BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD

Record 1978/79

An Appraisal of Petroleum Exploration Title Areas

NT/P2, NT/P7, NT/P8, NT/P9, NT/P10, NT/P13, NT/P14, NT/P15, July 1975

by

W.J. McAvoy and P.R. Temple

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Contents

SUMMARY

This Record is the result of a brief examination of data relevant to the title areas. All available data have been used in its preparation including confidential company reports, but no original interpretation has been made.

Summaries are given of the regional geology, hydrocarbon potential, geophysical activity, and drilling results in the title areas. Assessments have been made of the prospectivity of the title areas and recommendations are made for further exploration.

The area has been covered by a reconnaissance seismic grid with detail coverage over the various drilling locations. A total of thirteen wells have been drilled and a small uneconomic oilfield has been located within Upper Cretaceous sands at the Puffin location on the southeast flanks of the Ashmore-Sahul Block. Prospects for future discoveries are considered to be best on the Ashmore-Sahul Block, especially the south eastern flank between the Puffin field and Brown Gannet No. 1 well.

INTRODUCTION

This Record is the result of a brief examination of data relevant to the title areas under consideration; only six weeks were allotted to the work.

All available data were used in its preparation and these included reports received under the Petroleum Search Subsidy Act (PSSA) and the Petroleum (Submerged Lands) Act (P(SL)A), review reports from private companies, and BMR data. No original interpretations were made.

Because a large proportion of the data used is confidential and not available to the general public this record must be classified confidential.

REGIONAL SETTING

The area studied covers a triangular shaped area off the northern coast of Western Australia. The island of Timor lies to the north. The area lies on the continental shelf and slope, water depths vary from 50 m (165 ft) near the southern margins of NT/P2 to in excess of 800 m (2625 ft) along the northern margins of the title areas.

Title areas NT/P10, NT/P13, and NT/P5 comprise the B.O.C. Group 'C' title areas and NT/P7, NT/P8, NT/P9, NT/P14 and NT/P15 comprise the Group 'B' title areas (Fig. 1). Title NT/P2 is held by Arco.

GEOPHYSICS

Magnetics

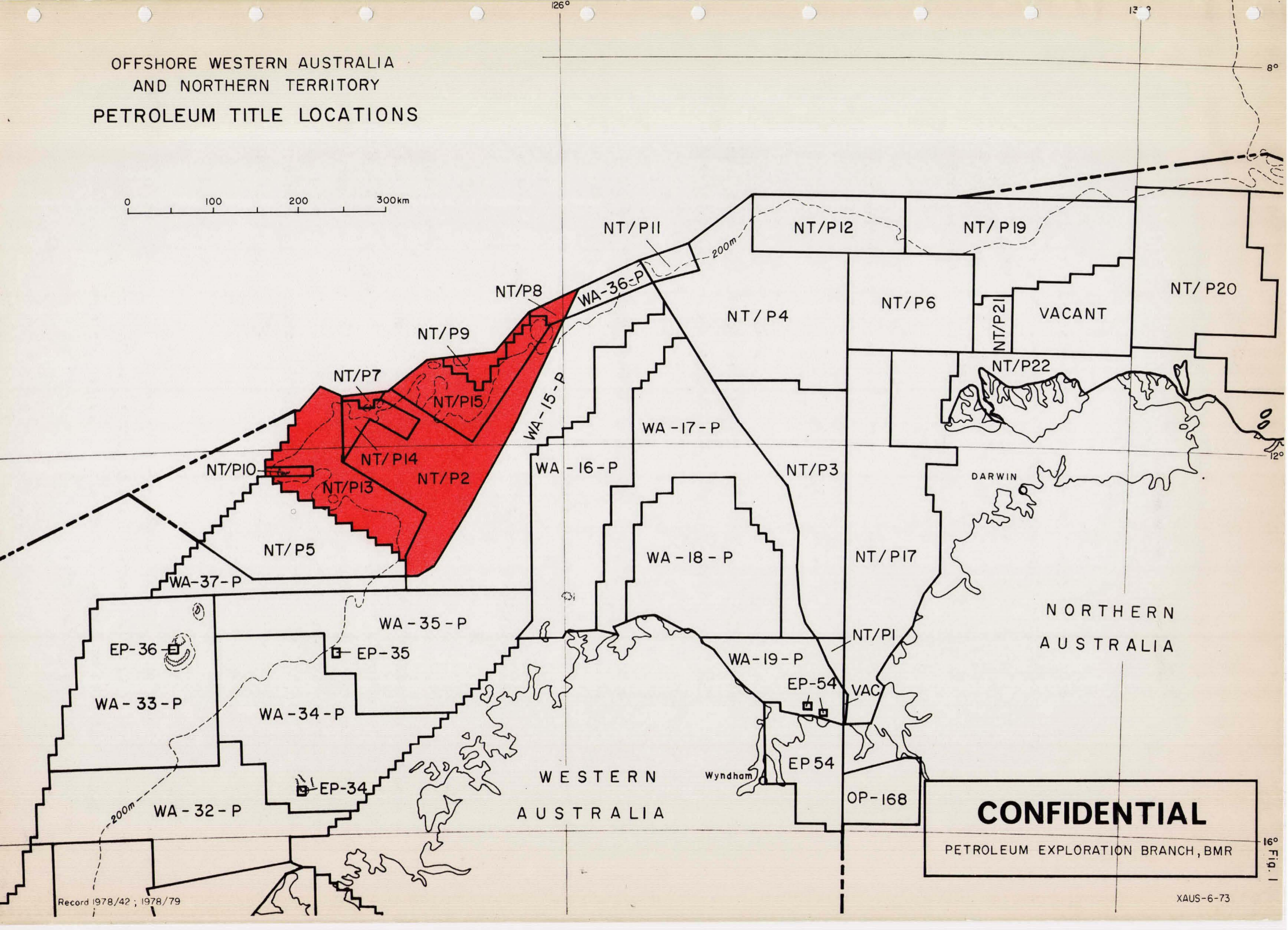
The earliest magnetic work in the area was carried out by Mid-Eastern Oil N.L. and Woodside (Lakes Entrance) in the Rowley Shoals, Scott Reef and Sahul Banks Aeromagnetic Survey. The results indicated the presence of a thick wedge of sediments on the continental shelf, sloping into the Timor Trough. A more extensive survey was flown for Arco Limited and Australian Aquitaine Petroleum Pty Ltd, in the 1965 Timor Sea Aeromagnetic Survey. This work outlined basinal configuration indicating substantial sedimentary thickness, and depositional axes and fault lineations.

Gravity

Coverage of the permit areas was obtained in 1965 and 1967 in BMR reconnaissance gravity and marine seismic surveys in the Timor Sea - Joseph Bonaparte Gulf area of Northwest Australia. Bouguer contours reflect the major structural features of the area.

OFFSHORE WESTERN AUSTRALIA AND NORTHERN TERRITORY

PETROLEUM TITLE LOCATIONS



CONFIDENTIAL

PETROLEUM EXPLORATION BRANCH, BMR

Record 1978/42 ; 1978/79

XAUS-6-73

Seismic

Seismic exploration of the permits commenced in 1964 with the Northwest Shelf Marine Seismic Survey. Reconnaissance sparker seismic surveys were carried out for BMR in 1965 and 1967 and for Arco in 1966. Other reconnaissance traverses were recorded for BOC in the Montebello-Mermaid (1965), Rankin-Troubadour (1966), Scott-Cartier (1967), Legendre-Marie (1968), and Trimouille-Dillon (1970) surveys. The flexotir technique was introduced by Arco in the Londonderry Rise survey (1968).

The Van Diemen Rise survey produced better quality deep data in 1969 with a dynamite energy source. In 1970 high resolution 2400% coverage was introduced in the Holothuria survey. At this stage, a reconnaissance grid, approx 20 km (12 mile) square had been completed over the group of permits and a secondary phase of detailing of structural leads was entered. Among these detail surveys were Baldwin Bank (1972), Pago (1972), Hat Point (1973), Cartier (1973), Dillon Shoals (1973) and Cape Talbot (1974). Generally, data quality of the work recorded since 1970 is poor to fair. Problems exist in regard to data deeper than the Tertiary (Hor. 2A) as primary events are weak and easily overcome by strong multiples.

REGIONAL GEOLOGY

The title areas under consideration are located on the northwest portion of the Bonaparte Gulf Basin and northern margins of the Browse Basin.

The regional structural configuration is basically the result of the intersection of two major structural trends. The Palaeozoic to mid-Jurassic structural grain is northwest-southeast while Late Jurassic to Holocene trends are predominantly northeast-southwest.

The area under study can be divided into a number of distinct structural provinces. These are - the Northeast Londonderry Rise (which separates the northern extension of the Browse Basin from the Bonaparte Gulf Basin), the Vulcan Sub-basin, the Ashmore-Sahul Block, and northern margins of the Browse Basin, and the Sahul Syncline.

Northeast Londonderry Rise

The Northeast Londonderry Rise separates the Browse and Bonaparte Gulf Basins. It is expressed on seismic maps as an intensely faulted shelf extending northeastward from the Londonderry Arch. To the northeast it is bordered by the Sahul Syncline, to the east by the Bonaparte Shelf and Kimberley Block margins and on the northwest by the Vulcan Sub-basin (Cartier Trough).

There is some evidence for post-Permian faulting in a northwest-southeast direction but the major fault trend is northeast-southwest. This may have been initiated at the close of the Triassic (?). If so, it was strongly rejuvenated in the Callovian-Oxfordian when the Northeast Londonderry Rise was uplifted. The high was subsequently eroded and then thinly overlapped by Upper Jurassic and younger sediments. A rejuvenation of old faults occurred in the Upper Tertiary with the development of faults at a shallow angle to the original fault direction.

Five wells, Dillon Shoals-1, Eider-1, Osprey-1, Whimbrel-1, and Turnstone-1 have been drilled on the Northeast Londonderry Rise. Osprey-1, Dillon Shoals-1 and Turnstone-1 have been drilled within the title areas under consideration.

Osprey-1 tested a large anticlinal feature and drilled Tertiary, Upper Cretaceous, Triassic, and Upper Permian to TD 3185 m (10 451 ft). Only minor gas shows were recorded.

Turnstone-1 was drilled to test a Jurassic-Triassic sandstone section in a large elongate horst feature. The well drilled Tertiary, Cretaceous, Jurassic, and Triassic sediments. Only minor gas shows were recorded and the well was plugged and abandoned at TD 2019 m (6625 ft).

Dillon Shoals-1 was drilled on a structure on the northern flank of the Northeast Londonderry Rise. The well drilled Tertiary, Cretaceous, Jurassic, Triassic and Permian sediments to TD 3970 m (13,026 ft). Only 6 m (20 ft) of Lower Cretaceous sediments and 1 m (3 ft) of Jurassic sediments were encountered. Only minor residual oil shows were noted in a core at the top of the Triassic and the well was plugged and abandoned.

Vulcan Sub-basin

The Vulcan Sub-basin is a horst-and-graben province separated from the Northeast Londonderry Rise to the east and the Ashmore-Sahul Block to the west by two en echelon fault systems. It broadens southward into the Browse Basin but its northeast extension is not well known. The Vulcan Sub-basin probably had its major development in mid-Jurassic time (Callovian-Oxfordian), the same time as the Malita Graben was actively subsiding in the Bonaparte Gulf Basin. Mid-Jurassic block faulting within the sub-basin is complicated by subsequent Cretaceous and Tertiary movement along old zones of weakness. The depocentre has been migrating from east to west from Jurassic to lower Tertiary but the Vulcan Sub-basin has always maintained a northeasterly trending axis. The major axis of the sub-basin is referred to as the Cartier Trough which has its best expression in the Tertiary and to some extent is reflected in the bathymetry.

