DEPARTMENT OF ~~NATIONAL RESOURCES~~ NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1978/42

An Appraisal of Petroleum Exploration Title Areas - Offshore

Canning Basin

WA-29-P, WA-30-P, WA-31-P, WA-32-P, May 1975

by

W.J. McAvoy and P.R. Temple

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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 under consideration consists mainly of the offshore Canning Basin. It has been covered by a reconnaissance seismic grid with detailed coverage around the structural leads. Ten wells have been drilled and although potential reservoir sands have been encountered, no hydrocarbon shows have been recorded.

This area cannot be rated highly.

INTRODUCTION

This Record is the result of a brief examination of data relevant to the title areas under consideration. All available data were used in its preparation and these include 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 as confidential.

Regional Setting

The title areas under consideration are located offshore from the western coast of Western Australia stretching from Port Hedland northwards to Adele Island (Figures 1A & 1B). The title areas are bounded to the south-west by WA-28-P, WA-1-P and WA-23-P and to the northeast by WA-33-P and WA-34-P. They are separated from the mainland by WA-21-P and WA-2-P and have no title areas bounding them to the west.

A little more than one-third of the title areas lie in water depths in excess of 180 m. The maximum depth approaches 1600 m off the edge of the continental shelf in the northwest corner of WA-32-P.

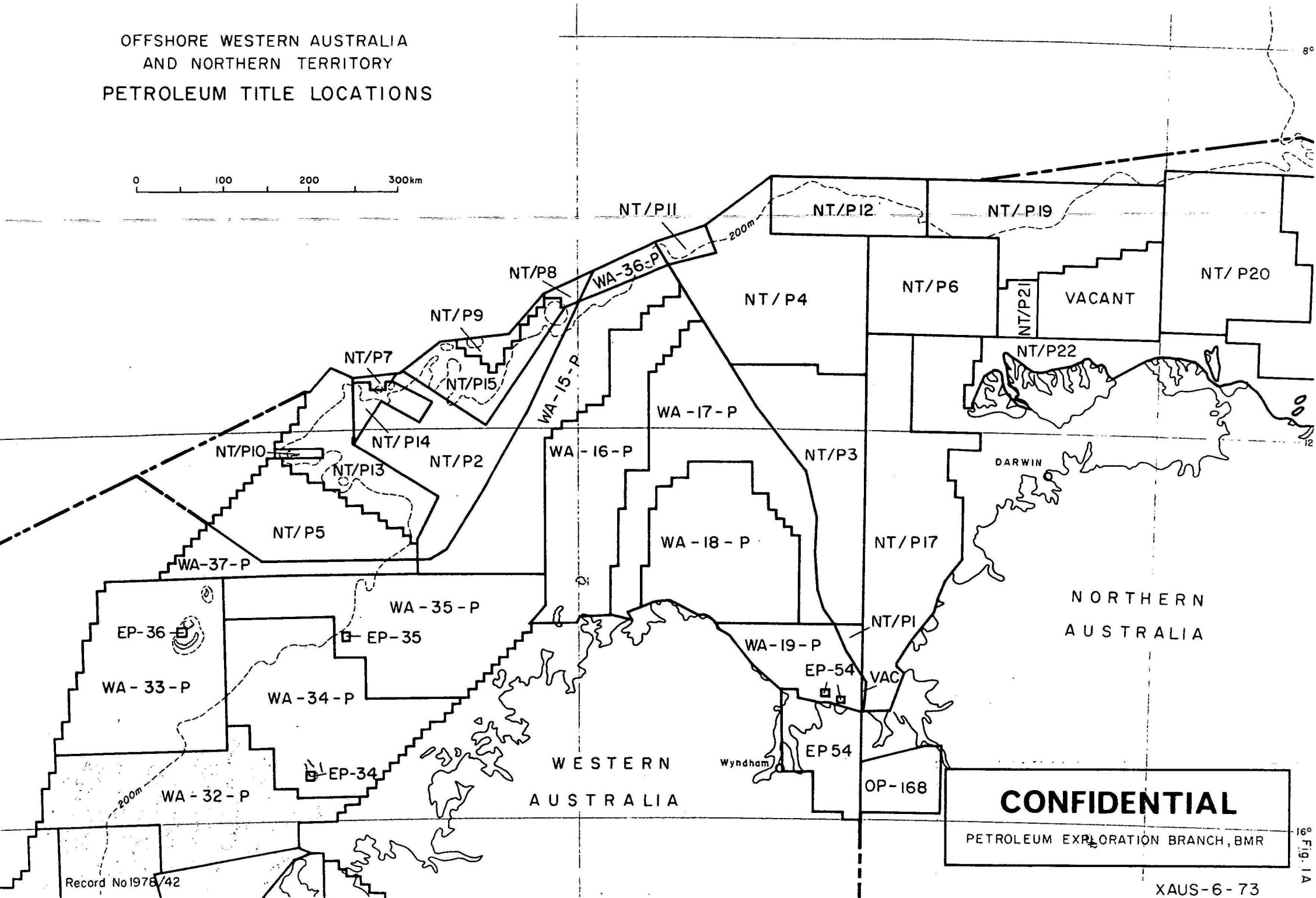
GEOPHYSICS

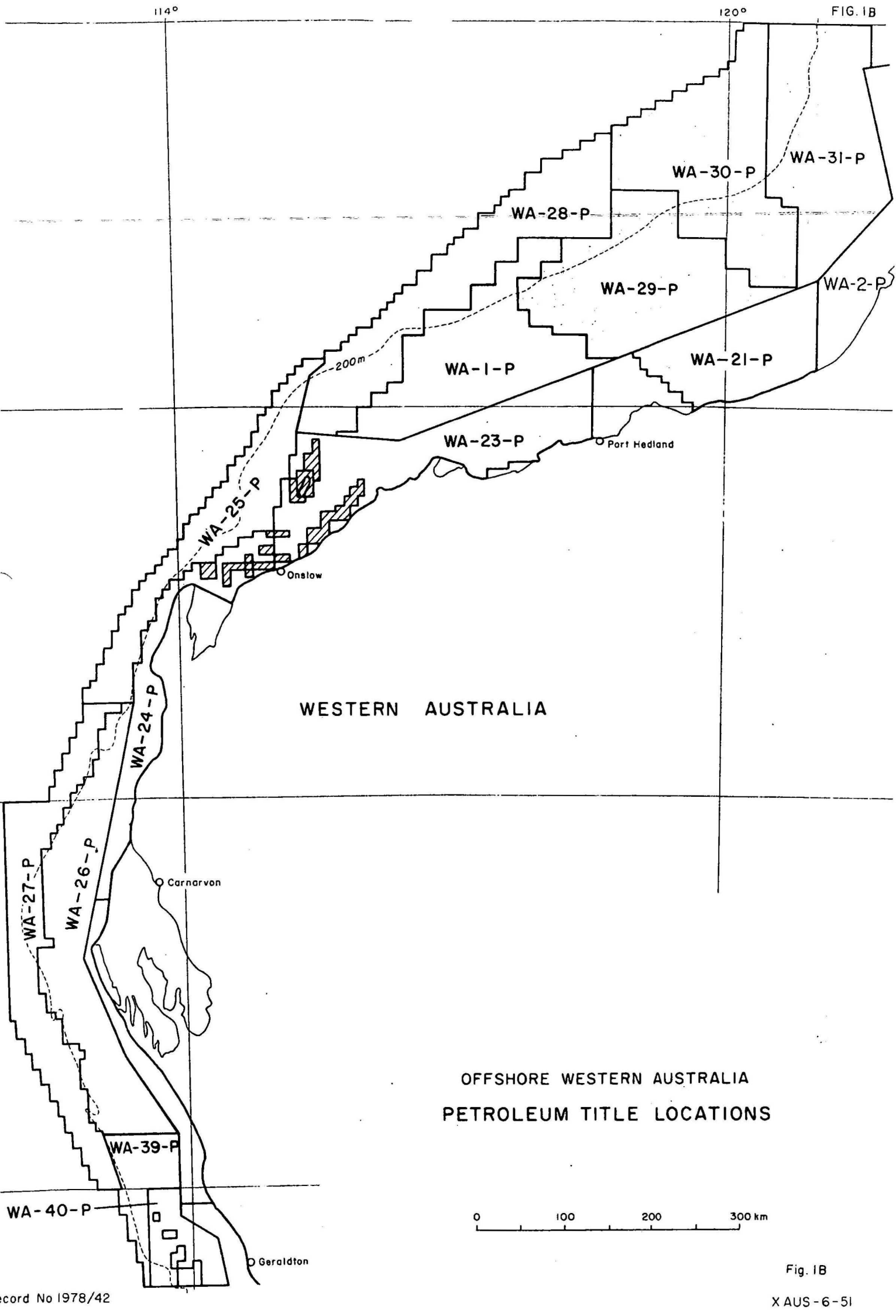
Regional Setting The title areas under consideration are mainly located in the offshore Canning Basin, a major sedimentary basin which is bounded to the south by the North Turtle Arch and to the north by the Buccaneer Trend. The offshore part of the basin is made up of eight main structural areas - Pilbara Shelf, Broome Swell, Jurgurra Terrace, Fitzroy Graben, Leveque Shelf and Platform, Leveque Margin Structural Trend, Rowley Sub-basin and Shelf, and Bedout Sub-basin (see Pl. 4).

A little more than one-third of the permit areas lies in water depths in excess of 180 m. The maximum depth approaches 1600 m off the edge of the shelf, in the northwest corner of WA-32-P.

Magnetic

Widely spaced reconnaissance lines were flown over the offshore


OFFSHORE WESTERN AUSTRALIA
AND NORTHERN TERRITORY
PETROLEUM TITLE LOCATIONS
0
100
200
300km
NT/P11
NT/P12
NT/P19
200m
WA-36-P
NT/P8
NT/P9
NT/P4
NT/P6
NT/P21
VACANT
NT/P20
NT/P7
NT/P15
NT/P22
WA-15-P
WA-17-P
NT/P14
NT/P10
NT/P2
WA-16-P
NT/P3
NT/P13
DARWIN
NT/P5
WA-18-P
NT/P17
WA-37-P
WA-35-P
NORTHERN
AUSTRALIA
EP-36
EP-35
NT/P1
WA-19-P
EP-54
VAC
WA-33-P
WA-34-P
EP54
WESTERN
Wyndham
EP-34
AUSTRALIA
OP-168
200m
WA-32-P
CONFIDENTIAL
PETROLEUM EXPLORATION BRANCH, BMR
Record No 1978/42
XAUS-6-73
16°
Fig. 1A
8°
12



OFFSHORE WESTERN AUSTRALIA

PETROLEUM TITLE LOCATIONS

Fig. 1B

X AUS-6-51

permits as far out as Rowley Shoals in the Rowley Shoals, Scott Reef, and Sahul Banks Aeromagnetic survey in 1963. Results indicated the presence of 15000-18000 ft (4572-5486 m) of sediments under the Rowley Shoals, increasing to about 20000 ft (6000 m) in the Bedout Sub-basin and thinning rapidly towards the coast.

Additional regional magnetic coverage was obtained in the BMR Marine Geophysical Survey of the N.W. Continental Shelf in 1968 in which seismic, gravity, and magnetic data were recorded. More magnetic data were recorded in the BMR Continental Margins Survey 1970-1973.

Gravity

Gravity readings have been recorded on BMR marine surveys in 1968 and 1970-1973. The gravity and magnetic contours show a fair degree of correlation and allow subdivision of the area into provinces. Within the survey area, a zone of high Bouguer anomaly gradients occurs along the edge of the continental shelf with few significant features within it and very little magnetic disturbance. This is attributed to the shallowing of the Moho discontinuity towards the ocean basin. There is little indication of a basement ridge along the edge of the shelf. Between the continental shelf and the coast is a zone of broad gentle contours of relatively low amplitude which are related to a basinal depression, the Bedout Sub-basin.

Seismic

In 1964, BOC initiated seismic exploration with the North West Shelf Marine Seismic Survey which provided a reconnaissance of prominent shoal areas between Barrow Island and Bathurst Island. Only shallow data were obtained as deeper events were obscured by multiples. Results showed shallow horizons dipping to the northwest with little evidence of structures in the province extending from the coast to the Rowley Shoals.

In 1965, the Montebello - Mermaid Shoal Survey provided a semi-reconnaissance coverage of the shelf, introducing C.D.P. techniques, and confirmed the existence of sedimentary structure north of Barrow Island and over much of the Northwest Shelf. In the 1968 Offshore Canning-Seringapatam survey a detail grid was recorded over the Rowley Shoals and reconnaissance grids over the eastern portions of WA-30-P and WA-31-P. Introduction of

the Aquapulse energy source with routine deconvolution and increased application of velocity analyses resulted in data of improved quality which revealed several structural leads.

In 1969 Aquapulse energy source and 3600 % CDP stacking were used in further reconnaissance in the Offshore Canning Basin, in the Legendre-Marie and the Adele-Scott surveys. In the former the Legendre structural trend was detailed and the margin of the Leveque platform defined. Offshore trends of known features onshore were confirmed. In the Adele-Scott survey three anomalies were matured as drill-sites and other leads outlined. The westward extension of the Fitzroy Graben and a zone of complex faulting along the seaward margin of the Pilbara Block were delineated.

