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Review of Developments in the Australian Petroleum Industry Since the Third ECAFE Petroleum Symposium

by

M.C. Konecki, J.M. Henry and K. Blair

Paper Presented at Fourth ECAFE Symposium on the Development of Petroleum Resources of Asia and the Far East, Canberra, October - November 1969

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SUMMARY

This paper reviews briefly the events which occurred and affected in some way the Australian petroleum industry in the four-year period between the present and the 1965 E.C.A.F.E. Symposium on the Development of the Petroleum Resources of Asia and the Far East.

Perhaps the most significant aspect has been the relatively sharp shift of exploration and subsequent development from land on to the continental shelf, particularly the offshore Gippsland Basin.

Another aspect of the Australian petroleum picture has been the recognition of the significance and importance to Australia of natural gas; a significant portion of the cumulative recoverable reserves estimated to be about 11 trillion cubic feet, has been already committed to the supplying of three major industrial and commercial centres, and the remaining reserves are likely to be committed in the near future.

Exploration successes and current development activity in respect of crude oil have stimulated discussion and optimistic opinions concerning Australia's self-sufficiency. Production will rise sharply by the end of 1969 and in two years' time may reach 350,000 bbl/day or 67 percent of local crude oil consumption.

Australia's future needs are compared with the projected levels of self-sufficiency, and the Governments' role in helping to achieve this is described

The existing and projected gathering, transmission and processing systems for hydrocarbons are briefly described and illustrated.

A short summary of refining and local and overseas marketing of petroleum and products and petrochemicals is also given.

Numerous tables and charts augment the text.

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INTRODUCTORY COMMENT

Certain significant events in the Australian petroleum industry which have taken place in the last four years were already foreshadowed in the review presented in November, 1965 at the Third Symposium on the Development of Petroleum Resources of Asia and the Far East. (1)

EMPHASIS HAS BEEN ON THE CONTINENTAL SHELF

In particular, these events concern the early exploration successes on land, and more significantly on the continental shelf.

The exploration, and to a certain degree, the development during the period under review have decisively shifted to the offshore areas of Australia and Papua and New Guinea. This trend, which began in the previous period, is likely to continue in the future, although for reasons which will be mentioned later in this review, it may not be as spectacular as it has been hitherto. Table I illustrates these comments in terms of expenditure.

Apart from the unprecedented success in the offshore Gippsland Basin resulting in the discovery and development of at least two large natural gasfields and two large oilfields, this emphasis on exploration on the continental shelf has paid further dividends in the form of significant hydrocarbon discoveries on the western and northwestern shelves, and in the Gulf of Papua. Some of these discoveries may develop into commercial fields, and new ones may be added to the list, for there has been only a comparatively small number of exploration holes drilled so far in this vast area of relatively highly prospective Tertiary and older sediments. Figure 1 and Table II illustrate these comments in better detail. The area of the Australian continental shelf is estimated to be about 600,000 square miles, (1,558,000 square kilometers) and to contain more than twice the average thickness (exceeding 6,000 feet or 1,540 metres) of Mesozoic and Tertiary sediments on land; their facies is also more abundantly marine. (2)

ENTER NATURAL GAS

Although less spectacular than offshore, solid progress has been made, nevertheless, in the exploration, development and exploitation of hydrocarbon reserves on land. However, save for the 1964 oil discovery at Barrow Island, subsequently developed into a moderately sized producing oilfield, the developments on land have been largely concerned with natural gas; the previously discovered accumulations had been developed and put into production, and new discoveries were made. By the end of 1969 three important market centres - Melbourne, Adelaide and Brisbane - will be supplied with natural gas from the producing areas in the offshore Gippsland Basin, in the Cooper Basin and in the Surat Basin; the total length of the three transmission pipelines, as shown on Figure 1 is 878 miles (1,396 kilometres).

The year 1969 may be justly taken to mark the beginning of an era of natural gas utilization in Australia. This relatively new form of energy and chemical feedstock together with its associated "products", LPG and NGL, has been admitted to participate in the industrial and commercial activities of the country by the sheer virtue of its availability in significant and increasing quantities.

The cumulative recoverable reserves of the largely non-associated natural gas discovered so far are estimated to be in the region of 11 trillion (11×10^{12})cubic feet (0.311×10^{12} cubic metres). A significant portion of this volume has been made commercially available at the previously-mentioned three important market centres.

The largest reserves, 5.3 trillion cubic feet (0.15 trillion cubic metres), are in the Eocene sands of the Latrobe Valley Formation in the Barracouta and Marlin fields in the offshore Gippsland Basin. An additional 0.3 trillion cubic feet (0.0085 trillion cubic metres) of the solution gas are estimated by the producers to be recoverable from the crude oil accumulations of the Kingfish and Halibut fields in this basin. Significant, but very much smaller gas reserves have been found in the Snapper, Tuna and Flounder prospects in the basin. However, at this juncture, their commercial availability is uncertain.

Next in size, about 1.8 trillion cubic feet (0.051 trillion cubic metres) are the reserves in the Permian sands in the Gidgealpa, Moomba and Daralingie gasfields in the Cooper Basin. Toolachee, the fourth prospect nearby appears to have indications of being a sizeable gasfield; the discovery well tested at a rate of 6.9 and 4.1 million cubic feet (0.196 and 0.116 million cubic metres) per day of gas on a 7/16-inch (11.1 mm) choke from two separate intervals; the second well, some 8 miles away, (14.5 kilometres) was dry.

The smallest of the three commercially available gas reserves is in the Roma area of the Surat Basin, where some 0.2 trillion cubic feet (0.0057 trillion cubic metres) of gas have been established in over a dozen small accumulations in the Mesozoic and Permian sands, more than double the reserve established at the end of the previous four-year period.

Most of the remaining 35 percent of cumulative reserves of about 11 trillion cubic feet (0.311 trillion cubic metres) of natural gas are for the present not commercial because of their less favourable relation to suitable markets. These reserves are in the Gingin, Yardarino, Dongara and Mondarra fields in the Perth Basin; in the Mereenie and Palm Valley fields in the Amadeus Basin, and in the Uramu and Pasca fields in the Gulf of Papua and at Bwata, Iehi, Barikewa, Kuru and Puri on land in Papua. However, we may shortly see the Dongara reserves at least, made commercially available for the nearby Perth market; and feasibility studies have been made, or are in progress, in respect of the others. There are not inconsiderable volumes of solution gas being produced with oil at Barrow Island, but due to the lack of a suitable market and the choice of water-flood for the production of oil in preference to gas repressuring, the associated gas is being flared.

Other, non commercial discoveries of natural gas were made at Arrowsmith and Whicher Range in the Perth Basin and in the Bonaparte Basin in the north.

CRUDE OIL SELF-SUFFICIENCY DREAM COME TRUE?

It must not be forgotten, however, that these developments in respect of natural gas came about through the determined and sustained effort of the industry and of Commonwealth and State Governments to find and develop adequate reserves of crude oil of which none were known until the Moonie oilfield was discovered in December, 1961.

Subsequently, the combined reserves of Moonie and other small oil accumulations found in the Surat Basin, together with those of the Barrow Island field in the Carnarvon Basin amounted to some 230 million barrels (36.5 million kilolitres).

The picture changed radically, almost overnight, with the discovery in 1967 in the offshore Gippsland Basin of the Halibut and Kingfish oil accumulations, with the combined reserves conservatively estimated at 1,500 million barrels (238.5 million kilolitres). Both these fields are in the major class by world standards, Kingfish with 1,060 million barrels (168.5 million kilolitres) being in seventieth place in respect of the size of recoverable reserves. Dramatically, the dream of crude oil self-sufficiency began to approach realisation. Additional estimated 20 million barrels (3.18 million kilolitres) were subsequently found below the gas accumulations in the Barracouta structure, and a small unspecified volume of crude was discovered in the Marlin structure. Continued exploration in the basin resulted in further discoveries of oil and/or gas in the following prospects; Dolphin (oil), Perch (oil), Tuna (oil and gas), Flounder (oil and gas), Snapper (mostly gas). The first two are considered to be non-commercial, the others are still being evaluated.

A reserve estimate of about 300 million barrels (47.7 million kilolitres) of oil "in place" has been made for an accumulation in the Pacoota Sandstone of Ordovician age in the large, elongated Mereenie Anticline in the Amadeus Basin. (3) An oil column of some 320 feet (97.5 metres) underlies a 1090-foot (332 metres) gas column in this composite sandstone reservoir of a variable, but generally low porosity and permeability development. Not unlike the Upper Cretaceous Windalia Sandstone reservoir of the Barrow Island oilfield, the Pacoota Sandstone has been found to be responsive to "sand-frac" stimulation. In the circumstances, the recovery of up to 20 percent, or 60 million barrels (9.54 million kilolitres) of oil in place may not be impossible, given an incentive to produce at this remote locality. A small refinery in Alice Springs is being considered for the refining of crude that may be produced at Mereenie and at any future discoveries in the area.

Apart from the Bass Strait in the south, significant oil discoveries were recently made on the western continental shelf in the Gage Roads No. 1 well, and in the Legendre No. 1, Dampier No. 1 and Lacrosse No. 1 wells on the northwestern shelf. Non-commercial oil flows were tested in the Gage Roads and Legendre wells, and shows were found in the other two. Flinders Shoal No. 1 was dry as far as oil is concerned, but it tested a small flow of gas from a shallow depth. These discoveries on the northwestern shelf are being followed by further exploration including drilling.

The crude oil reserves referred to above have been augmented by hydrocarbon liquids contained in various proportions in most of the natural gas accumulations discovered to date, and a reserve estimate of some 275 million barrels (43.7 million kilolitres) would, perhaps, be pessimistic. About half of these NGL reserves would not be considered commercially available at this stage for the same reason as the gas reserves

they are associated with, i.e. remoteness from ready market.

PRODUCTION, TRANSMISSION AND UTILIZATION OF NATURAL GAS AND CRUDE OIL

The production of natural gas on a small scale commenced in the Roma area in 1961; it was sold for electricity generation and use in the hospital at Roma at a rate rising from about 30 million cubic feet (0.765 million cubic metres) in 1961 to 101.76 million cubic feet (2.886 million cubic metres) in 1964. Small amounts of condensate also have been produced along with the gas. The gas production and sales in the Roma area in the period from 1964 to the end of 1968 are shown in Table III. Currently, the gas reserves in the area are committed to supply 100 billion cubic feet (2.83 billion cubic metres) over the next 15 years for the ammonia fertilizers production and for domestic and other industrial use in the Brisbane area; about 3 billion cubic feet (0.085 billion cubic metres) will be sold over and above this commitment in Roma and other towns en route to Brisbane. The transmission is through a 12 3/4-inch (32.4 centimetres) pipe over 24 5 miles (39.4 kilometres) and a 10 3/4-inch (27.3 centimetres) pipe over 257 miles (414 kilometres), a total distance of 281.5 miles (453.4 kilometres). The field gathering system shown in Figure 2 comprises 23 wells in 13 fields connected by 11 miles (17.7 kilometres) of 2 3/8-inch (6.4 centimetres), 20 miles (32.18 kilometres) of 8 5/8-inch (21.9 centimetres) and 8 miles (13 kilometres) of 10 3/4-inch (27.3 kilometres) pipelines. No processing of gas is carried out apart from the wellhead separation, and the collection of condensate formed in the gathering lines. The transmission of gas commenced late in March, 1969 and an average daily rate of delivery for the month of June 1969 was 11.08 million cubic feet (0.314 cubic metres). The maximum capacity of the pipeline is 55 million cubic feet

(1.56 million cubic metres) per day, but the two contracts mentioned involve a delivery of only 20 million cubic feet (0.566 million cubic metres) per day. The cost of the pipeline was about $A11 million ($US12.3); $A5.3 ($US5.94) million were financed from the shareholders' funds and $A5.7 million ($US6.38 million) from outside loans.

South Australian natural gas will be transmitted via a 22-inch (55.9 centimetres), 486-mile (782 kilometre) pipeline from the Gidgealpa and Moomba fields to Adelaide and environs for electricity generation, cement manufacture and domestic and other industrial use. The Electricity Trust of South Australia is the biggest buyer of gas worth $A140 million ($US158 million) over a 20-year period; the contract calls for the supply of 60 million cubic feet (1.7 million cubic metres) per day in the first year rising to 90 million cubic feet (2.55 million cubic metres) per day in the fifth year. The South Australian Gas Company will buy $A45 million ($US50 million) worth of gas over 20 years at a delivery rate of 30 billion cubic feet (0.77 billion cubic metres) in the first five years increasing thereafter. Initially, the field gathering system consists of 42 miles (67.5 kilometres) of small-diameter lines in the two fields, and a 16-inch (40.7 centimetres), 16-mile (25.7 kilometres) connecting line between the separator stations, at Gidgealpa and Moomba, the latter plant also serving for the removal of carbon dioxide from the gas stream as shown in Figure 3. Natural gas liquids obtained from separators are to be used as fuel for plant operations. No other processing of gas is envisaged at present. The transmission to Adelaide is scheduled to commence in November, 1969. The pipeline is owned and operated by the Natural Gas Pipeline Authority of South Australia, a semi-government body. The cost of the pipeline is about $A40 million ($US46.8 million), of which $A15 million ($US16.8 million) have been obtained from a special Commonwealth loan and the balance from the outside, mainly institutional lending sources.

The production of natural gas from the offshore Gippsland Basin fields commenced in March, 1969. The arrangements for transmission and processing of this gas and the incipient oil production, are shown in Figure 4.

Gas and oil arriving at Dutson by the separate pipelines, buried under the sea are, respectively, processed and stabilized at this $A36 million ($US40.3 million) plant. The throughput of wet gas was planned to be between 300 and 400 million cubic feet (8.5 and 11.3 million cubic metres) per day and that of crude oil up to 300,000 barrels (47,700 kilolitres) per day. The "sales" gas is transmitted via a 30-inch (76.2 centimetres), 110-mile (177 kilometres) pipeline operated by the Victorian Pipeline Commission to the "city gate" at Dandenong for distribution in Melbourne and environs.

The initial daily delivery rate of 4.5 million cubic feet (0.127 million cubic metres) rose in a few months to 11 million (0.31 million cubic metres) and will eventually reach 200 million cubic feet (5.1 million cubic metres). However, the line is capable of operating at a much greater rate of delivery. From Dutson, the NGL and stabilized crude are transmitted by separate pipelines, about 115 miles (185 kilometres) long and 10 inches (25.4 centimetres) and 28 inches (71 centimetres) in diameter respectively, to the fractionation plant at Long Island Point near Westernport Bay. The LPG production which is planned to be about 1 million tons (1.015 million metric tons) per annum is sold to the local and overseas (mainly Japan) markets, and ethane is for use in petrochemical plants. The crude oil is shipped to the refineries.

An 80-mile (129 kilometre) pipeline is presently to be built from Long Island Point to the Altona petrochemical complex, and to the Shell refinery at Corio near Geelong to transmit initially some 150,000 barrels (23,900 kilolitres) of crude a day. The completion of the pipeline is scheduled for the latter half of 1970.

The commercial production of crude oil in Australia commenced in February 1964 from the Moonie oilfield in Queensland. A 190-mile (306-kilometre), 10-inch (25.4-centimetre) pipeline was built at a cost of $A9 million ($US10.08) to transmit this production from Moonie to Brisbane, as shown in Figure 1. In 1966 oil then hauled by road tankers from the Alton oilfield and oil from the Conloi and Bennett wells was added to the Moonie production.

In December, 1966, oil production began from the Barrow Island oilfield. The main producing reservoir is the Windalia Sandstone of Lower Cretaceous age occurring at a shallow depth (2200 feet to 2400 feet) (670 metres to 732 metres); some production is also obtained from the shallow Muderong Formation below the Windalia and from the "deep" (6000 feet-7500 feet) (1830 metres to 2125 metres) Upper Jurassic sandstones. The wells in the Windalia reservoir are sand-fracced and the natural producing mechanism, largely expansion of the solution gas, almost from the start of production has been assisted by the introduction of a water-flood scheme. Consequently, the produced gas, as mentioned previously is being flared, save for small volumes being used in field operations. The position regarding wells involved in the production of crude oil is summarized in Table IV.