Two wells, Skua-1 and Swan-1, have been drilled within the Vulcan Sub-basin. Skua-1 was drilled on a large closed horst feature. The well drilled Tertiary, Upper Cretaceous, and Jurassic to TD 3048m (10 000 ft). Although indications of hydrocarbons were encountered no significant hydrocarbon shows were recorded.

Swan-1 was drilled on the northwest flank of a positive feature thought to be a salt plug. This feature was on the northern extension of the Puffin feature. Results from the drilling of the well and additional high-power seismic indicate it to be a northeast-southwest horst with bounding faults of considerable throw. Swan-1 drilled Tertiary, Cretaceous, and Jurassic (Petrel Formation) to TD 3284 m (10,775 ft). Only minor indications of hydrocarbons were encountered in the Upper Cretaceous section.

Ashmore-Sahul Block

The Ashmore-Sahul Block forms a large positive feature in the northern portion of the Browse Basin. It is separated from the Londonderry Arch and Northeast Londonderry Rise by the fault-controlled Vulcan Sub-basin and is bounded to the north and west by late Tertiary faults resulting from the downwarping of the Timor Trough.

The geological history is only known from the Late Permian. Only one well, Sahul Shoals, drilled into Upper Permian limestones. The Triassic was essentially a regressive phase resulting in thick deltaic sedimentation. An Upper Triassic shallower carbonate shelf was, however, temporarily established prior to renewed progradation of fluvio-deltaic sands.

Well data indicate that Upper Cretaceous deep-water marls and calcilutites for the most part unconformably overlie the block-faulted and tilted Triassic structures. The time of uplift is thought to have been at the close of the Middle Jurassic (Callovian-Oxfordian) although local subsidence occurred in the Ashmore Reef area in the Tithonian following a volcanic episode. Where penetrated on the Ashmore-Sahul Block the Lower Cretaceous has been shown to be extremely thin (Sahul Shoals-1 20 m (65 ft), North Hibernia-1 24 m (78 ft)). The Jurassic was absent at both these localities. Prion-1 drilled 47 m (155 ft) of Lower Cretaceous/Upper Jurassic section.

Thick Tertiary carbonates cover the Ashmore-Sahul Block and continuous deposition through the Oligocene regressive cycle is characteristic of much of the area.

Prior to the formation of the Vulcan Sub-basin the Ashmore-Sahul Block and the Northeast Londonderry Rise probably composed a single entity.

The marginal area between the Ashmore-Sahul Block and the Vulcan Sub-basin has been the site of recent drilling operations on the Ashmore-Sahul Block. Rejuvenation of a high to the northwest during the Upper Cretaceous has provided the source area for sands within this interval. The drilling of three wells on the Puffin feature has revealed a small uneconomical oil field.

Sahul Syncline

The Sahul Syncline separates the Northeast Londonderry Rise from the Sahul Platform. The area has only been covered by a reconnaissance seismic reflection grid of lines. It is, however, defined and is demonstrated on magnetics and is also expressed on bathymetry.

It seems likely that prior to Mid-Jurassic (Callovian-Oxfordian) the Sahul Platform, Sahul Syncline and Petrel Sub-basin probably formed a single structural entity which was subsequently interrupted by uplift and subsidence following the Mid-Jurassic.

No wells have been drilled within the Sahul Syncline so the stratigraphic section remains rather speculative. The Sahul Syncline is separated from the Kelp structure to the northeast by a northwest-southeast trending structure (Laminaria). This straddles the boundary between NT/P8 and WA-36-P.

Northern margins of the Browse Basin

Only a minor portion of the Browse Basin occurs within the title areas under consideration. This portion of the Browse Basin occurs on the southern margins of the Ashmore-Sahul Block and at the southern extremity of the Vulcan Sub-basin where it merges into the Browse Basin.

HYDROCARBON POTENTIAL

Tables 1 and 2 show the stratigraphic sections penetrated and the hydrocarbon indications of wells drilled within the areas under consideration.

The most prospective horizons are sands within the Upper Cretaceous Bathurst Island Formation, the Lower Cretaceous/Upper Jurassic Petrel Formation and the Triassic. Permian and Tertiary sands are secondary objectives.

On the Ashmore-Sahul Platform a small uneconomic oilfield has been discovered in Upper Cretaceous sands on the Puffin structure. It seems that these sands are very localised and occur only in the area between the Puffin field and Brown Gannet-1 wells. The source is from the northwest. These sands could prove prospective on other structures in this area.

Over most of the Ashmore-Sahul Block the Upper Cretaceous unconformably overlies Upper Triassic fluvio-deltaic deposits and the Lower Cretaceous/Jurassic section is absent. A number of Triassic horsts have been mapped and the Triassic section has not been adequately tested. Triassic and Upper Cretaceous objectives are considered as the best prospects on the Ashmore-Sahul Block.

On the margins of the Ashmore-Sahul Block and Northeast Londonderry Rise and also in the Vulcan Sub-basin, the Petrel Formation is the primary objective. There are a number of stratigraphic-type plays in these areas where the Petrel Formation has been truncated by the Bathurst Island Formation.

As with the Ashmore-Sahul Block the Lower Cretaceous/Jurassic section is either thin or absent on the Northeast Londonderry Rise, and the best prospects are confined to the Triassic and Permian sections. Elsewhere in the Bonaparte Gulf Basin the Permian section has had significant hydrocarbon shows. On the southwestern margins of the Ashmore-Sahul Block a number of minor hydrocarbon shows (oil recovery in cores) has been reported from a sandstone section just below the Miocene/Eocene unconformity. These will provide secondary targets in this area.

TITLE ASSESSMENT NT/P2

Title holder: Arco Australia Ltd
Australian Aquitaine Petroleum Pty Ltd
Esso Exploration and Production Aust. Inc.

Number of blocks: 315

Expiry date: 1.7.75

Previous six-year conditions:

	$A
First year)	200 000
)	
Second year)	
Third year)	2 500 000
)	
Fourth year)	
Fifth year	100 000
Sixth year	2 500 000
Total	$A 5 300 000

Regional setting: NT/P2 is situated off the northwest coast of Australia about 500 km (300 mls) northwest of Wyndham. The permit is located in the adjacent area of the Territory of the Ashmore and Cartier Islands. Most of the title area is situated in water depths less than 200 m (600 ft).

Wells drilled: To date 9 wells, Brown Gannet-1, Puffin-1, 2, and 3, Swan-1, Prion-1, Skua-1, Osprey-1, and Turnstone-1 have been drilled within NT/P2.

Prion-1, Puffin-1, 2 and 3, Skua-1 and Turnstone-1 were drilled to test large horst features. Brown Gannet-1 tested a faulted Triassic high. Osprey-1 was drilled to test an anticlinal feature and Swan-1 was drilled to test a large intrusive feature.

Two of these wells, Osprey-1 and Turnstone-1 were drilled on the North-east Londonderry Rise. Osprey-1 tested a large anticlinal feature. The well drilled Tertiary, Upper Cretaceous, Triassic and Upper Permian sequences, and was plugged and abandoned at 3185 m (10 451 ft) after encountering only minor gas shows. Turnstone-1 was drilled to test a Jurassic-Triassic sandstone section in a large elongate horst feature. The well drilled Tertiary, Cretaceous, Jurassic and Triassic sediments. Only minor gas shows were encountered and the well was plugged and abandoned at TD 2019 m (6625 ft).

Three wells, Puffin-1, 2 and 3, were drilled on the Puffin feature on the margins of the Ashmore-Sahul Block. The wells proved a small uneconomical oil-field within sands in the Upper Cretaceous Bathurst Island Formation. Minor oil shows were also noted in the section at the Miocene/Eocene unconformity.

Swan-1 was drilled on the northwest flank of a positive feature thought to be a salt plug. This feature was on the northern extension of the Puffin feature and is located within the Vulcan Sub-basin. Results from the drilling of the well and additional high power seismic indicate it to be a northeast-southwest horst with bounding faults of considerable throw. Swan-1 drilled Tertiary, Cretaceous and Jurassic Petrel Formation to TD 3284 m (10 775 ft). Only minor indications of hydrocarbons were encountered in the Upper Cretaceous section.

Skua-1 was drilled on a large closed horst feature within the Vulcan Sub-basin. The well drilled Tertiary, Upper Cretaceous and Jurassic to TD 3048 m (10 000 ft). Although indications of hydrocarbons were encountered no significant shows were recorded.

Prion-1 was drilled on a large horst feature on the Ashmore-Sahul Block - Vulcan Sub-basin margin. The well drilled Tertiary, Cretaceous, Jurassic and Upper Triassic sediments. Only minor gas shows were encountered and the well was plugged and abandoned at TD 2961 m (9713 ft).

Brown Gannet-1 was drilled on a large, faulted Triassic high on the Ashmore-Sahul Block. The well drilled Tertiary, Upper Cretaceous and Upper Triassic sediments and reached TD 2743 m (9000 ft). Only minor hydrocarbon shows were encountered and the well was plugged and abandoned.

Geophysical coverage: Earliest magnetic coverage in the area was carried out by Mid Eastern Oil N.L. and Woodside (Lakes Entrance) in the Rowley Shoals, Scott Reef and Sahul Banks Aeromagnetic Survey. The results indicated the presence of a thick wedge of sediments on the continental shelf, sloping into the Timor Trough. A more extensive survey was flown for Arco Limited and Australian Aquitaine Petroleum Pty Ltd, in the 1965 Timor Sea Aeromagnetic Survey.

Earliest seismic work consisted of reconnaissance sparker surveys in late 1965 and 1966. Further regional information was obtained in the Sahul Rise Survey in 1967. Structural anomalies were located in the Londonderry Rise survey which introduced the Flexotir technique.

A significant improvement in quality of deep data was achieved with a dynamite energy source in 1969 in the Van Diemen Rise survey and in 1970 high resolution 2400% coverage was introduced in the Holothuria survey. This was the last regional survey through the permit. Drill prospects have been detailed in a series of localised surveys between 1970 and 1974. The most recent of these, the Cape Talbot survey, detailed the Puffin locality. Density of seismic coverage ranges from a 60 km (37.5 mile) square grid in the extremities of the permit to a 10 km (6 mile) square grid in the Puffin locality. Record quality of the modern data is fair. Horizon 2A (Base Tertiary)can be correlated over the whole of the permit. Horizons 2 (Base Cretaceous) and Horizon 4 (Top Permian) are difficult to correlate across faults.

Prospectivity: NT/P2 lies in an area marginal to the Bonaparte Gulf Basin to the east and the Browse Basin to the southwest and covers three main tectonic provinces - the Northeast Londonderry Rise, the Vulcan Sub-basin and the Ashmore-Sahul Block.

The Northeast Londonderry Rise. Two wells, Turnstone No. 1 and Osprey No. 1, have been drilled on the central part of the Northeast Londonderry Rise. Osprey No. 1 encountered several thin potential hydrocarbon bearing zones in the Upper Permian. On test these all flowed water. The Petrel Formation was completely absent at this location. Turnstone No. 1 was drilled on a horst parallel to Eider No. 1. Minor shows were encountered in the well which terminated in Upper Triassic sediments. Minor hydrocarbon shows were recorded in Upper Cretaceous limestones. Prospective sections are expected to be sands

within the Cretaceous, Jurassic, Triassic and possibly Permian. The Lower Cretaceous/Upper Jurassic section is truncated in this area and lends itself to the possibility of stratigraphic trapping. Density of seismic coverage varies from a 60 km (37.5 mile) square grid in the extremities of the permit to 4 km (2.5 mile) square in the Puffin locality. Record quality of the modern data is fair. Horizon 2A (Base Tertiary) can be correlated over the whole of the permit. Horizons 2 (Base Cretaceous) and Horizon 4 (Top Permian) are difficult to correlate across faults. A number of fault controlled structural leads have been mapped.