The 1970 Tryal-Evans survey carried out detailing of Lynher, Leveque, and Lacepede anomalies and completed a seismic tie between Rowley Shoals and the Leveque Platform. Also in 1970, in the Trimouille-Dillon survey, Maxipulse energy source was introduced in the hope that the more powerful source would improve data quality below the basal Cretaceous unconformity. Better penetration resulted and some existing anomalies were confirmed as drill-sites and new leads uncovered. Only since the introduction of Maxipulse in 1970 have seismic records with adequate resolution at depth been obtainable. While the seismic cover appears quite extensive, only portion of the coverage is composed of lines of good quality.

Reconnaissance of the northern portion of the Picard Trend and the Beagle Trough was carried out in the Montebello-Turtle survey in 1972. In the same year Hematite recorded the Bedout-Broome Swell seismic and magnetic survey in the Bedout Sub-basin. Two prominent block-faulted Lower Mesozoic structures overlain by thick Upper Mesozoic and Tertiary sediments were discovered. Other detail and semi-detail surveys conducted during 1972 included the Browse Basin and Naringla surveys. These surveys revealed that sediments down to the Late Triassic unconformity dipped uniformly in a northwesterly direction. Sediments beneath the unconformity show structural complexity with a series of block-faulted ridges parallel to the margin of the Broome Swell offering entrapment prospects. In 1973 the Mermaid-Cartier Survey provided a reconnaissance of the deeper-water portions (more than 180 m) of permits WA-30-P, WA-31-P and WA-32-P. Two promising structural trends were outlined in the Canning Basin. In the 1972-73 Steamboat-Spit survey four horizons from Base Tertiary to Jurassic were mapped.

Under the P(SL)A, Amax have carried out an aeromagnetic survey and three seismic surveys in evaluating their farmout from BOC. In the Baleine Marine Seismic Survey data of fair quality were obtained in delineating twenty-six structural leads, two of which were of major size. Wamac well site was detailed in the Walker Rock survey. Subsequent to the drilling of Wamac-1, Leveque Shelf Aeromagnetic Survey was programmed to investigate shallow volcanics encountered in the well. The Leveque Shelf Marine Seismic Survey followed with the objective of maturing a drilling prospect on the Leveque Shelf. At the time of writing, results of this survey have not been supplied.

BMR carried out reconnaissances of the Northwest Shelf in 1968 and from 1970-73, seismic, gravity, and magnetic data were recorded. Gulfrex and Teledyne Scientific surveys also traversed the Northwest Shelf.

Most recent work was carried out in BOC's extensive Kendrew-Cootamundra Marine Seismic Survey recorded between December 1973 and September 1974. Maxipulse energy source produced data of good quality down to the Triassic in a detail and semi-detail coverage over a wide area of the Northwest Shelf extending from the Dampier Sub-basin to Bonaparte Gulf in the northeast.

REGIONAL GEOLOGY

The titles under consideration cover the offshore Canning Basin and a minor part of the offshore Carnarvon Basin. The Carnarvon Basin portion of the area occurs in WA-29-P and includes the northern extension of the Beagle Sub-basin and the North Turtle Arch which effectively form the hinge-line between the offshore Carnarvon and Canning Basins.

The Canning Basin is a sedimentary province bounded by the Kimberley Block on the north side and the Pilbara Block on the south. The basin extends offshore across the northwest continental shelf and is contiguous with the Carnarvon and Browse Basins.

From an economic viewpoint the onshore basin is essentially one of Palaeozoic interest; however, the offshore basin is of mostly Mesozoic interest. Seismic and well data indicate that Palaeozoic sediments extend offshore beneath the seaward thickening wedge of Mesozoic.

The offshore basin of Mesozoic deposition is a linear feature trending northeast along the stable epicontinental margin which developed in response to rifting and eventual 'pull apart', or fragmentation at the margins. The initial rifting may have involved the formation of a half-graben hinged along the southeastern (shoreward) edge. The northwestern flank of the graben was subsequently removed.

By contrast the Palaeozoic basin is an intra-continental embayment in which deposition was controlled by relative movements of the adjacent cratonic blocks.

Extensive seismic coverage and the drilling of numerous offshore wells have enabled the offshore Canning Basin to be divided into several subdivisions, each subdivision being defined by its tectonic character. Those tectonic subdivisions falling within the title areas under consideration are: Pilbara Shelf, Broome Swell, Southern Margin of the Fitzroy Graben (Jurgurra Terrace), Fitzroy Graben, Leveque Margin Structural Trend, Leveque Shelf and Platform, Rowley Sub-basin and Shelf, and Bedout Sub-basin and will be discussed in further detail.

Pilbara Shelf

The Pilbara Shelf lies between the Pilbara Block of Archaean granite, metamorphic rocks, and Proterozoic sediments and the southern flank of the Bedout Sub-basin. Within the title areas under consideration it only occurs in the southern portion of WA-29-P. The Shelf contains thinning Phanerozoic sediments wedging out shorewards onto the Pilbara Block. No wells have been drilled on the Pilbara Shelf to date.

Broome Swell

The Broome Swell is an area which has been positive throughout most of the Phanerozoic and represents a zone of shallow rigid basement south of the Fitzroy Graben. Onshore it acts as a dividing feature between the Fitzroy Graben and the intra-cratonic basin of the South Canning Basin. It projects offshore as a blunt nose-like feature and occupies part of permits WA-29-P, WA-30-P and WA-31-P.

Wells drilled onshore have penetrated basement at shallow depths (4000-6000 ft (1219-1829 m)) and the sedimentary section comprises a thin veneer of Cretaceous/Jurassic unconformably lying on up to 2000 ft (610 m) of Permian, which in turn rests unconformably on variable thicknesses of Lower Palaeozoics.

Indications are that the sedimentary section thins shorewards either by wedging out or erosional truncation. Although no wells have been drilled offshore on the Broome Swell, a similar stratigraphic section to that encountered onshore is envisaged with Cretaceous shales overlying Cretaceous/Jurassic sandstones. The Ordovician section which has had fair shows onshore could also prove to be of some prospect in the offshore acreage.

To date the offshore Broome Swell has proved uninteresting and no significant structural leads have been mapped. Clearly the area has remained stable since the Precambrian. The only leads of any interest are stratigraphic pinchouts where Mesozoic clastics wedge out against the Broome Swell.

Southern margin of the Fitzroy Graben

To the north of and bordering the Broome Swell is a broad shelf-like area known as the Jurgurra Terrace. This area narrows towards the coast where it loses its terrace form and becomes an area of basin margin faults.

No wells have been drilled offshore though it is anticipated that the stratigraphic section will be similar to that drilled onshore with about 3500-4000 ft (1067-1219 m) of Mesozoic rocks above thin representatives of Permian, Devonian, Ordovician, and possibly Carboniferous sediments.

Structure at Mesozoic level is absent and the hydrocarbon potential of the section can therefore not be regarded too highly. One structural trend, an extension of the onshore Barlee Anticline, continues into the offshore area. This trend is believed to represent one of the Upper Palaeozoic fault-blocks developed in the original graben 'pull apart' movements. A number of structural leads have been mapped within WA-31-P on this trend and could represent valid drilling targets. They are ideally

located to have received migrating hydrocarbons owing both to their original positive nature and their graben margin position.

Reservoirs will be confined to Upper Palaeozoic levels, which have all been demonstrated onshore. Reef possibilities must be of importance offshore in this area.

Fitzroy Graben

The offshore extension of the Fitzroy Graben lies within WA-31-P. The synclinal axis forming the offshore extension of the graben, continues northwestwards where it merges with the Rowley Sub-basin near the outer boundary of the permit. Offshore the north and south boundaries of the Fitzroy Graben are the southern portion of the Leveque Shelf hinge zone and the Jurgurra Terrace respectively.

The Fitzroy Graben owes its development to two major phases of relative movement between the Kimberley and Pilbara Blocks. The first was a tensional one with the development in Upper Palaeozoic time of a narrow taphrogeosyncline. Compressional folding in Upper Triassic time became involved during the second phase as wrench or rotational movements by the Leveque Platform and Kimberley Block took place. These trends can be followed into the offshore title areas.

The Fitzroy Graben contains a thick section of Upper Palaeozoic rocks beneath some 6000-8000 ft (1829-2438 m) of Mesozoic and Tertiary cover. At certain localities up to 10000 ft (3048 m) of Permian and up to 15000 ft (4572 m) of Carboniferous Sediments are inferred. A number of sub-parallel east-west trends have been mapped. The synclinal trends appear simple but the anticlinal trends may be complicated by faulting.

Two wells, Lacepede-1A and Wamac-1, have been drilled in WA-31-P on structures within the Fitzroy Graben. Both wells were plugged and abandoned without encountering any hydrocarbon shows. Several closures have been defined, all within the Palaeozoic but some with minor Mesozoic drape. Reservoirs are known throughout the section and gas shows encountered onshore within the Fitzroy Graben provide sufficient impetus for further exploration in this area.

Leveque Margin Structural Trend

This is an arcuate faulted hinge-line between the stable Leveque Shelf and the Fitzroy Graben and Rowley Sub-basin. It lies within permits WA-31-P and WA-32-P. At the northern end of the Leveque Shelf margin, the hinge-line is truncated by an east-west fault. Considerable movement has occurred on these faults until very recent times.

Two dry wells, Lynher-1 and Lombardina-1, have been drilled near the margin. Both wells encountered reservoirs within the Mesozoic and Upper Permian but no shows were recorded.

Rapid stratigraphic thinning of the whole sedimentary section and some erosional truncation on intervals occur from the basin across the hinge zone. Palaeozoic structure along the trend is poorly understood at present and could provide some prospective interest. Stratigraphic pinchout and biohermal reefs are a possibility in the Upper Palaeozoic sequence. This area should have been well situated to receive early migrating hydrocarbons.

Leveque Shelf and Platform

This is an area of thin Mesozoic sediments overlying shallow economic basement formed by a westerly extension of the Precambrian Kimberley Block. While both Shelf and Platform have remained stable for much of Phanerozoic time the shelf is differentiated from the platform on the grounds of a slightly thicker Mesozoic section dipping away uniformly towards the Leveque Margin faults.

The Shelf and Platform consist of flat-lying sediments and are featureless except for some local palaeotopography beneath the basal Mesozoic unconformity. Minor Mesozoic drape over the crest and onlap on the flanks may be associated with such highs. Leveque-1 drilled such a feature and only had minor gas shows in thin, Lower Cretaceous and Tithonian sandstone horizons.

Minor drape and pinchout possibilities associated with palaeotopographic highs represent the only features of any interest.

Rowley Sub-Basin and Shelf

The Rowley Sub-basin is a northeast southwest elongate depression of thick tertiary and Mesozoic sedimentation lying along the outer continental shelf. The sub-basin appears to be contiguous with the Beagle Sub-basin to the south and the outer part of the Browse Basin to the north.

Inshore from the Rowley Sub-basin and separated from it by a down-to-the-basin fault zone is the Rowley Shelf. The sedimentary section thins out of the sub-basin onto the Shelf which probably marks an uplifted basement block which rises gradually towards the Broome Swell.

The Rowley Sub-basin and Shelf lying in WA-30-P, WA-31-P and WA-32-P are in deep water; water depths varying from near 500 ft (152 m) at the Shelf margins to 5000 ft (1524 m) in the northwest corner of WA-32-P.

East Mermaid-1 was drilled in 1272 ft (388 m) of water within the Rowley Sub-basin. The well drilled a Tertiary, Cretaceous/Jurassic section and terminated in Triassic sediments at 13345 ft (4068 m). No hydrocarbon shows were encountered though good-quality reservoir rocks were penetrated in the Jurassic. Thick Cretaceous and Lower Jurassic shale and siltstones provide adequate seals for underlying reservoirs.

Bedout Sub-basin

The Bedout Sub-basin is the major downwarp in the offshore extension of the South Canning Basin. The east-trending Bedout Sub-basin is bounded by the Pilbara Shelf to the south, the North Turtle Arch to the west, the Broome Swell to the east, and the Bedout High to the north.

Initial downwarping connenced in the Palaeozoic and continued through the Mesozoic. Prospects are principally Mesozoic as Palaeozoic objectives are generally too deep except near the inshore sub-basin margins. Three wells have been drilled within the sub-basin, Bedout-1, Keraudren-1, and Minilya-1. Keraudren-1, drilled on the southern margin of the Bedout Sub-basin penetrated nearly 7546 ft (2300 m) of Jurassic/Triassic sandstones which possess fair to good porosity although the porosity decreases lower in the section. No significant hydrocarbon shows were encountered.

Bedout-1 was drilled to test the crest of a structure drilled on the Bedout High, a culmination on trend with the Rowley Shelf and Broome Swell and which separates the Bedout Sub-basin from the Rowley Sub-basin. The Bedout High is a Palaeozoic structure which was further uplifted and eroded during the Triassic. The feature was still positive during the Jurassic and Triassic as witnessed by the thinning of these horizons over the crest. Bedout-1 drilled a Tertiary, Cretaceous, Jurassic, and Triassic section before bottoming in extrusive volcanic rocks at TD 10082 ft (3072 m). No shows were encountered. As to whether the volcanics represent an intersedimentary layer, or not, is uncertain but seismic reflections beneath the volcanics tend to support the fact that a sedimentary section occurs below this volcanic layer.

Minilya-1 was drilled on a faulted anticline 72 km west of Bedout-1 well on the northwest margin of the Bedout Sub-basin. The well drilled a sedimentary sequence ranging from sub-Recent to Middle Jurassic. No significant shows of hydrocarbons were encountered. Sandstones within the Cretaceous/Jurassic exhibited good porosity.

Beagle Sub-basin

The Beagle Sub-basin is separated from the offshore Canning Basin by the North Turtle Arch and only the eastern portion of the sub-basin lies within the title areas under consideration. Regional seismic mapping and stratigraphic results of wells drilled to date have indicated that the area has sufficient geological similarity to the Dampier Sub-basin to be regarded as the northernmost extension of the Carnarvon Basin.