The production is gathered from seven groups of wells, each containing about 40 wells; each group is connected to a separator station designed for automatic operation. The "dry" oil is transmitted from the separators to four 200,000-barrel (31,800 kilolitres) storage tanks located about half-way along the north-eastern coast of the island. From these storage tanks a 6-mile (9.6 kilometre), 20-inch (50.8 centimetre) pipeline runs on the sea bottom to the offshore terminal moored by means of five 10-ton (10.15 metric tons) anchors. The pumping station located near the storage tanks is capable of transmitting crude oil to the loading tankers at the terminal at a rate of up to 15,000 barrels (2,385 kilolitres) per hour. The first shipment of crude from the island to the refinery at Kwinana near Perth was in late April, 1967 by the Australian-built 250,000-barrel (39,750 kilolitres) tanker, "P.J. Adams". A schematic diagram of the delivery system is shown in Figure 5.

CONSUMPTION, PRODUCTION AND IMPORTS OF CRUDE OIL

The daily production of the indigenous crude oil has risen in the current four-year period from about 9,000 barrels (1,430 kilolitres) in 1965 to some 41,000 barrels (6,500 kilolitres) in the first six months of 1969. The 1966 production came almost entirely from the Queensland fields, mainly from Moonie and Alton, and in that year they appear to have reached the peak of their productivity; they are now on the decline, and their contribution to the national crude oil output is fast becoming insignificant.

The production of the Barrow Island oilfield, on the other hand, is still rising, and is planned to reach a level of some 45,000 barrels (7,150 kilolitres) per day by the end of 1969.

The production of crude oil from the offshore Gippsland Basin is scheduled to commence in the latter part of 1969 or early in 1970, at an initial daily rate of 25,000 barrels (3,970 kilolitres), and to reach 205,000 barrels (32,550 kilolitres) per day in the last quarter of 1970 and 300,000 barrels (47,700 kilolitres) a day by the end of 1971, at which level it will remain for some time.

We may, therefore, look forward to a cumulative daily production of indigenous crude of some 350,000 barrels (55,600 kilolitres) before 1971 is out. This represents some 67 percent of the equivalent crude oil required to meet local consumption of some 520,000 barrels (82,650 kilolitres) per day at that point of time.(4) In 1968, the requirement was about 450,000 barrels (71,550 kilolitres) per day and the local production represented 8 percent of this requirement. The historic relationship between the local consumption, production, and import, and the forecast extension to 1980 is shown in Table V and Figure 6.

It will be seen that the import requirements of crude oil should reach a maximum by the end of 1969, and will drop thereafter. However, if no significant new production is added by 1972/73 they will rise again as a result of the annual consumption growth and natural production decline. With reference to natural decline it has been assumed that a reasonably constant maximum rate of production would be maintained for four to five years from the Kingfish, Halibut and Barrow Island fields; in the first two fields a natural active water drive, and in the Barrow Island an "induced" water drive are operative.

SECURING A PETROLEUM RESOURCE BASE

Governments' Role

The road to self-sufficiency is still an uphill one, and the arguments for the need to press on with exploration have not lost any of their validity, in spite of the success achieved so far.

Actually, the term self-sufficiency requires some clarification, inasmuch as the crudes so far discovered have been light gravity crudes yielding relatively high proportions of naphthas and low percentages of residuals. This deficiency in "heavy products" estimated at between 35 and 40 percent of the total demand will have to be met by imports; under these circumstances the maintenance for the next thirty years or so of the present level of self-sufficiency of between 65 and 60 percent of the total requirement would call for about threefold increase of the current estimated crude oil reserves by 1985 or thereabout. Should we aim at the complete autarky in respect of petroleum, it would be necessary to discover sufficient reserves of the heavy crudes as well, and to improve the current reserve level at least sixfold between now and, say, 1985.

These rough estimates are subject to considerable modification, due to a decisive entry of natural gas into the fields of energy and petrochemistry, and to a probable application of nuclear fuel for industrial purposes in the next decade. Already, Australia's estimated natural gas reserves, when converted to the crude oil equivalent (1 million cubic feet = 170 barrels) are of the same size as the estimated reserves of crude oil, not counting the LPG and NGL available from this gas. The impact of nuclear power is not likely to be as great as that of natural gas, but together they are bound to downgrade the current estimates of our future crude oil requirements by a considerable margin.

Most of the current estimates of the Australian primary fuels consumption in the near and not-so-near future include natural gas but shy away from nuclear energy as being too difficult or impossible to forecast at this early stage. One such estimate (4) sees an increase of natural gas participation in the usage of primary fuels in Australia from less than 0.01 percent in 1968/69 to about 2.1 percent in 1969/70 and to about 6.3 percent in 1974/75. The relative participation of petroleum products in these years is estimated to be about 48.9, 48.4 and 47 percent respectively. The consumption of primary fuels in Australia is shown in Figure 13. (An illustration of the significance of natural gas in the national economy mentioned above, has been recently presented by Prof. Camatini (5) who has shown that in 1966 Italy's balance of payments was improved by some $A482.7 ($US540.6) million due to the activities of E.N.I. (Ente Nazionale Idrocarburi) in the field of hydrocarbons. Of this total, $A100 ($US112) million were due to the replacement of imported crude oil by natural gas and its "products", $A206.9 ($US231.7) million accrued to the economy from the export of petro-chemicals and fertiliser products from natural gas, and $US196.9) million was derived from the price reduction of imported crude oil).

Whether a complete crude oil self-sufficiency is desirable, let alone technically and economically attainable, is open to considerable debate. Suffice it to say that we have not as yet, secured an adequate resource base even for a limited self-sufficiency, whatever this may yet turn out to be; both private enterprise and Government are currently engaged in an effort to secure and to widen such a base within reasonable limits of time, expenditure and technical and administrative capacity. In this effort, the governments, particularly the Federal Government, have assumed an active role by providing the following services, assistance and incentives:-

- regional geological, geophysical and topographic surveys and other technical and scientific studies;
- through the Petroleum Search Subsidy Act 1959-1969 - a direct financial assistance in respect of the approved exploration operations;
- through the Petroleum (Submerged Lands) Act 1967 - a suitable legislation system in respect of exploration, development and production on the continental shelf;
- policies and machinery concerning the valuation, pricing, absorption and allocation of indigenous crude oil;
- policies, largely in the field of taxation and import tariff relief, designed to provide further incentive for exploration.

In the current year (1969) the Petroleum Search Subsidy Act 1959-1967 has been amended and extended for a further period of five years to the end of June, 1974. It is to be known as the Petroleum Search Subsidy Act 1959-1969.

Briefly, the amendments limit the general availability of subsidy for exploration to the onshore operations; the offshore operations may draw the full subsidy only if they are carried out by an Australian-owned company; where the company is foreign-owned but has an Australian equity component, the subsidy may be payable in proportion to that component. The categories of test and stratigraphic drilling have been included in one category - exploration drilling. The rate of subsidy of 30 percent of the approved costs has been adopted for all types of operations, and the "footage rate" method of subsidy allocation in respect of drilling has been deleted. The re-payment of subsidy upon discovery will not be demanded by the Government until this can be provided by income earned from production.

These changes were designed with the declared intention to intensify the exploration on land as being cheaper, more desirable from the defence viewpoint and likely to give Australian companies more chance to undertake the work on their own or in partnership with the foreign operators.

The Petroleum (Submerged Lands) Act 1967 was approved in November, 1967 simultaneously by the Federal and all State Parliaments as uniform legislation governing the exploration and exploitation of petroleum on the continental shelf of Australia and the Territory of Papua and New Guinea. The Acts became fully effective on 1st April, 1968.

Under this legislation each State Government is responsible for administration in offshore areas adjacent to its shores, including the granting of offshore titles, collection of rents, fees and royalites. However, the granting of petroleum titles is subject to the approval by the Federal Government which also receives 40 percent of the royalty on production.

There are two kinds of titles - the PERMIT for exploration and the LICENCE for production.

A graticular system of blocks (5 minutes by 5 minutes per graticular block) was introduced for the purpose of granting titles and for subsequent administration. The maximum size of a permit is 400 blocks or roughly 10,000 square miles, and there is no limit to the number of the permits that may be granted to an operator. The granting of the permit carries specific working conditions and a compulsory relinquishment requirement of half of the area after the

first six years of tenure, and a further 50 percent of the remaining area at the end of each successive five-year period.

The licence is issued as a matter of right to the permittee upon the discovery of a commercial petroleum deposit in the permit area. The procedure calls for the permitee to nominate a central discovery block which, together with the surrounding eight blocks becomes a (discovery) LOCATION. The permittee then may either take up five blocks of the location as a licence for production at a standard royalty rate of 10 percent, or add from one to four of the remaining blocks to make up a licence and pay an override royalty, additional to the standard ten percent royalty, on ensuing production; this rate of the override royalty is subject to negotiation and may range from 1 to 2.5 percent. The licence is issued for an initial period of 21 years; it may be extended for a further 21 years and perhaps beyond.

The holder of a production licence has a preferential right to a pipeline licence, which allows the construction and operation of a marine pipeline for the transmission of petroleum to shore.

The Operating and Safety Regulations, allowed for in the Petroleum (Submerged Lands) Act 1967, have been drafted by a joint Government/Industry Committee and are ready for adoption by the relevant Federal and State authorities.

In order to ensure domestic absorption of indigenous crude oil at a reasonable price, so that continuing exploration would be encouraged, the Federal Government decided in 1965 to control the price and to impose a quota system for the allocation of domestic crude oil to refineries. This decision was based on the recommendations of the Tariff Board following a public enquiry.

The problems of absorbing indigenous crude oil in 1965 were relatively minor because of the small quantities of crude produced from the Moonie field; no sudden or large increase in the production of indigenous crude was seriously expected in the near future and accordingly, the matter was to be reviewed in September, 1970 or earlier if necessary.

However, the discovery in 1967 of large oil reserves on the Gippsland shelf raised the fear that the Australian consumer would pay more for the indigenous petroleum products than for similar products refined from imported crudes. This problem has now been largely resolved following negotiations which resulted in a new policy on pricing and absorption of indigenous crude oil.

Exploration and Development

(a) Expenditure and Costs

At the end of 1964, cumulative expenditure on petroleum exploration, development and production amounted to $A299,082,830 ($US334,972,770). By the end of 1968, cumulative expenditure had increased to $A689,688,100 ($US772,450,700), as shown in Table XI.

Development programmes in respect of the Moonie and Alton oilfields and the Roma Area gasfields in Queensland, the Barrow Island oilfield in Western Australia and the gas and oilfields on the Gippsland Shelf, offshore Victoria, accounted for a large portion of this increase.

Figure 7 illustrates the pattern of expenditure since 1962. This chart shows that annual exploration expenditure increased steadily from $A43.8 million ($US49.1 million) in 1964 to $A68.4 million ($US76.6 million) in 1968. However, it is evident from this figure and from Table VI that this increase is mainly due to intensified offshore exploration activity, and that the onshore exploration component has actually declined over the past few years.

A detailed cost statement is presented for both on - and offshore operations on a "footage drilled" and "line mile" basis, in Tables XI and XII. This statement reflects the world-wide trend, in that offshore drilling is much more expensive than onshore drilling, and that marine geophysical operations are generally cheaper than those on land, by virtue of greater coverage in less time.

(b) Geological, Geophysical and Drilling Activities

Geological activities have shown a marked and continuous decline since the peak year of 1963, and in fact, the year 1968 saw the lowest activity since 1959 (see Table XIII and Figure 8). This trend is normal, as in chronological terms, geological surveys decrease as other phases of exploration and development follow on and increase. The trend has perhaps been accelerated by the increased accent on offshore exploration where geological work is negligible.

Geophysical activity in crew months was at its maximum in 1965, two years after the geological peak. Since then the geophysical activity appears to have declined as shown by the "crew months" figures in Table XIII and Figure 8. Actually, this decline is less severe when the activity is assessed on the basis of line miles, bearing

in mind that the output in line miles from a marine geophysical crew is generally greater than that from a crew on land. Nevertheless, the annual expenditure on geophysics dropped from $A20.8 million ($US23.3 million) in 1966 to $A12.5 million ($US14.0 million) in 1968 as shown in Table VII and Figure 8. Annual expenditure on drilling increased by just over 100% from $A24.8 million ($US27.8 million) in 1965 to $A50.7 million ($US56.8 million) in 1968.

This activity, presented in Table XVI, is categorised under "Exploration" embracing wildcat, stratigraphic and extension wells; and "Development", which comprises wells drilled for production and production services (water injection, observation, etc.).

The number of wells drilled, and the footage involved are presented in Tables XIV, XV, XVI and Figure 9 which detail the statistics under the two categories, for onshore and offshore. By 31 December 1968, cumulative footage drilled was 7,642,536 feet (2,330,973 metres). This figure involved some 1,801 wells, of which 1,295 were exploration and 506 were development.

The highest annual footage was 1,153,189 feet (351,723 metres) in 1965, the next being 1,106,804 feet (337,575 metres) in 1968. Of the latter, 312,613 feet (95,347 metres), or 28.2% were drilled offshore.

By 31 December 1968, 431 wells, or 23.9% of the total drilled, had been completed as producers or as potential producers awaiting suitable production facilities or a market outlet. These wells are apportioned as follows:-

Oil Wells : 313 (25 Exploration wells, 288 Development wells)

Gas Wells : 118 (36 Exploration wells, 82 Development wells)

Discoveries out of the 1295 exploration wells resulting in completions for commercial production amounted to 61, which gives a success ratio of 1:21.2. However, this figure is pessimistically misleading, as several significant discovery wells, particularly offshore, have had to be abandoned, suspended or secured. Taking these wells into account, the success ratio is approximately 1:15.

The number of drilling rigs continuously available for use in Australia and Papua-New Guinea has been between 40 and 43 for the last few years. At mid-1969, six offshore mobile units were operating; three of these were drilling ships, two simi-submersible platforms, and one a jack-up unit.

The onshore units span a depth range of 4,000 feet (1,220 meters) to 20,000 feet (6,100 metres), and the deepest well drilled in Australia was Keep River No. 1 at 15,623 feet (4,765 metres).

About 40 percent of available rigs are currently active, one third of which are operating offshore.

A recently concluded survey by the Bureau of Mineral Resources of the usage of oilfield tubular goods in 1968 has shown that there is no domestic production of oilfield tubular goods in Australia, and that all these items had to be imported. Information on usage, type and origin of tubulars was made available by the operating companies, and is summarised in Table XVII. Considering the expansion of the petroleum

industry, it is of interest to know the principal sources of various types of tubular goods used or to be used and whether or not domestic production of some or all of these goods is feasible.

REFINING

At the end of 1961, six Australian refineries were in operation, the total capacity being 307,000 barrels (48,813 kilolitres) per stream day. This increased to 374,800 barrels (59,593 kilolitres) per stream day by the end of 1964, and to 607,500 barrels (96,503 kilolitres) per stream day by the end of 1968, following the commissioning of two new refineries in Queensland, one at Westernport in Victoria, and one in South Australia, making ten in all.

Total capital investment in the refining industry to 30 June 1961 was $A 292.5 ($US 327.6) million, to 30 June 1964 $A 409.5 ($US 458.6) million and by 30 June 1968, it had risen to $A 657.8 ($US 736.7) million.

At the end of 1968, two refineries were operating in Queensland, three in New South Wales, one in Western Australia, three in Victoria, and one in South Australia. Lubricating oil plants associated with refineries were operating in New South Wales, Western Australia, and Victoria. Eight of the refineries were owned wholly by overseas interests, one was wholly Australian, and one was jointly held by Australian and overseas interests.

All the refineries except one of those in Victoria and that in South Australia incorporated cracking units.

The locations and distillation capacities are tabulated in Table XVIII.

Figures showing the input of crude oil and other refinery feedstock to Australian refineries, and output of refined products for the calendar years 1965 to 1968 inclusive, are given in Table XIX.