Recommendations: Further investigation of all of these leads is recommended, prior to the drilling of the more promising locations.

The Vulcan Sub-basin. Two wells, Skua No. 1 and Swan No. 1 have been drilled within NT/P2. Skua No. 1 was drilled on a horst parallel to the Puffin feature. The well terminated in Upper Jurassic Petrel Formation at TD 3048 m (10 000 ft). No significant shows of hydrocarbons were encountered. Swan No. 1 was drilled on a continuation of the Puffin trend into the Vulcan Sub-basin. The well terminated in Upper Jurassic Petrel Formation at 3284 m (10 755 ft). Minor gas shows were encountered in the Upper Cretaceous. Seismic coverage ranges from a 10 km (6 mile) square grid in remote parts of the area to a 4 km (2.5 mile) square grid over the well locations. Record quality at depth is questionable. Prospective horizons are expected to be sands within the Cretaceous-Jurassic sequence, and possibly in Triassic rocks. No undrilled structural leads are known.

Recommendations: Increasing the density of seismic coverage may reveal further structural leads.

Ashmore-Sahul Block: NT/P2 is located on the eastern flank of the Ashmore-Sahul block. Five wells have been drilled in this area. Puffin Nos. 1, 2 and 3 have located a small uneconomic oil field in Upper Cretaceous sands. Prion No. 1 and Brown Gannet No. 1 both terminated in Upper Triassic sediments and no significant shows were encountered. Seismic coverage over this part of the permit is generally on a grid approximately 6 km (4 mile) by 10 km (6 mile) except over the Puffin location where a detailed grid about 2 km (1 mile) square has been completed. Record quality is good down to the base of the Tertiary sequence but deeper data is variable ranging from fair to questionable.

Prospective section is expected to be within Upper Cretaceous and possibly the Jurassic-Triassic sands around the margins of the block. A number of structural leads have been mapped on the base of the Tertiary between the Puffin wells and Brown Gannet No. 1. One of these, (A 11), is fairly well detailed.

Recommendations: Further detail seismic work over the A 11 structure to upgrade it to drillable status is recommended. A well can then be recommended to total depth 3500 m (11 484 ft). Further improvement of the deep pre-Cretaceous horizons is desirable over all of the area. Seismic work, especially in the area between Puffin and Brown Gannet No. 1, is recommended to investigate the potential of entrapment in the Upper Cretaceous sequence.

TITLE ASSESSMENT NT/P7

Title holder: BOC of Australia Ltd
Shell Development (Aust) Pty Ltd
Woodside Oil N.L.
Mid Eastern Oil N.L.

Number of blocks: 13

Expiry date: 9.9.75

Notes: BOC of Australia Ltd holds half of its 33 1/3 percent interest in trust for BP Petroleum Development Australia Pty Ltd. BOC of Australia Ltd, Woodside Oil N.L. and Mid Eastern Oil N.L. now operate as Woodside-Burmah Oil N.L. The title still has to be re-issued in the name of the new company.

Previous six-year conditions:

	$A
First year	Nil
Second year	Nil
Third year	4 000
Fourth year	4 000
Fifth year	Nil
Sixth year	Nil
Total $A	8 000

Also to expend on approved drilling or other approved associated works in the permit area or in the area of E.P. Nos. NT/P8, NT/P9, NT/P14, or NT/P15 the amount

	$A
First year	Nil
Second year	3 000 000
Third year	Nil
Fourth year	Nil
Fifth year)	3 000 000
Sixth year)	

Regional setting: NT/P7 is located off the northwest coast of Western Australia on the continental shelf. It is a small T-shaped area bounded by NT/P2, NT/P4 and NT/P13. The northern boundary is the Indonesian-Australian border. Water depths vary from 360 m (1200 ft) to 560 m (1850 ft) at the northern boundary.

Wells drilled: No wells have been drilled within NT/P7.

Geophysical coverage: Cf. basin notes, data sheets of geophysical surveys and line density maps. NT/P7 covers a small area which is crossed by a single traverse from the 1963 Rowley Shoals, Scott Reef and Sahul Banks Aeromagnetic survey. Seismic coverage is very sparse, being restricted to scattered lines from the Rankin Troubadour (1966) Sahul Ashmore (1971) and Prudhoe-Hibernia (1972) surveys carried out for BOC. The existing seismic grid is 10 km (6 mile) square with data quality at depth poor to questionable.

Prospectivity: No wells have been drilled in NT/P7. Seismic coverage is sparse (approx. 10 km (6 mile) square) and one poorly defined fault controlled structural lead is known.

Recommendations: A modern seismic grid is needed over the entire title area.

TITLE ASSESSMENT NT/P8

Title holder: BOC of Australia Ltd
Shell Development (Aust) Pty Ltd
Woodside Oil N.L.
Mid Eastern Oil N.L.

Number of blocks: 18

Expiry date: 9.9.75

Notes: BOC of Australia holds half of its 33 1/3 percent interest in trust for BP Petroleum Development Australia Pty Ltd. BOC of Australia Ltd, Woodside Oil N.L. and Mid Eastern Oil N.L. now operate as Woodside Burmah Oil N.L. The title still has to be re-issued in the name of the new company.

Previous six-year conditions:	$A
First year	Nil
Second year	Nil
Third year	6 000
Fourth year	6 000
Fifth year	Nil
Sixth year	Nil
	12 000

Also to expend on approved drilling or other associated works in the permit area or in the area of EP Nos. NT/P7, NT/P9, NT/P14 or NT/15 the amount

	$A
First year	Nil
Second year	3 000 000
Third year	Nil
Fourth year	Nil
Fifth year)	3 000 000
Sixth year)	
	6 000 000

Regional setting: NT/P8 is located on the outer margins of the continental shelf of northwestern Australia. Water depths vary from 28 m (92 ft) over a shoal in the southwestern portion of the title area to over 560 m (1950 ft) along the northern margin. Apart from the area in the immediate vicinity of the shoal, water depths are in excess of 200 m (600 ft) throughout the title area.

Wells drilled: No wells have been drilled in NT/P8

Geophysical coverage: Cf. basin notes, data sheets of geophysical surveys and line density maps. No aeromagnetic traverses have been flown over the permit although shipborne regional magnetometer and gravimeter readings were taken on

BMR marine seismic surveys in 1967 and in 1970-1973. Earliest seismic recording in the permit was carried out in the BMR 1967 Sparker Survey and in the 1968 Sahul Rise survey carried out for Arco. Other scattered traverses in the permit were recorded in Arco's Holothuria survey in 1970 and BOC's Trimoville-Dillon (1971) and Dillon Shoals (1973) surveys.

Seismic coverage is on a reconnaissance grid (approx. 10 km (6 mile) square) and contours and isopach maps have been prepared on three horizons - Near Base Tertiary (Hor M), Near Base Upper Cretaceous (Hor P) and Near Top Permian (Hor S). Data quality ranges from poor in the early work to fair in the later surveys.

Prospectivity: NT/P8 lies on the northeastern flank of the Sahul Syncline near its confluence with the Timor Trough, between the Ashmore-Sahul Block and the Sahul Ridge. No wells have been drilled within the title area and it has only been covered by a very sparse reconnaissance seismic grid. (Trimouille-Dillon 1971 33.6 km (21 miles); Dillon Shoals 1973 60.5 km (38 miles).

Prospective horizons in this area are expected to be within Mesozoic sands. The Permian section is regarded as being too deep to be prospective.

A high trend has been mapped at the near base Upper Cretaceous horizon and two culminations have been delineated.

Recommendations: Further seismic work to reduce the size of the grid, particularly along the northern boundary of the permit is necessary. Further detailing of the Laminaria structure may mature a drill site. Depth of burial of prospective horizons may adversely affect their reservoir characteristics.

TITLE ASSESSMENT NT/P9

Title holder: BOC of Australia Ltd
Shell Development (Aust) Pty Ltd
Woodside Oil N.L.
Mid Eastern Oil N.L.

Number of blocks: 28

Expiry date: 9.9.75

Notes: BOC of Australia holds half of its 33 1/3 percent interest in trust for BP Petroleum Development Australia Pty Ltd. BOC of Australia Ltd, Woodside Oil N.L. and Mid Eastern Oil N.L. now operate as Woodside-Burmah Oil N.L. The title still has to be re-issued in the name of the new company.

Previous six-year conditions:

	$A
First year	Nil
Second year	Nil
Third year	10 000
Fourth year	20 000
Fifth year	Nil
Sixth year	Nil
	30 000

Also to expend on approved drilling or other associated works in the permit area or in the area of EP. Nos. NT/P7, NT/P8, NT/P14 or NT/P15 the amount

	$A
First year	Nil
Second year	3 000 000
Third year	Nil
Fourth year	Nil
Fifth year)	3 000 000
Sixth year)	
	6 000 000

Wells drilled: No wells have been drilled within NT/P9.

Regional setting: NT/P9 is located on the Indonesian/Australian boundary on the outer margins of the continental shelf of northwestern Australia. Water depths are greater than 200 m (600 ft) over the entire title area and vary from 340 m (1100 ft) at the southern margins to over 600 m (2000 ft) along the territorial boundaries.

Geophysical coverage: Cf. basin notes, data sheets of geophysical surveys and line density maps. No aeromagnetic traverses have been flown over the permit although shipborne regional magnetometer and gravimeter readings were taken on BMR marine seismic surveys in 1967 and in 1970-73. Earliest seismic recording in the permit was carried out in the BMR 1967 Sparker Survey. The only other seismic traverses in the permit are a few widely spaced lines from BOC's Montebello-Mermaid (1965) and Rankin-Troubadour (1966). These lines constitute a reconnaissance grid 15 km (9 mile) square in the southern half of the permit while the northern half is virtually unexplored. Record quality at depth ranges from poor to "No reflections".

Prospectivity: NT/P9 is located at the head of the Cartier Trough and in the Timor Trough and also partly on the Sahul-Ashmore Block. No wells have been drilled within NT/P9 and the only seismic coverage is of 1965 and 1966 vintage. Only two or three lines cross the title area and record quality ranges from very poor to "No reflections".

Recommendations: Semi-reconnaissance seismic followed by detailing of any leads is recommended. It appears that Mesozoic reservoirs will be at depths in excess of 4500 m (14 750 ft) and drilling would only be justified if large potential traps are indicated.

Existing maps based on very sparse data indicate the presence of a large high north of the title area in Indonesian waters.

TITLE ASSESSMENT NT/P10

Title holder: BOC of Australia Ltd
Shell Development (Aust) Pty Ltd
Woodside Oil N.L.
Mid Eastern Oil N.L.

Number of blocks: 6

Expiry date: 9.9.75

Notes: BOC of Australia holds half of its 33 1/3 percent interest in trust for BP Petroleum Development Australia Pty Ltd. BOC of Australia Ltd, Woodside Oil N.L. and Mid Eastern Oil N.L. now operate as Woodside-Burmah Oil N.L. The title concerned has still to be re-issued in the name of the new company.

Previous six-year conditions:	$A
First year	1 000
Second year	1 000
Third year	2 000
Fourth year	Nil
Fifth year	Nil
Sixth year	2 000
	Total $A 6 000

Also to expend on approved drilling or other approved associated works in the permit area or in the area of EP Nos. NT/P5 or NT/P13 the amount

	$A
First year	Nil
Second year	Nil
Third year	Nil
Fourth year)	3 000 000
Fifth year)	
Sixth year	Nil
Total	3 000 000

Regional setting: NT/P10 is located around Ashmore Reef off the northwest coast of West Australia. The dominant feature in the title area is the Ashmore Reef. Water depths are less than 200 m (600 ft) throughout except at both the eastern and western extremities.