The Beagle Sub-basin within WA-29-P consists of a northeast-trending downwarp of deeply buried Mesozoic sediments called the Beagle Trough that is flanked to the northwest by a trend of faulted highs called the Picard Trend. Depuch-1 well was drilled within WA-29-P on a Jurassic fault controlled high overlain by Cretaceous draped sediments. The well encountered a sedimentary section ranging from Pliocene to Jurassic; no significant shows were encountered and the well was plugged and abandoned at TD 14108 ft (4300 m).

The eastern margin of the Beagle Sub-basin, the North Turtle Arch, is a wide complex zone of block-faulting which is structurally positive overall relative to the main basinal area separating it from the Bedout Sub-basin of the offshore Canning Basin.

Within the Beagle Sub-basin, a very great thickness of Mesozoic sediments was deposited owing to a considerable downwarping. This compares with the substantially thinner sequence deposited over the Bedout Sub-basin which has minor, if any, Mesozoic downwarps. This different depositional evolution probably explains the presence of folded and faulted growth structures in the more mobile Beagle Sub-basin compared with the virtual absence of structures within the offshore Canning Basin. The North Turtle Arch thus represents a hinge zone between two entirely different depositional provinces.

Hydrocarbon potential

The offshore Canning Basin covers a large area and consists of distinct tectonic regions. Each tectonic region has distinct hydrocarbon objectives which may not necessarily occur elsewhere in the basin.

The development of the Canning Basin can be divided into two distinct stages. The Palaeozoic (and Lower Triassic) saw the development of the Fitzroy Graben with subsidence, deposition, uplift, and compressional folding. Structural trends are clearly mapped onshore and extend offshore beneath the younger cover. In the late Triassic the new phase of structural history imposed itself with the subsidence of the shelf and the deposition of a wedge of Mesozoic and Tertiary sediments. The younger structural trends are northeast-southwest paralleling the coast-line.

Within the title areas under consideration the Rowley Sub-basin, Bedout Sub-basin, and the Beagle Sub-basin offer primarily Mesozoic prospects and the Palaeozoic sequence except along the margin areas is considered too deep to be of economic significance. The absence of Mesozoic shows in near-shore wells downgrades these Mesozoic prospects, which are also structurally poorly defined.

The main reservoir beds in the Mesozoic section are sandstones of a deltaic origin within the Jurassic/Triassic section. Although no significant shows have been encountered in any wells drilled in the offshore Canning Basin, sandstones with excellent reservoir properties

have been drilled. Interbedded shales within the Jurassic/Triassic are present and could act as intraformational seals, also shales within the Tithonian and Lower Cretaceous in parts of the offshore basin could act as caprock at the top of the prospective section.

The Palaeozoic section of the offshore Canning Basin becomes of importance in the near-shore areas where it is within reach of the drill. It also exhibits far greater structural possibilities with good closure being demonstrable in the Fitzroy Graben and the Broome Swell area. In the central part of the Fitzroy Graben primary objectives are likely to be Permo-Carboniferous sandstones and along the southern margin (Jurgarra Terrace). Devonian and Ordovician reservoirs could also be at reasonable drilling depths. Besides structural closure the Palaeozoic also possesses the possibility of pinchout and reef prospects along the northern and southern margins of the offshore Canning Basin.

TITLE ASSESSMENT WA-29-P

Title Holder — Woodside Oil N.L.
Shell Development (Aust.) Pty Ltd
BOC of Australia Ltd

No. of blocks — 400

Expiry date — 18.5.75

Notes — BOC of Australia, 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. BOC of Australia Ltd, a wholly owned subsidiary of Woodside-Burmah Oil N.L. is operator on behalf of the group.

Previous six-year conditions (A$)

First year	269,000	(672.50 per block per year)
Second year	3,070,000	(7675.00 per block per year)
Third year	10,000	(25.00 per block per year)
Fourth year	200,000	(50.00 per block per year)
Fifth year	225,500	(563.75 per block per year)
Sixth year	225,500	(563.75 per block per year)
	$4,000,000	total (9550.00)
		av. 1592.00 per block/year

Regional setting

WA-29-P is located offshore from Port Hedland. It is bordered to the south by WA-21-P, north by WA-28-P and WA-30-P, west by WA-1-P and east by WA-31-P. Water depths, except for the northern portion are less than 200 metres.

Geophysical Coverage Cf. basin notes, data sheets of geophysical surveys, and line density maps. No aeromagnetic lines cover WA-29-P although ship-borne regional magnetometer and gravimeter readings were taken on BMR marine seismic surveys in 1968 and 1970-1973. Seismic reconnaissance on a 20-km square grid has covered the entire permit and a detail grid 4 km square has been completed around the four wells drilled in the permit. Most of the reconnaissance coverage was recorded in 1970 or earlier, whereas the detailing work has been done since 1970 and consequently is of much better quality.

Wells drilled Four wells (Bedout-1, Keraudren-1, Depuch-1, and Minilya-1) have been drilled in WA-29-P. Bedout-1 and Keraudren-1 were drilled in the Bedout Sub-basin of the offshore Canning Basin. Both wells drilled a Tertiary/Cretaceous/Jurassic section and terminated in Triassic. No significant shows were encountered and both wells were plugged and abandoned.

Depuch-1 was drilled on the Ronsard-Picard Trench in the Beagle Sub-basin. The well drilled a sedimentary section ranging in age from Pliocene to Jurassic. No significant hydrocarbon shows were recorded and the well was plugged and abandoned.

Minilya-1 was drilled on the Minilya Trend - a northern extension of the North Turtle Arch. This trend effectively acts as a hinge zone separating the Bedout and Beagle Sub-basins. The well drilled a sedimentary section ranging from Sub-Recent to Middle Jurassic. No significant hydrocarbon shows were recorded and the well was plugged and abandoned.

PROSPECTIVITY

The title area covers a number of discrete tectonic regions viz. the Beagle Sub-basin, the North Turtle Arch-Minilya Trend, Pilbara Shelf, and the Bedout Sub-basin.

Beagle Sub-basin Only one well, Depuch No. 1, drilled on the Picard Trend, has been drilled within WA-29-P. The well drilled a section ranging from Tertiary to Lower Jurassic. No shows of hydrocarbons were encountered. The well was plugged and abandoned at TD 4300 m (14,108 ft). Fair to good porosities were encountered in Jurassic sandstones which together with Triassic sandstones are regarded as the most prospective section in this area. Detail seismic coverage has been carried out in the Depuch vicinity. Other possible closures have been mapped from data of questionable reliability on the 'Deep Form' (Y?) horizon.

Recommendation A number of structural leads are known which will require further seismic detailing. Depending on the results, a well may be indicated, drilled to the Upper Triassic (about 5000 m) (16400 ft).

North Turtle Arch - Minilya Trend One well, Minilya No. 1, was drilled on the Bedout Sub-basin flank of the North Turtle Arch-Minilya Trend. The well terminated in Middle Jurassic sediments at TD 2400 m (7840 ft). No significant shows of hydrocarbons were reported. Recent seismic work in this area has indicated a number of fault-controlled structural highs. The most promising of these, North Turtle, requires further seismic work to confirm southeast closure.

Recommendation Further seismic work is recommended in order to mature the North Turtle lead to drillable status. The structure is located on a hinge-zone between two major basins and should be favourably situated to receive migrating hydrocarbons. Sands within the Jurassic and Triassic represent the prime drilling targets (3500 m) (11 480 ft).

Pilbara Shelf This area only occurs in the extreme southwest corner of the title area. The thin sedimentary section and shallow basement make this area unattractive for petroleum exploration.

Recommendation No further work.

Bedout Sub-basin Two offshore wells, Bedout-1 and Keraudren-1, have been drilled within the Bedout Sub-basin, in WA-29-P. Both wells drilled a Tertiary to Triassic sedimentary section. Bedout-1 terminated in extrusive volcanics of unknown age at 10 082 ft (3073 m). No significant shows of hydrocarbons were encountered in either well. Minilya-1, previously discussed in the North Turtle Arch section, was drilled in the Bedout Sub-basin. The prospective section in the Bedout Sub-basin is sandstones within

the Jurassic-Triassic. These are known to have fair to good porosities in the wells drilled to date. The Bedout Sub-basin has been covered by a reconnaissance grid with detailing near the wells. Horizons within the Mesozoic show very little structural development, except near the Bedout High where a number of structural leads have been delineated. However, the results of Bedout-1, give little encouragement, although on a structure of this magnitude, distinct pinch-out possibilities must exist around the flanks as horizons become truncated. Further seismic work will be necessary to detail such leads.

Palaeozoic sediments offer prospects around the basin margins where they occur at drillable depths. One lead has been recognised as a broad dome on the offshore extension of the Wallal Platform.

Recommendations Further seismic work is necessary near and over the Bedout High to detail a well location preferably where volcanics are absent. In such an area, the Triassic and possibly the Permian could also be objectives. Further seismic work would be required to locate and upgrade other leads within the sub-basin. At present, no leads are suitable for drilling. Further seismic work is also required to detail the Wallal Platform lead. Depending on the results of this work, a well may be in order.

Title Assessment WA-30-P

Title Holder	Woodside Oil N.L. Shell Development (Aust.) Pty Ltd BOC of Australia Ltd
No. of blocks	400
Expiry date	2.7.75

Notes BOC of Australia, 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. BOC of Australia Ltd, a wholly owned subsidiary of Woodside-Burmah Oil N.L., is operator on behalf of the group.

Farmin Agreements Shell Development (Australia) Pty Ltd has a farmin agreement of 4743 sq. miles within WA-30-P. The agreement was dated 15 August 1972, approved 22 December 1972, and registered 22 December 1972.

Previous six-year conditions (A$)		
First year	241,800	(604.50 per block/year)
Second year	50,000	(125.00 per block/year)
Third year	100,000	(25.00 per block/year)
Fourth year	3,100,000	(7,750.00 per block/year)
Fifth year	10,000	(25.00 per block/year)
Sixth year	588,200	(1,470.50 per block/year)
	4,090,000 Average ($10,000)	1,667.00 per block/year

Regional setting WA-30-P is situated entirely offshore from the northwest coast of Western Australia. Water depths range from less than 60 m in the southeast corner to about 600 m in the northern extremity of the title area. Approximately two-thirds of the title area lies in water depths in excess of 200 m.

Wells drilled Only one well, East Mermaid-1, has been drilled within WA-30-P. It was the first well to be drilled in the Rowley Sub-basin and was drilled in a water depth of 1272 ft (388 m). The well drilled Tertiary from 1670 ft (509 m) to 5340 ft (1628 m), Cretaceous to 9460 ft (2883 m) and Middle to Lower Jurassic to T.D. 13345 ft (4068 m). No shows of hydrocarbons were recorded and the well was plugged and abandoned.

Geophysical Coverage Cf. basin notes, data sheets of geophysical surveys, and line density maps. Widely spaced reconnaissance lines were flown over the Rowley Shoals in 1963. Results indicate the presence of from 4572 metres (15 000 ft) to 5486 m (17 999 ft) of sediments under the Rowley Shoals, increasing to about 6000 m in the Bedout Sub-basin and thinning rapidly towards the coast.

Regional magnetic and gravity data were obtained on BMR marine surveys carried out in 1968 and 1970-73. This work has defined three distinct tectonic subdivisions - the Rowley and Bedout Sub-basins and the offshore extension of the Broome Swell.

The entire permit area has been covered by a loose reconnaissance seismic coverage approx. 25 km square, most of which was recorded before 1970. The reconnaissance traverses along the eastern margin of the permit are of recent vintage (1973) and consequently have produced improved quality deep data. Extensive detailing has been carried out in the Rowley Shoals area (4 km square 1972) and in the Bedout Sub-basin - Broome Swell margins (2 km x 4 km 1972). The recent work has produced data considered reliable down to the T (Upper Triassic unconformity) horizon.

PROSPECTIVITY

WA-30-P covers the Rowley Sub-basin, the Rowley Shelf, and the Broome Swell.

Rowley Sub-basin Most of the Rowley Sub-basin lies in water depths in excess of 300 m. Only one well has been drilled, East Mermain No. 1, which penetrated a section ranging in age from Recent to Lower Jurassic. No hydrocarbons were encountered and the well was plugged and abandoned at TD 13345 ft (4068 m) water depth 1272 ft (388 m). Prospects of the Jurassic section have been downgraded because the target sands were found to be terrestrial and not deltaic and coastal sands as anticipated.

The sub-basin has been covered out to 500 m water depth contour by a semi-detail seismic grid carried out in the 1972 Rowley Shoals seismic survey (Shell). No report on this survey has yet been supplied to BMR.

Recommendations Until the results of the Rowley Shoals Marine Seismic Survey have been received no recommendations can be made.

Rowley Shelf The Rowley Shelf is situated between the Rowley Sub-basin and the Broome Swell. No wells have been drilled in this area. It has been covered by broad reconnaissance seismic work and some semi-detailing has been carried over a structural lead in the area northeast of the Bedout High. The prospective section lies within the Jurassic and Triassic sandstones.

Recommendations The northeast Bedout structure requires further detailing before a well can be recommended (3500 m (11 483 ft) approx. to U. Triassic). Should a test well produce encouraging indications, semi-reconnaissance coverage of the rest of the Rowley Shelf would be in order.