In 1961 total input of crude oil and other refinery feedstock was 92,578,000 barrels (14,719,000 kilolitres). By 1968, this had risen to 163,589,000 barrels (26,010,651 kilolitres), an increase of some 77%, or 11% per annum. Output of motor spirit increased from 33,859,000 barrels (5,383,581 kilolitres) in 1961 to 56,085,000 barrels (8,919,515 kilolitres) in 1968, an increase of some 66%. Over the same period, output of kerosines rose by 4,712,000 barrels (749,208 kilolitres) (133%) to 8,224,800 barrels (1,311,432 kilolitres); furnace fuel by 19,615,000 barrels (3,118,785 kilolitres) (78%) to 44,729,000 barrels (7,111,911 kilolitres). Diesel oils increased by 7,380,000 (1,173,420 kilolitres) (38%) to 26,648,000 barrels (4,237,032 kilolitres).

Output of lubricating oil base stock increased by 2,249,000 barrels (357,432 kilolitres) (1,470%).

Total output of marketable products rose by 65,832,000 barrels (10,467,288 kilolitres) (77%) to 151,065,000 barrels (24,019,335 kilolitres) in 1968.

MARKETING AND CONSUMPTION

Distribution and marketing of petroleum products are carried out by nine major companies, two of which are Australian owned and one owned jointly by Australian and overseas firms. By 30 June 1968, $A 864.9 ($US 968.7) million had been invested in marketing in Australia. Table XX shows consumption figures for petroleum products in Australia for the years 1965 to 1968 inclusive.

By 1968, petroleum products accounted for some 48% of primary energy consumed in Australia.

OVERSEAS TRADE

Imports

Notwithstanding the indigenous crude oil production from the Barrow Island and Moonie-Alton fields, imports of petroleum products have continued to rise, until in 1968, total imports amounted to 155,809,000 barrels (24,773,631 kilolitres). However, the rate of increase is diminishing, whereas the rate of increase of consumption is expanding. After the Gippsland Basin fields begin production in 1969, it is expected that, import figures will level out and eventually decrease, as indigenous production figures increase. Imports of refinery feedstock and refined products are outlined in Table XXI.

Exports

Since 1964, cargo exports of petroleum products from Australia levelled out to some 8,000,000 barrels (1,272,000 kilolitres) per year, worth $A 33 ($US 37) million. This reflects increasing refining self-sufficiency of the main overseas markets, of which New Zealand was the largest. Cargo exports in the 1964-1968 period are shown in Table XXII.

PETROCHEMICALS

Since 1961, the petrochemical industry in Australia has expanded considerably. In 1968, there were about 30 plants operating and several planned or under construction.

These plants embrace a wide spectrum of petrochemicals, and their products and capacities are listed in Table XXIII.

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TABLE I

Expenditure on Petroleum Exploration Development and Production in Australia and Papua and New Guinea

Year	Total (million)		Offshore (million)		Fraction of Total (%)
	$A	$US	$A	$US	
1959	14.7	16.5	None		None
1960	16.2	18.1	0.3	0.34	1.9
1961	18.4	20.6	0.6	0.67	3.3
1962	34.4	38.5	0.9	1.01	2.6
1963	43.4	48.6	1.7	1.9	3.9
1964	50.0	56.0	5.1	5.6	10.2
1965	70.8	79.3	9.0	10.1	12.7
1966	73.4	82.1	14.3	16.0	19.5
1967	104.0	116.5	54.3	60.8	52.2
1968	142.3	159.4	89.05	99.7	62.7

TABLE II

Australia and Papua and New Guinea

Offshore Drilling Operations to 30.6.69

GIPPSLAND BASIN

* F.K.A. - Formerly known as.

** See explanatory notes following Table.

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS**	CLASSIFICATION ON COMPLETION OR ABANDONMENT **
Barracouta 1 (F.K.A.* E.G.S. 1 and Barracouta A-1)	ESSO-BHP	Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd	148	45	27.12.64	5.6.65	8,701	2,325	Secured	NFD/GAS
Barracouta 2 (F.K.A.* E.G.S. 2 and Barracouta B-1)	"	ditto	150	45.7	8.6.65	16.7.65	4,015	1,225	Secured	EXT/GAS
Cod 1 (F.K.A.* E.G.S. 3 and Cod A-1)	"	ditto	202	61.2	20.9.65	2.12.65	9,540	2,909	Plugged & abandoned	NFW/DRY
Marlin 1 (F.K.A.* E.G.S. 4 and Marlin A-1)	"	ditto	196	59.7	5.12.65	10.4.66	8,485	2,800	Secured	NFD/GAS
Marlin 2 (F.K.A. Marlin B-1)	"	ditto	198	60.3	30.5.66	3.11.66	10,007	3,064	Secured	EXT/GAS

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Golden Beach No. 1 (see Golden Beach No.2)	B.O.C./ Continental/ Planet/ Woodside	Investigator. Drilling Barge. Zapata O.D.E.	65	19.8	4.4.67	1.5.67	1,378	420	Plugged & abandoned (due mechanical difficulties)	NFW
Kingfish 1 (F.K.A.* Kingfish A-1)	ESSO-BHP	Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd	253	83.2	6.4.67	15.6.67	8,451	2,575	Secured	NFD/OIL
Golden Beach No. 1A	B.O.C./ Continental/ Planet/ Woodside	Investigator. Drilling Barge. Zapata O.D.E.	65	19.8	3.5.67	28.8.67	9,636	2,970	Secured	NFD/GAS
Halibut 1 (F.K.A.* Halibut A-1)	ESSO-BHP	Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd	236	71.8	20.6.67	25.9.67	10,011	3,080	Secured	NFD/OIL

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Dolphin 1 (F.K.A.* Dolphin A-1)	"	ditto	134	40.8	28.9.67	25.11.67	9,461	2,880	Plugged & abandoned	NFW/OIL SHOWS
Kingfish 2 (F.K.A.* Kingfish B-1)	"	ditto	252	76.7	28.11.67	30.1.68	8,021	2,450	Secured	EXT/OIL
Marlin 3 (F.K.A.* Marlin C-1)	"	ditto	192	58.5	16.12.66	9.1.67	5,845	1,780	Secured	EXT/OIL & GAS
Kingfish 3 (F.K.A.* Kingfish C-1)	"	ditto	243	74.0	2.2.68	5.3.68	8,299	2,528	Secured	EXT/OIL
Barracouta A-2	"	DE (National 110) from Barracouta production platform. Richter-Bawden.	150	45.7	8.3.68	74.68	4,154	1,265	Completed	DEV/GAS PRODUCER

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Perch 1 (F.K.A.* Perch A-1)	ESSO-BHP	Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd	138	42.1	13.3.68	2.5.68	9,406	2,868	Plugged& abandoned	NFW/OIL & GAS
Barracouta A-3	"	DE (National110) from Barracouta production platform RichterBawden	150	45.7	20.4.68	29.7.68	11,275	3,434	Suspended	DPD/OIL & GAS
Tuna 1 (F.K.A.* as Tuna A-1)	"	Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd	198	60.5	6.5.68	17.10.68	11,944	3,635	Secured	NFD/OIL & GAS
Snapper 1 (F.K.A.* as Snapper A-1)	"	Discoverer II. Drilling Ship. Off-Shore Drilling Australia Pty Ltd	180	54.8	9.5.68	12.12.68	12,320	3,725	Secured	NFD/OIL & GAS

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Marlin A-3	ESSO-BHP	National 55 M3 from Marlin productionplatform Richter Bawden.	192	58.7	18.5.68	25.8.68	6,420	1,957	Completed as potential gas producer	DEV/GAS PRODUCER
Flounder 1 (F.K.A.* As Flounder A-1)	"	Ocean Digger. Semi-submersible. Ocean Drilling & Exploration Co. (Aust) Ltd.	287	87.4	10.7.68	25.9.68	11,740	3,580	Plugged & abandoned	NFD/OIL
Barracouta A-4	"	DE (National 110) from Barracouta production platform Richter Bawden.	150	45.7	20.7.68	25.8.68	5,770	1,755	Completed as potential gas producer	DEV/GAS
Marlin A-6	"	National 55 M3 from Marlin production platform Richter Bawden.	192	58.4	13.8.68	22.11.68	10,846	3,305	Completed as potential gas producer	DEV/GAS

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Barracouta A-6	ESSO-BHP	DE (National 110) from Barracouta production platform Richter Bawden.	150	45.7	12.9.68	30.9.68	5,745	1,747	Completed as potential gas producer	DEV/GAS
Barracouta A-5	"	ditto	150	45.7	1.10.68	9.10.68	4,967	1,513	ditto	DEV/GAS
Marlin A-4	"	National 55 M3 from Marlin production platform Richter Bawden.	192	58.4	3.10.68	7.11.68	6,784	2,068	ditto	DEV/GAS
Barracouta A-7	"	DE (National 110) from Barracouta production platform Richter Bawden.	150	45.7	6.10.68	7.11.68	7,685	2,340	ditto	DEV/GAS
Tuna 2	"	Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd.	195	59.3	30.10.68	5.12.68	9,060	2,760	Secured	EXT/OIL & GAS

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Barracouta A-8	ESSO-BHP	DE (National 110) from Barracouta production platform. Richter Bawden.	150	45.7	7.11.68	19.11.68	6.046	1.842	Completed as potential gas producer	DEV/GAS
Marlin A-5	"	National 55 M3 from Marlin production platform. Richter Bawden.	192	59.2	7.11.68	22.11.68	6,885	2,095	Completed as potential gas producer.	DEV/GAS
Barracouta A-9	"	DE (National 110) from Barracouta production platform. Richter Bawden.	150	45.7	22.11.68	29.11.68	5,528	1,685	Completed as potential gas producer.	DEV/GAS
Marlin A-7	"	National 55 M3 from Marlin production platform. Richter Bawden.	192	48.4	26.11.68	2.12.68	4,857	1,481	Abandoned due to blowout	DEV

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Barracouta A-10	ESSO-BHP	DE (National 110) from Barracouta production platform. Richter Bawden.	150	45.7	6.12.68	30.12.68	3,997	1.219	Completed as potential gas producer.	DEV/GAS
Groper 1	"	Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd	190	58.3	19.12.68	10.1.69	3,379	1,030	Plugged & abandoned.	NFW/DRY
Mullet 1	"	ditto	180	54.9	9.1.69	16.1.69	2,463	750	Plugged & abandoned.	NFW/DRY
Barracouta A-1	"	DE (National 110) from Barracouta production platform. Richter Bawden.	150	45.7	1.1.69	15.1.69	3,720	1,134	Completed as potential gas producer.	DEV/GAS

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Salmon 1	ESSO-BHP	Ocean Digger. Semi-submersible. Ocean Drilling & Exploration Co. (Aust) Ltd	210	64.0	13.1.69	16.2.69	9,865	3,008	Suspended	NFW/DRY
Bream 1		Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd.	190	57.8	20.1.69	22.1.69	790	203	Plugged & abandoned (mechanical difficulties)	NFW
Flounder 2	"	ditto	310	94.4	19.2.69	24.3.69	9,321	2,842	Plugged & abandoned	EXT/OIL & GAS
Bream 2	"	ditto	191	58.2	24.2.69	17.4.69	10,657	3,250	Secured	NFW/OIL & GAS
Halibut A-1	"	DE National 1320 M3 Richter Bawden	238	72.6	24.3.69	6.5.69	8,329	2,540	Completed as potential oil producer	DEV/OIL

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION OF COMPLETION OR ABANDONMENT
Mackerel 1	ESSO-BHP	Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd.	322	97.6	27.3.69	22.4.69	10,003	3,050	Plugged & abandoned	NFW/OIL SHOWS
Flathead 1	"	ditto	173	52.7	30.4.69	27.5.69	3,494	1,066	Plugged & abandoned	NFW/DRY
Flounder 3	"	Ocean Digger. Semi-submersible. Ocean drilling & Exploration Co. (Aust) Ltd.	363	110.5	26.4.69	15.5.69	8,415	2,564	Secured	EXT/OIL & GAS
Halibut A-2	"	DE National 1320M3 Richter Bawden.	238	72.6	3.5.69	12.5.69	4,201	1,280	Abandoned due to mechanical difficulties.	DEV/DRY

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Halibut A-3	ESSO-BHP	ditto	238	72.6	12.5.69	23.5.69	8,414	2,565	Completed as potential producer.	DEV/OIL
Turrum 1	"	Ocean Digger. Semi-submersible. Ocean Drilling & Exploration Co. (Aust) Ltd.	192	58.5	19.5.69	26.6.69	10,029	3,057	Plugged & abandoned.	NFW/DRY
Wahoo 1	"	Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd	245	74.7	27.5.69	11.6.69	2,446	723	Plugged & abandoned.	NFW/DRY
Snapper 2	"	ditto	175	53.3	16.6.69	-	-	-	Drilling ahead.	EXT

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

GIPPSLAND BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Halibut A-4	ESSO-BHP	DE National 1320M3 Richter Bawden.	238	72.6	17.6.69	-	-	-	Drilling ahead.	DEV

OTWAY BASIN

Pecten 1	Shell	Sedco 135E. Semi-submersible. Southeastern Drilling Co.	205	62.4	26.3.67	11.4.67	877	264	Plugged & abandoned	NFW
Pecten 1-A	"	ditto	205	62.4	12.4.67	11.6.67	9,352	2,850	Plugged & abandoned	NFW/GAS SHOW
Nerita 1	"	ditto	245	74.6	1.7.67	2.8.67	6,700	2,042	Plugged & abandoned.	NFW/DRY
Voluta 1	"	ditto	301	91.8	25.8.67	15.12.67	13,037	3,972	Plugged & abandoned.	NFW/DRY

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

OTWAY BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Crayfish A-1	ESSO-BHP	Ocean Digger. Semi-submersible. Ocean Drilling & Exploration Co. (Aust) Ltd	169	50.7	24.9.67	24.12.67	10,486	3,197	Plugged & abandoned.	NFW/GAS SHOW
Prawn A-1	"	ditto	360	109.7	19.1.68	2.4.68	10.477	3,190	Plugged & abandoned.	NFW/DRY
Nautilus A-1	"	ditto	327	100	13.4.68	10.5.68	6,597	2,010	Plugged & abandoned.	NFW/DRY
Argonaut A-1	"	ditto	253	77.1	14.5.68	29.6.68	12,163	3,700	Plugged & abandoned.	NFW/DRY

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

BASS BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Bass 1	ESSO-BHP	Glomar III. Drilling Ship. Global Marine Australasia Pty Ltd	265	80.8	21.7.65	14.9.65	7,717	2,349	Plugged & abandoned.	NFW/DRY
Bass 2	"	ditto	280	85.3	14.4.66	25.5.66	5,910	1,800	Plugged & abandoned.	NFW/DRY
Bass 3	"	ditto	202	60.8	14.2.67	2.4.67	7,978	2,429	Plugged & abandoned.	NFW/GAS SHOW.

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

TIMOR SEA

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Ashmore Reef 1	B.O.C./ Woodside/ Shell.	Investigator. Drilling Barge. Zapata ODE.	152	45.4	16.10.67	27.3.68	12,843	3,907	Plugged & abandoned.	NFW/DRY
Lacrosse 1 (Bonaparte Gulf Basin)	ARCO	Sedco 135G. Semi-submersible. South Eastern Drilling Co.	90	27.4	21.2.69	6.5.69	10,020	3,115	Plugged & abandoned.	NFW/OIL & GAS SHOWS.
Petrel 1	"	ditto	320	97.5	12.5.69	-	-	-	Drilling ahead.	NFW

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

CARNARVON BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Legendre 1	B.O.C./ Woodside/ Shell	Glomar Tasman. Drilling Ship. Global Marine Australasia Pty Ltd	170	50.9	7.6.68	17.11.68	11,393	3,475	Plugged & abandoned.	NFW/OIL SHOW.
Flinders Shoal 1	Wapet	Jubilee Jack-up. Emsco A1500E. Off-shore Drilling Australia Pty Ltd	44	13.4	10.4.69	-	-	-	Drilling ahead.	NFW
Madeleine 1	B.O.C./ Woodside/ Shell	Glomar Tasman. Drilling ship. Global Marine Australasia Pty Ltd	266	81.0	15.5.69	-	-	-	Drilling ahead.	NFW

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
PERTH BASIN										
Quinns Rock 1	Wapet	Jubilee Jack-up. Emsco A1500E. Off-shore Drilling Australia Pty Ltd	132	40.2	10.10.68	20.11.68	7,248	2,210	Plugged & abandoned.	NFW/DRY
Gage Roads 1	"	ditto	191	58.3	27.11.68	21.3.69	12,009	3,655	-	NFW/OIL SHOWS.
CANNING BASIN										
Dampier 1	B.O.C./ Woodside/ Shell	Glomar Tasman. Drilling Ship. Global Marine Australasia Pty Ltd	132	39.6	22.11.68	12.5.69	13,588	4,142	Plugged & abandoned.	NFW/GAS SHOWS.