Wells drilled: One well Ashmore Reef No. 1 has been drilled within NT/P10 on a large structure. The well drilled Tertiary to 1994 m (6542 ft), Palaeocene/ Upper Cretaceous to 2425 m (12 845 ft). No significant hydrocarbon shows were recorded and the well was plugged and abandoned.

Geophysical coverage: Cf. basin notes, data sheets of geophysical surveys and line density maps. NT/P10 is a small permit, rectangular in size, being 55 km x 9 km. It was crossed by a single reconnaissance traverse from the 1963 Rowley Shoals, Scott Reef and Sahul Banks Aeromagnetic survey. Seismic coverage consists of reconnaissance traverses recorded in the Rankin-Troubadour (1966) and Trimouille-Dillon (1970) seismic surveys, and detailing of the Ashmore Reef location in the Ashmore Reef survey (1967). The grid varies from 10 km (6 mile) square in the eastern part of the permit to 5 km (3 mile) square around the well-site. Record quality ranges from fair (shallow) to questionable (deep).

Prospectivity: One well, Ashmore Reef No. 1, (the first offshore well drilled on the Northwest Shelf), has been drilled. The well was drilled on a structure associated with the reef. It drilled Tertiary Paleocene-Upper Cretaceous, Upper Jurassic rocks (mostly volcanics) and Upper Triassic rocks to TD 3915 m (12 845 ft). Only very minor hydrocarbon shows were encountered and the well was plugged and abandoned. The Ashmore Volcanics and Hibernia Beds are the only Jurassic sediments encountered to date on this part of the Ashmore-Sahul block.

Seismic coverage is reconnaissance 10 km (6 mile) square except over the Ashmore Reef structure where a 5 km (3 mile) square detail grid has been recorded.

Recommendation: The Ashmore Reef No. 1 well has adequately tested the only structure in the title area and no further work is recommended.

TITLE ASSESSMENT NT/P13

Title holder: BOC of Australia Ltd
Shell Development (Aust) Pty Ltd
Woodside Oil N.L.
Mid Eastern Oil N.L.

Number of blocks: 184

Expiry date: 9.9.75

Notes: BOC of Australia Ltd holds half of its 33 1/3 percent interest in trust for BP Petroleum Development Australia Pty Ltd. BOC of Australia Ltd, Woodside Oil N.L. and Mid Eastern Oil N.L. now operate as Woodside-Burmah Oil N.L. The title concerned has still to be re-issued in the name of the new company.

Previous six-year conditions:

	$A
First year	4 000
Second year	24 000
Third year	48 000
Fourth year	Nil
Fifth year	Nil
Sixth year	48 000
Total	124 000

Also to expend on approved drilling or other approved associated works in the permit area or in the area of EP Nos. NT/P5 or NT/P10 the amount

	$A
First year	Nil
Second year	Nil
Third year	Nil
Fourth year)	3 000 000
Fifth year)	
Sixth year	Nil
Total	3 000 000

Regional setting: NT/P13 is located off the northwest coast of Western Australia on the edge of the continental shelf. NT/P5 borders it to the west and NT/P14 and NT/P2 to the south and east. The northern boundary is the seabed boundary by agreement with Indonesia (9 October 1972). The northern and western portions of the title area lie in water depths in excess of 200 m (600 ft). A number of shoal areas occur throughout the title area.

Wells drilled: One well, North Hibernia-1 has been drilled within the title area. The well was drilled on a large fault controlled feature on the Ashmore-Sahul Block. It drilled Tertiary sediments to 1664 m (5460 ft), Upper Cretaceous to 1958 m (6424 ft), Lower Cretaceous to 1983 m (6506 ft) and Upper Triassic to TD 4000 m (13 124 ft). No significant hydrocarbon shows were reported at North Hibernia and the well was plugged and abandoned.

Geophysical coverage: The permit area was covered by aeromagnetic reconnaissance traverses flown for Mid Eastern Oil N.L. and Woodside (Lakes Entrance) in the Rowley Shoals, Scott Reef and Sahul Banks aeromagnetic survey in 1963. Shipborne magnetometer and gravimeter readings were made on BMR regional seismic sparker surveys in 1967 and 1970-73.

The earliest seismic recording in the permit area was carried out in the 1964 Northwest Shelf survey for BOC. Further reconnaissance coverage was completed in the Montebello-Mermaid Shoals (1965), Rankin-Troubadour (1966), Ashmore Reef Shallow Water, Scott-Cartier (1967) and Adele-Scott (1969) Marine Seismic Surveys. This early reconnaissance phase of exploration established the structural configuration of the permit area with the main tectonic elements being the Ashmore-Sahul Block, the Vulcan Sub-basin and the Londonderry Rise.

In surveys carried out since 1970 a significant improvement in the quality of deep data has resulted from the introduction of digital recording and processing, increased multiplicity, longer cables and improved energy sources. These surveys included the Trimouille-Dillon, Sahul-Ashmore, Prudhoe-Hibernia, Mermaid-Cartier and Kendrew-Cootamundra Marine seismic surveys. These surveys have detailed structural leads and matured well-locations.

Prospectivity: The area can be conveniently divided into three structural divisions - the Sahul-Ashmore Block, the Vulcan Sub-basin, and the Northeast Londonderry Rise.

The Ashmore Sahul Block: Only one well, North Hibernia No. 1, has been drilled on the Ashmore-Sahul Block within the title area. The well was drilled to test Triassic sandstones in a faulted anticline. The well penetrated Tertiary, Cretaceous and Triassic sediments to 4000 m (13 124 ft). No significant hydrocarbon shows were noted, and the well was plugged and abandoned at TD. Seismic density is approximately 10 km (6 mile) square except around the wellsite where a modern grid approx. 5 km (3 mile) square has been completed. Two significant structural leads and a number of fault controlled highs have been mapped. Prospective section is expected to be Triassic sands and possibly Jurassic and Upper Cretaceous sands around the southwest margins of the Ashmore-Sahul Block.

Recommendations: In the absence of any hydrocarbon indications in the North Hibernia No. 1 well, prospects of the adjacent East Hibernia structure do not justify the drilling of a well. If further work is to be done in the relinquished portion of the permit, the Cartier Island lead appears to be the most attractive prospect. Further detail seismic work would be required to mature a well location.

The Vulcan Sub-basin: No wells have been drilled within NT/P13 in the Vulcan Sub-basin. Skua No. 1 was drilled in NT/P2 just north of the NT/P13 boundary. It was drilled on a horst parallel to the Puffin feature. A thick Jurassic Petrel Formation was encountered from 2438 m (8000 ft) to TD. No significant shows of hydrocarbons were encountered. Recent seismic mapping indicates that at the Upper Cretaceous horizon (the lowest continuously mappable horizon) a poorly defined fault controlled high occurs on a terrace marginal to the Ashmore-Sahul block. No other large leads have been defined.

Recommendations: As the area has only been covered by a broad reconnaissance grid of seismic lines, further seismic semi-detailing will be necessary to locate further leads. Further detail seismic is recommended over the terrace lead possibly followed by a well. (3050 m) (10 000 ft).

Northeast Londonderry Rise: Only a minor portion of this area occurs in the southern part of the title area. It has been covered by recent seismic reconnaissance but it was not possible to map below horizon P (base of Upper Cretaceous). Prospective horizons in this area are sands within the Petrel Formation and possibly within the Permo-Triassic sequence. No wells have been drilled. Best prospects for the area may be stratigraphic traps.

Recommendations: Further seismic semi-detailing is necessary to locate drill-sites.

TITLE ASSESSMENT NT/P14

Title holder: BOC of Australia Ltd
Shell Development (Aust) Pty Ltd
Woodside Oil N.L.
Mid Eastern Oil N.L.

Number of blocks: 47

Expiry date: 9.9.75

Notes: BOC of Australia holds half of its 33 1/3 percent interest in trust for BP Petroleum Development Australia Pty Ltd. BOC of Australia Ltd, Woodside Oil N.L. and Mid Eastern Oil N.L. now operate as Woodside-Burmah Oil N.L. The title has still to be re-issued in the name of the new company.

Previous six-year conditions:

	$A
First year	Nil
Second year	Nil
Third year	20 000
Fourth year	20 000
Fifth year	Nil
Sixth year	Nil
Total	40 000

Also to expend on approved drilling or other associated works in the permit area or in the area of EP Nos. NT/P7, NT/P8, NT/P9 or NT/P15 the amount

	$A
First year	Nil
Second year	3 000 000
Third year	Nil
Fourth year	Nil
Fifth year)	3 000 000
Sixth year)	
	6 000 000

Regional setting: NT/P14 is located off the northwest coast of Western Australia on the continental shelf. It is bounded by the east and south by NT/P2, to the north by NT/P7 and to the west by NT/P13. Most of the title area lies in water depths in excess of 200 m (600 ft). One small shoal is located near the central boundary with NT/P2.

Wells drilled: No wells have been drilled within NT/P14.

Geophysical coverage: The permit area was covered by aeromagnetic reconnaissance traverses flown for Mid Eastern N.L. and Woodside (Lakes Entrance) in the Rowley Shoals, Scott Reef and Sahul Banks Aeromagnetic Survey in 1963. A more detailed grid was flown for Arco Limited and Australian Aquitaine Petroleum Pty Ltd, in the 1965 Timor Sea Aeromagnetic Survey. Shipborne magnetometer and gravimeter readings were made on BMR regional seismic sparker surveys in 1967 and 1970-73.

The earliest seismic data in the permit were recorded in the 1964 BMR Timor Sea Sparkarray survey. Further reconnaissance coverage was completed in the Montebello-Mermaid Shoal (1965), Rankin-Troubadour (1966), and Londonderry Rise surveys for BOC. Since 1970 additional reconnaissance lines have been added in the Sahul-Ashmore (1971), Prudhoe-Hibernia (1972) and Kendrew-Cootamundra surveys (1974). Data recorded since 1970 show a significant improvement over the early work which was affected by multiple interference and lack of penetration. Quality of the post-1970 data is fair to good although below the basal Cretaceous unconformity correlation across faults is uncertain. Seismic density through the permit is reconnaissance only, being on a 10 km (6 mile) square grid.

Prospectivity: The title area is located centrally on the Ashmore Sahul Block. No wells have been drilled to date in the area. Seismic coverage is restricted to sparse reconnaissance (in excess of 10 km (6 mile) spacing). Prospective horizons are expected to be within Triassic sands. Structural high trends have been mapped and one significant high (East Hibernia) has been mapped at the southern apex of the title area.

Recommendations: Wells to date drilled on the central portion of the Ashmore-Sahul Block do not lend much encouragement for further exploration. If additional work is regarded as necessary within the title area, further seismic detailing over the East Hibernia structure and further reconnaissance seismic over the rest of the title area is recommended. The high feature ARBU 1 shown on Arco maps as straddling the NT/P2, NT/P14 boundary, is optimistically mapped

on sparse seismic control. The feature requires further seismic detailing.

TITLE ASSESSMENT NT/P15

Title holder: BOC of Australia Ltd
Shell Development (Aust) Pty Ltd
Woodside Oil N.L.
Mid Eastern Oil N.L.

Number of blocks: 137

Expiry date: 9.9.75

Notes: BOC of Australia holds half of its 33 1/3 percent interest in trust for BP Petroleum Development Australia Pty Ltd. BOC of Australia Ltd, Woodside Oil N.L. and Mid Eastern Oil N.L. now operate as Woodside-Burmah Oil N.L. The title has still to be re-issued in the name of the new company.