Broome Swell The Broome Swell is an area which has been positive throughout most of Phanerozoic times and represents a zone of shallow basement. No wells have been drilled in this area. The Mesozoic section thins onto the Broome Platform and sands within the Cretaceous-Jurassic and Triassic could be prospective. Onshore the Ordovician has shown some prospects. Reconnaissance seismic work indicates minor structural development. Stratigraphic pinch-out leads where the Mesozoic section wedges out against the Broome Swell, would probably form the most promising prospects in this area.

Recommendations Semi-detail and detail seismic work is recommended to locate pinch-out possibilities on the Broome Swell.

Title Assessment WA-31-P

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

No. of blocks — 400

Expiry date — 18.5.75

Notes — BOC of Australia, 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. BOC of Australia Ltd, a wholly owned subsidiary of Woodside Burmah Oil N.L., is operator on behalf of the group.

Previous six-year conditions (A$)

First year	129,000	($ 322.50 per block/year)
Second year	3,170,000	($7,925.00 per block/year)
Third year	10,000	($ 25.00 per block/year)
Fourth year	90,000	($ 225.00 per block/year)
Fifth year	10,000	($ 25.00 per block/year)
Sixth year	590,000	($1,475.00 per block/year)
	3,999,000	($9,997.50)
		average 1666.25 per block/year.

Regional Setting — WA-31-P is situated entirely offshore from the northwest coast of Western Australia. Water depths vary from 60 m at the southern margin to 500 m in the northwestern corner of the title area.

Wells drilled — Two wells, Lacepede-1A and Wamac-1 have been drilled within WA-31-P. Both wells were drilled on structures within the Fitzroy Graben, and both encountered Cretaceous/Jurassic sediments unconformably overlying Upper Palaeozoic sediments. Wamac-1 terminated in ?Permian or Lower Carboniferous to Devonian sediments with intrusives (dolerite) and Lacepede-1A

terminated in Upper Permian sediments. Neither well encountered significant hydrocarbon shows and both were plugged and abandoned.

Geophysical Coverage Cf. basin notes, data sheets of geophysical surveys, and line density maps. The only aeromagnetic traverses over WA-31-P are two tie-lines from the Rowley Shoals, Scott Reef, and Sahul Banks survey in 1967. However, marine magnetometer and gravimeter data was recorded in the 1968 BMR marine survey. The entire permit has been covered by a reconnaissance seismic grid (approx. 20 km square) ranging in vintage from 1965 through to 1973. Additional reconnaissance cover on an 8-km grid exists over the offshore extension of the Fitzroy Graben and along the margins of the Leveque Shelf (1968). Some detailing in the same area was completed in 1972 in maturing a well-site at Wamac-1. The early work was adequately outlined the sedimentary configuration down to the intra-Triassic unconformity. The more recent coverage has resulted in considerable improvement in data quality below the unconformity enabling definition of Palaeozoic structural leads.

PROSPECTIVITY

The area can be conveniently divided into the Rowley Sub-basin, the Leveque Margin Structural Trend, the Leveque Shelf, the Fitzroy Graben, the Jurgurra Terrace, and the Broome Swell.

Rowley Sub-basin This area only occurs in the northwest portion of WA-31-P and lies in water depths of 200-500 m. No wells have been drilled and the area has only been covered by a broad reconnaissance seismic grid and no structural leads are known.

The prospective section is confined to sands within the Mesozoic.

Recommendations Further seismic work would be necessary to define any structural anomalies.

Leveque Margin Structural Trend This is a faulted hinge-line between the stable Leveque Shelf and the Fitzroy Graben and Rowley Sub-basin. No wells have been drilled within WA-31-P on the trend although two dry wells Lynher-1 and Lombardina-1 have been drilled in WA-32-P. Lynher-1 terminated in Permian sediments at 8940 ft (2725 m) and Lombardina-1 was still drilling

Jurassic at TD 9366 ft (2855 m) Jurassic and Triassic sands constitute the primary targets although the Palaeozoic may hold some potential. Traps are likely to be either fault-controlled and/or stratigraphic pinch-outs.

The trend was covered by seismic reconnaissance in 1969 and semi-detailed in 1972. A number of structural leads, all associated with step-down faults into the basin, were delineated. However the drilling of both Lynher-1 and Lombardina-1 on similar reversals into faults must downgrade prospects.

Recommendations If further work is to be carried out in this area, more detail seismic would be necessary to upgrade the best feature to drillable status.

Leveque Shelf This is an area of shallow basement with thin Mesozoic cover. The area appears featureless, consisting of flat-lying sediments. The only prospects would be pinch-out possibilities against the Leveque Platform. Seismic coverage is limited to a broad reconnaissance grid and recent detailing carried in the Leveque Shelf marine seismic survey. Only minor structural leads were noted.

Recommendations The area does not appear to have any significant prospects but if further work is to be carried out, detail seismic work will be required prior to drilling.

Fitzroy Graben The synclinal axis forming the offshore extension of the graben continues northwestwards where it merges with the Rowley Sub-basin near the outer boundary of WA-31-P. The north and south boundaries of the graben are the Leveque Shelf hinge and the Jurgurra Terrace. Two wells, Lacepede-1A, and Wamac-1 have been drilled on structures within the graben. No significant hydrocarbon shows were encountered. Lacepede-1A was drilled to test Mesozoic drape over a Palaeozoic fold and Wamac-1 was drilled to test a structure within the Palaeozoic. Although the Mesozoic section is regarded as having good reservoir potential, it lacks structural development. However, there are numerous structures in the Palaeozoic. Reservoirs are known within this section and shows of gas have been reported in onshore wells. A drillstem test of the Carboniferous section in Yulleroo-1 gave flows of gas up to 48 000 cu. ft/day (Laurel Formation) and from St George Range-1 (Anderson? Laurel? Formation) - 102 000 cu. ft/day. Shows of gas were also reported from the Carboniferous in Barlee-1.

The entire area has been covered by reconnaissance seismic work on a 20-km square grid since 1965. Detailing on a 2-km square grid has been carried out around the well sites. Record quality of the earlier work was fair-good down to the intra-Triassic unconformity but only with the more modern work has the configuration of the folded Palaeozoic section been adequately defined.

Recommendations Although a number of Palaeozoic structural leads are known, two of the best structures have been drilled and results have been disappointing. However, Wamac-1 did not reach the target horizons, the well being prematurely abandoned after drilling 38 ft (11 m) of very fractured dolerite. If the area is to be retained, some further detail seismic work would be required to mature a well-site. In addition, more seismic work to reduce the grid size in the seaward deeper-water parts of the permit could uncover further structural leads.

Jurgurra Terrace This unit is situated between the Fitzroy Graben and the Broome Swell. No wells have been drilled within WA-31-P on the terrace. Prospects occur in the Palaeozoic section which will be encountered at shallower depths than in the Fitzroy Graben. Structure is absent in the Mesozoic section and the hydrocarbon potential above the Triassic unconformity is regarded as poor. Within the Palaeozoic, seismic work indicates that the onshore structural leads extend into the offshore areas.

The area has been covered by a reconnaissance grid 8-km square. Record quality ranges from f-g down to the intra-Triassic unconformity.

Recommendations A number of structural leads are indicated along two sub-parallel trends. The largest feature, Naringla, has been sufficiently detailed to recommend a well location to test the hydrocarbon potential not only of the Permian but also of the Devonian and even the Ordovician sediments (3500 m) (11 483 ft). Depending on the results of this well further semi-detailed seismic and drilling operations may be programmed.

Broome Swell This is an area which has remained high throughout geologic time. No wells have been drilled in this area although the seismic data indicate a rapid thinning of the Mesozoic section by onlap onto the Palaeozoic and basement. The area has been covered by reconnaissance

seismic work and no structures have been revealed. Prospects are restricted to stratigraphic pinchout against the Broome Swell. Reservoirs can be expected throughout the Cretaceous, Jurassic, Permian, and possibly Ordovician section.

Recommendations Prospects of this area are poor and at this stage no further work is recommended.

Title Assessment WA-32-P

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

No. of blocks — 395

Expiry date — 2.7.75

Notes BOC of Australia, 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. BOC of Australia Ltd, a wholly owned subsidiary of Woodside-Burmah Oil N.L. is now operator on behalf of the group.

Previous six year conditions (A$)

First year	262,000	(663.29 per block/year)
Second year	129,000	(326.58 per block/year)
Third year	3,000,000	(7,594.94 per block/year)
Fourth year	10,000	(25.32 per block/year)
Fifth year	30,000	(75.95 per block/year)
Sixth year	518,000	(1,311.39 per block year)
	3,949,000	(9,997.47 total) av.1,666.24 per block/year)

Regional Setting WA-32-P is situated entirely offshore from the northwest coast of Western Australia. Water depths vary from very shallow at the coast to over 1600 m (5249 ft) at the offshore extremities.

Wells drilled Three wells have been drilled within WA-32-P, Leveque-1, Lynher-1, and Lombardina-1.

Leveque-1 was drilled on the Leveque Shelf, an area of shallow economic basement forming a westerly extension of the Precambrian Kimberley Block. The well encountered Cretaceous and Tithonian (Upper Jurassic) shales and minor sandstones unconformably overlying Carboniferous gabbro. No significant hydrocarbon shows were encountered and the well was plugged and abandoned.

Lynher-1 and Lombardina-1 were drilled on the Leveque Margin Hinge Zone, an arcuate faulted hinge-line between the stable Leveque Shelf and the Fitzroy Graben and Rowley Sub-basin. Lynher-1 terminated in Permian sediments and Lombardina in Jurassic. No significant hydrocarbon shows were encountered and both wells were plugged and abandoned.

Geophysical Coverage Cf. basin notes, data sheets of geophysical surveys, and line density maps. The title area was traversed by scattered aeromagnetic traverses tying Scott Reef to the mainland in 1965. Basement is interpreted as being deeper than 5000 m (16,404 ft) under Scott Reef and rising to outcrop at the coast. Regional magnetic and gravity data were obtained on BMR marine surveys carried out in 1968 and 1970-73. This work has defined three distinct tectonic subdivisions - the Rowley Sub-basin, the Leveque Margin Structural Trend, and the Leveque Shelf and Platform.

The entire permit area has been covered by a loose reconnaissance seismic coverage approximately 20 km square. This reconnaissance is evenly divided between work recorded before and after 1970. Closer grids (approx. 5 km square) were recorded near the Leveque -1 and Lynher-1 well sites. Most recent exploration has been concentrated in the Rowley Sub-basin in the western deep-water part of the title area where the grid size was reduced to 10 km square in 1974.

Generally speaking, the pre-1970 data quality was adequate for the mapping of the Mesozoic section only. Only the more recent data show the configuration beneath the intra-Triassic unconformity.

PROSPECTIVITY

WA-32-P may be conveniently divided into three distinct areas: the Rowley Sub-basin, the Leveque Margin Structural Trend, the Leveque Shelf and the Leveque Platform.

Rowley Sub-basin Most of this area occurs in water depths greater than 300 m and has recently been investigated by reconnaissance seismic coverage. This has revealed a structural high trend along the outer continental margin in water depths in excess of 600 m. This high trend could possibly represent a southwestern extension of the highly prospective Scott Reef Trend of the Browse Basin. One large fault-controlled high extending into WA-33-P has been mapped at both the Lower Cretaceous and Upper Triassic levels. Not only is this high in very deep water but the prospective Jurassic-Triassic section will also be very deep (Top Triassic 5500 m (18 045 ft), Base Cretaceous 4500 m (14764 ft). The high trend is plunging to the northeast and there must be possibilities of other culminations which will be structurally higher farther to the southwest.

Recommendation Further seismic work is required to complete definition of this structural trend. A well site can then be recommended provided a drillable structure has been located.

Leveque Margin Structural Trend This completely faulted structural trend is separated from the outer continental shelf high trend previously described by a large depression. Two wells, Lynher-1 and Lombardina-1, have been drilled on the Leveque Margin Structural Trend without encouragement. Lynher-1, drilled on a fault-controlled anticlinal structure in the southern part of WA-32-P, terminated in Permian sediments, unconformably overlain by Upper Triassic sediments. No significant shows of hydrocarbons were encountered and the well was plugged and abandoned.

Lombardina-1 was drilled on a faulted anticlinal feature located at the northern extremity of the Leveque Shelf in the southern margin of the Browse Basin. The well drilled a Tertiary, Cretaceous, Jurassic section and terminated in Lower Jurassic sediments at TD 2855 m (9367 ft). No significant hydrocarbon shows were recorded.

The area has been covered by a reconnaissance seismic grid (8 km square) most of which was recorded between 1965 and 1971. In the

recent 1974 coverage, two fault-controlled structures on the outer margin of the trend were delineated. Record quality was generally fair on strike lines but adversely affected by faulting on dip lines.

Recommendation The Leveque Margin Structural Trend must be rated as one of the more prospective parts of the permit. The known structural leads require further seismic detailing to bring them to drillable status. A well should be drilled on the largest feature and depending on the outcome, further seismic semi-reconnaissance may be desirable.

Leveque Shelf and Leveque Platform This is an offshore extension of the Kimberley Block. Both the shelf and platform have remained stable throughout most of the Phanerozoic. Mesozoic and perhaps Upper Palaeozoic sediments onlap and thin onto this area. One well, Leveque-1, has been drilled on the platform and encountered basement (gabbro) at 2900 ft (884 m). The sedimentary section consists of Tertiary, Cretaceous, and Tithonian sediments. No significant shows were encountered and the well was plugged and abandoned. The area has only been covered by a broad seismic grid except near Leveque-1. Because of the long history of stability, shallowness of basement, and the thin sedimentary section, this area cannot be rated highly.