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

BARRIER REEF

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Capricorn 1	Australian Gulf	E.W. Thornton. Drilling Ship. Reading & Bates (Aust) Pty Ltd	347	106	16.11.67	21.11.67	940	286	Plugged & abandoned (mechanical difficulties)	NFW
Capricorn 1-A	"	ditto	347	106	22.11.67	10.1.68	5,609	1,710	Plugged & abandoned.	NFW/DRY
Aquarius 1	"	ditto	213	64.8	21.1.68	27.3.68	8,695	2,550	Plugged & abandoned.	NFW/DRY
Matjara 1	Amalgamated/ Phillips/ Sunray.	ditto	275	50.3	25.6.68	31.7.68	3,275	998	Plugged & abandoned.	NFW/DRY
Anchor Cay 1	Tenneco/ Signal	Glomar Conception. Drilling Ship. Global Marine Australasia Pty Ltd	234	71.3	26.2.69	4.5.69	11,888	3,620	Plugged & abandoned.	NFW/DRY

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

PAPUA BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Borabi 1	Phillips et al.	Glomar Conception. Drilling Ship. Global Marine Australasia Pty Ltd	73	22.3	8.10.67	23.11.67	9,442	2,860	Plugged & abandoned.	NFW/DRY
Uramu 1	"	ditto	29	8.8	27.11.67	5.1.68	6,433	1,960	Plugged & abandoned (mechanical difficulties)	NFW/GAS
Uramu 1-A	"	ditto	34	10.4	9.1.68	18.3.68	10,106	3,080	Plugged & abandoned.	NFW/GAS
Orokolo 1	"	ditto	180	54.8	23.3.68	10.5.68	11,999	3,659	Plugged & abandoned.	NFW/DRY
Maiva 1	"	ditto	270	82.3	11.5.68	21.6.68	9,807	2,990	Plugged & abandoned.	NFW/DRY

TABLE II (Cont'd)

Australia and Papua - New Guinea

Off-Shore Drilling Operations to 30.6.69

PAPUA BASIN

WELL	OPERATOR	DRILLING UNIT: NAME TYPE OWNER	WATER DEPTH ft.	WATER DEPTH m.	DATE SPUD	DATE TOTAL DEPTH REACHED	TOTAL DEPTH ft.	TOTAL DEPTH m.	STATUS	CLASSIFICATION ON COMPLETION OR ABANDONMENT
Iokea 1	"	Glomar Conception. Drilling Ship. Global Marine Australasia Pty Ltd	98	29.9	22.6.68	9.7.68	4,840	1,475	Plugged & abandoned.	NFW/DRY
Kapuri 1	"	ditto	87	26.5	11.7.68	1.8.68	5,572	1,699	Plugged & abandoned.	NFW/DRY
Pasca 1	"	ditto	288	87.7	6.8.68	21.10.68	8,477	2,583	Plugged & abandoned.	NFW/GAS
Pasca C-1	"	ditto	286	87.0	25.10.68	10.12.68	14,001	4.263	Plugged & abandoned.	EXT/DRY
Pasca A-2	"	ditto	314	95.9	13.12.68	16.1.69	8,506	2,598	Plugged & abandoned.	EXT/GAS & NGL
Pasca C-2	"	ditto	309	92.9	8.5.68	12.6.69	10,475	3,200	Plugged & abandoned.	EXT/DRY

TABLE II

EXPLANATORY NOTE

TENTATIVE
A.A.P.G.*/A.P.E.A.** CLASSIFICATION OF WELLS

Classification - Description

1. NEW FIELD WILDCAT (NFW) - A new field wildcat is located far from producing pools, and on a structure which has not produced before. In regions where local structure has little or no control on accumulation, these holes are generally at least two miles from the nearest productive area. Distance, however, is not the determining factor. The classification is based on the degree of risk assumed by the operator, and his intention to test a structure or stratigraphic condition not previously proven productive.

2. NEW-POOL (Pay) WILDCAT (NPW) - A new pool wildcat is located to explore for new pools on a structure already producing, but off to one side of the presently producing area. In some regions where local structure is almost negligible as a control, exploration holes of this group may be called "near wildcats". Such will usually be less than two miles from the nearest productive area. Sometimes a new pool wildcat may extend a pool already partly developed; if so its final classification is an "Extension".

3. DEEPER-POOL (Pay) TEST (DPT) - A deeper-pool test is an exploratory hole located within a productive area of a pool, or pools, already partly or wholly developed. It is drilled below the deepest such pool penetrated by it in order to explore for deeper unknown prospects. Sometimes such a hole extends a deeper pool which has been partly developed in another part of the field.

4. SHALLOWER-POOL (Pay) TEST (SPT) - A shallower-pool test is exploratory only if drilled in search of some new productive reservoir, unknown but possibly suspected from data secured from other wells. The test must be located within the productive area of a pool, or pools, previously developed. Sometimes such a test extends a shallower-pool partly developed elsewhere in the same field.

5. OUTPOST OR EXTENSION TEST (EXT) - An outpost or extention test is located and drilled with the expectation of extending for a considerable distance the productive area of a partly developed pool. It is usually two or more locations distant from the nearest productive area. Sometimes an outpost discovers a new pool.

6. DEVELOPMENT WELL (DEV) - A well drilled to exploit a hydrocarbon accumulation discovered by previous drilling.

7. STRATIGRAPHIC TEST (STR) - A drilling effort, geologically directed, to obtain information pertaining to a specific earth condition that might lead toward a possible accumulation of hydrocarbons. It must be drilled without the intention of being completed for hydrocarbon production. This classification includes tests identified as "core tests" by some operators.

8. SERVICE WELL (SRV) - A well that is either drilled or completed for the purpose of supporting production of an existing field through observation, injection, water supply, etc.

9. MISCELLANEOUS (MSC) - Any test drilled that does not fit one of the above classifications. Two types are Waste Disposal (WD) and Gas Storage (GS) test or well.

*A.A.P.G. = American Association of Petroleum Geologists
**A.P.E.A. = Australian Petroleum Exploration Association

TABLE II

WELL CLASSIFICATION - POSSIBILITIES CHART

WELLS DRILLED WITH THE INTENTION OF BEING COMPLETED FOR HYDROCARBON PRODUCTION

Classification When Started		Classification After Completion or Abandonment					
		Successful (Completed)				Unsuccessful (Abandoned)	
CODE	MEANING	CODE	MEANING	CODE	MEANING	CODE	MEANING
NFW	New Field Wildcat	NFD	New Field Discovery			DRY	Dry New Field Wildcat
NPW	New Pool Wildcat	NPD	New Pool Discovery	or EXT	Outpost/ Extension Well	DRY	Dry New Pool Wildcat
DPT	Deeper Pool Test	DPD	Deeper Pool Discovery	or DPE	Deeper Pool Extension	DRY	Dry Deeper Pool Wildcat
SPT	Shallower Pool Test	SPD	Shallower Pool Discovery	or SPE	Shallow Pool Extension	DRY	Dry Shallow Pool Test
EXT	Outpost/Extension Test	NPD	New Pool Discovery	or EXT	Extension Well	DRY	Dry Outpost/Extension Test
DEV	Development Well	NPD	New Pool Discovery	or DEV	Development Well	DRY	Dry Development Well

TABLE II

EXPLANATORY NOTE

"STATUS"

"Completed" is a term which usually applies to a successful development or discovery well which has been brought to such a condition when it is a producer or, with a minor re-work can be made a producer. Wells in this category are generally equipped with production tubing and a wellhead, ready to connect to the production facility.

"Secured" means that well is possibly productive but it has been completed with all possible safety measures, including in some cases, cement plugs. The well may be worked-over at some future date.

"Suspended" means that the well has encountered hydrocarbons, and may be re-entered in the future with a view to completing it for production.

"Plugged and abandoned"means that cement or other plugs have been installed in the well in order to isolate the producing or potentially productive horizons, and to prevent leaks of reservoir fluids. In some cases casing may have been removed from the hole.

"Abandoned due to blowout" means that for reasons of safety the well which blew out has been abandoned and a re-entry is either impossible or not contemplated.

"Abandoned due to mechanical difficulties" means that casing failure, bad hole conditions, fish in the hole, etc. are the causes for the abandonment of the well, which may be subsequently re-drilled at a nearby location.

TABLE III

Natural Gas Production and Sales 1964-1968

Roma Area, Queensland

Year	Production		Sales		No. of Producing Wells
	(MMCF)*	(MMCM)**	(MMCF)	(MMCM)	
1964	214.79	6.08	101.76	2.88	2
1965	339.771	9.61	113.314	3.21	1
1966	218.680	6.19	118.087	3.34	2
1967	150.905	4.27	126.785	3.59	1
1968	111.508	3.17	108.451	3.07	1

*MMCF = Million cubic feet. ** MMCM = Million cubic metres.

TABLE IV

Barrow Island Well Status as at 30th June, 1969

Producing formation	Full-time producers	Part-time producers	Non-producers	Water injection wells	Water source wells	Wells uncompleted
Windalia	225	22	4	92	6	14
Muderong	6	-	-	-	-	-
Jurassic	7	-	2	-	-	-
TOTALS	238	22	6	92	6	14

TABLE V

Australian Crude Oil Consumption, Production and Import
(in thousands of barrels
and thousands of kilolitres (in brackets))

Year	Refinery feedstock input			Production				Import Required	
	Actual	Forecast by		Offshore	Barrow Island	Moonie, Alton,	Total Australia	Ref. N.D.	Ref. Stacey
		N.D.*	Stacey **	Gippsland		et al.			
1964	114,885(16,666)					1,497(238)	1,497(238)	113,795(18,100)	
1965	124,098(19,710)					2,622(417)	2,622(417)	122,110(19,420)	
1966	135,270(21,500)				1(0.159)	3,397(539)	3,398(539)	132,771(21,100)	
1967	150,936(23,980)				4,983(792.3)	2,786(443)	7,774(1,238)	144,726(23,050)	
1968	163,589(26,000)				10,834(1,722)	3,132(494)	13,966(2,220)	148,647(23,650)	
1969		167,900(26,680)	172,940(27,490)	2,300(3,654)	12,775(2,030)	1,920(305)	16,995(2,710)	154,555(24,580)	
1970		175,200(27,830)	183,900(29,220)	55,800(8,865)	16,425(2,595)	1,520(241)	73,745(11,730)	106,930(17,000)	110,155(16,080)
1971		186,150(25,900)	193,400(30,730)	91,980(14,600)	16,425(2,595)	1,360(216)	109,865(17,460)	81,760(13,000)	83,535(13,210)
1972		197,100(31,310)	201,675(32,020)	109,500(17,390)	16,425(2,595)	1,200(191)	127,125(20,213)	74,537(11,460)	74,550(11,890)
1973		206,225(32,770)	208,400(33,220)	109,500(17,390)	16,425(2,595)	1,080(172)	127,005(20,100)	84,695(13,440)	81,395(12,930)
1974		217,175(34,510)	215,000(34,170)	109,500(17,390)	16,425(2,595)	1,000(159)	126,925(20,181)	95,725(15,220)	88,075(13,920)
1975		228,125(36,290)	221,200(35,160)	109,500(17,390)	16,425(2,595)	960(153)	126,885(20,040)		94,315(15,000)

* "Petroleum Statistics, Calendar Year 1968" by Fuel Branch, Department of National Development.

** "Consumption and Production of Petroleum from the Australian Mainland 1968-1990" by K. Stacey, June 1968, A.N.U. Press.

TABLE VI

Australia and Papua & New Guinea

Expenditure (in $A) on petroleum exploration, development and production by governments and private enterprise to end of 1968

Governments:	To end 1965	1966	1967	1968	TOTAL
Federal Government	24,643,920	3,649,362	4,508,104	4,756,241	37,557,627
Government Depts. Government subsidies	42,024,570	10,154,169	10,326,475	13,805,484	76,310,698
State Governments	9,388,700	767,050	466,134	783,274	11,405,158
British Government (prior to 1945)	50,000	-	-	-	50,000
Private Enterprise	293,829,708	58,819,507	88,715,993	122,999,409	564,364,617
TOTALS	369,936,898	73,390,088	104,016,706	142,344,408	
				GRAND TOTAL	$689,688,100

Note: For conversion purposes use: $A1 = $U.S. 1.12

TABLE VII

Australia and Papua and New Guinea

Analysis of petroleum exploration expenditure (in $A)
by private enterprise 1965 to 1968 (Breakdown prior to 1965 not available)
exluding subsidy

EXPLORATION ACTIVITY	1965	% year's total	1966	% year's total	1967	% year's total	1968	% year's total	Total 1965-1968	% total
Drilling:										
Onshore	n.a.		n.a.		10,451,497	18.6	14,578,660	21.4	-	
Offshore	n.a.		n.a.		22,028,304	39.4	36,171,922	52.9	-	
Total Drilling (i)	24,825,000	49.0	24,775,247	48.4	32,479,801	57.9	50,750,582	74.1	132,830,630	58.7
Geology (ii)	2,380,464	4.7	2,743,848	5.4	2,743,848	4.9	1,645,574	2.3	9,456,243	4.1
Geophysics										
Seismic										
Reflection										
Onshore	17,936,120	35.4	19,308,221	37.8	6,152,749	10.9	3,404,163	4.9	-	
Offshore					9,469,732	16.9	8,425,653	12.4	-	
					(15,622,481)		(11,829,821)			
Refraction										
Onshore	526,788	1.1	654,772	1.3	292,743	0.6	91,773	-	-	
Offshore					-		-			
					(292,743)					
Gravity										
Onshore	783,416	1.6	654,300	1.3	653,310	1.2	109,372	0.2	-	
Offshore									-	
Magnetic										
Ground	2,900	-	23,300	-	15,222	-	-	-	-	
Marine					75,000	-	-	-	-	
Aero Onshore	714,468	1.4	222,865	0.4	182,463	0.3	393,952	0.6	-	
Offshore					60,578	-	74,111	-	-	
Total - Geophysical (iii)	19,963,692	39.3	20,863,458	40.7	16,901,737	30.1	12,499,009	18.2	70,227,896	31.1
"Other" (prorated) (iv)	3,437,410	6.8	2,863,597	5.4	3,984,224	7 2	3,534,930	5.3	13,820,161	6.1
TOTALS (i, ii, iii, iv)	50,606,566	100	51,188,659	100	56,109,610	100	68,430,09	100	226,334.930	100

Note: For conversion purposes use: $A1 = $U.S. 1.12

TABLE VIII

Australia and Papua and New Guinea

Private enterprise
expenditures (in $A) on petroleum exploration development and production in 1967 and 1968
excluding subsidy