Previous six-year conditions:	$A
First year	Nil
Second year	Nil
Third year	50 000
Fourth year	50 000
Fifth year	Nil
Sixth year	Nil
Total	100 000

Also to expend on approved drilling or other associated works in the permit area or in the area of EP Nos NT/P7, NT/P8, NT/P9 or NT/P14 the amount

	$A
First year	Nil
Second year	3 000 000
Third year	Nil
Fourth year	Nil
Fifth year)	3 000 000
Sixth year)	
	6 000 000

Regional setting: NT/P15 is located along the northern boundary between Indonesia and Australia on the outer margins of the continental shelf of Northwest Australia. A northeast-southwest trend of shoals extend centrally throughout the title area. Water depths are very shallow over these shoals and increase to 500 m (1650 ft) at the northern margins.

Wells drilled: Two wells, Dillon Shoals-1 and Sahul Shoals-1, have been drilled within the title area. Dillon Shoals-1 was drilled on an elongate, completely fault bounded block lying on the western flank of the Northeast Londonderry Rise adjacent to the Cartier Trough. The well drilled Tertiary, Cretaceous, Jurassic and Triassic sediments before terminating in Upper Permian sediments at 3970 m (13 026 ft). The Lower Cretaceous/Jurassic interval was only 6 m (20 ft) thick. Residual oil traces were noted in a core at the top of the Triassic sequence but log analysis showed the interval to be fully water-saturated. The well was plugged and abandoned.

Sahul Shoals-1 was drilled on a culmination in a northeast oriented anticlinal trend on the eastern edge of the Ashmore-Sahul Block adjacent to the Cartier Trough. The well drilled Tertiary, Cretaceous, Triassic and Permian sediments to TD 3802 m (12 474 ft). Jurassic sediments were completely absent. No hydrocarbon shows were encountered and the well was plugged and abandoned.

Geophysical coverage: The permit area was covered by aeromagnetic reconnaissance traverses flown for Mid Eastern N.L. and Woodside (Lakes Entrance) in the Rowley Shoals, Scott Reef, and Sahul Banks Aeromagnetic Survey in 1963. This was followed by a more detailed grid flown for Arco Limited and Australian Aquitaine Petroleum Pty Ltd., in the 1965 Timor Sea Aeromagnetic Survey. Shipborne magnetometer readings were made on BMR regional seismic sparker surveys in 1967 and 1970-73.

The earliest seismic data in the permit was recorded in the 1964 BMR Timor Sea Sparkarray survey. Further reconnaissance coverage was completed in the Montebello-Mermaid Shoal (1965), the Rankin-Troubadour (1966), the Scott Cartier (1967), and the Londonderry Rise survey (1968). Subsequently additional reconnaissance traverses were added in the Legendre-Marie (1969), the Trimouille -Dillon (1970), and the Dillon Shoals (1973) surveys. Generally, the entire permit has been covered by a broad reconnaissance grid approximately 20 km (12 mile) square, with a detail grid 5 km (3 mile) square around Sahul Shoals No. 1 and a semi-detail grid (8 km x 6 km) along the Northeast Londonderry Ridge on the eastern margin of the permit. Data quality has improved with advances in technology over the years. Quality of the data recorded since 1970 shows a

marked superiority over earlier data, being fair to good to the basal Cretaceous unconformity. Deeper data is affected by faulting which makes correlation difficult.

Prospectivity: NT/P15 may be conveniently divided into a number of regional tectonic elements. The western part of the area lies on the northern edge of the Ashmore-Sahul Block, the central portion covers the Cartier Trough and the northern portion within the Sahul Syncline. The eastern portion of the title area includes the western flank of the northeast Londonderry Rise.

The Ashmore-Sahul Block: One well, Sahul Shoals-1 has been drilled in this area. The area has only been covered by a sparse seismic grid except in the vicinity of the well location, where detail work was carried out. Prospective horizons are expected to be within Upper Cretaceous and Triassic sands, the Jurassic section being absent. So far no structural leads other than on the Sahul Shoals trend are known.

Recommendations: Semi-detail seismic coverage over the unexplored areas may uncover leads worthy of detailing.

The Cartier Trough: The Cartier Trough is a fault-controlled graben between the Ashmore-Sahul Block and the Northeast Londonderry Rise. No wells have been drilled in the Cartier Trough. The western flank of the trough has only been covered by reconnaissance seismic lines, whereas the eastern flank has been covered by a semi-detailed modern seismic grid.

A number of small fault-controlled closures has been mapped on a northeast-southwest trend on the eastern flank of the trough. Prospective horizons are expected to be Cretaceous, Jurassic and possibly Triassic sands.

Recommendations: Further detailed seismic is required on the eastern flank, and reconnaissance and semi-detailing is required on the western flank.

The Northeast Londonderry Rise: The western flank of the Londonderry Rise falls within NT/P15. One well, Dillon-Shoals-1, tested a structure in this area. No hydrocarbon shows were encountered and only a thin Lower Cretaceous section 6 m (20 ft) was drilled. A number of structures similar to Dillon Shoals occur along the western flank of the Northeast Londonderry Ridge. It seems unlikely that thicker accumulations of Jurassic sediments occur on the flanks. However the area does lie updip from the Cartier Trough and Triassic sediments must still be regarded as prospective.

Recommendations: Further seismic detailing to reduce the size of the grid followed by drilling of any significant leads uncovered.

The Sahul Syncline: The southwestern flank of the Sahul Syncline occurs in NT/P15. No wells have been drilled in the area and only sparse seismic coverage exists. Prospective horizons are expected to be within Mesozoic sands. No large structural leads are known.

Recommendation: Further seismic work will be required to define structural leads.

Appendix 1

Geophysical data sheets

Areas: NT/P2, NT/P7, NT/P8, NT/P9, NT/P10
NT/P13, NT/P14, NT/P15

SURVEY: N. Western Shelf M.S. No: 64/4529 MAPCODE:

DATES: 12/7/64 - 17/10/64 COMPANY: B.O.C. CONTRACTOR: Western

TENEMENTS: OP 108, OP 90 (1) and (2). OP 92 (A) 92 (B) 105, 106 PE 232H, NE part of 213H SW part of PE 213H

SEISMIC SOURCE: Explosives PROCESSING:

CABLE: 1200/2000 m RECORDING: Western Techno magnetic tape

MULTIPLE COVERAGE: Single-fold

MILEAGE:

REFRACTION:

GRAVITY: -

MAGNETIC: -

DATA QUALITY: P - F. Multiples obscure deep data

RESULTS: Province between coast and Rowley Shoals indicated to be nearly featureless. NW dipping flank of a broad sedimentary basin. No structure apparent.

SURVEY: Timor Sea M/S Survey No: 65/11042 MAPCODE:

DATES: 12-31/10/65 COMPANY: Arco CONTRACTOR: G.A.I.

TENEMENTS: NT/P4, etc

SEISMIC SOURCE: Sparker PROCESSING: -

CABLE: 1100 ft RECORDER: E.G.G. Mod 254

MULTIPLE COVERAGE:

MILEAGE: 1437 miles (total)

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: p

RESULTS: Confirmed previous indications of a large sedimentary basin in the area with structurally interesting areas.

SURVEY: Timor Sea Gravity, Magnetic & Seismic Survey 1967 No: MAPCODE:
DATES: 67 COMPANY: B.M.R. CONTRACTOR: United
TENEMENTS: NT/P19, NT/P6, NT/P4, NT/P12, NT/P11, WA-36-P
SEISMIC SOURCE: 21,000 j sparker PROCESSING:
CABLE: 4600 ft RECORDER: Analogue
MULTIPLE COVERAGE: -
MILEAGE: 13,000 miles
REFRACTION:
GRAVITY:
MAGNETIC:
DATA QUALITY: p
RESULTS: Provided a reconnaissance cover over the whole area.

SURVEY: Sahul Rise M/S Survey No: 67/11166 MAPCODE
DATES: 15/6/67 - 4/11/67 COMPANY: Arco CONTRACTOR: C G G, Western & Namco.
TENEMENTS: NT/P4, etc
SEISMIC SOURCE: - Airguns (NAMCO) - Explosives (NAMCO, WESTERN) PROCESSING:
CABLE: 2400 m WESTERN RECORDING: Digital - DFR-200 (WESTERN)
2450 m NAMCO SDS 1010 (NAMCO)
MULTIPLE COVERAGE: 6f (WESTERN), 12f (NAMCO)
MILEAGE: 6988 km
REFRACTION: Reserved refractions
GRAVITY: -
MAGNETIC: -
DATA QUALITY: P
RESULTS: The survey confirmed the regional interpretation involving the Sahul Rise, the Londonderry Rise, the Van Diemen Rise and the Bonaparte Depression. Two structural trends are evident, an older NW trend (Palaeozoic) and a younger NE trend.

SURVEY: Montebello-Mermaid Shoal No: 65/11015 MAPCODE:

DATES: 6/8/65 - 23/11/65 COMPANY: B.O.C. CONTRACTOR: Western

TENEMENTS: OP 90, 92, 132 N.T., PE 213H, 217H W.A.

SEISMIC SOURCE: Explosives PROCESSING:

CABLE: RECORDER:

MULTIPLE COVERAGE: 200%

MILEAGE: 3806 (6125 km)

REFRACTION:

GRAVITY: -

MAGNETIC: -

DATA QUALITY: F

RESULTS: Survey has indicated the existence of sedimentary structure north of Barrow Island and over much of the NW Shelf area.

SURVEY: Scott-Cartier M.S. No: 67/11173 MAPCODE

DATES: 4/8/67 - 24/9/67 COMPANY: B.O.C. CONTRACTOR: Western

TENEMENTS: PE 213H W.A., OP 92 (1) and (2) N.T.

SEISMIC SOURCE: Explosives PROCESSING: Western

CABLE: RECORDING:

MULTIPLE COVERAGE: 300%

MILEAGE: 1020.25 (1641 km)

REFRACTION: Four refraction profiles and four velocity profiles recorded

GRAVITY: -

MAGNETIC: -

DATA QUALITY: F - G

RESULTS: Numerous prospective targets uncovered along NW Shelf

SURVEY: Rankin-Troubadour M/S Survey (Northern Portion) No: 66/11104 MAPCODE

DATES: 3/7/66 - 19/7/66 COMPANY: B.O.C. CONTRACTOR: Western

TENEMENTS: NT/P6, NT/P12

SEISMIC SOURCE: Explosives PROCESSING: Western

CABLE: 1200-1200 m RECORDER: F M Analogue (Digital)

MULTIPLE COVERAGE: 3 or 2 f

MILEAGE: 1715.5 mls (Survey total)

REFRACTION: 5 Profiles

GRAVITY: -

MAGNETIC: -

DATA QUALITY: P

RESULTS: Located the Troubadour Structure

SURVEY: Sahul Shelf M/S survey No: 66/11088 MAPCODE

DATES: 2/5/66 - 25/11/66 COMPANY: ARCO CONTRACTOR C G G

TENEMENTS: NT/P4, etc

SEISMIC SOURCE: SPARKER 130kjoule PROCESSING:
4 days FLEXOTIR

CABLE: RECORDING:

MULTIPLE COVERAGE: 6 f

MILEAGE: 12050 km

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: P

RESULTS: The survey outlined the major structural units in the area including the Sahul Rise.

SURVEY: Ashmore Reef No: 67/11144 MAPCODE

DATES: 13/2/67 - 19/2/67 COMPANY: B.O.C. CONTRACTOR: Western

TENEMENTS: OP 141 and OP 92 (1) N.T.

