Money Shoal Basin	Blocks: 112	Sq Km: 9 298	16/08/2005
TSP Arafura Petroleum Pty Ltd*			75.00	
Oz-Exoil NL			25.00	
NT/P61	Bonaparte Basin	Blocks: 63	Sq Km: 5 299	13/11/2007
Santos offshore Pty Ltd*			100.00	
NT/P62	Bonaparte Basin	Blocks: 56		19/09/2008
National Oil & Gas Pty Ltd*			35.00	
Australian Natural Gas PL			35.00	
Nations Natural Gas Pty Ltd			30.00	
NT/P63	Bonaparte Basin	Blocks: 37		19/09/2008
National Oil & Gas Pty Ltd*			35.00	
Australian Natural Gas PL			35.00	
Nations Natural Gas Pty Ltd			30.00	
NT/P64	Bonaparte Basin	Blocks: 50		19/09/2008
Bonaparte				
National Oil & Gas Pty Ltd*			35.00	
Australian Natural Gas PL			35.00	
Nations Natural Gas Pty Ltd			30.00	
NT/P65	Bonaparte Basin	Blocks: 56		21/04/2009
National Oil & Gas Pty Ltd*			35.00	
Australian Natural Gas Pty Ltd			35.00	
Nations Natural Gas Pty Ltd			30.00	
NT/P66	Bonaparte Basin	Blocks: 47		25/06/2009
Nexus Energy (Aust.) NL*			100.00	
NT/P67	Bonaparte Basin	Blocks: 43		14/09/2009
Santos Offshore Pty Ltd*			100.00	
NT/P68	Bonaparte Basin	Blocks: 140		22/02/2010
TSP Arafura Petroleum Pty Ltd*			50.00	
Oz-Exoil NL				
Retention Lease				
Legislation Group: PSLA		Sq km approximate		
NT/RL1	Bonaparte Basin	Blocks: 9	Sq Km: 747	31/01/2005
Petrel				
Santos Ltd*			35.49	
Bonaparte Gas & Oil Pty Ltd			44.51	
Origin Energy Bonaparte Pty Ltd			5.00	
Santos Offshore Pty Ltd			15.00	
NT/RL2 R1	Bonaparte Basin	Blocks: 22		16/01/2007
Sunrise, Troubadour				
Woodside Energy Ltd*			35.00	
Osaka Gas Australia Pty Ltd			10.00	
Phillips STL Pty Ltd			30.00	
Shell Development (Australia) Pty Ltd			25.00	