PE = Private Enterprise
GT = Grand Total for Year

	1967							1968						
	onshore		offshore		comb. on & offshore			onshore		offshore		comb. on & offshore		
Drilling		% of A		% of A	A	% of PE (1)	% of GT (2)	$	% B	$	% B	B	% of PE (3)	% of GT (4)
Exploration	10,451,497	32.8	22,028,304	67.8	32,479,801	36.6	31.2	14,578,660	28.7	36,171,922	71.3	50,750,582	41.3	35.7
Development	7,023,691	96.8	235,540	3.2	7,259,231	8.2	6.9	4,844,647	38.1	7,857,200	61.9	12,701,847	10.4	8.9
Total (Drilling) (i)	17,455,188	43.9	22,263,844	56.1	39,739,032	44.8	38.2	19,423,307	30.6	44,029,122	69.4	63,452,429	57.6	44.6
Production (ii)	4,657,661	20.7	17,774,848	79.3	22,432,509	25.8	21.8	6,280,993	16.0	32,919,774	84.0	39,200,767	31.9	27.5
Geological (iii)	2,743,848	100.0	incl.in "Other"	-	2,743,848	3.1	2.6	1,645,574	100.0	Incl. in "Other"	-	1,645,574	1.3	1.1
Geophysical														
Seismic Reflection	6,152,749	39.4	9,469,732	60.6	15,622,481	17.5	15.0	3,404,168	28.7	8,425,653	71.3	11,829,821	9.7	8.9
Refraction	292,743	100.0	-	-	292,743	0.3	0.3	91,773	100.0	-	-	91,773	-	-
Gravity Onshore	653,310	100.0	-	-	653,310	0.6	0.6	109,372	100.0	-	-	109,372	-	0.07
Marine	-	-	incl.in On-Shore	-	-	-	-	-	-	incl.in On-Shore	-	-	-	-
Magnetic Ground	15,222	100.0	-	-	15,222	-	-	-	--	-	-	-	-	-
Marine	-	-	75,000	100.0	75,000	-	-	-	-	-	-	-	-	-
Aeromagnetic	182,463	75.2	60,518	24.8	242,981	0.2	0.2	393,932	84.1	74,111	15.9	468,043	0.4	0.3
Total (Geophysical) (iv)	7,296,487	43.1	9,605,250	56.9	16,901,737	17.9	16.2	3,999,245	32.0	8,499,764	68.0	12,499,009	10.2	8.8
"Other" (v)	2,233,059	32.3	4,665,808	67.7	6,898,867	7.7	6.6	2,593,315	41.7	3,607,715	58.3	6,201,630	5.0	4.3
Totals (i, ii, iii, iv, v)	34,406,243	38.8	54,309,756	61.2	88,715,993 (1)	100.0	71.7	33,943,034	27.6	89,056,375	72.4	122,999,409 (3)	100.0	86.8

(2)
G.T. $104,016,706
(Incl. Governments & Subsidy)

(4)
G.T. $142,344,408
(Inc. Governments & Subsidy)

Note: For conversion purposes use: $A1 = $U.S. 1.12

TABLE IX

Total Government expenditures in Australia and the Territory of Papua & New Guinea to 1966

Years	COMMONWEALTH							NON-COMMONWEALTH		
	Prior to Dept. of Nat. Dev.	Dept. of the Interior	Dept. of National Development (since 1.7.50)				Total Commonwealth Government	British Gov't.	State Depts of Mines	TOTAL ALL GOVERNMENTS
			National Mapping	B.M.R. Oil Search	Subsidy Payments	Total Nat. Dev.				
Totals to 31.12.45	1,375,550	-	-	-	-	-	1,375,550	50,000	3,084,000*	4,509,550
1.1.46 to 30.6.50	-	-	-	-	-	-	-	-		
1.7.50 to 30.6.55	-	-	-	2,000,000*	-	2,000,000*	2,000,000*	-		
1.7.55 to 31.12.56	-	-	-	852,000	-	852,000	852,000	-		
1957	-	-	182,000	675,200	-	857,200	857,200	-		
1958	-	-	210,000	744,800	564,728	1,519,528	1,519,528	-	4,784,000*	42,683,428
1959	-	-	306,000	905,600	1,197,854	2,409,454	2,409,454	-		
1960	-	-	431,000	1,171,200	1,581,486	3,183,686	3,183,686	-		
1961	-	-	572,000	1,522,400	2,695,800	4,790,200	4,790,200	-		
1962	-	-	728,400	2,026,400	5,930,752	8,685,552	8,685,552	-		
1963	-	-	844,400	2,238,200	10,519,208	13,601,808	13,601,808	-		
1964	-	200,000*	968,200	2,867,000	9,121,910	12,957,110	13,157,110	-	809,334	13,966,444
1965	-	200,000*	1,002,720	2,620,850	10,412,832	14,036,402	14,236,402	-	711,366	14,947,768
1966	-	210,000	1,099,960	2,339,402	10,154,169	13,593,531	13,803,531	-	767,050	14,570,581
Total to 31.12.66	1,375,550	610,000	6,344,680	19,963,052	52,178,739	78,486,471	80,472,021	50,000	10,155,750	90,677,771

* Estimates

TABLE X

Australia and Papua and New Guinea
Private enterprise
expenditures (in $A) on petroleum exploration, development and production
to end of 1966

CALENDAR YEAR	GEOLOGICAL	GEOPHYSICAL						DRILLING	OTHER	ANNUAL TOTALS
	Surveys Airphoto Reviews, etc.	Magnetic		Gravity	Seismic		Total Geophysical	Exploratory and Development	Admin. Office Studies etc.	
		Aero	Ground		Reflection	Refraction				
To end 1945	..	..	..	..	..	..	..	..	..	7,079,206*
1946 - 1952	..	..	..	..	..	..	..	..	..	20,929,718*
1953	..	..	..	..	..	..	..	..	..	5,094,834
1954	..	..	..	..	..	..	..	..	..	8,929,034
1955	..	..	..	..	..	..	..	..	..	22,873,678
1956	..	..	..	..	..	..	..	..	..	19,518,570
1957	..	..	..	..	..	..	..	..	..	14,649,894
1958	..	..	..	..	..	..	..	..	..	11,093,712
1959	669,526	..	..	..	..	..	2,309,022	8,070,774	121,862	11,771,184
1960	833,462	..	..	..	..	..	3,893,258	7,298,678	465,120	12,490,518
1961	774,646	475,518	5,300	164,082	4,969,634	132,168	5,746,702	5,760,536	702,872	12,984,756
1962	1,388,788	738,574	-	352,860	8,492,356	593,312	10,177,102	12,558,722	1,033,082	25,157,694
1963	1,395,120	582,300	31,630	1,112,350	9,615,410	777,980	12,119,670	13,602,230	2,127,680	29,244,700
1964	1,348,350	338,968	3,600	820,874	9,450,070	874,018	11,487,530	20,289,890	2,980,240	36,106,010
1965	2,380,464	714,468	2,900	783,416	17,936,120	526,788	19,963,692	(EXP.24,825,000) (DEV. 4,917,700)	3,819,344	55,906,200
1966	2,686,357	222,865	23,300	654,300	19,308,221	654,772	20,863,458	(EXP.24,775,247 (DEV. 3,106,411	7,397,004 *	58,819,507
									TOTAL	352,649,215

* "Others" includes $3,947,766 production expenditure in 1966

.. indicates breakdown of funds not available.

Note: For conversion purposes use: $A1 = $U.S. 1.12

TABLE XI

Analysis of petroleum exploration overall cost per unit of work done in 1968 by private enterprise excluding and including subsidy payments

Type of operation	Private enterprise work done, footage drilled, crew-months, line-miles etc.	Unit of measure ft, crew-months, line-miles	Cost $ A excluding subsidy	Overall cost per unit, including overhead, office reviews, rework etc. but excluding subsidy	Cost $ A including subsidy payments where applicable	Overall cost per unit including overhead, office, reviews of work etc. including subsidy
Drilling						
onshore						
Exploration	361,282	feet	$14,578,660	$40.35	$18,304,205	$50.66
Development (incl. Service)	432,909	feet	$4,844,647	$11.19	not applicable	$11.19
Offshore						
Exploration	236,771	feet	$36,171,922	$152.77	$42,065,856	$177.66
Development	75,842	feet	$ 7,857,200	$103.59	not applicable	$103.59
Geological	95.¾	Crew-month	$ 1,645,574	not applicable inadequate detail	not applicable	-
Geophysics						
Seismic-onshore						
Reflection	1042½	line mile	$ 3,404,168	$3266.95	$4,790,378	$4597.29
Refraction	169½	line mile	$ 91,773	$539.84	$ 128,776	$757.50
Seismic-offshore						
Reflection	20,983	line mile	$8,425,653	$401.54	$10,554,401	$502.99
Refraction	-	-	-	-		

TABLE XI (contd.)

Gravity						
Comb. on & offshore (breakdown not available)	25,171	line mile	$109,372	$4.34	$187,248	$7.43
Magnetic						
Ground	677	-	Expd. not available	-	Expd. not available	-
Marine	2914	-	Expd. not available	-	Expd. not available	-
Aero onshore	24,308	line mile	$393,932	$16.20	$464,297	$19.10
Aero Offshore	6334	line mile	$74,111	$11.70	$92,960	$14.67

Based on expenditure and activity figures supplied by industry and subsidy payments in 1968 under the Petroleum Search Subsidy Act, 1959-1965

TABLE XII

Analaysis of petroleum exploration overall cost per unit of work done in 1967 by private enterprise including subsidy payments

Type of operation	1967			
	Work done & unit of work	Cost $ A incl. subsidy where applicable	Cost per unit	Remarks
Drilling				
onshore				
Exploration	379,334 ft.	15,101,384	$39.81	
Development	580,354 ft.	7,023,691	$12.10	
Offshore				
Exploration	118,172ft	22,839,641	$193.27	
Development	nil	-	-	
Geological	130½ crew mnths	2,743,848	-	Not applicable
Geophysics Seismic-onshore				
Reflection	142 crew months	8,363,573	$58,898	
Refraction	9½ crew months	401,766	$42,291	
Seismic-offshore				
Reflection	39¼ crew months	11,789,589	$298,470	
Refraction	nil	nil	-	
Gravity on & offshore comb.	80¼ crew months	675,116	$8,438	
Magnetic ground	½	15,222	$3,044	
marine	4¾ crew months	75,000	$15,789	
aero-onshore	32,587 line miles	193,758	$5,945	
aero-offshore	8,188 line miles	15,328		

TABLE XIII

Australia and Papua & New Guinea

Geological & geophysical activity by Industry, Bureau of Mineral Resources & State Mines Departments

1959 to 1968 (earlier figures are not complete)

Abbreviations: R&R = Reconnaissance & Regional, Det = Detailed

Unit or work: 1962 to 1967 is in crew months except for Aeromagnetics which is in line miles

1968 units are all in line miles except for geological surveys

YEAR	GEOLOGICAL SURVEYS		GEOPHYSICAL											
			Land Seismic				Marine Seismic		Gravity		Magnetic			
			Reflection		Refraction								Aero-line miles	
	R&R	Det.	R&R	Det.	R&R	Det.	R&R	Det.	R&R	Det.	Ground	Marine	on-shore	off-shore
1959	153	70¼	17½	23	4	-	-	-	35	26½	1	-	8 crew months	
1960	131½	18½	32¾	46¼	14¼	-	¼	3	26	3	2½	-	7½ crew months	
1961	187½	31¼	94½	60	2½	-	3½	2¾	26½	7¼	3¼	-	30¼ crew months	
1962	253¾	43¾	195¼	84	26	2¾	3¼		37½	11½	-	-	39¼ crew months	
1963	176¾	153	180¾	99	22½	6¼	4½		73¼	47	10¾		148,618	
1964	186¾	58¾	141¾	81¼	12¾	9¼	25¼		67¾	59¾	2½		91,161	
1965	99½	50½	202	150½	10¼	5¼	39		70	27½	2		127,440	
1966	131	15½	190¾	64¾	8½	5	52½		53	15½	4¼		67,559	
1967	101	29½	92¼	49¾	8¾	¾	18¾	20½	51	29¼	½	4¾	32,527 (40,715)	8,188
	Crew months		Unit of work for 1968 is all in line miles											
1968	65½	53¾	1245½	1348	1631½	6	18008(1)	5575(2)	275171 (11236 stns)	4613 (10213 stns)	786	2914	48788	6334

(1) Includes 90 line mile refraction R&R.

(2) Includes 15 line miles refraction Det.

NOTE; For conversion purposes use:
1 line-mile =
=1.609 line kilometers

TABLE XIV

Australia and Papua and New Guinea

Onshore drilling and completions summary to end of 1968

O = Oil, G = Gas, Serv. = Service, I = Injection, OB = Observation W/S = water source (for injection).

* Footage includes uncompleted hole @ 31 December

@ These are cumulative figures to 31 December 1960

Wells are Wells that reached final depth, excludes wells drilling at 31 Dec.

@ Completions for O and G include only wells compl as producers or potential producers others such a suspended secured discoveries abandonments etc. are included in "S"

YEAR	WELLS AND FOOTAGE* DRILLED								SUMMARY OF COMPLETIONS@												
	EXPLORATORY		DEVELOPMENT		SERVICE		TOTAL		EXPL'N			DEV.			SERV.			TOTAL			
	WELLS	FOOTAGE*	WELLS	FOOTAGE*	WELLS	FOOTAGE*	WELLS	FOOTAGE*	O	G	S	O	G	S	I	OB	W/S	O	G	SERV.	S
To 31.12.60 @	527	1,282,217	-	-	-	-	527	1,282,217	2	5	520	-	-	-	-	-	-	2	5	-	520
1961	19	123,239	1	5,591	-	-	20	128,830	1	2	16	-	-	1	-	-	-	1	2	-	17
1962	60	342,911	10	65,600	-	-	70	408,511	2	-	58	9	-	-	-	-	-	11	1	-	58
1963	105	543,481	21	114,414	1	6,047	127	663,942	2	3	100	7	7	7	-	1	-	9	10	1	107
1964	150	712,882	60	351,712	-	-	210	1,064,594	6	10	134	6	29	25	-	-	-	12	39	-	159
1965	152	870,762	53	248,653	-	-	205	1,119,415	5	6	141	20	12	21	-	-	-	25	18	-	162
1966	98	602,400	33	128,591	-	-	131	730,991	1	3	94	12	8	13	-	-	-	13	11	-	107
1967	74	379,334	189	575,541	2	4,813	265	959,688	3	5	66	171	7	11	2	-	-	174	12	2	77
1968 (preliminary)	65	361,282	75	306,840	49	126,069	189	794,194	3	2	60	59	12	6	44	-	5	60	14	49	66
TOTALS	1,250	5,218,508	442	1,796,942	52	136,929	1,744	7,152,379	25	36	1,189	282	76	84	46	1	5	307	112	52	1,273

Note: For conversion purposes use: 1 ft = 0.305 m.

TABLE XV

Australia and Papua and New Guinea
Offshore drilling and completions summary to end of 1968

* Footage includes uncompleted hole at 31 December
@ Barracouta No. 1 (1st offshore well in Aust.) spudded 27.12.64.

YEAR	WELLS AND FOOTAGE* DRILLED								SUMMARY OF COMPOETIONS @													
	EXPLORATORY		DEVELOPMENT		SERVICE		TOTAL		EXPL'N			DEV.			SERV.			TOTAL			
	WELLS	FOOTAGE*	WELLS	FOOTAGE*	WELLS	FOOTAGE*	WELLS	FOOTAGE*	O	G	S	O	G	S	I	OB	W/S	O	G	SERV.S	
To 31.12.64	-	7679	-	-	-	-	-	767	-	-	-	-	-	-	-	-	-	-	-	-	-	
1965	4	33,774	-	-	-	-	4	33,774	-	-	4	-	-	-	-	-	-	-	-	-	-	4
1966	3	24,831	-	-	-	-	3	24,831	-	-	3	-	-	-	-	-	-	-	-	-	-	3
1967	13	118,172	-	-	-	-	13	118,172	-	-	13	-	-	-	-	-	-	-	-	-	-	13
1968 (Preliminary)	25	236,771	12	75,847	-	-	37	312,613	-	-	25	6	6	-	-	-	-	6	6	-	25	
TOTALS	45	414,315	12	75,842			57	490,157	-	-	45	6	6	-	-	-	-	6	6	-	45	

Explanatory notes

O = Oil, G = Gas, Serv. = Service, I = Injection, OB = Observation W/S = water source (for injection).

Note: for conversion purposes use:
1 ft = 0.305 m

* Footage includes uncompleted hole @ 31 December
@ These are comulative figures to 31 December 1950 Wells are Wells that reached ftnal depth, excludes wells drilling at 31 Dec.

@ Completions for O and G include only wells completed as producers or potential producers others such as suspended secured discoveries abandonments etc. are included in "S"

TABLE XVI

Australia and Papua and New Guinea
Drilling and completions summary (on & offshore) to end of 1968

	NO. OF WELLS COMPLETED				FOOTAGE DRILLED				SUMMARY OF COMPLETIONS							
									EXPL'N			DEV.				TOTAL
	EXPL'N	DEV.	SERV.	TOTAL	EXPL'N	DEV.	SERV.	TOTAL	O	G	S	O	G	S	SERV.	S
ON SHORE	1250	442	52	1744	5,218,508	1,796,942	136,929	7,152,379	25	36	1189	282	76	84	52	1273
OFF SHORE	45	12	-	57	414,315	75,842	-	490,157	-	-	45	6	6	-	-	45
TOTAL	1295	454	52	1801	5,632,823	1,872,784	136,929	7,642,536	25	36	1234	288	82	84	52	1318

Oil and gas producers or potential producers

Oil = 313 (25 Expl'n, 288 Dev.)