Recommendation No further work is necessary. The only prospects worth noting are pinch-outs of the Mesozoic section against the shelf.

Table 1

OFFSHORE WELLS GENERAL DATA

Well	No.	Title area	Rig Release	Rig	KB/Wd	T.D.	Tectonic Province	Deepest horizon	Base K.	Trap	Remarks
Lacepede-1A	70/426	WA-31-P	19. 8.70	Tasman	+31'/192'	7500'	Canning	U. Permian	3950'	Anticline (minor high)	No testing
Leveque-1	70/670	WA-32-P	6. 9.70	Tasman	+31'/255'	2951'	Leveque Platform	Precambrian	2770'	Nil. strat info.	No testing. Minor shows in L. Cret. + Tithonian
Lynher-1	70/948	WA-32-P	16. 1.71	Tasman	+31'/190'	8940'	Browse margin	U. Permian	2500'?	faulted anticline	No testing
Bedout-1	71/435	WA-29-P	7. 9.71	Digger	+94'/465'	10 082'	Bedout S. basin	U. Permian?	5900'	Anticline	No testing
					(33')(246')	(9069')			(4347')		
Wamac-1	73/246	WA-31-P	10.10.73	Tasman	+10m/75m	2764m	Canning	U. Palaeozoic	1325m	Anticline	p/a due to mechanical difficulties. TD in dolerite
East Mermaid-1	P(SL)A	WA-30-P	12.10.73	Sedco 445	+37'/1272'	13 345'	Rowley S. basin	L. Jurassic	9460'	Anticline	Jurassic sands proved to be terrestrial rather than deltaic
					(98')(312')	(12,612')			(4741')		
Keraudren-1	73/240	WA-29-P	17.12.73	Digger	+30m/95m	3844m	Bedout S. basin	M. Triassic	1445m?	Fault wedge w/drape	No significant shows
					(33'/469')	(14108')			(8242')		
Depuch-1	73/283	WA-29-P	3. 4.74	Tasman	+10m/143m	4300m	Canning	L. Jurassic	2512m	Fauld controlled high	No significant shows
					(98'/574')	(9366')			(7573')		
Lombardina-1	P(SL)A	WA-32-P	21. 7.74	Digger	+30m/175m	2855m	Browse Margin	L. Jurassic	2308m	Anticline	No significant shows
					(98'/479')	(7874')			(6907')		
Minilya-1	P(SL)A	WA-29-P	5. 9.74	Digger	+30m/146m	2400m	Bedout/ Beagle hinge N.Turtle Arch ext.	M. Jurassic	2105m	faulted anticline	No significant shows

Table 2

OFFSHORE WELLS - STRATIGRAPHY

		WA-29-P				30-P	31-P		WA-32-P		
		KB - 94'	KB - 30 m (98')	KB - 10 m (33')	KB - 30 m (98')	RT - 37'	KB - 31'	KB - 10 m (33')	KB - 31'	KB - 31'	KB - 30 m (98')
		Bedout-1	Keraudren-1	Depuch-1	Minilya-1	E.Mermaid-1	Lacepede-1A	Wamac-1	Leveque-1	Lynher-1	Lombardina-1
	msl - sea bed	465'	95m (312')	143m (469')	146m (479')	1272'	192'	75m (246')	255'	190'	175m (574')
Quaternary		1450'	-	-	486m (1595')	No Samples			288'		No samples prior to
Tertiary		1815'	527m (1729')	486m (1595')	1034m (3393')	1670'	223'			960'	530m (1739')
Cretaceous Upper	Maastrichtian	2605'	600m (1969')	1636m (5368')	1681m (5515')	5340'	893'	357m (1171')	1098'	1505	976m (3202')
	Campanian			1667m (5469')	1702m (5584')	5590'					
	Santonian	3490'	805m (2641')	1910m (6267')	1870m (6135')	5700'					1131m (3711')
	Coniacian		815m (2674')		1883m (6178')	5750'				2398'	
	Turonian	3648'		1985m (6513')	1892m (6208')	Abs					1238m (4062')
	Cenomanian	Abs basal only	843m (2765')	U M L 2008m (6588')	1898m (6227')	5790' 5800'			1362'		Abs
	Albian	3692'		2038m (6697')	1906m (6254')	5880'	1255'	Abs			1276m (4187')
Cretaceous Lower	Aptian	4130'	1055m (3484')	2133m (6998')	1990m (6529')	6360'		405m (1329')	2210'		
		U M Abs	U M Abs								1727m (5666')
	Neocomian	L 5406'	L 1400m (4593')	2164m (7100')		7550'					
Jurassic Upper	Tithonian	5900'	1445m (4741')	Abs	2105m (6907')		3950'	1325m (4347')	2770'		
	Kimmeridgian		Abs	Abs	Abs	Abs		Abs			2308m (7573')
	Oxfordian		1539m (5049')	Abs	2127m			Abs			Abs
	Callovian			Abs	2140.6m (7023')	9460'		Abs			2432.5m (7980')
Jurassic Mid	Bathonian	6830'	1543m (5063')	2512m (8242')			4175'	1604m (5263')		5000'Tc	2509m (8232')
	Bajocian										
Jurassic Lower	Toarcian	7087'	1650m (5414')	3550m (11648')		11890'	5235'			5600'Tc	2701m (8862')
	Pliensbachian										
	Sinemurian										
	Hettangian										

Table 2 (cont.)

		Bedout-1	Keraudren-1	Depuch-1	Minilya-1	E. Mermaid-1	Lacepede-1A	Wamac-1	Leveque-1	Lynher-1	Lombardina-1
Trias.	U	9550'	2460m (8071')				Abs			7?60'	
	M	Ab	2801m (9190')				Abs				
	L	Abs					Abs 65??'	2071m (6795')		8?5?'	
Permian	U	9911'(volcanics)									
	M							U. Palaeozoic to TD			
	L										
PreCambrian									2939'		
T.D.		10 ?82'	3844m (12 612')	430?m (14 108')	240?m (7874')	13345'	7500	2764m (9069')	2951'	894C'	285?m (9366')

APPENDIX

Details of Geophysical Surveys

SURVEY: Rowley Shoal, Scott Reef, Sahul Banks A/M NO: 63/1709 MAP CODE:

DATES: 23/8-28/10/63 COMPANY: Woodside CONTRACTOR: Aero Service

TENEMENTS: OP 90, OP 92, OP 79, OP8NT, PE 213H, PE 127H W.A.

SEISMIC SOURCE: NA PROCESSING: NA

CABLE: NA RECORDER: NA

MULTIPLE COVERAGE: NA

MILEAGE: 3600 (5793 km)

REFRACTION: NA

GRAVITY: NA

MAGNETIC: NA

DATA QUALITY: G

RESULTS: Indicates approx. 15 000 ft of sediments under most of the shoals, reefs, and banks. Between the shoals and the shore the thickness increases to about 20 000 feet and then thins again towards the shore - except near the Bonaparte and Canning Basins.

SURVEY: Offshore Canning A-mag NO: 65/4614 MAP CODE:

DATES: 3/7/65-11/8/65 COMPANY: WAPET CONTRACTOR: Adastra Hunting

TENEMENTS: 30H WA

SEISMIC SOURCE: NA PROCESSING: NA

CABLE: NA RECORDER: NA

MULTIPLE COVERAGE: NA

MILEAGE: 4000 (6437 km)

REFRACTION: NA

GRAVITY: NA

MAGNETIC: NA

DATA QUALITY: G

RESULTS: Survey results indicate that the offshore extension of the Canning Basin consists largely of basement swells and intervening sedimentary basins with easterly strike and fault-controlled boundaries. The sedimentary basins may contain significant thicknesses of Mesozoic sediments and are considered worthy of further exploration. The depth to basement ranges from 6000 to 10000 feet and some but not all of the major geological features known onshore extend seawards into the survey area.

SURVEY: Scott-Cartier M.S. NO: 67/11173 MAP CODE: ———

DATES: 4/8/67-24/9/67 COMPANY: BOC CONTRACTOR: Western

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

SEISMIC SOURCE: Explosives PROCESSING: Western

CABLE: RECORDER:

MULTIPLE COVERAGE: 300%

MILEAGE: 1020.25 (1642 km)

REFRACTION: Four refraction profiles and four velocity profiles recorded.

GRAVITY: -

MAGNETIC: -

DATA QUALITY: F - G

RESULTS: Numerous prospective targets uncovered along Northwest Shelf.

SURVEY: Offshore Canning - Seringapatam NO: 68/3027 MAP CODE: ———

DATES: 20/6/68-23/9/68 COMPANY: BOC CONTRACTOR: Western

TENEMENTS: PE 213H

SEISMIC SOURCE: Explosives PROCESSING: Western

CABLE: 2300 m RECORDER: SDS 1010

MULTIPLE COVERAGE: 1200%

MILEAGE: 1741 miles (2801.8 km)

REFRACTION:

GRAVITY: -

MAGNETIC: -

DATA QUALITY: F - G

RESULTS: 950 miles of 1965 data from the southern part of WA-28P and WA-1P were converted to digital and deconvolved and all data in this area were reinterpreted. An improvement was obtained in the definition of unconformities and three horizons were mapped: base Tertiary, ?top Jurassic, (unidentified), interpretation being based on Barrow No 1 and Legendre No. 1. The Madeleine and Dampier structures were detailed from the reprocessed data to drill site (see also Scott-Cartier M/S 67/11173 for reprocessed lines)

SURVEY: Wallal A-Mag NO: 69/3037 MAP CODE:

DATES: 4/7/69-17/7/69 COMPANY: WAPET CONTRACTOR: Hunting

TENEMENTS: WA-21-P and WA-30-P

SEISMIC SOURCE: NA PROCESSING: NA

CABLE: NA RECORDER: NA

MULTIPLE COVERAGE: NA

MILEAGE: 1410 (2269km)

REFRACTION: NA

GRAVITY: NA

MAGNETIC: NA

DATA QUALITY: G

RESULTS: The survey has outlined the offshore extensions of the Wallal Embayment and the Wallal Platform and marginal faults. It appears that the Wallal Embayment is a deep trough which narrows to the north. Sedimentary thickness increases to about 10 000 feet and then decreases on the northern margin of the embayment.

SURVEY: Montebello-Mermaid Shoal NO: 65/11015 MAP CODE:

DATES: 6/8/65-23/11/65 COMPANY: BOC CONTRACTOR: Western

TENEMENTS: OP90,92,132 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 Northwest Shelf area.

SURVEY: NO: MAP CODE:

DATES: COMPANY: CONTRACTOR:

TENEMENTS:

SEISMIC SOURCE: PROCESSING:

CABLE: RECORDER:

MULTIPLE COVERAGE:

MILEAGE:

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY:

RESULTS:

SURVEY: N. Western Shelf M.S. NO: 64/4529 MAP CODE: — — — —

DATES: 12/7/64-17/10/64 COMPANY: BOC CONTRACTOR: WESTERN

TENEMENTS: OP 108, OP 90 (1) and (2). OP92(A) 92(B) 105, 106 PE232H, NE part of 213H SW part of PE213H

SEISMIC SOURCE: Explosives PROCESSING:

CABLE: 1200 m/ 2400 m RECORDER: 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: Legendre-Marie M.S. NO: 69/3005 MAP CODE: ———

DATES: 23/2/69-12/6/69 COMPANY: BOC CONTRACTOR: Western

TENEMENTS PE's 213H and 238H W.A. and in OP's 108, 153, 159 N.T.

SEISMIC SOURCE: Aquapulse PROCESSING: Western

CABLE: RECORDER:

MULTIPLE COVERAGE: Sum 3 + 1200%

MILEAGE: 4348.5

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY: F - G

RESULTS: Several anomalies were detailed sufficiently for drilling. Other structural leads were revealed which require further seismic detailing. The Legendre structural trend was detailed and the margin of the Leveque platform determined. Offshore trends of onshore features were confirmed.

SURVEY: Adele - Scott M.S. NO: 69/3038 MAP CODE: ———

DATES: 13/6/69-14/8/69 COMPANY: BOC CONTRACTOR: Western

TENEMENTS: WA-30-P, WA-31-P, WA-29-P, WA-1-P

SEISMIC SOURCE: Aquapulse PROCESSING: Western

CABLE: RECORDER:

MULTIPLE COVERAGE: Sum 3 + 1200%

MILEAGE: 3264.6 (5253.7 km)

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY: F - G

RESULTS: Survey detailed three anomalies sufficiently for the location of drill sites and outlined others for further investigation. The westward extension of the Fitzroy Graben and a zone of complex faulting along the seaward margin of the Pilbara Block were delineated. Reconnaissance delineated the margins of the Leveque Platform and Lennard Terrace and established indications of folding, thereby isolating a potential zone of interest for further more detailed work.

SURVEY: Tryal-Evans M.S. NO: 70/245 MAP CODE: ———

DATES: 7/3/70-18/7/70 COMPANY: BOC CONTRACTOR: Western

TENEMENTS: WA-1,28,29,30,31,32,33,35,36,37-P W.A. and NT/P6,P11,P12 N.T.

SEISMIC SOURCE: Aquapulse PROCESSING: Western

CABLE: 7520 ft RECORDER:

MULTIPLE COVERAGE: Sum 3 + 2400%

MILEAGE: 4604 (7409 km)

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: F - G

RESULTS: The survey confirmed a number of anomalies indicated by earlier work and downgraded others. Several new leads were discovered.