KEY TO PETROLEUM EXPLORATION AND DEVELOPMENT TITLES

Title / Accumulation / Company (Operator*)			Equity	Expiry Date
NT/RL3	Bonaparte Basin	Blocks: 1	Sq Km: 67	18/03/2006
Barnett				
OMV Timor Sea Pty Ltd*			75.00	
Basin Oil NL			20.00	
Frontier Bonaparte Pty Ltd			5.00	
Territory of Ashmore and Cartier Islands Adjacent Area Offshore				
Exploration Permit				
Legislation Group: PSLA			Sq km approximate	
AC/P4 R4	Bonaparte Basin	Blocks: 17	Sq Km: 494	13/08/2007
Woodside Energy Ltd*			80.00	
OMV Timor Sea Pty Ltd			20.00	
AC/P8 R4	Bonaparte Basin	Blocks: 12	Sq Km: 996	07/04/2007 Renewal Pending
Woodside Energy Ltd*			75.00	
Shell Development (Australia) Pty Ltd			25.00	
AC/P17	Bonaparte Basin	Blocks: 7	Sq Km: 581	08/07/2007
Audacious, Tenacious				
OMV Timor Sea Pty Ltd*			35.00	
Cosmo Oil Ashmore Ltd			35.00	
Woodside Energy Ltd			30.00	
AC/P19	Bonaparte Basin	Blocks: 18	Sq Km: 1 494	29/05/2003
Sahul Shoals				
Odyssey International Pty Ltd*			80.00	
Indo-Pacific Energy Australia Ltd			20.00	
AC/P20	Bonaparte Basin	Blocks: 18	Sq Km: 1 494	29/07/2005
Maple				
Coastal Oil & Gas Australia 20 Pty Ltd*			50.00	
Newfield Australia (Cartier) Pty Ltd			40.00	
Todd Petroleum Australia Ltd			10.00	
AC/P21	Bonaparte Basin	Blocks: 19	Sq Km: 1 577	29/10/2004
East Swan, Eclipse, Swan				
Coastal Oil & Gas Australia 21 Pty Ltd*			57.00	
AGIP Australia Ltd			43.00	
AC/P22	Bonaparte Basin	Blocks: 22	Sq Km: 1 826	29/09/2003
Puffin				
Ashmore Oil Pty Ltd*			50.00	
Westranch Holdings Pty Ltd			50.00	
AC/P23	Bonaparte Basin	Blocks: 2	Sq Km: 172	28/02/2004
Crux, Keeling, Maret				
Crux S.A.*			100.00	
AC/P24	Bonaparte Basin	Blocks: 20	Sq Km: 1 660	25/11/2004
OMV Timor Sea Pty Ltd*			38.47	
EnCana International (Australia) Pty Ltd			38.46	
Wandoo Petroleum Pty Ltd			23.08	
AC/P25	Bonaparte Basin	Blocks: 14	Sq Km: 1 162	25/10/2005
Bounty Oil & Gas NL*			100.00	
AC/P26	Bonaparte Basin	Blocks: 5	Sq Km: 415	25/05/2005
West Oil NL*			50.00	
Indo-Pacific Energy Australia Ltd			5.00	
Trans-Orient Petroleum Ltd			45.00	
AC/P27	Bonaparte Basin	Blocks: 14	Sq Km: 1 162	25/06/2005
Bounty Oil & Gas NL*			100.00	
AC/P30	Browse Basin	Blocks: 49	Sq Km: 4 068	16/12/2004
BHP Billiton (Australia) Pty Ltd*			66.67	
EnCana International (Australia) Pty Ltd			33.33	
AC/P31	Bonaparte Basin	Blocks: 1	Sq Km: 83	11/09/2005
Odyssey International Pty Ltd*			80.00	
Indo-Pacific Energy Australia Ltd			20.00	
AC/P32	Bonaparte Basin	Blocks: 13	Sq Km: 1 079	27/02/2007
Daytona Energy Corporation*			18.00	
Eagle Bay Resources NL			30.00	
West Oil NL			18.00	
Westranch Holdings Pty Ltd			34.00	
Production Licence				
Legislation Group: PSLA			Sq km approximate	
AC/L1	Bonaparte Basin	Blocks: 4	Sq Km: 332	16/07/2022
Jabiru, Pengana				
Anadarko Australia Company Pty Ltd			14.69	
Coogee Resources Pty Ltd			50.00	
Mobil Australia Resources Company Pty Ltd			6.25	
OMV Petroleum Pty Ltd			18.75	
Santos Offshore Pty Ltd			10.31	
AC/L2	Bonaparte Basin	Blocks: 4	Sq Km: 332	16/07/2006
Challis, Jabiru				
Anadarko Australia Company Pty Ltd			14.69	
Coogee Resources Pty Ltd			50.00	
Mobil Australia Resources Company Pty Ltd			6.25	
OMV Petroleum Pty Ltd			18.75	
Santos Offshore Pty Ltd			10.31	