Gas = 118 (36 Expl'n, 82, Dev.)

Total = 431

Explanatory notes:

O = Oil, G = Gas, Serv. = Service, I = Injection, OB = Observation W/S= water source (for injection).

Note: For conversion purposes use:
1 ft = 0.305 m

* Footage includes uncompleted hole @ 31 December
@ These are comulative figures to 31 December 1960 Wells are Wells that reached final depth, excludes wells drilling at 31 Dec.

@ Completions for O and G include only wells completed as producers or potential producers others such as suspended secured discoveries abandonments etc. are included in "S"

TABLE XVII

Petroleum exploration, development & production

Summary of oilfield tubulars usage by type

in 1968

OILFIELD CASING:

Size O.D. inches	Total footage used	Country of origin, footage and % of total for given size											
		Japan		U.S.A.		Canada		Czechoslovakia		U.K.		Unknown	
		Footage	%	Footage	%	Footage	%	Footage	%	Footage	%	Footage	%
5½	223,083	210,224	94	12,859	6	-	-	-	-	-	-	-	-
6 5/8	2,850	2,850	100	-	-	-	-	-	-	-	-	-	-
7	102,544	70,011	69	18,467	18	-	-	6,732	6	7,334	7	-	-
7 5/8	2,323	-	-	2,323	100	-	-	-	-	-	-	-	-
8 5/8	54,936	54,936	100	-	-	-	-	-	-	-	-	-	-
9 5/8	287,605	194,454	68	83,494	29	2,523	0.8	4,996	1.7	11,60	0.4	978	0.1
10¾	3,554	2,030	57	-	-	-	-	-	-	-	-	1524	43
11¾	4,154	-	-	4,154	100	-	-	-	-	-	-	-	-
13⅜	135,216	75,036	55	56,352	42	-	-	-	-	1,580	1.2	2,248	1.8
16	529	529	100	-	-	-	-	-	-	-	-	-	-
20	8,885	584	6.2	7,425	84	-	-	-	-	-	-	876	9.8
30	968	166	18	802	82	-	-	-	-	-	-	-	-
36	144	-	-	144	100	-	-	-	-	-	-	-	-
TOTAL	826,791	610,820	73.9	186,020	22.5	2,523	0.3	11,728	1.4	10,074	1.3	5,626	0.6

% is percentage of total footage for a given casing size or in the case of the bottom line of the total footage used.

TABLE XVII (contd.)

OILFIELD TUBING

Size O.D. inches	Total footage used	Country of origin, footage & % of total for given size											
		Japan		U.S.A.		Canada		Czechoslovakia		U.K.		Unknown	
		Footage	%	Footage	%	Footage	%	Footage	%	Footage	%	Footage	%
$2\frac{3}{8}$	174,570	149,570	86	25,000	14	-	-	-	-	-	-	-	-
$2^{7}/8$	97,818	68,362	70	1,116	0.6	-	-	21,034	22	7,206	7.4	-	-
$4\frac{1}{2}$	7,159	-	-	-	-	7,159	100	-	-	-	-	-	-
TOTAL	279,547	218,002	78	26,116	9.3	7,159	2.6	21,034	7.5	2,206	2.6	-	-

% is percentage of total footage for a given casing size or in the case of the bottom line of the total footage used.

TABLE XVII (Contd.)

LINE PIPE

Size O.D. Inches	Total footage used	Country of origin, footage & % of total for given size											
		Australia		Japan		Germany		U.K.		U.S.A.		Unknown	
		Footage	%	Footage	%	Footage	%	Footage	%	Footage	%	Footage	%
1	6000	6,000	100	-	-	-	-	-	-	-	-	-	-
2	124,847	500	0.5	124,347	99.5	-	-	-	-	-	-	-	-
3	10,000	10,000	100	-	-	-	-	-	-	-	-	-	-
3½	555,969	-	-	555,969	100	-	-	-	-	-	-	-	-
4½	7,983	-	-	7,983	100	-	-	-	-	-	-	-	-
6	477	-	-	477	100	-	-	-	-	-	-	-	-
6 5/8	9,405	-	-	9,405	100	-	-	-	-	-	-	-	-
8 5/8	15,618	-	-	15,618	100	-	-	-	-	-	-	-	-
10	430	-	-	403	100	-	-	-	-	-	-	-	-
10¾	515,350	504,800	98.1	9,550	1.9	-	-	-	-	-	-	-	-
12	256	-	-	256	100	-	-	-	-	-	-	-	-
16	217	-	-	217	100	-	-	-	-	-	-	-	-
18	162,331	81,161	49.9	-	-	-	-	81,170	50.1	-	-	-	-
20	227,381	180,899	79.5	19,807	8.8	23,863	10.5	-	-	2,812	1.2		
24	523	-	-	523	100	-	-	-	-	-	-	-	-
30	1,340	-	-	669	50	-	-	-	-	671	50		
TOTAL	1,637,127	783,360	47.8	745,251	45.5	23,863	1.6	81,170	4.9	3,483	0.2	—	—

% is percentage of total footage for a given casing size or in the case of the bottom line of the total footage used.

TABLE XVIII

Location and crude throughput capacities of refineries in Australia

Unit: barrels and kilolitres per stream day

Company	Refinery Location	Crude Oil Distillation Capacity	
		Barrels	Kilolitres
Amoco Australia Pty Ltd	Bulwer Island Qld	25,000	3,975
Ampol Refineries Ltd	Lytton Qld	45,000	7,155
Australian Oil Refining Pty Ltd	Kurnell N.S.W.	90,000	14,310
Total Boral Refineries Ltd	Matraville N.S.W.	20,000	3,180
B.P. Refinery (Kwinana) Pty Ltd	Kwinana W.A.	90,000	14,310
B.P. Refinery (Westernport) Pty Ltd	Westernport Vic.	50,000	7,950
Petroleum Refineries (Australia) Pty Ltd	Altona Vic.	61,500	9,779
Petroleum Refineries (Australia) Pty Ltd	Hallet's Cove S.A.	45,000	7,155
Shell Refining (Australia) Pty Ltd	Geelong Vic.	106,000	16,854
Shell Refining (Australia) Pty Ltd	Clyde N.S.W.	75,000	11,925
	TOTAL	607,500	96,593

Source: Petroleum Information Bureau

TABLE XIX

Statistics of refining in Australia 1965 to 1968

(Unit: '000 barrels and '000 kilolitres (in brackets))

	1965	1966	1967	1968
Input of crude oil and other refinery feedstock	124,098 (19,732)	135,270 (21,508)	150,936 (23,999)	163,589 (26,011)
Output of marketable products				
Refinery gas (f.o.e.)	830 (132)	1,006 (160)	1,186 (189)	1,249 (199)
Liquefied Petroleum Gas	1,511 (240)	1,741 (277)	2,170 (345)	2,887 (459)
Aviation Gasoline	377 (60)	319 (51)	339 (54)	312 (50)
Motor Spirit	43,524 (6,920)	46,385 (7,375)	52,487 (8,345)	56,085 (8,918)
Power Kerosine	616 (98)	609 (97)	609 (97)	551 (88)
Aviation Turbine Fuel	2,486 (395)	4,160 (661)	5,471 (870)	6,374 (1,013)
Lighting Kerosine	1,122 (178)	1,009 (160)	1,152 (183)	1,323 (210)
Heating Oil	880 (140)	1,260 (200)	1,619 (257)	2,201 (350)
Diesel Oils	20,095 (3,195)	22,041 (3,505)	24,225 (3,852)	26,648 (4,237)
Furnace Fuel	34,580 (5,498)	37,929 (6,031)	40,737 (6,477)	44,729 (7,112)
Lubricating Oil Base Stock	1,805 (287)	1,868 (297)	2,291 (364)	2,402 (382)
Bitumen	2,402 (382)	2,470 (393)	2,514 (400)	2,540 (404)
Other Marketable Products	1,900 (302)	2,171 (345)	2,721 (433)	3,764 (598)
Total Marketable Products	112,128 (17,828)	122,968 (19,552)	137,521 (21,866)	151,065 (24,019)

Source: Fuel Branch, Department of National Development

TABLE XX

Consumption of petroleum products in Australia, 1965 to 1968

(Unit: '000 barrels & '000 kilolitres (in brackets))

	1965	1966	1967	1968
Liquefied Petroleum Gas	(a)	1,705 (271)	2,166 (344)	2,895 (460)
Aviation Gasoline	822 (131)	795 (126)	697 (111)	653 (104)
Motor Spirit	48,764 (7,753)	50,653 (8,054)	53,416 (8,493)	56,511 (8,985)
Power Kerosine	832 (132)	776 (123)	694 (110)	635 (101)
Aviation Turbine Fuel	3,808 (605)	4,238 (674)	5,077 (807)	5,996 (953)
Lighting Kerosine & Heating Oil	2,199 (350)	2,671 (425)	2,810 (447)	3,408 (542)
Automotive Distillate - Inland	11,464 (1,823)	13,040 (2,073)	15,414 (2,451)	17,583 (2,796)
Automotive Distillate - Bunkers	278 (44.2)	337 (53.6)	357 (56.8)	498 (79.2)
Industrial Diesel Fuel - Inland	6,131 (975)	6,044 (961)	5,654 (899)	5,993 (953)
Industrial Diesel Fuel - Bunkers	1,425 (227)	1,390 (221)	1,697 (270)	1,975 (314)
Furnace Fuel - Inland	21,090 (3,353)	23,577 (3,749)	25,950 (4,126)	29,629 (4,711)
Furnace Fuel - Bunkers	9,598 (1,526)	10,318 (1,641)	11,975 (1,904)	13,280 (2,112)
Lubricants	2,173 (346)	2,165 (344)	2,256 (359)	2,308 (367)
Bitumen	2,377 (378)	2,487 (395)	2,573 (409)	2,519 (401)
Other Products	4,848 (771)	3,576 (569)	5,039 (801)	5,498 (874)
Total Market Sales	115,809 (18,414)	123,772 (19,680)	135,775 (21,588)	149,381 (23,752)
Refinery Fuel (f.o.e.)	11,441 (1,819)	12,373 (1,967)	14,177 (2,254)	15,295 (2,432)
Total Consumption (b)	127,250 (20,233)	136,145 (21,647)	149,952 (23,842)	164,676 (26,183)

(a) Included with "Other Products"

(b) Excludes refinery loss/gain

Source: Fuel Branch, Department of National Development

TABLE XXI

Imports of petroleum into Australia 1965 to 1968

(Unit: '000 barrels & '000 kilolitres (in brackets))

	1965	1966	1967	1968
Crude oil & other refinery feedstock	122,110 (19,415)	132,771 (21,111)	144,726 (23,011)	148,647 (23,635)
Aviation Gasoline	607 (96.5)	559 (88.9)	475 (75.5)	435 (69.2)
Motor Spirit	6,664 (1,060)	4,781 (760)	2,653 (422)	2,419 (385)
Power Kerosine	147 (23.4)	142 (22.6)	119 (18.9)	98 (15.6)
Aviation Turbine Fuel	1,704 (271)	795 (126)	498 (79.2)	432 (68.7)
Lighting Kerosine	464 (73.8)	349 (55.5)	354 (56.3)	246 (39.1)
Diesel Oils	1,394 (222)	1,064 (169)	697 (111)	1,108 (176)
Furnace Fuel Oil	242 (38.5)	267 (42.5)	541 (86.0)	1,062 (169)
Lubricating Oils	651 (104)	461 (73.3)	387 (61.5)	495 (78.7)
Other Products	848 (135)	928 (148)	1,545 (246)	867 (138)
Total Refined Products	12,721 (2,023)	9,346 (1,486)	7,269 (1,156)	7,162 (1,139)
Total Petroleum Imports	134,831 (21,438)	142,117 (22,597)	151,995 (24,167)	155,809 (24,774)

Source: Fuel Branch, Department of National Development

TABLE XXII

Cargo exports of petroleum products from Australia 1965 to 1968

(Unit: '000 barrels &'000 kilolitres (in brackets))

	1965	1966	1967	1968
Aviation Gasoline	47 (7.5)	28 (4.5)	79 (12.6)	47 (7.5)
Motor Spirit	293 (46.6)	1,018 (162)	1,130 (180)	1,868 (297)
Aviation Turbine Fuel	328 (52.2)	537 (85.4)	598 (95.0)	760 (121)
Lighting Kerosine	140 (22.3)	96 (15.3)	106 (16.9)	192 (30.5)
Diesel Oils	1,426 (227)	2,329 (370)	1,531 (243)	1,503 (239)
Furnace Fuel Oil	5,097 (810)	3,642 (579)	3,495 (556)	2,964 (471)
Lubricating Oil Base Stock	372 (59.1)	423 (67.3)	722 (115)	535 (85.1)
Other Products (a)	227 (36.1)	216 (34.3)	469* (74.6)	317 (50.4)
Total Exports of Petroleum Products	7,930 (1,261)	8,289 (1,318)	8,130 (1,293)	8,186 (1,302)

* Includes 145,000 barrels (23,055 kilolitres) of crude oil

(a) Including unfinished oils exported

Source: Fuel Branch, Department of National Development

TABLE XXIII

Australian petrochemical plants in operation, under construction, or planned, 1968

Company	Location	Chemical products marketed	Capacity (tons/year) (metric tons in brackets)	Products used for
Altona Petrochemical Co. Pty Ltd	Altona, Vic.	Ethylene Butadiene Propylene	46,000 (46,690) 21,000 (21,315)	Polyethylene, styrene, ethylene dichloride, Synthetic rubber, Cumene
The Ammonia Co. of Queensland Pty Ltd	Pinkenba, Qld	Ammonia	50,000 (50,750)	Fertilisers
Amoco Australia Pty Ltd	Bulwer Is., Qld	Sulphur	4,300 (4,365)	Sulphuric acid
Australian Carbon Black Pty Ltd	Altona, Vic.	Carbon black	35,000 (35,525)	Rubber, plastics, paints, inks
Australian Petrochemicals Ltd	Silverwater, N.S.W.	Styrene monomer	(n.a.)	Polystyrene plastics, polyester resins, surface coating materials, synthetic rubber
Australian Synthetic Rubber Co. Ltd	Altona, Vic.	SBR rubber Polybutadiene rubber	35,000 (35,525) (gross) total	Tyres, rubber industry
Austral-Pacific Fertilizers Ltd	Gibson Is., Qld	Ammonia (a) Urea (a)	192,000* (194,880) 209,000 (212,135)	Agricultural fertilisers
Badocol Chemicals Pty Ltd	Altona, Vic.	Expandable polystyrene, plastic emulsions	(n.a.)	Plastics industry, insulation, packaging paper, leather, textiles
Borden Chemical Co. (Australia)	Granville, N.S.W.	Formaldehyde	10,000 (10,150)	Resin, glues, plastics, bonded wood
	Derrimut, Vic.	Formaldehyde Urea formaldehyde Phenolic resins	20,000 (20,300) (n.a.) (n.a.)	Adhesives, plastics, bonded wood

* 120,000 (121,800) tons of ammonia output will be used to manufacture 209,000 (212,135) tons of urea