SEISMIC SOURCE: Explosives PROCESSING: Western

CABLE: RECORDER:

MULTIPLE COVERAGE:

MILEAGE: 91.45 km

REFRACTION: 1 velocity profile

GRAVITY : -

MAGNETIC: -

DATA QUALITY: F - G

RESULTS: Closure confirmed on two horizons with culminations north of East Island.

SURVEY: Sahul Ashmore No: 71/667 MAPCODE

DATES: 14/10/71 - 21/10/71 COMPANY: B.O.C. CONTRACTOR: Western

TENEMENTS: NT/P2, NT/P7, NT/P10, NT/P13, NT/P14, NT/P15.

SEISMIC SOURCE: Maxipulse PROCESSING: Western

CABLE: 2400 m RECORDING: DDS- 777

MULTIPLE COVERAGE: 2400%

MILEAGE: 601.88 km

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: F - G

RESULTS: The survey provided a seismic tie between the Ashmore Reef No. 1 and Sahul Shoals No. 1 wells. A large anticlinal trend has also been revealed in the north west of the survey area.

SURVEY: Londonderry Rise M/S survey No: 68/3024 MAPCODE:
DATES: 12/6/68 - 17/12/68 COMPANY: ARCO CONTRACTOR: C G G
TENEMENTS: NT/P4, etc
SEISMIC SOURCE: explosives and flexotir PROCESSING: C G G
CABLE: 2400 m RECORDING: Digital
MULTIPLE COVERAGE: 24 f
MILEAGE: 5140 mls (8270.7 km)
REFRACTION: -
GRAVITY: -
MAGNETIC: -
DATA QUALITY: F - P
RESULTS: A number of structures detailed including Anson.

SURVEY: Legendre-Marie M/S Survey Projects J,H,D. No: 69/3005 MAPCODE:
DATES: 12/4/69 - 1/5/69 COMPANY: B.O.C. CONTRACTOR: Western
TENEMENTS: WA-36-P, NT/P12, NT/P6, NT/P4
SEISMIC SOURCE: Aqua Pulse PROCESSING: Western
CABLE: 7590 ft RECORDING: SDS-1010 (DFR-300)
MULTIPLE COVERAGE: Sum 2, 24-f or Sum 3, 12-f
MILEAGE: 4348.5 mls (Total)
REFRACTION: -
GRAVITY: -
MAGNETIC: -
DATA QUALITY: P-F
RESULTS: Kelp & Troubadour structures partially detailed.

SURVEY: Van Diemen Rise M/S Survey No.: 69/3044 MAPCODE:

DATES: 7/7/69 - 21/8/69 COMPANY: ARCO CONTRACTOR: C G G

TENEMENTS: NT/P4 etc

SEISMIC SOURCE: explosives PROCESSING: C G G

CABLE: 2400 m RECORDING: SERCEL AS-626

MULTIPLE COVERAGE: 6 f

MILEAGE: 1414.8 km

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: f

RESULTS: Several structures detailed (incl. Anson & Heron).

SURVEY: Holothuria Rise M/S Survey No: 70/8 MAPCODE:

DATES: 17/10/70 - 11/12/70 COMPANY: ARCO CONTRACTOR: Western

TENEMENTS: WA-36-P, NT/P2, NT/P3 etc.

SEISMIC SOURCE: Aqua Pulse PROCESSING: Western

CABLE: 2400 m RECORDER: DDS 777

MULTIPLE COVERAGE: 24 f

MILEAGE: 1068.2 mls (Total)

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: f

RESULTS: Few tie lines to B.O.C. data in WA-36-P.

SURVEY: Trimouille - Dillon No: 70/976 MAPCODE:

DATES: 20/12/70 - 7/1/71 COMPANY: B.O.C. CONTRACTOR: Western
13/2/70 - 2/5/71

TENEMENTS: W.A.-1, 28, 29, 30, 31, 42, 33, 34, 35, 36, 37P and NT/P5, P8, P10, P15.

SEISMIC SOURCE: Aquapulse, Maxipulse PROCESSING: Western 0

CABLE: 7773 ft RECORDER:

MULTIPLE COVERAGE: 1200%, 2400%

MILEAGE: 4063.5 mls (6539.4 km)

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: P - G

RESULTS: Some existing anomalies confirmed as drill-sites, others downgraded and several new leads uncovered. Resulted in drilling of North Rankin, Rankin and De Grey wells and siting of the Angel and Goodwyn wells.

SURVEY: Gale Bank M/S No: 71/3 MAPCODE:

DATES: 21/9/71 - 5/10/71 COMPANY: ARCO AUST. LTD CONTRACTOR: W.G.C. of America.

TENEMENTS: W.A.-15, 16, 17, 18 - P and NT/P2, 3

SEISMIC SOURCE: Aquapulse PROCESSING:

CABLE: 7773 ft 48 group RECORDING: Digital Data Systems Model 777

MULTIPLE COVERAGE: 2400%

MILEAGE: 1345 km

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: ? - G

RESULTS: Regional control was strengthened and previous shooting tied in WA-15-P. A20 (Eider-1) was further detailed. A-1, A-2, A-4 (Penguin - 1), A-7 and A-15 shown to be a result of salt flowage.

SURVEY: Baldwin Bank M/S Survey No: 72/1 MAPCODE:

DATES: 13/1/72 - 20/3/72 COMPANY: Arco Aust CONTRACTOR: Western

TENEMENTS: WA-15-P, WA-16-P, WA-17-P, NT/P2, NT/P3, NT/P4, NT/P12, NT/P15, NT/P14.

SEISMIC SOURCE: Aqua Pulse PROCESSING: Western

CABLE: 2369 m RECORDER: SDS 1010

MULTIPLE COVERAGE: 24 f

MILEAGE: 1345 km

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: f - g

RESULTS: The survey gave detail of semi detail coverage in NT/P4. Several low relief anomalies mapped on the Sahul Rise.

SURVEY: Prudhoe - Hibernia M/S No: 72/2530 MAPCODE:

DATES: May-June, 1972 COMPANY: B.O.C. CONTRACTOR: Western

TENEMENTS: WA-35P, WA-37P NT/P5 etc.

SEISMIC SOURCE: Maxipulse (1/2 lb) PROCESSING: Western

CABLE: 3200m) 240 m offset RECORDER: DDS-777

) 300 m offset

MULTIPLE COVERAGE: 24-fold

MILEAGE: 285.2 miles (part of large survey)

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY: Mostly good

RESULTS: Shows NW Regional dip but no structural features of consequence indicated.

SURVEY: Mermaid-Cartier M/S No: 73/204 MAPCODE:
DATES: Feb. - April, 1973 COMPANY: B.O.C. CONTRACTOR: Western
TENEMENTS: WA-33P, WA-34P, -35P, -37P, NT/P5 etc
SEISMIC SOURCE: Maxipulse PROCESSING: Western
CABLE: 3200 m, 230 m offset RECORDING: DDS-777
MULTIPLE COVERAGE: 24-fold
MILEAGE: 2,100 miles (part of survey)
REFRACTION:
GRAVITY:
MAGNETIC:
DATA QUALITY: Fair to 2.5 secs from sea bottom and poor at greater depth.
RESULTS: A member of new closed structures within Scott-Reef trend and a few other similar structures were indicated. A very prominent intrusive type feature south of Ashmore Reef but within NT/P5 was outlined. NW-SE trending fault controlled anomalies within NT/P5 area were also indicated.

SURVEY: Pago Seismic Survey NO: 72/13 MAPCODE:
DATES: 25/4/72 - 25/7/72 COMPANY: Arco Aust. CONTRACTOR: Western
TENEMENTS: WA-15-P, WA-16-P, WA-17-P, NT/P2, NT/P3, NT/P4
SEISMIC SOURCE: Aqua Pulse PROCESSING: Western or G.S.I. (2000 km)
CABLE: 7590 ft RECORDING: SDS
MULTIPLE COVERAGE: 24 fold
MILEAGE: 2709 mls (4359 km)
REFRACTION: -
GRAVITY: -
MAGNETIC:
DATA QUALITY: f - g
RESULTS: Two lines in NT/P4 on northern boundary of Malita Trough.

SURVEY, Hat Point M/S Survey No: 73/5 MAPCODE:

DATES: 16/1/73 - 19/2/73 COMPANY: Arco Aust. CONTRACTOR: G.S.I.

TENEMENTS: WA-15-P, WA-16-P, WA-17-P, WA-18-P, NT/P2, NT/P4

SEISMIC SOURCE: Airgun PROCESSING:

CABLE: 2400 m, 3200 m RECORDING: DFS 111

MULTIPLE COVERAGE: 24 & 48 f

MILEAGE: 2345.5 km

REFRACTION: -

GRAVITY: -

MAGNETIC: 2345.5 km

DATA QUALITY: G

RESULTS: One line recorded over Anson in NT/P4. (H.P. 82)

SURVEY: Dillon Shoals M/S No: 73/9 MAPCODE:

DATES: 21/6/73 - 15/7/73 COMPANY: B.O.C. CONTRACTOR: Western

TENEMENTS: WA-36-P, NT/P8, NT/P9, NT/P15

SEISMIC SOURCE: Maxipulse PROCESSING: Western

CABLE: 3200 m RECORDER: DDS 777

MULTIPLE COVERAGE: 24 f

MILEAGE: 533 miles

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: G

RESULTS: Western flank of Kelp further detailed. 2 small structures outlined as well as one in western end of WA-36-P.

SURVEY: Cartier M/S Survey No: 73/11 MAPCODE:

DATES: 21/6/73 - 4/7/73 COMPANY: Arco Aust CONTRACTOR: G.S.I.

TENEMENTS: WA-15-P, WA-16-P, WA-17-P, WA-18-P, WA-19-P, NT/P2, NT/P3, NT/P4

SEISMIC SOURCE: Airguns PROCESSING: G.S.I.

CABLE: 2400 m RECORDING: DFS 111

MULTIPLE COVERAGE: 24 f

MILEAGE: 2043 km

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: G

RESULTS: In NT/P4: 2 lines crossed structure A-44 and helped to substantiate the anomaly C52, 54. The northern boundary of the Malita trough has been crossed by Cartier lines which are of sufficient quality to make some lithological distinctions across the fault boundary. A number of low relief structures lie along this boundary - A40, A28, A30, A44, A31 some of which could be caused by velocity anomalies.