SURVEY: Trimouille-Dillon NO: 70/976 MAP CODE: ———

DATES: 20/12/70-7/1/71, 13/2/70-2/5/71 COMPANY: BOC CONTRACTOR: Western

TENEMENTS: WA-1,28,29,30,31,32,33,34,35,36,37P and NT/P5,P8,P10,P15

SEISMIC SOURCE: Aquapulse, Maxipulse PROCESSING: Western

CABLE: 7773 ft RECORDER:

MULTIPLE COVERAGE: 1200%, 2400%

MILEAGE: 4063.5 (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 deGrey wells and siting of the Angel and Goodwyn wells.

SURVEY: Montebello-Turtle NO: 72/509 MAP CODE: [redacted]

DATES: 10/2/72-15/3/72 COMPANY: BOC CONTRACTOR: Western

TENEMENTS: WA-1-P, WA-28-P and WA-29-P

SEISMIC SOURCE: Maxipulse PROCESSING: Western

CABLE: 3200 m RECORDER:

MULTIPLE COVERAGE: 4800% and 2400%

MILEAGE: 1704.4 (2742.9 km)

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY: P - G

RESULTS: The survey provided structural detail at various stratigraphic levels on at least twenty prospects in the Montebello-Angel and Angel-Turtle areas. A number of structures were upgraded as drilling targets and seismic reconnaissance coverage was extended.

SURVEY: Bedout-Broome Swell S & M NO: 72/2616 MAP CODE: [redacted]

DATES: 12/7/72-31/7/72, 8/8/72-13/8/72 COMPANY: Hematite CONTRACTOR: GSI Western

TENEMENTS:

SEISMIC SOURCE: Maxipulse PROCESSING: (Western) (GSI)

CABLE: RECORDER: DDS 777 (Western) DFS 111 (GSI)

MULTIPLE COVERAGE: 2400%

MILEAGE: 2396 (3855 km)

REFRACTION:

GRAVITY: -

MAGNETIC: -

DATA QUALITY: P - G

RESULTS: Two prominent block-faulted Lower Mesozoic structures overlain by thick Upper Mesozoic and Tertiary sediments were discovered on the Bedout Block. Structural development apparently stopped during the Upper Triassic as the overlying sediments show no compaction or draping over pre-existing features. Further detailing is required to mature a drill site.

SURVEY: NARINGLA NO: 72/2716 MAP CODE: ——

DATES: 16/7/72-27/7/72 COMPANY: BOC CONTRACTOR: Western

TENEMENTS:

SEISMIC SOURCE: Maxipulse PROCESSING: Western

CABLE: 3200 m RECORDER:

MULTIPLE COVERAGE: 2400%

MILEAGE: 247 (397 km)

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: F - G

RESULTS: Sediments exhibit uniform northwesterly dip down to the late Triassic unconformity but below this show structural complexity, with a series of block-faulted ridges paralleling the margin of the Broome Swell. Numerous closures of small areal extent appear along these ridges.

SURVEY: Browse Basin Seismic NO: 72/791 MAP CODE: ——

DATES: 18/2/72-23/3/72 COMPANY: BOC CONTRACTOR: GSI

TENEMENTS: WA-32,33,34,35P

SEISMIC SOURCE: Air-gun (1300 c. inch) PROCESSING: GSI

CABLE: 3200 m RECORDER: DFS 111

MULTIPLE COVERAGE: 4800%

MILEAGE: 1464 (2356 km)

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: G

RESULTS: Tertiary and Mesozoic sediments thicken rapidly in a northwesterly direction. Below the near Top Triassic unconformity, faulted Triassic and older rocks may give rise to structural traps suitable for testing with the drill.

SURVEY: Mermaid-Cartier M.S. NO: 73/204 MAP CODE:

DATES: 28/2/73-16/4/73 COMPANY: BOC CONTRACTOR: Western

TENEMENTS: WA 30 P, 31P, 32P, 33P, 34P, 35P, 37P, NT/P5, P13

SEISMIC SOURCE: Maxipulse PROCESSING: Western

CABLE: 3200 m RECORDER:

MULTIPLE COVERAGE: 2400%

MILEAGE: 3021 (4861.7 km)

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: P - F

RESULTS: Two promising structural trends were outlined in the Canning Basin and the Scott Reef trend has been extended north in the Browse Basin. A number of isolated structures have been detected in the Browse Basin but most are in deep water (more than 1000 feet). Further detailed seismic work is required before drilling any of the anomalies.

SURVEY: Steamboat - spit NO: 72/3253 MAP CODE:

DATES: 23/11/74-4/1/73 COMPANY: BOC CONTRACTOR: Western

TENEMENTS: WA-1-P, WA-28-P, and WA-29-P

SEISMIC SOURCE: Maxipulse PROCESSING: Western

CABLE: 3200 m RECORDER: DDS 777

MULTIPLE COVERAGE: 2400%

MILEAGE: 1640 miles (2639 km)

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: F - G

RESULTS: Four horizons from Base Tertiary to Jurassic were mapped. A number of structures were explored and some developed to drillable prospects including the structures known as Pueblo, Nelson Rocks, and Depuch.

SURVEY: Kendrew-Cootamundra M/S NO:74/31 MAP CODE:

DATES: 16/12/73-8/9/74 COMPANY: BOC CONTRACTOR: GSI

TENEMENTS: WA-1,28,29,30,32,33,34,35 & 37P

SEISMIC SOURCE: Airgun (Maxipulse) PROCESSING:

CABLE: 3200 m RECORDER:

MULTIPLE COVERAGE: 1200%

MILEAGE: 4625 miles (7400 km)

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY: F - P

RESULTS: Provided detail and semi-detail coverage over wide area of Northwest Shelf extending from Dampier Sub-basin to Bonaparte Gulf in northeast.

SURVEY: Walker Rock M/S NO: 73/1 MAP CODE:

DATES: 26/2/73 COMPANY: BOC (Amax F/O 3) CONTRACTOR: Western

TENEMENTS: WA-31-P

SEISMIC SOURCE: Maxipulse PROCESSING:

CABLE: 3200 m RECORDER: DDS-777

MULTIPLE COVERAGE: 2400%

MILEAGE: 55 miles (88 km)

REFRACTION: -

GRAVITY: -

MAGNETIC:

DATA QUALITY:

RESULTS: Detailed Wamac No. 1 Well. (Feature XX)

SURVEY: Leveque Shelf A/M NO: 74/4 MAP CODE:

DATES: 2/3/74-15/3/74 COMPANY: Amax CONTRACTOR: Geosearch Pty Ltd

TENEMENTS: WA-31-P

SEISMIC SOURCE: High sensitivity Proton Precession Magnetometer PROCESSING: NA

CABLE: NA RECORDER: NA

MULTIPLE COVERAGE: NA

MILEAGE: 4100 miles

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY:

RESULTS: Survey located a large number of small-amplitude magnetic features. Wamec No. 1 Well is located in a zone of shallow intra-sedimentary volcanics.

SURVEY: Leveque Shelf M/S NO: 74/5 MAP CODE:

DATES: 15/7/74-18/7/74 COMPANY: BOC Amax F/O 3 CONTRACTOR: GSI

TENEMENTS: WA-31-P, WA-32-P, and WA-2-P

SEISMIC SOURCE: Air-guns PROCESSING:

CABLE: RECORDER:

MULTIPLE COVERAGE:

MILEAGE: 300 miles (480 km)

REFRACTION: -

GRAVITY: -

MAGNETIC: -

DATA QUALITY:

RESULTS: No results to hand.

SURVEY: Baleine M/S NO: 72/25 MAP CODE:

DATES: 27/7/72-8/8/72 COMPANY: Amax CONTRACTOR: Western

TENEMENTS: WA-31-P

SEISMIC SOURCE: Maxipulse PROCESSING:

CABLE: 3200 m RECORDER:

MULTIPLE COVERAGE: 2400%

MILEAGE: 615 miles

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY: F - G

RESULTS: Data of improved quality was obtained both above and below the intra-Triassic ("T") unconformity. Twenty-six structural leads, two of major size, were delineated.

SURVEY: Bedout North S & M NO: 74/225 MAP CODE:

DATES: 25/6/74-29/6/74 COMPANY: Hematite CONTRACTOR: GSI

TENEMENTS: WA-29-P

SEISMIC SOURCE: Air-gun PROCESSING:

CABLE: RECORDER:

MULTIPLE COVERAGE: 2400%

MILEAGE: 683.36 km

REFRACTION: -

GRAVITY: -

MAGNETIC:

DATA QUALITY: F - G

RESULTS: Bedout high is now seen as a large domed structure with its high point about 10 km to the north, and 400 m higher than at Bedout No. 1 well, at basement level. Little secondary closure was found on the flanks of the structure. Volcanics found in Bedout No. 1 well are thought to thin out to the NW.

SURVEY: BROOME 1 M/S M & G NO: 72/29 MAP CODE:

DATES: 30/1-1/2 COMPANY: WAPET CONTRACTOR: Western

TENEMENTS: WA-2-P

SEISMIC SOURCE: Maxipulse PROCESSING:

CABLE: RECORDER:

MULTIPLE COVERAGE: 2400%

MILEAGE: 101.323

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY: F - G

RESULTS: Detailed a structure offshore from Broome. Shown to be an offshore extension of the Jurgura Terrace.

SURVEY: RANKIN TREND M/S NO: 71/538 MAP CODE:

DATES: September 1971 COMPANY: BOC CONTRACTOR: Western

TENEMENTS: WA-28P, WA-29P, WA-1P

SEISMIC SOURCE: Maxipulse ($\frac{1}{2}$ lb) PROCESSING: Western

CABLE: 7590 ft 24-trace RECORDER: SDS 1010 (DFR 300)

MULTIPLE COVERAGE: Sum 2, 24-fold

MILEAGE: 439 miles (total survey)

REFRACTION: 3 profiles on lines 71-750, 751, and 754.

GRAVITY: -

MAGNETIC: -

DATA QUALITY: Fair to good

RESULTS: Four horizons were mapped: lower Miocene, middle Eocene, Upper Cretaceous, and Lower Cretaceous/Upper Triassic Unconformity. The quality at the Upper Triassic Unconformity level was not very reliable. The survey provided more detail on the Rankin and North Rankin areas of the Rankin Trend after the success of the Rankin No. 1 and North Rankin No. 1 wells, with particular attention to the selection of optimum positions for step-out wells on the North Rankin feature.

SURVEY: TELEDYNE SCIENTIFIC M/S & H NO: PSLA 70/19 MAP CODE: [redacted]

DATES: 1970 COMPANY: TELEDYNE CONTRACTOR:

TENEMENTS: WA-27-P (WA-26-P)

SEISMIC SOURCE: SPARKER, 100 Kj. PROCESSING:

CABLE: Single-channel RECORDER: GS111

MULTIPLE COVERAGE: -

MILEAGE: -

REFRACTION: -

GRAVITY: -

MAGNETIC:

DATA QUALITY: POOR

RESULTS: Gave little useful information below the basal Cretaceous unconformity.

SURVEY: AUSTRALIAN CONT. MARGIN M/S, M, G. NO: MAP CODE: [redacted]

DATES: 1972 COMPANY: BMR CONTRACTOR: CGG

TENEMENTS: WA-26-P, WA-27-P

SEISMIC SOURCE: SPARKER, 120 Kj PROCESSING:

CABLE: 1000 m,6-channel RECORDER: SIE PT700 analogue

MULTIPLE COVERAGE: 6-fold

MILEAGE: -

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY: Poor

RESULTS:

SURVEY: ROWLEY SHOALS M/S NO: 72/38 MAP CODE: ——

DATES: May '72 COMPANY: SHELL CONTRACTOR: WGC

TENEMENTS: WA-30-P

SEISMIC SOURCE: Aquapulse PROCESSING:

CABLE: RECORDER:

MULTIPLE COVERAGE:

MILEAGE: 1200

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY: F - G

RESULTS: Matured the East Mermaid drill site

SURVEY: BROOME 2 M/S & G NO: 73/16 MAP CODE:

DATES: 13-8-73-22-8-73 COMPANY: WAPET CONTRACTOR: GSI

TENEMENTS: WA-2-P, WA-31-P

SEISMIC SOURCE: AIR-GUN PROCESSING:

CABLE: 2400 m RECORDER:

MULTIPLE COVERAGE: 48 CDP

MILEAGE: 98.5

REFRACTION: NA

GRAVITY:

MAGNETIC: NA

DATA QUALITY: F - G

RESULTS: Detailed 6 structural leads in the Fitzroy Trough and margins.

SURVEY: GULFREX RECONNAISSANCE M/S, G, M NO: PSLA 72/9 MAP CODE: ——

DATES: May-July 1972 COMPANY: Australian Gulf Oil Co. CONTRACTOR: Aust. Gulf Oil Co.