Commercial Solvents Pty Ltd	Matraville, N.S.W.	Benzene, toluene, mixed xylenes	70,000 (71,050)	Styrene, chemicals and solvents
Continental Carbon Australia Pty Ltd	Kurnell, N.S.W.	Carbon black	20,000 (20,300)	Rubber, plastics, paints, inks
C.S.R. Chemicals Pty Ltd	Rhodes, N.S.W.	Butanol, iso-butanol, iso-octanol	18,000 - (18,270) 20,000 (20,300)	Solvents, plasticisers, paints and plastics industries
	Rhodes and Mayfield, N.S.W.	Phthalic anhydride	20,000 (20,300)	Plasticisers, alkyd resins, polyester resins
Dow Chemical Pty Ltd	Altona, Vic.	Styrene monomer	(n.a.)	Synthetic rubber, polystyrene
		Ethylene dichloride	(n.a.)	P.V.C. plastics
		Chlorine	(n.a.)	P.V.C.
		Polystyrene	(n.a.)	Plastics industry
		Caustic soda	(n.a.)	
		Styrene/ butadiene latex (b)	(n.a.)	Paper coatings, carpet backing
	Rhodes, N.S.W.	Polystyrene	(n.a.)	Plastics industry
Eastern Nitrogen Ltd	Newcastle, N.S.W.	Ammonium nitrate (a)	150,000 (152,250)	Agricultural fertilisers
		Anhydrous ammonia (a)	175,000 (177,625)	
B.F. Goodrich-C.S.R. Chemicals Ltd	Altona, Vic.	P.V.C. resins and rigid compounds P.V.C. latexes	(n.a.)	Plastics industry
Hoechst Chemicals (Australia) Ltd	Altona, Vic.	High density polyethylene	12,000 (12,180) (c)	Plastics industry
ICIANZ Ltd	Botany, N.S.W.	Polyethylene	(n.a.)	Plastics industry
		Ethylene oxide	(n.a.)	Chemical derivatives, fumigants
		Glycols, glycol ethers, triethano-lamine, non-ionic surfa-ctants, hydraulic brake fluids	(n.a.)	Detergents, wetting agents, emulsifiers, solvents, commercial explosives, polyester resins, polyurethane foams

ICIANZ Ltd	Botany, N.S.W.	Ammonia, nitric acid, ammonium nitrate, urea, methanol, formaldehyde	63,000 (63,945)	Fertilisers, explosives, plastics, chemicals, paints
		Carbon tetrachloride, perchlor-ethylene	(n.a.)	Aerosol propellants, refrigerants, fire extinguishers, sheep drench, dry cleaning solvent
		Ethylene, butadiene	70,000 (71,050)	Polyethylene, P.V.C., ethylene oxide, synthetic rubber
		P.V.C.	(n.a.)	Plastics industry
Kwinana Nitrogen Co. Pty Ltd	Kwinana, W.A.	Ammonia and derivatives	100,000 (101,500)	Fertilisers
Marbon Chemical (Australia) Pty Ltd	Dandenong, Vic.	ABS plastics resin, synthetic rubber latexes	(n.a.)	Engineering industry, automotive, radio, television, travel goods
Monsanto Chemicals (Aust.) Ltd	West Footscray, Vic.	Polystyrene	(n.a.)	Plastics industry
		Synthetic phenol	(n.a.)	Phenolic resins, aspirin, agricultural chemicals
		Formalde-hyde	(n.a.)	Resins, glues, plastics
Petroleum and Chemical Corp. (Australia) Ltd	Silverwater, N.S.W.	Oil gas	114,500 (116,218)	Styrene monomer, town gas, ethylene, propylene, butadiene extraction
		Mixed aromatics extract	28,000 (28,420)	Benzene, toluene, and xylenes
		Pitches	10,000 (10,150)	Aluminium industry, road making, etc.
Petroleum Refineries (Aust.) Pty Ltd	Altona, Vic.	Sulphur	12,000 (12,180)	Sulphuric acid
	Adelaide, S.A.	Sulphur	1,460 (1,482)	Sulphuric acid and miscellaneous

Phillips Imperial Chemicals Ltd	Kurnell, N.S.W.	Synthetic rubbers	20,000 (20,300)	Tyres, rubber industry
		Carbon black	15,000 (15,225)	Rubber, plastics paints, inks
Shell Chemical (Aust.) Pty Ltd	Geelong, Vic.	Detergent alkylate	7,000 (7,105)	Detergents
		Sulphuric acid	35,000 (35,525)	Superphosphate
		Hydrocarbon solvents	45,000 (45,675)	Paint, rubber, dry-cleaning, etc.
	Clyde, N.S.W.	Ethylene	25,000 (25,375)	Polyethylene, ethylene oxide, and derivatives
		Propylene	(n.a.)	Butanols
		Poly-propylene(a)	(n.a.)	Plastic mouldings, fibre, and film
		Epoxy resins	2,000 (2,300)	Plastics and paints
		Hydrocarbon solvents	45,000 (45,675)	Paints, rubber, dry-cleaning, etc.
		Ketone and alcohol solvents	(n.a.)	Paints, lacquers, and pharmaceuticals
Union Carbide Australia Ltd	Altona, Vic.	Low density polyethylene	15,000 (initial)	Plastics industry
		High density polyethylene (b)	(n.a.) (15,225)	Plastics industry
	Rhodes, N.S.W.	Polyethylene film	(n.a.)	Packaging, building, agriculture

(a) Under construction (b) Planned

(c) Capacity will be extended to 18,000 tons/yr (18,270) by end of 1968

(n.a.) Not available

Source: Petroleum Information Bureau (Australia)

Fig. 1

AUSTRALIA & PAPUA AND NEW GUINEA

SEDIMENTARY AREAS AND LOCATION OF OIL AND GAS FIELDS, SIGNIFICANT DISCOVERIES AND PIPELINES

KEY TO SIGNIFICANT OIL AND GAS DISCOVERIES

O = Oil
G = Gas

1	Barracouta Field	G & O
2	Marlin Field	G & O
3	Halibut Field	O
4	Kingfish Field	O
5	Dolphin No1	O
6	Perch No1	O
7	Tuna No1	G & O
8	Flounder No1, 2 & 3	G & O
9	Gidgealpa Field	G
10	Moomba Field	G
11	Daralingie Field	G
12	Toolachee No1	G
13	Whicher Range No1	G
14	Gage Roads No1	O
15	Arrowsmith No1	G
16	Gingin No1	G
17	Yardarino Field	G & O
18	Dongara Field	G & O
19	Mondarra Field	G
20	Rough Range No1	O
21	Barrow Island Field	O
22	Dampier No1	O(Shows)
23	Legendre No1	O
24	Bonaparte No2	G
25	Keep River No1	G
26	Mereenie Field	G & O
27	Palm Valley Field	G
28	Pasca Field	G
29	Uramu No1	G
30	Barikewa No1	G
31	Kuru No's 1 & 2	G
32	Puri No1	G & O
33	Bwata No1	G
34	Iehi No1	G
35	Gilmore Field	G
36	Roma Area	G & O
37	Moonie Field	O
38	Alton Field	O
39	Rolleston Area	G
40	Snapper No1	G
41	Caroline No1	G(CO_2)
42	Bennett No 1	O
43	Flinders Shoal No1	G(Shows)
44	Lacrosse No1	O(Shows)
45	Petrel No 1	G
46	Madeleine No1	
47	Golden Beach No1A	G

PIPELINES

A Moonie - Brisbane (oil)
B Roma - Brisbane (gas)
C Dutson - Melbourne (gas)
D Dutson - Westernport (oil and liquids)
E Gidgealpa / Moomba - Adelaide (gas)

Sedimentary Areas

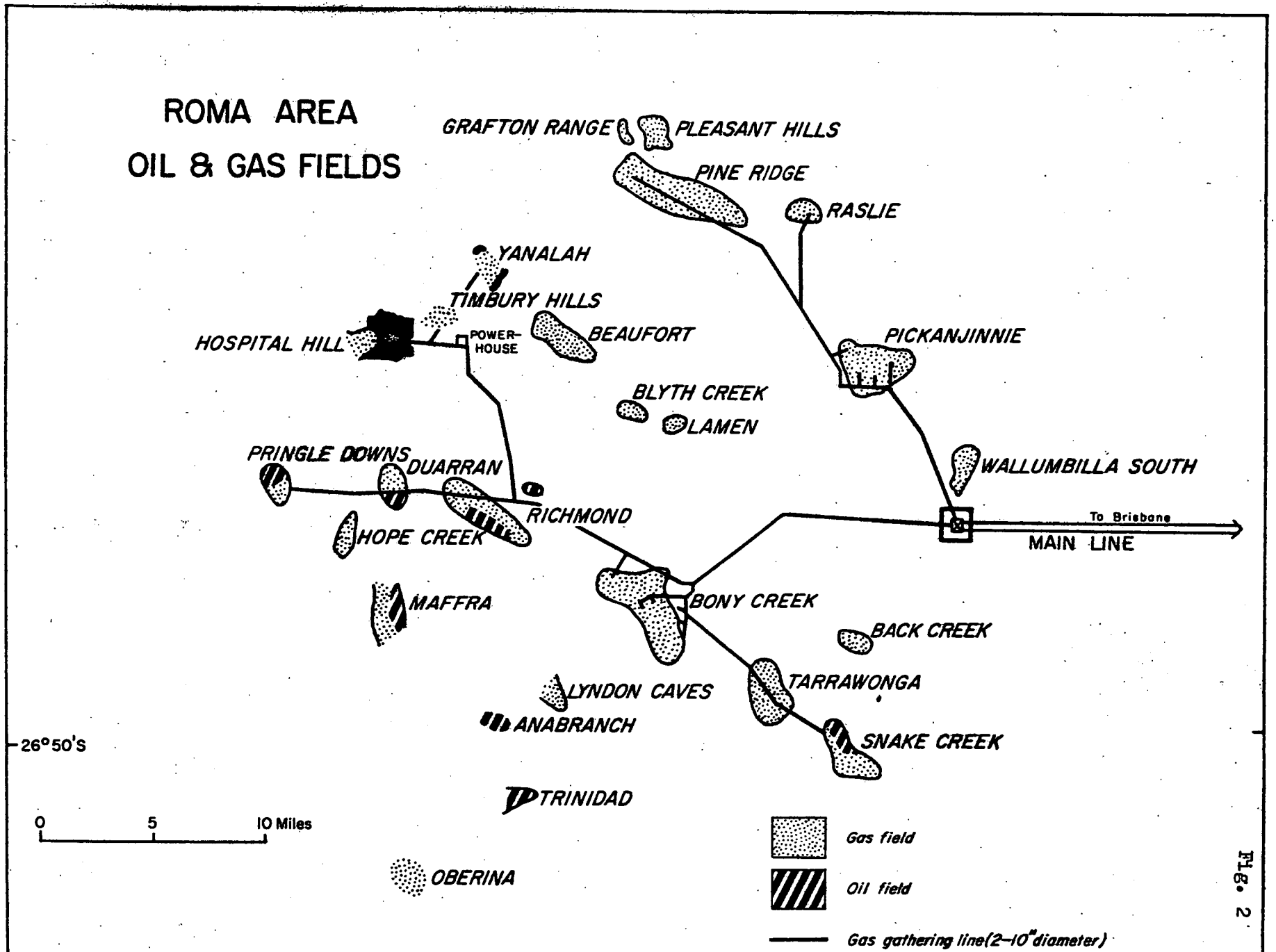

ROMA AREA
OIL & GAS FIELDS
GRAFTON RANGE
PLEASANT HILLS
PINE RIDGE
RASLIE
YANALAH
TIMBURY HILLS
HOSPITAL HILL
POWER-HOUSE
BEAUFORT
PICKANJINNIE
BLYTH CREEK
LAMEN
PRINGLE DOWNS
DUARRAN
WALLUMBILLA SOUTH
RICHMOND
To Brisbane
MAIN LINE
HOPE CREEK
MAFFRA
BONY CREEK
BACK CREEK
LYNDON CAVES
TARRAWONGA
ANABRANCH
SNAKE CREEK
26°50'S
TRINIDAD
0
5
10 Miles
OBERINA
Gas field
Oil field
Gas gathering line(2-10" diameter)