SURVEY: Kendrew-Cootamundra M/S Survey No: 74/31 MAPCODE:

DATES: 16/12/73 - 8/9/74 COMPANY: B.O.C. CONTRACTOR: G.S.I. & Western

TENEMENTS: NT/P6, NT/P12, etc

SEISMIC SOURCE: + Airguns & Magnapulse PROCESSING: G.S.I. &
- Aquapulse Western

CABLE: 3200 m RECORDER: DFS III

MULTIPLE COVERAGE: 24 f

MILEAGE: 9191 km

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: -

RESULTS: provided extensive coverage over NT/P6 and NT/P12

Table 1

Offshore wells - general data

Well/No	Title	Rig Release	Kb/wd	Rig	T.D.	Deepest horizon	Thickness Petr. 1 FM	(Kb) Base U. Cret.	Tectonic Element	Remarks
Osprey - 1 71/618	NT/P2	7.4.72	112'/330' 34m 101m	Sedco 135G	10,451' 3,165m	U. Permian	x	4,123' 1,257m	NE Londonderry Rise Anticlin	Several thin potential HC zones between 2527m - 2582m 8290' - 8472' - DST flowed water Hyland Bay Fm is over pressured. Jurassic completely absent.
Puffin - 1 72/55	NT/P2	15.6.72	113'/336' 34m 102m	Sedco 135G	9,715' 2,961m	U. Triassic	x	7,750' 2,362m	Ashmore-Sahul Block	Oil recovered from core below Mio/Eo u/c. FIT @ 6,782' 2,067m Rec. gas and oil (interval 6778' - 6783' 2066m - 2067m) from U. Cret.
Brown Gannet 1 72/2911	NT/P2	6.11.72	112'/362' 34m 110m	Sedco 135G	9,000' 2,743m	U. Triassic	x	7,110' 2,167m	Ashmore-Sahul Block faulted Tr. high	HC indications in Oligocene/Eocene? FIT recovered water only. No Jurassic - high during Jurassic.
Swan - 1 72/3261	NT/P2	13.2.73	112'/358' 34m 109m	Sedco 135G	10,775' 3,284m	U. Jurassic	✓(588m) (1929'+)	8,629' 2,630m	Vulcan S. basin	Drilled on salt plug? Results indicate well drilled on a horst w/consid. bounding faults. Minor gas shows in U.Cret.
Puffin - 2 74/105	NT/P2	7.7.74	82'/257' 25m 78m	Margie	8,400' 2,560m	U. Triassic	x	8,005' 2,440m	Ashmore-Sahul Block	2,028m - 2034m 6,655' - 6672' DST 1 4068 bopd 48° API ½" surf. dobs. U. Cretaceous.
Prion - 1 74/104	NT/P2	16.8.74	82'/229' 25m 70m	Margie	9,713' 2,961m	M. Triassic	✓(40') (12m)	8,527' 2,599m	Ashmore-Sahul Block	No signif. shows.
Turnstone 1 74/119	NT/P2	16.9.74	82'/387' 25m 118m	Margie	6,625' 2,019m	U. Triassic	✓(895') (273m)	4,675' 1,425m	NE Londonderry Rise	Horst // to Eider. Structually higher. Minor shows in U. Cret. 1st (3,259' - 3,300') (993m - 1,006m)
Skua - 1 74/106	NT/P2	27.12.74	97'/264' 30m 80m	Ocean Digger	10,000' 3,048m	M. Jurassic	✓(2065'+) (629+m)	7,935' 2,419m	Vulcan S. basin	No signif. shows. Drilled on horst trend // to Puffin trend.
Puffin - 3 74/124	NT/P2	26.2.75	82'/322' 25m 98m	Margie	8,103' 2,470m	U. Triassic	x	7,914' 2,412m	Ashmore-Sahul Block	U. Cret 6,888' - 6898' 2,099m - 2103m FIT's rec. 40 - 42° API oil.
							Jurassic Thickness			
Ashmore Reef - 1 67/4264	NT/P10	2.4.68	33'/160' 10m 49m	Glomar Tasman	12,843' 3,915m	U. Triassic	1187' 362m	7,956' 2,425m	Ashmore-Sahul Block	No significant HC Shows U.+ M. Jurassic (also Scott Reef & Yampi Wells) consisted of volcanic.
Sahul Shoals 69/2042	NT/P15	1.4.70	33'/93' 10m 28m	Glomar Tasman	12,475' 3,802m	U. Permian	Nil	5,805' 1,769m	Ashmore-Sahul Block	No significant HC shows.
North Hibernia - 1	NT/P13	31.1.74	43'/108' 13m 33m	Big John	13,124' 4,000m	U. Triassic	Nil	6,424' 1,958m	Ashmore-Sahul Block	No signif. HC Shows. (2550' - 2575' Dolomite and Salt) 777m - 785m
Hillon Shoals - 1	NT/P15	30.5.74	41'/410' 12.5m 125m	Big John	13,026' 3,970m	U. Permian	3' (1m)	5,919' 1,804m	Ashmore-Sahul Block	Minor HC Shows. 1m of Late M. Jurassic greensand. 6m of L. Cretaceous High gas readings at base U. Cret.

Table 2

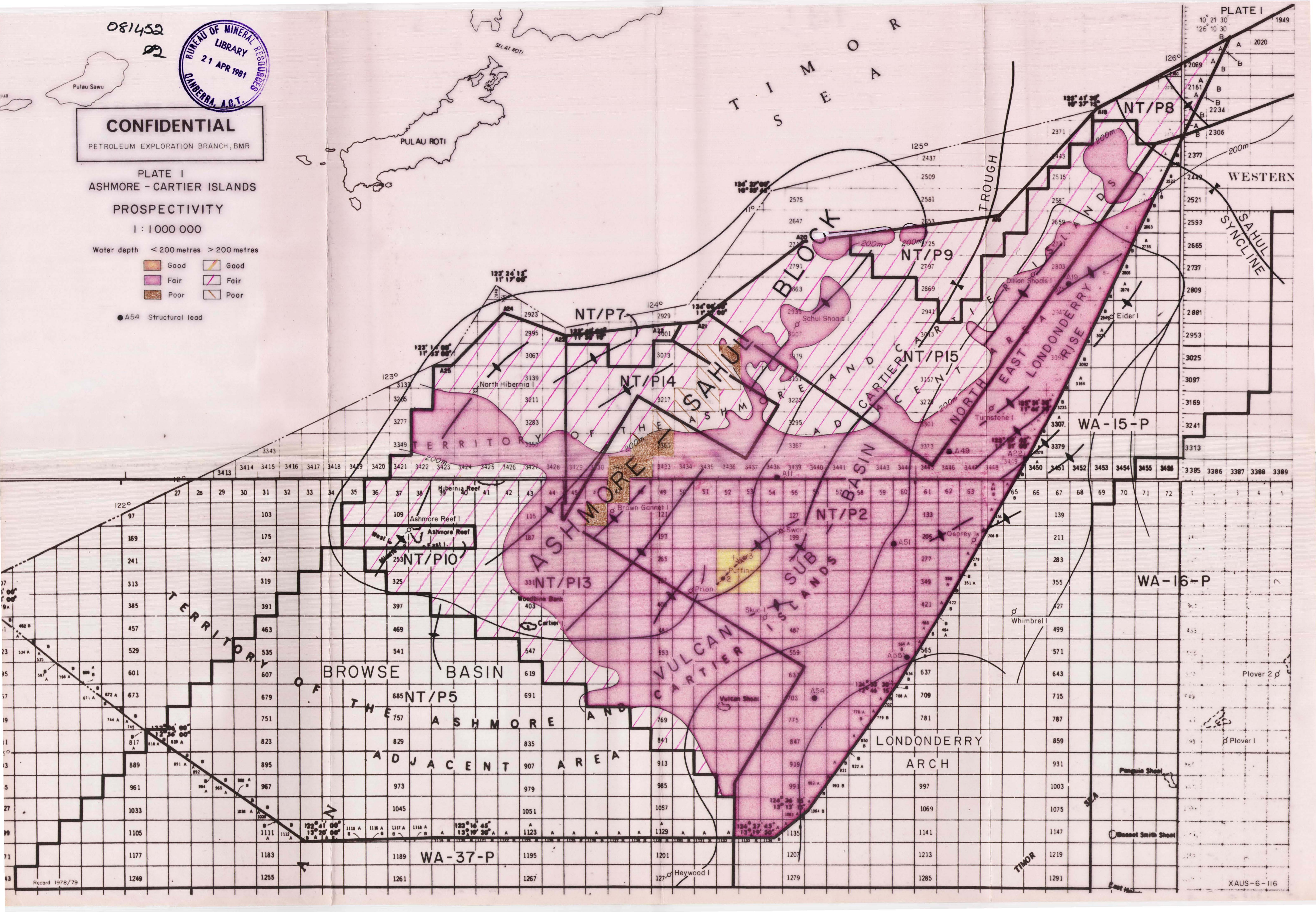
Offshore Wells - Stratigraphy

Seismic Horizons			Osprey - 1	Puffin - 1	Brown Gannet - 1	Swan - 1	NT/P2 Puffin - 2	Prion - 1	Turnstone - 1	Skua - 1	Puffin - 3	NT/P10 Ashmore Reef - 1	NT/P15 Sahul Shoals - 1	NT/P13 N. Hibernia	NT/P15 Dillon Shoals-1
Rt/wd			112'/330' 34m/101m	113'/336' 34m/102m	112'/362' 34m/110m	112'/358' 34m/109m	82'/257' 25m/78m	82'/229' 25m/70m	82'/387' 25m/118m	97'/264' 30m/80m	82'/322' 25m/98m	33'/160' 10m/49m	31'/93' 10m/28m	43'/108' 13m/33m	41'/410' 12.5m/125m
Quaternary		P										193' (58m)			
	Upper	M	930' (283m)	1100' (335m)	904' (276m)	973' (297m)	2650' '808m)	311' (95m)	387' (117m)	798' (243m)	No samples	1053' (321m)	1250' (381m)	1034' (315m)	1847' (563m)
		O	Abs	Abs	2603' (793m)	Abs	Abs	Abs	Abs	Abs		3062' (933m)	2873' (876m)	3530' (1076m)	
10	Lower	E	1815' (553m)	3350' (1021m)	2822' (860m)	2866' (874m)	3418' (1042m)	3460' (1055m)	1176' (358m)	2675' (815m)	3311' (1009m)	4009' (1222m)	3810' (1161m)	4541' (1384m)	
		P		5655' (1724m)	5800' (1768m)	5153' (1571m)	5689' (1734m)	6071' (1850m)		4503' (1373m)	5695' (1736m)		5007' (1526m)	5256' (1602m)	
2A	Upper	U. Bathurst Is. Fm	2398' (731m)	6560' (1999m)	6364' (1940m)	7063' (2153m)	6516' (1986m)	6938' (2115m)	3028' (923m)	6222' (1896m)	6635' (7022m)	6543' (1994m)	5450' (1661m)	5460' (1664m)	4964' (1513m)
Cretaceous	Lower	L. Bathurst Is. Fm	?	Abs	Abs	Abs	Abs	8527' (2599m)	?	Abs	Abs	Abs	5820' (1774m)	6424' (1958m)	5919' (1804m)
C		Petrel 'A'	Abs	Abs	Abs	8629' (2630m)	Abs	?	4675' (1425)	Abs	Abs				
	Upper	Petrel 'B'	Abs	Abs	Abs	8846' (2696m)	Abs	8642' (2634m)		7935' (2419m)	Abs	7956' (2425m)			
J	Jurassic	Petrel 'C'	Abs	Abs	Abs	9250' (2819m)	Abs				Abs	Volcanics etc.	Jurassic absent	Jurassic absent	1 metre Jurassic 5939' (1810m).
3A	Lower	"Red Beds"	Abs	Abs	Abs		Abs	Abs	equiv. 4770' (1454m)		Abs	Abs			
3	Upper	Undiff.	4123' (1257m)	7750' (2362m)	7110' (2167m)		8005' (2440m)	8682' (2646m)	5580' (1701m)		7914' (2412m)	9143' (2787m)	5885' (1794m)	6506' (1983m)	5942' (1811m)
Triassic MT															
	Lower	Mt. Goodwin Fm	6017' (1834m)										10700' (3261m)		
4	Upper	Hyland Bay Fm	8108' (2471m)										12300' (3749m)		12077' (3681m)
5															
Permian	Lower	Undiff. Kulshill Fm													
MD															
			Anticlinal	horst	faulted Tr. high	horst	horst	horst	elongate horst	horst	horst				
			10451' 3185m	9715' 2961m	9000' 2743m	10775' 3284m	8400' 2560m	9713' 2961m	6625' 2019m	10000' 3048m	8103' 2470m	12843' 3915m	12475' 3802m	13124' 4000m	13026' 3970m