Title / Accumulation / Company (Operator*)			Equity	Expiry Date
AC/L3	Bonaparte Basin	Blocks: 9	Sq Km: 747	28/01/2009
Cassini, Challis				
Anadarko Australia Company Pty Ltd			14.69	
Coogee Resources Pty Ltd			50.00	
Mobil Australia Resources Company Pty Ltd			6.25	
OMV Petroleum Pty Ltd			18.75	
Santos Offshore Pty Ltd			10.31	
AC/L5	Bonaparte Basin	Blocks: 2	Sq Km: 166	05/02/2018
Corallina, Laminaria				
Woodside Energy Ltd*			50.00	
BHP Billiton Petroleum (North West Shelf) Pty Ltd			25.00	
Shell Development (Australia) Pty Ltd			25.00	
Retention Lease				
Legislation Group: PSLA			Sq km approximate	
AC/RL1	Bonaparte Basin	Blocks: 1	Sq Km: 83	31/01/2005
Talbot				
Ashmore Oil Pty Ltd*			100.00	
AC/RL3	Bonaparte Basin	Blocks: 3	Sq Km: 249	21/02/2007
Bilyara, Montara, Tahbilk				
Coogee Resources (AC) Pty Ltd*			50.00	
Coogee Resources Pty Ltd			50.00	
Joint Petroleum Development Area Offshore				
Exploration Permit				
Legislation Group: JPDA			Sq km approximate	
JPDA 03-01	Bonaparte Basin		Sq Km: 1 225	08/01/2022
Jahal				
Woodside Petroleum (Timor Sea 1) Pty Ltd*			40.00	
Inpex Timor Sea Ltd			35.00	
Santos (JPDA 91-01) Pty Ltd			25.00	
JPDA 03-12	Bonaparte Basin		Sq Km: 1 470	06/02/2022
Bayu/Undan, Elang, Flamingo, Kakatua				
ConocoPhillips Petroleum (03-12) Pty Ltd*			46.71	
Emet Pty Ltd			1.58	
Inpex Sahul Ltd			19.07	
Petroz (Timor Sea) Pty Ltd			13.37	
Santos (JPDA 91-12) Pty Ltd			19.27	
JPDA 03-13	Bonaparte Basin		Sq Km: 1 406	13/11/2026
Bayu/Undan, Fohn				
ConocoPhillips JPDA Pty Ltd*			37.50	
ConocoPhillips (03-13) Pty Ltd			13.13	
Eni JPDA 03-13 Ltd			26.87	
Tokyo Timor Sea Resources Pty Ltd			22.50	
JPDA 03-16	Bonaparte Basin		Sq Km: 2 684	13/11/2026
ConocoPhillips (03-16) Pty Ltd*			66.00	
NWE (ZOCA 96-16) Pty Ltd			14.00	
ZOCA 96-16 Pty Ltd 10.00 ZOCA Pty Ltd			10.00	
JPDA 03-19	Bonaparte Basin		Sq Km: 2 262	13/11/2026
Sunrise, Troubadour				
Woodside Petroleum (Timor Sea 19) Pty Ltd*			27.67	
ConocoPhillips (03-19) Pty Ltd			30.00	
OG ZOCA (95-19) Pty Ltd			10.00	
Shell Development (PSC 19) Pty Ltd			32.33	
JPDA 03-20	Bonaparte Basin		Sq Km: 3 216	13/11/2026
Sunrise				
Woodside Petroleum (Timor Sea 20) Pty Ltd*			26.67	
ConocoPhillips Petroleum (03-20) Pty Ltd			30.00	
OG ZOCA (96-20) Pty Ltd			10.00	
Shell Development (03-20) Pty Ltd			33.33	
JPDA 03-21	Bonaparte Basin		Sq Km: 3 072	25/03/2031
ConocoPhillips (03-21) Pty Ltd*			75.00	
Eni JPDA 03-21 BV 25.00				

Appendix L
2003

Significant Australian offshore oil and gas discoveries up to the end of 2003

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
Cormorant	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
Penguin	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
TIDEPOLE	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
Jupiter (Phillips)	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
Veilfin	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
Mulloway	Esso	19-Feb-89		Gippsland	Oil
Angler	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
Fishburn	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	Feb-04	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
Cornea	Shell	07-Jan-97		Browse	Oil and Gas
KEAST	Woodside	21-Jan-97	not producing	Carnarvon	Gas
WOOLLYBUTT	Mobil	23-Apr-97	Apr-03	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
Sage	Apache	25-Mar-99		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
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
Hoover	Apache	03-Apr-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
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
2003

Australian producing onshore oil and gas discoveries up to the end of 2003

APPENDIX M: AUSTRALIAN PRODUCING ONSHORE 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.

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
Pickanjinnie	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
Duarran	AAO	02-Jul-64	1969	Surat	Oil and Gas
Beaufort	AAO	02-Jul-64	1984	Bowen/Surat	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
Anabranch	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

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
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
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
Toolachee	Delhi	22-Mar-69	1984	Cooper	Gas
Grafton Range	CSR	22-Mar-69	1981	Surat	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
Walyering	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
Barrolka	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	Jimbilly	17-May-78	1982	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
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
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	07-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
Jackson South	Delhi	06-Apr-82	1984	Eromanga	Oil
Newington	Hartogen	06-Apr-82	1989	Bowen	Gas
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
Yapunyah	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