TENEMENTS:

SEISMIC SOURCE: AQUAPULSE PROCESSING: Gulf R & D Co

CABLE: 1774 m 24-trace RECORDER: DDS 777

MULTIPLE COVERAGE: 24-fold

MILEAGE: 3318 nautical

REFRACTION:

GRAVITY:

MAGNETIC:

DATA QUALITY: F

RESULTS: Reconnaissance

SURVEY: N.W. Continental shelf M/S G.M. NO: MAP CODE: ——

DATES: Sept-Dec '68 COMPANY: BMR CONTRACTOR: RAY

TENEMENTS:

SEISMIC SOURCE: Sparker (21 kj) PROCESSING:

CABLE: single channel RECORDER: Analogue

MULTIPLE COVERAGE:

MILEAGE: 15000 miles (Total survey)

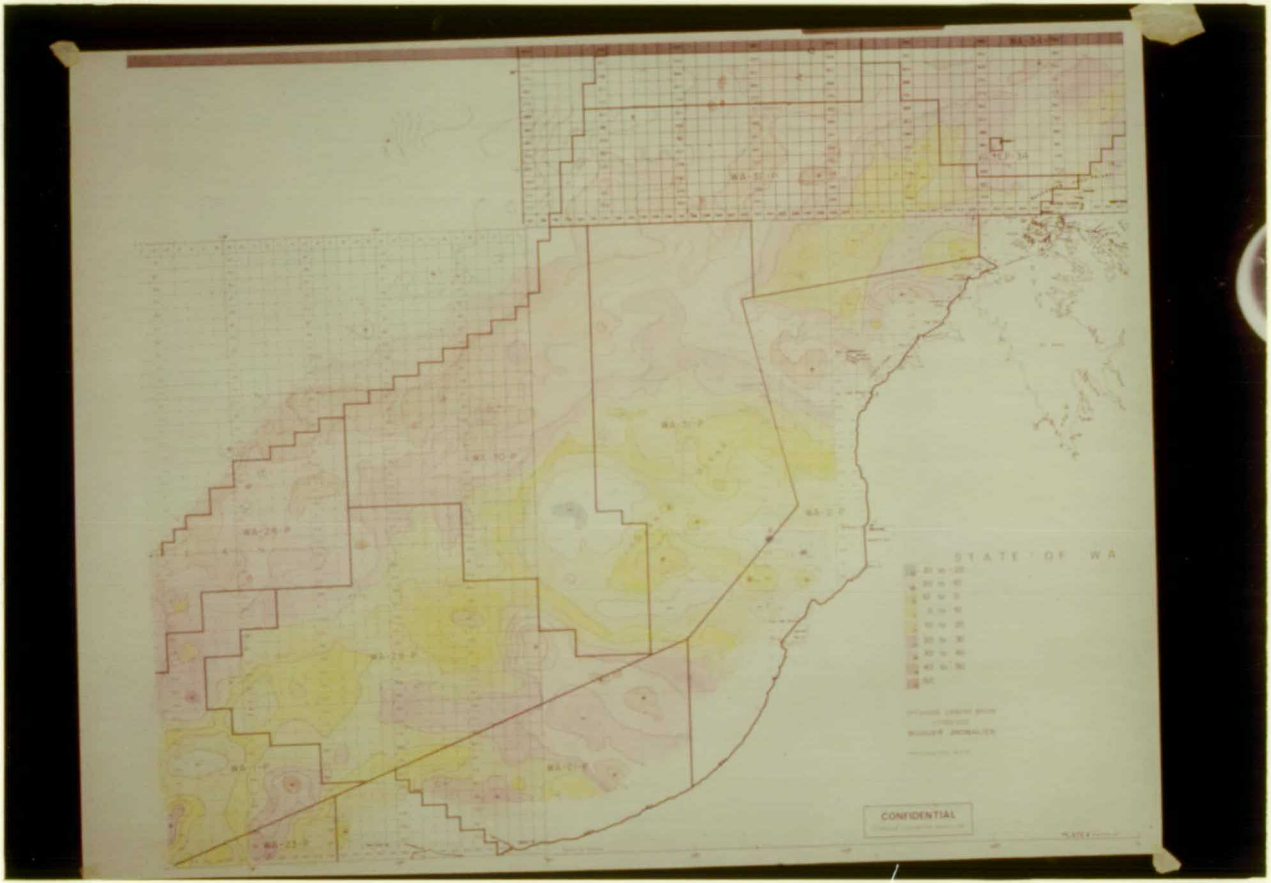
REFRACTION:

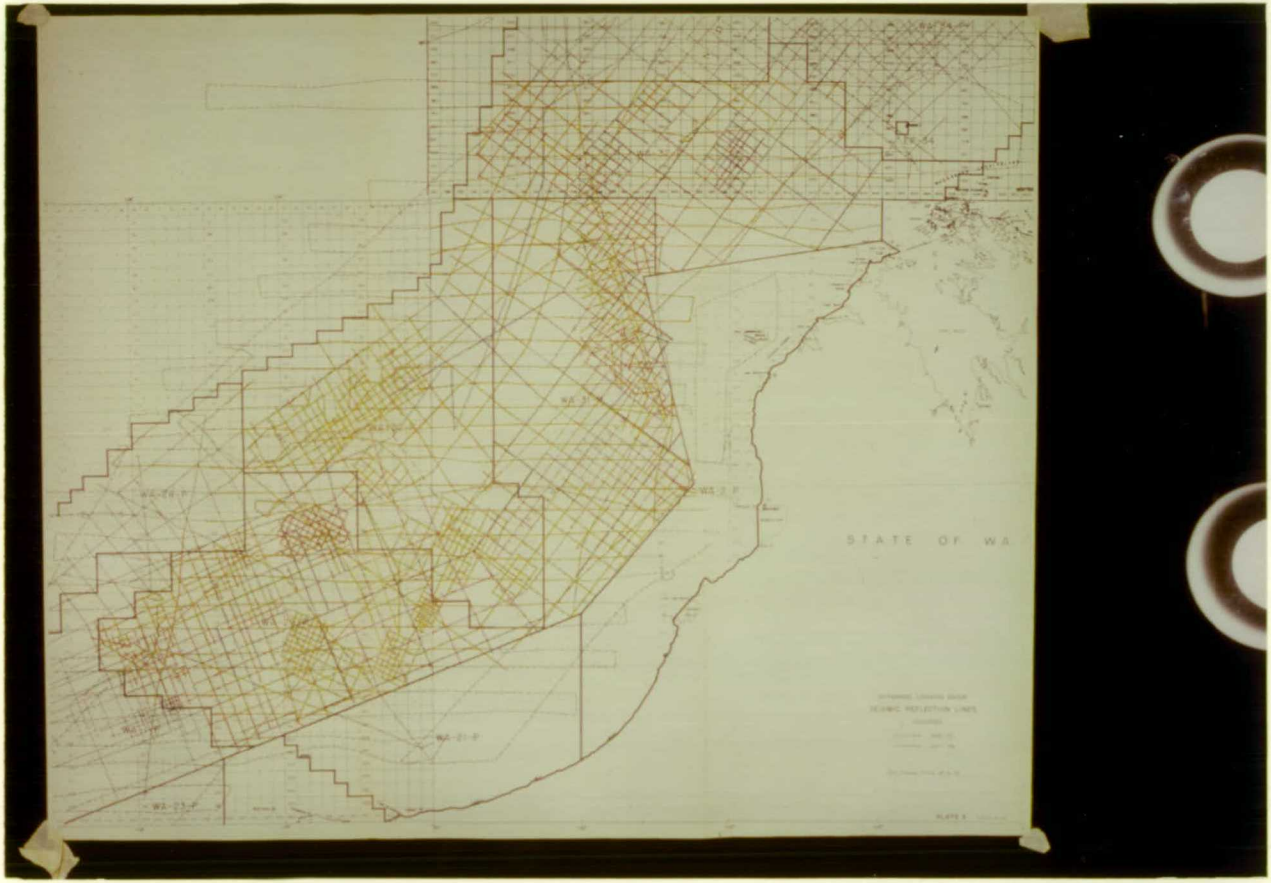
GRAVITY:

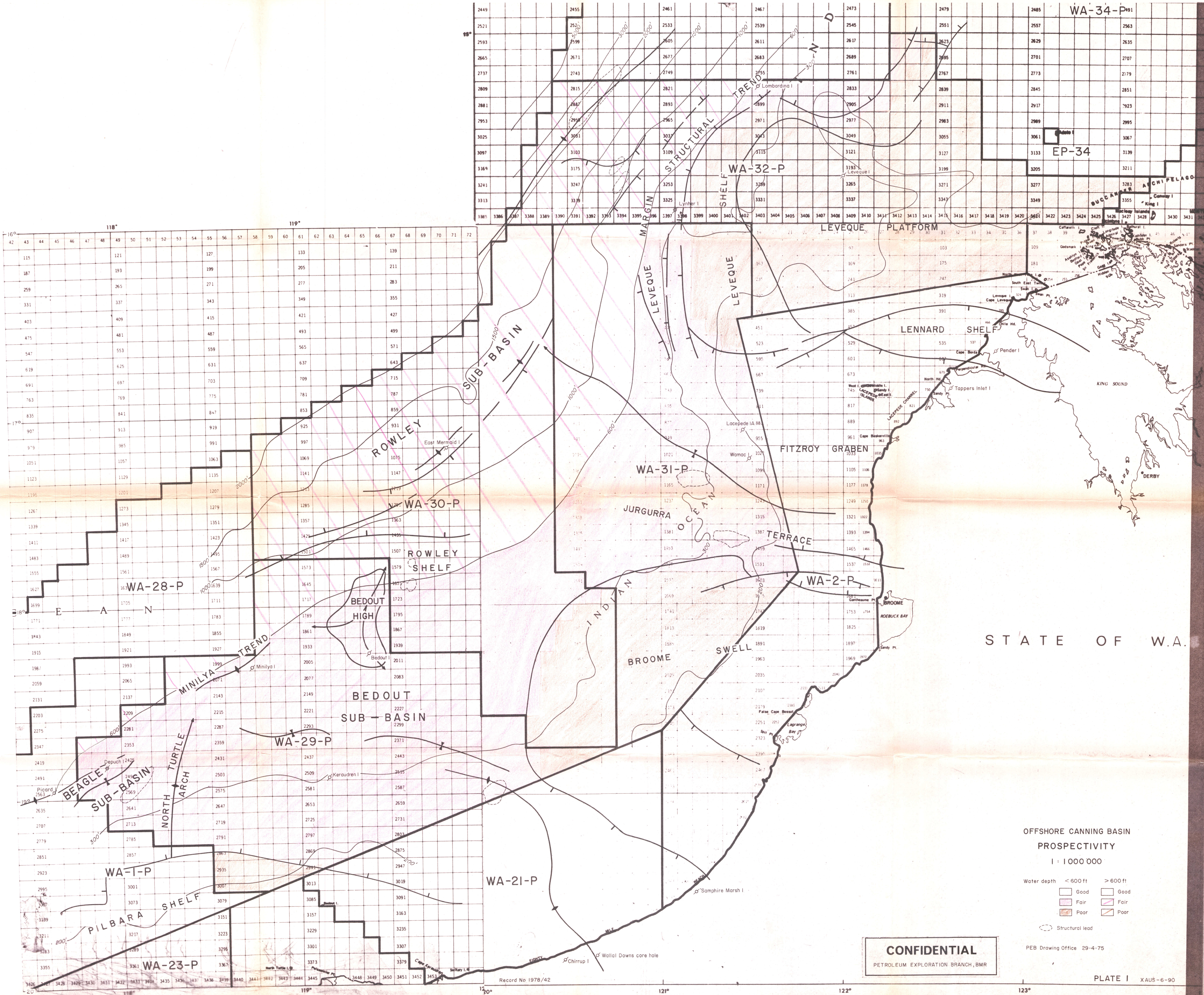
MAGNETIC:

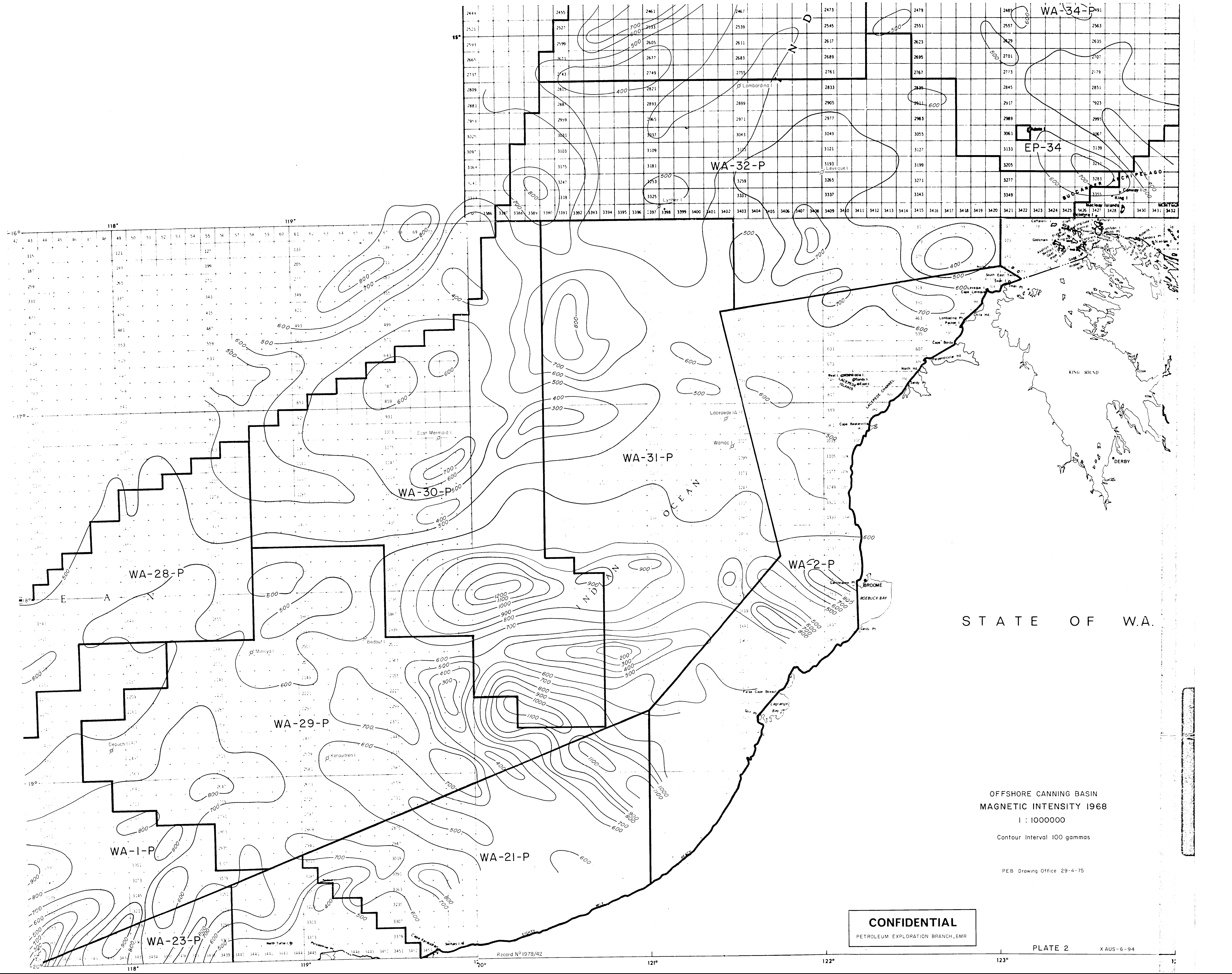
DATA QUALITY: F

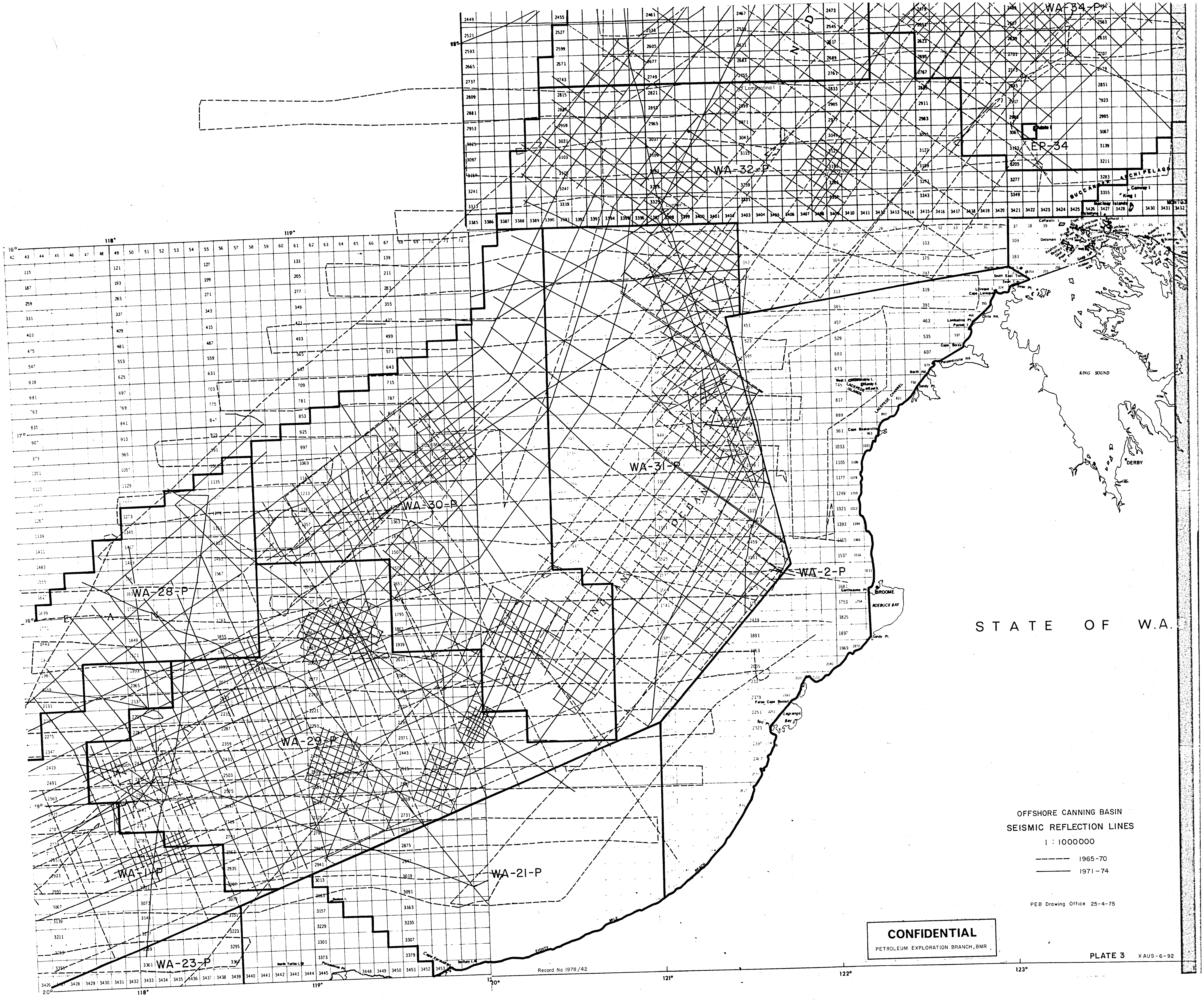
RESULTS: Reconnaissance


STATE OF WA
CONFIDENTIAL

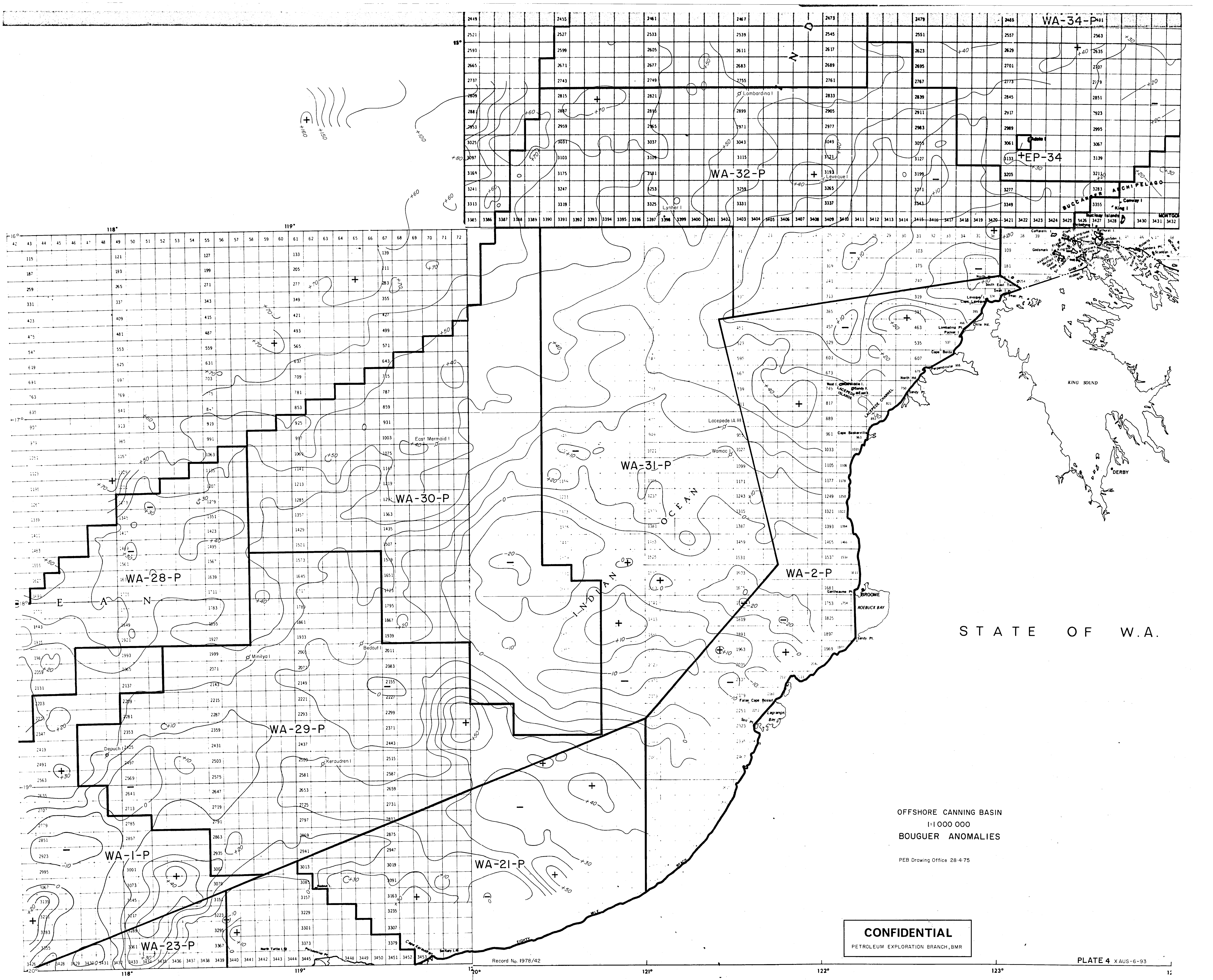

STATE OF WA


OFFSHORE CANNING BASIN
PROSPECTIVITY
1 : 1 000 000
Water depth <600 ft >600 ft
Good
Fair
Poor
Structural lead
PEB Drawing Office 29-4-75
CONFIDENTIAL
PETROLEUM EXPLORATION BRANCH, BMR
PLATE 1
XAUS-6-90
Record No 1978/42
STATE OF W.A.
WA-34-P
EP-34
WA-32-P
WA-31-P
WA-30-P
WA-28-P
WA-29-P
WA-2-P
WA-1-P
WA-21-P
WA-23-P
LEVEQUE PLATFORM
LEVEQUE SHELF
MARGIN STRUCTURAL TREND
LENNARD SHELF
FITZROY GRABEN
JURGURRA TERRACE
BROOME SWELL
ROWLEY SUB-BASIN
ROWLEY SHELF
BEDOUT HIGH
BEDOUT SUB-BASIN
MINILYA TREND
BEAGLE SUB-BASIN
NORTH TURTLE ARCH
PILBARA SHELF
INDIAN OCEAN
BUCCANEER ARCHIPELAGO
KING SOUND
DERBY
BROOME
ROEBUCK BAY
Lombardina I
Leveque I
Lynher I
Lacepede IA
Wamac I
East Mermaid I
Bedout I
Minilya I
Keraudren I
Depuch
Picard
Samphire Marsh I
Wallal Downs core hole
Chirrup I
Pender I
Tappers Inlet I
Cape Leveque
Cape Baskerville
Gantheaume Pt
Sandy Pt
False Cape Bossut
Lagrange Bay
Cape Borda
North Hd
118°
119°
120°
121°
122°
123°
16°
17°
18°
19°
20°


WA-34-P
EP-34
WA-32-P
WA-31-P
WA-30-P
WA-28-P
WA-29-P
WA-2-P
WA-1-P
WA-21-P
WA-23-P
STATE OF W.A.
BUCCANEER ARCHIPELAGO
KING SOUND
DERBY
BROOME
ROEBUCK BAY
LACEPEDE ISLANDS
Cape Leveque
Cape Bossut
Lombardina
Leveque I
Lynher I
Lacepede IA
Wamac I
East Mermaid I
Bedout I
Minilya I
Depuch I
Keraudren I
Cape Keraudren
Cape Baskerville
False Cape Bossut
Lagrange Bay
INDIAN OCEAN
OFFSHORE CANNING BASIN
MAGNETIC INTENSITY 1968
1 : 1000000
Contour Interval 100 gammas
PEB Drawing Office 29-4-75
CONFIDENTIAL
PETROLEUM EXPLORATION BRANCH, EMR
Record Nº 1978/42
PLATE 2
X AUS-6-94
118°
119°
120°
121°
122°
123°
15°
16°
17°
18°
19°
20°



OFFSHORE CANNING BASIN
SEISMIC REFLECTION LINES
1 : 1000000
1965-70
1971-74
PEB Drawing Office 25-4-75
CONFIDENTIAL
PETROLEUM EXPLORATION BRANCH, BMR
PLATE 3
XAUS-6-92
Record No 1978/42
STATE OF W.A.
WA-34-P
EP-34
WA-32-P
WA-31-P
WA-30-P
WA-28-P
WA-2-P
WA-29-P
WA-1-P
WA-21-P
WA-23-P
KING SOUND
DERBY
BROOME
ROEBUCK BAY
BUCCANEER ARCHIPELAGO
LACEPEDE CHANNEL



WA-34-P
WA-32-P
EP-34
WA-31-P
WA-30-P
WA-28-P
WA-29-P
WA-2-P
WA-1-P
WA-21-P
WA-23-P
INDIAN OCEAN
BUCCANEER ARCHIPELAGO
KING SOUND
DERBY
BROOME
ROEBUCK BAY
STATE OF W.A.
Lombardina I
Leveque I
Lynher I
Adele I
Lacepede IA 88
Wamac I
East Mermaid I
Minilya I
Bedout I
Depuch I
Keraudren I
Cape Leveque
Lombadina Pt.
Chile Hd.
Cape Borda
Perpendicular Hd.
North Hd.
Sandy Pt.
LACEPEDE ISLANDS
LACEPEDE CHANNEL
Cape Baskerville
Gantheaume Pt.
False Cape Bossut
Lagrange Bay
Cape Keraudren
EIGHTY MILE BEACH
OFFSHORE CANNING BASIN
1:1 000 000
BOUGUER ANOMALIES
PEB Drawing Office 28·4·75
CONFIDENTIAL
PETROLEUM EXPLORATION BRANCH, BMR
Record No. 1978/42
PLATE 4 X AUS-6-93