Offshore Wells - Stratigraphy

Table 2

Seismic Horizons			Osprey-1	Puffin-1	Brown Gannet-1	Swan-1	Puffin-2	Prion-1	Turnstone-1	Skua-1	Puffin-3	Ashmore Reef-1	Sahul Shoals-1	N.Hibernia	Dillon Shoals-1
Rt/wd			112'/330' 34m/101m	113'/336' 34m/102m	112'/362' 34m/110m	112'/358' 34m/109m	82'/257' 25m/78m	82'/229' 25m/70m	82'/387' 25m/118m	97'/264' 30m/80m	82'/322' 25m/98m	33'/160' 10m/49m	31'/93' 10m/28m	43'/108' 13m/33m	41'/410' 12.5m/125m
Quaternary	P											193' (58m)			
	Upper	M	930' (283m)	1100' (335m)	904' (276m)	973' (297m)	2650' (808m)	311' (95m)	387' (117m)	798' (243m)	No samples	1053' (321m)	1250' (381m)	1034' (315m)	1847' (563m)
		O	Abs	Abs	2603' (793m)	Abs	Abs	Abs	Abs	Abs		3062' (933m)	2873' (876m)	3530' (1076m)	
— 1C —															
	Lower	E	1815' (553m)	3350' (1021m)	2822' (860m)	2866' (874m)	3418' (1042m)	3460' (1055m)	1176' (358m)	2675' (815m)	3311' (1009m)	4009' (1222m)	3810' (1161m)	4541' (1384m)	
		P		5655' (1724m)	5800' (1768m)	5153' (1571m)	5689' (1734m)	6071' (1850m)		4503' (1373m)	5695' (1736m)		5007' (1526m)	5256' (1602m)	
— 2A —															
	Upper	U. Bathurst Is. Fm	2398' (731m)	6560' (1999m)	6364' (1940m)	7063' (2153m)	6516' (1986m)	6938' (2115m)	3028' (923m)	6222' (1896m)	6635' (7022m)	6543' (1994m)	5450' (1661m)	5460' (1664m)	4964' (1513m)
Cretaceous	Lower	L. Bathurst Is. Fm	?	Abs	Abs	Abs	Abs	8527' (2599m)	?	Abs	Abs	Abs	5820' (1774m)	6424' (1958m)	5919' (1804m)
— 2 —		Petrel 'A'	Abs	Abs	Abs	8629' (2630m)	Abs	?	4675' (1425)	Abs	Abs				
	Upper	Petrel 'B'	Abs	Abs	Abs	8846' (2696m)	Abs	8642' (2634m)		7935' (2419m)	Abs	7956' (2425m)			
— J —															
Jurassic		Petrel 'C'	Abs	Abs	Abs	9250' (2819m)	Abs				Abs	Volcanics etc.	Jurassic absent	Jurassic absent	1 metre Jurassic 5939' (1810m)
— 3A —									equiv. 4770' (1454m)						
	Lower	"Red Beds"	Abs	Abs	Abs		Abs	Abs			Abs	Abs			
— 3 —															
	Upper	Undiff.	4123' (1257m)	7750' (2362m)	7110' (2167m)		8005' (2440m)	8682' (2646m)	5580' (1701m)		7914' (2412m)	9143' (2787m)	5885' (1794m)	6506' (1983m)	5942' (1911m)
Triassic MT															
	Lower	Mt. Goodwin Fm	6017' (1834m)										10700' (3261m)		
— 4 —															
	Upper	Hyland Bay Fm	8108' (2471m)												
— 5 —													12300' (3749m)		12077' (3681m)
Permian	Lower	Unidiff. Kulshill Fm													
— MB —															
			Anticlinal	horst	faulted Tr. high	horst	horst	horst	elongate horst	horst					
			10451'	9715'	9000'	10775'	8400'	9713'	6625'	10000'	8103'	12843'	12475'	13124'	13026'
			3185m	3961m	2743m	3284m	2560m	2961m	2019m	3048m	2470m	3915m	3802m	4000m	3970m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CONFIDENTIAL
PETROLEUM EXPLORATION BRANCH, BMR
PLATE I
ASHMORE - CARTIER ISLANDS
PROSPECTIVITY
1 : 1 000 000
Water depth < 200 metres > 200 metres
Good
Fair
Poor
Good
Fair
Poor
A54 Structural lead
PLATE I
Pulau Sawu
PULAU ROTI
SELAT ROTI
TIMOR SEA
SAHUL BLOCK
TROUGH
SAHUL SYNCLINE
WESTERN
NT/P8
NT/P9
NT/P7
NT/P14
NT/P15
NT/P2
NT/P10
NT/P13
NT/P5
WA-15-P
WA-16-P
WA-37-P
ASHMORE - SAHUL
ASHMORE AND CARTIER
NORTH EAST LONDONDERRY RISE
VULCAN SUB-BASIN
CARTIER ISLANDS
TERRITORY OF THE ASHMORE AND ADJACENT AREA
BROWSE BASIN
LONDONDERRY ARCH
Sahul Shoals I
Dillon Shoals I
Eider I
Turnstone I
North Hibernia I
Hibernia Reef
Ashmore Reef I
Ashmore Reef
Brown Gannet I
Swan I
Puffin
Prion
Skua I
Osprey I
Woodbine Bank
Cartier I
Vulcan Shoal
Whimbrel I
Plover 2
Plover I
Penguin Shoal
Heywood I
200m
Record 1978/79
XAUS-6-116

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PETROLEUM EXPLORATION BRANCH, BMR

PLATE 2
ASHMORE – CARTIER ISLANDS
AEROMAGNETIC BASEMENT

1 : 1 000 000

Depth shown in thousands of metres below sea level

- Anticlinal trend
- Synclinal trend
- Fault
- —6·0— Basement isobath

PLATE 2

Pulau Sawu

SELAT ROTI

PULAU ROTI

TIMOR SEA

NT/P8

NT/P9

NT/P7

NT/P14

NT/P15

NT/P10

NT/P13

NT/P5

NT/P2

WA-15-P

WA-16-P

WA-37-P

TERRITORY OF THE ASHMORE AND ADJACENT AREA

WESTERN TERRITORY OF THE ASHMORE AND ADJACENT AREA

CARTIER ISLANDS

Hibernia Reef

North Hibernia I

Ashmore Reef I

Ashmore Reef West I.

Ashmore Reef East I.

Woodbine Bank

Cartier I.

Brown Gannet I

Swan I

Puffin

Prion I

Skua I

Vulcan Shoal

Heywood I

Sahul Shoals I

Dillon Shoals I

Eider I

Turnstone I

Osprey I

Whimbrel

Plover 2

Plover I

Penguin Shoal

Bassot Smith Shoal

TIMOR SEA

Record 1978/79

XAUS-6-118


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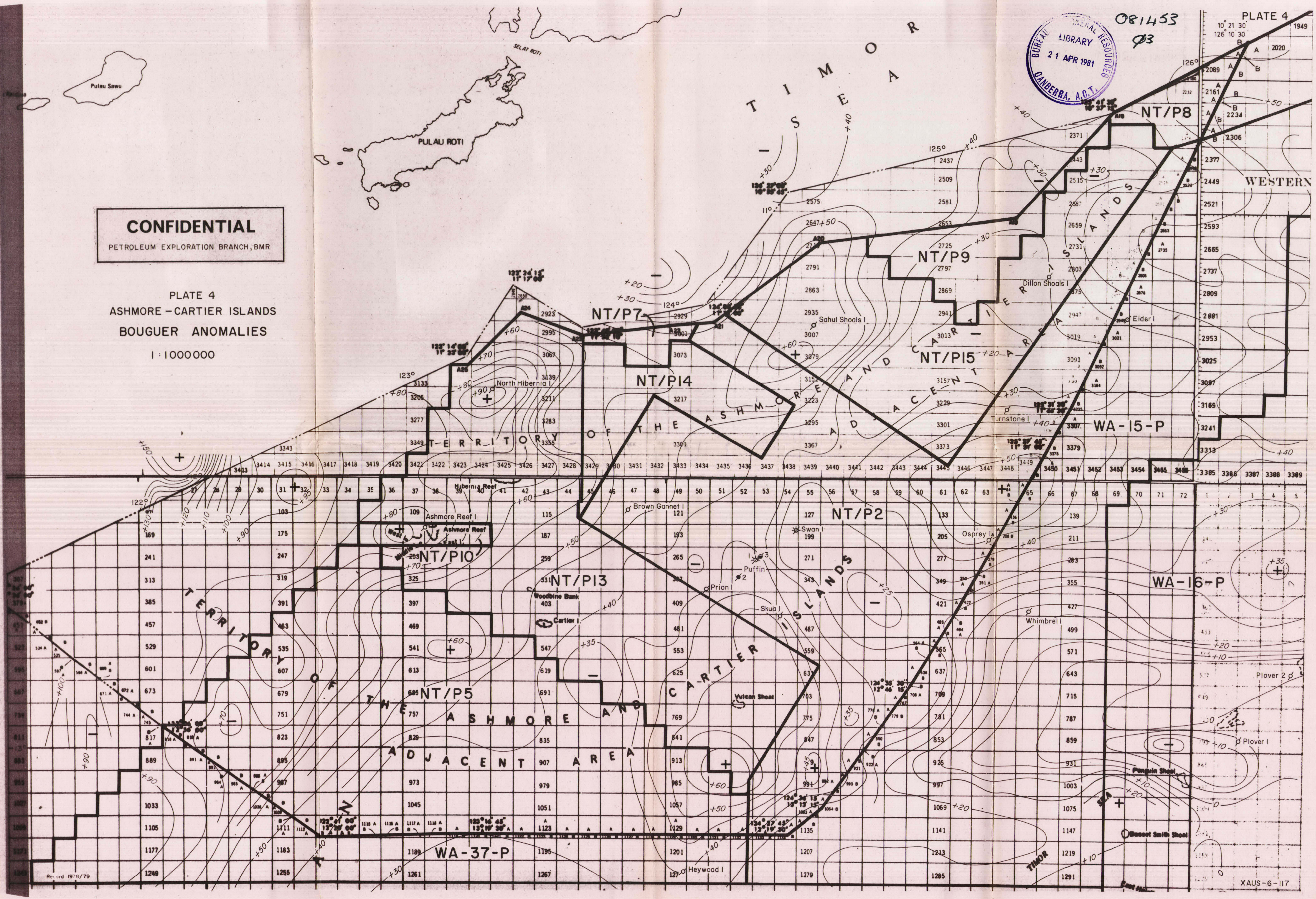
PETROLEUM EXPLORATION BRANCH, 1975
PLATE 3
ASHMORE – CARTIER ISLANDS
SEISMIC REFLECTION LINES
1 : 1000 000
1965 – 70
1971 – 74
TIMOR SEA
NT/P8
NT/P9
NT/P7
NT/P13
NT/P14
WA-15-P
NT/P6
NT/P10
WA-16-P
NT/P5
TERRITORY OF THE ASHMORE AND ADJACENT AREAS
WA-37-P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PETROLEUM EXPLORATION BRANCH, BMR
PLATE 4
ASHMORE - CARTIER ISLANDS
BOUGUER ANOMALIES
1:1000000
PLATE 4
TIMOR SEA
Pulau Sawu
PULAU ROTI
SELAT ROTI
WESTERN
NT/P8
NT/P9
NT/P7
NT/P14
NT/P15
NT/P2
NT/P10
NT/P13
NT/P5
WA-15-P
WA-16-P
WA-37-P
TERRITORY OF THE ASHMORE AND CARTIER ISLANDS ADJACENT AREA
North Hibernia I
Hibernia Reef
Ashmore Reef I
Ashmore Reef
Brown Gannet I
Swan I
Puffin
Prion I
Skua I
Woodbine Bank
Cartier I.
Vulcan Shoal
Heywood I
Sahul Shoals I
Dillon Shoals I
Eider I
Turnstone I
Osprey I
Whimbrel I
Plover 2
Plover I
Penguin Shoal
Bassett Smith Shoal
Record 1979/79
XAUS-6-117