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
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
Tinpilla	Delhi	14-Dec-83	1984	Eromanga	Oil
Naccowlah West	Delhi	22-Dec-83	1984	Eromanga	Oil
Challum	Delhi	22-Dec-83	1985	Cooper/Eromanga	Oil and Gas
Sigma	Delhi	29-Dec-83	1985	Eromanga	Oil
Tintaburra	Hartogen	31-Dec-83	1984	Eromanga	Oil
Roswin	Bridge	07-Feb-84	1993	Bowen	Gas
Myrtleville	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
Kooroopa	Hartogen	01-Jun-85	1985	Eromanga	Oil
Watson South	Delhi	22-Jun-85	1985	Eromanga	Oil
Kenmore	Lasmo	26-Jun-85	1985	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
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
Gooranie	Delhi	31-Jul-85	1987	Cooper	Gas
Wippo	Delhi	31-Jul-85	2000	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
Fairymount	Sydney Oil	04-Oct-85	1985	Bowen	Oil
Nulla	Delhi	04-Oct-85	1999	Cooper	Gas
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
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	31-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	03-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	01-Apr-87	1999	Cooper	Gas
Maxwell	Pancontinental	06-Apr-87	1987	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
Wingnut	CSR	18-Apr-87	1988	Bowen/Surat	Gas
Caneon	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	18-Jul-87	1996	Cooper	Gas
Kanaloo	Hartogen	19-Jul-87	1987	Bowen/Surat	Gas
Deina	Santos	02-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	08-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
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	11-Apr-88	2000	Cooper	Gas
Kujani	Santos	09-May-88	1991	Cooper	Gas
Narie	Santos	09-May-88	1990	Cooper	Oil and Gas
Taloola	Santos	30-May-88	1988	Eromanga	Oil
Tarbat	Hartogen	15-Jun-88	1988	Eromanga	Oil
Sturt	Santos	05-Jul-88	1988	Cooper/Eromanga	Oil and Gas
Varanus	Santos	06-Jul-88	1991	Cooper	Gas
Tantanna	Santos	23-Jul-88	1989	Eromanga	Oil
James	Santos	05-Sep-88	1989	Cooper	Oil
Kirralee	Santos	31-Oct-88	1991	Cooper	Gas
Arrakis	Santos	04-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	27-Jan-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

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
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	22-Feb-90	1996	Cooper	Gas
North Yardanogo	Barrack	02-Mar-90	1990	Perth	Oil
Moolalla	Santos	14-Apr-90	1990	Cooper	Gas
Caraka	Santos	14-Apr-90	1990	Cooper	Gas
Beharra Springs	Barrack	05-May-90	1990	Perth	Gas
Bottletree	OCA	06-Jul-90	1991	Bowen	Gas
Alisma	Santos	25-Jul-90	1994	Cooper	Gas
Malgoona	Santos	05-Aug-90	1990	Cooper	Oil and Gas
Boundary	Petroleum Securities	16-Aug-90	1990	Canning	Oil
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	19-May-91	1995	Cooper	Gas
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	01-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-Nov-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

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
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	15-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	03-Aug-95	1995	Cooper	Gas
Costa South	Santos	10-Aug-95	1996	Cooper	Gas
Kooroopa 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	02-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
Juno	Santos	09-Dec-96	2002	Cooper	Gas
Judga North	Santos	06-Jan-97	1997	Cooper	Gas
Tarragon	Santos	16-Jan-97	1997	Eromanga	Oil
Merindal	Santos	16-Jan-97	1997	Cooper	Gas
Nephrite	Santos	18-Jan-97	1997	Cooper	Gas
Koree South	Santos	06-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
Moolion North	Santos	05-Sep-98	1998	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
Welcome Lake East	Santos	11-Sep-98	1999	Cooper	Gas
Verona	Santos	03-Nov-98	1999	Cooper	Gas
Moonanga	Santos	04-Nov-98	1999	Cooper	Gas
Yandina	OCA	14-Dec-98	2000	Bowen	Gas
Mica	Santos	17-Dec-98	1999	Cooper	Gas
Raven	Santos	11-Jan-99	1999	Cooper	Gas
Touriga	Santos	31-Jan-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	14-Jan-01	2001	Cooper/Eromanga	Gas
McIntee	Santos	22-Feb-01	2001	Otway	Gas
Moona	Santos	15-Mar-01	2001	Cooper/Eromanga	Gas
Tregony	Santos	15-Mar-01	2001	Otway	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