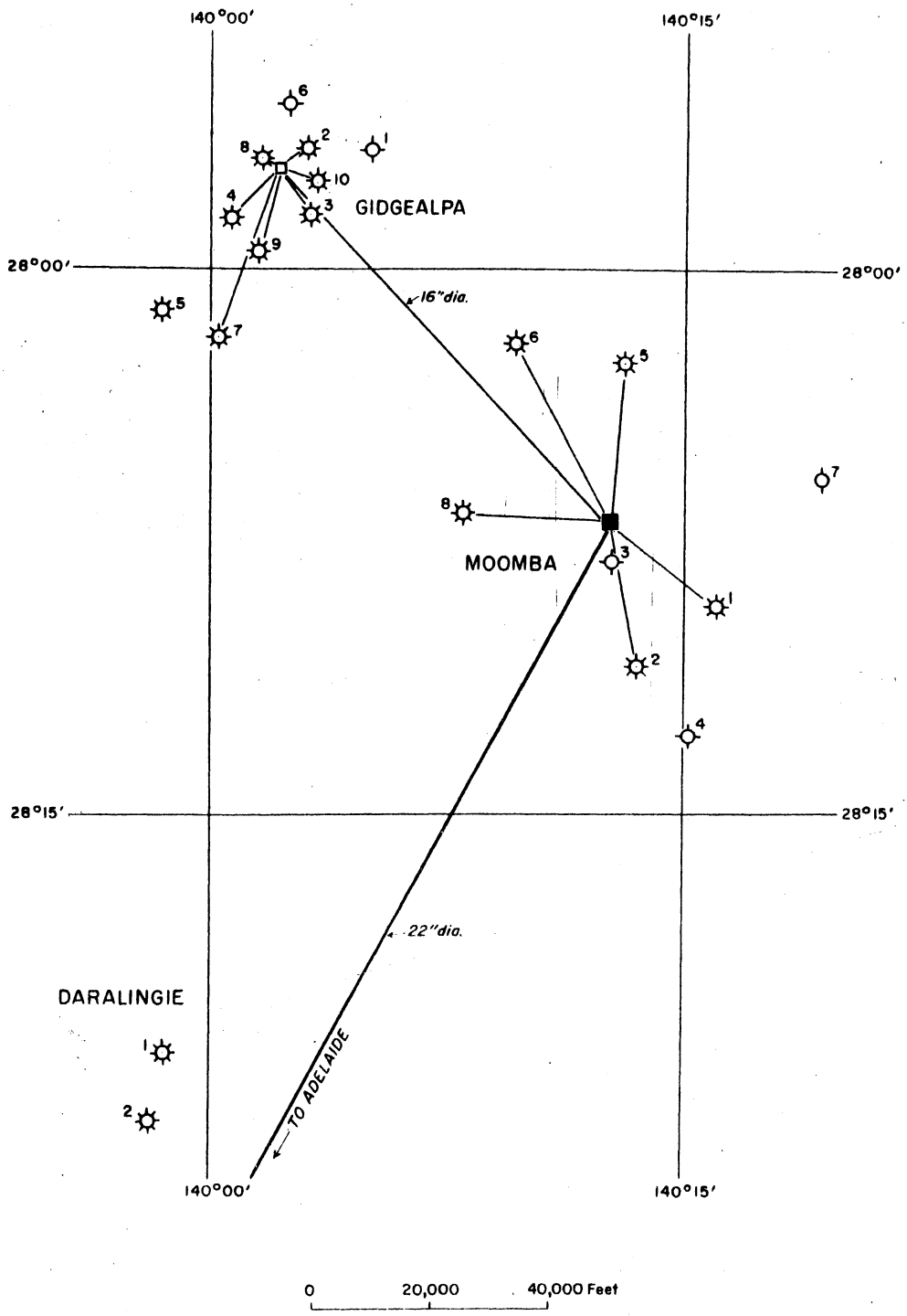
Fig. 2

Fig. 3

GIDGEALPA - MOOMBA - DARALINGIE AREA

South Australia

Gas gathering and transmission



Dry hole

Gas well

Temporarily suspended

Gas processing plant

Gathering system

Gas transmission line

H54/A2/2

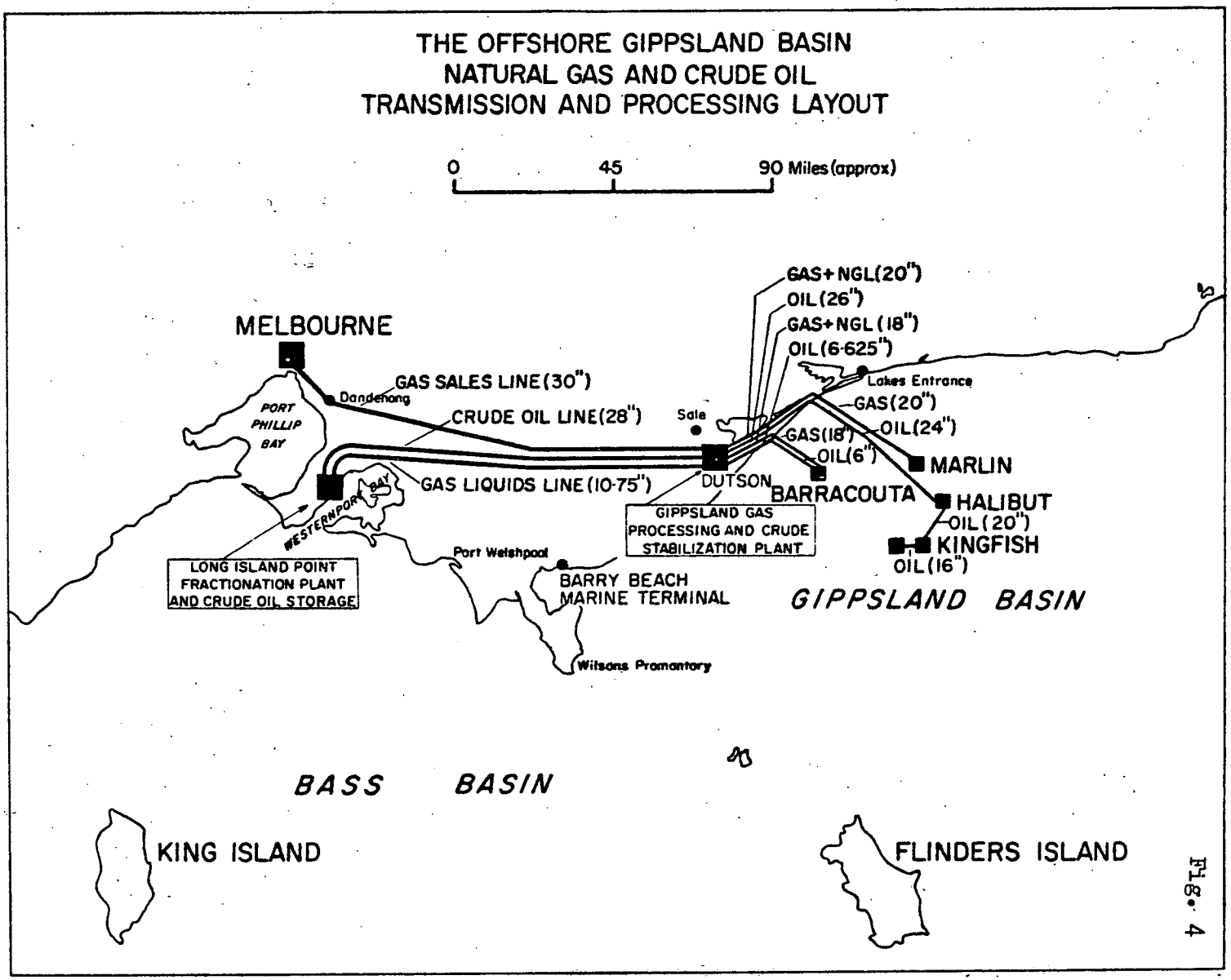
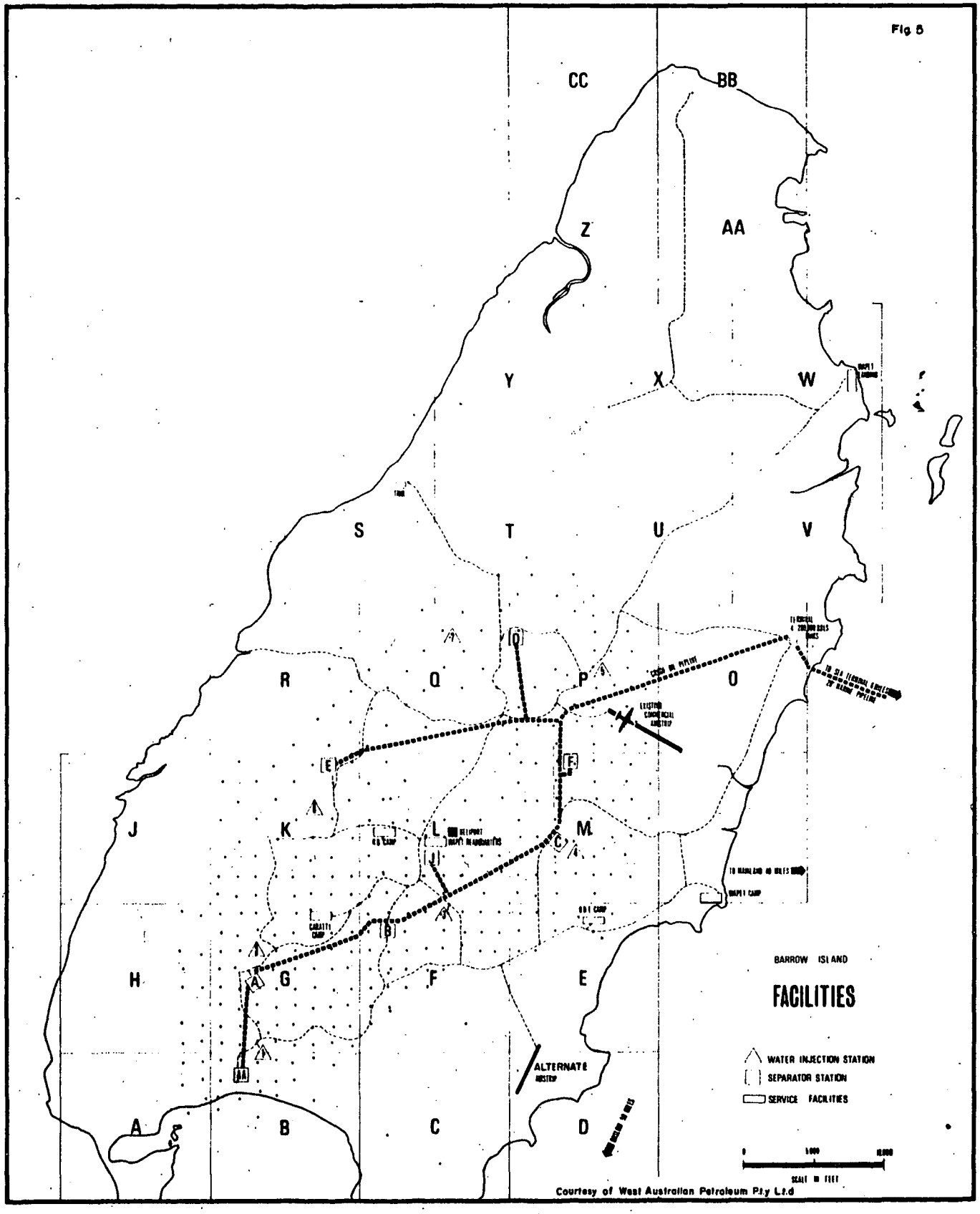
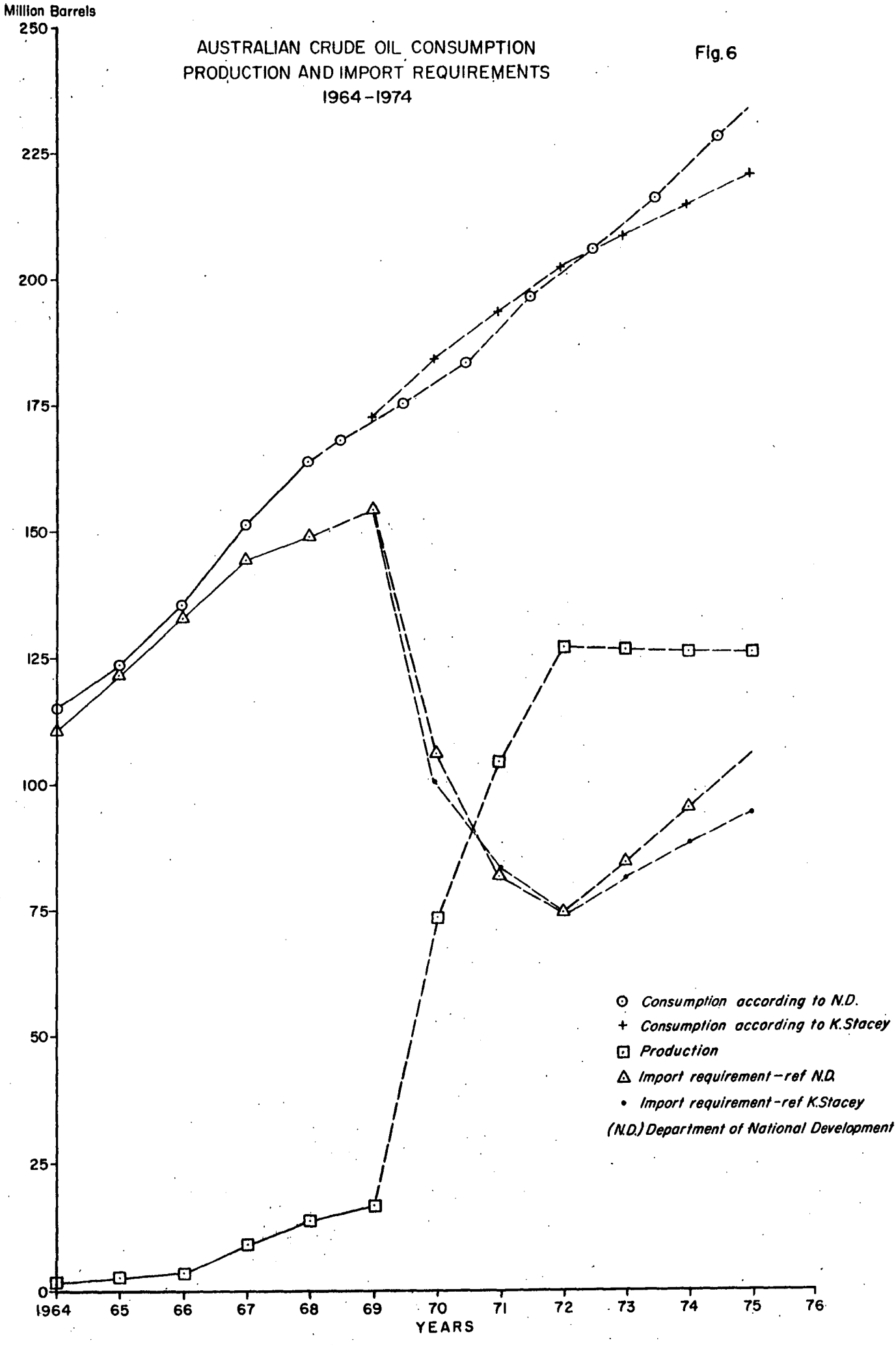

THE OFFSHORE GIPPSLAND BASIN
NATURAL GAS AND CRUDE OIL
TRANSMISSION AND PROCESSING LAYOUT
0
45
90 Miles (approx)
MELBOURNE
GAS SALES LINE (30")
Dandenong
CRUDE OIL LINE (28")
PORT PHILLIP BAY
Sale
GAS LIQUIDS LINE (10-75")
WESTERNPORT BAY
LONG ISLAND POINT FRACTIONATION PLANT AND CRUDE OIL STORAGE
DUTSON
GIPPSLAND GAS PROCESSING AND CRUDE STABILIZATION PLANT
Port Welshpool
BARRY BEACH MARINE TERMINAL
Wilsons Promontory
GAS+NGL (20")
OIL (26")
GAS+NGL (18")
OIL (6·625")
Lakes Entrance
GAS (20")
OIL (24")
GAS (18")
OIL (6")
MARLIN
BARRACOUTA
HALIBUT
OIL (20")
KINGFISH
OIL (16")
GIPPSLAND BASIN
BASS BASIN
KING ISLAND
FLINDERS ISLAND

Fig. 4

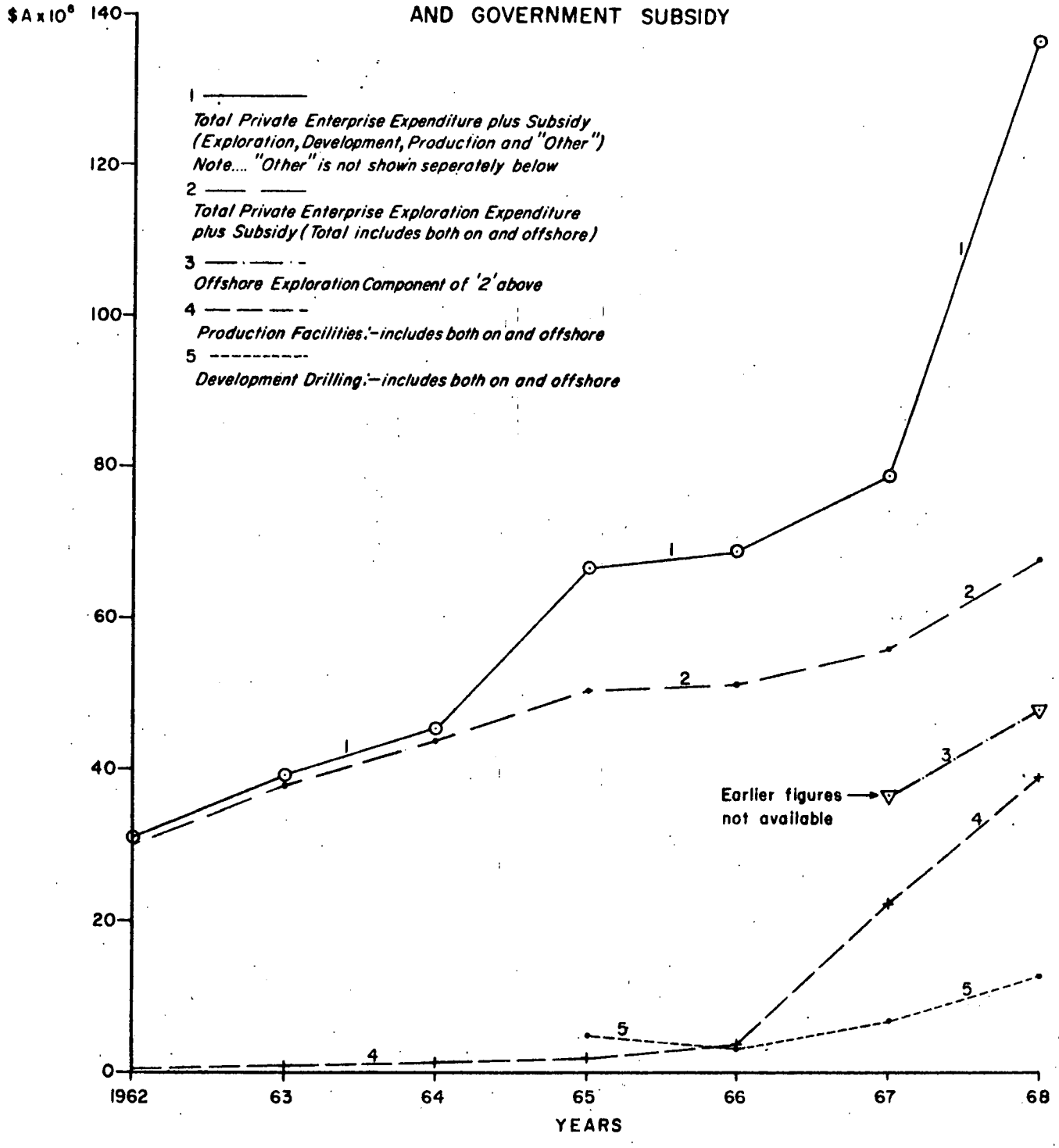
Fig 5


CC
BB
Z
AA
Y
X
W
S
T
U
V
R
Q
P
O
J
K
L
M
H
G
F
E
A
B
C
D
BARROW ISLAND
FACILITIES
WATER INJECTION STATION
SEPARATOR STATION
SERVICE FACILITIES
ALTERNATE
Courtesy of West Australian Petroleum Pty Ltd


Million Barrels
AUSTRALIAN CRUDE OIL CONSUMPTION
PRODUCTION AND IMPORT REQUIREMENTS
1964-1974
Fig. 6
250
225
200
175
150
125
100
75
50
25
0
1964
65
66
67
68
69
70
71
72
73
74
75
76
YEARS
Consumption according to N.D.
Consumption according to K.Stacey
Production
Import requirement-ref N.D.
Import requirement-ref K.Stacey
(N.D.) Department of National Development

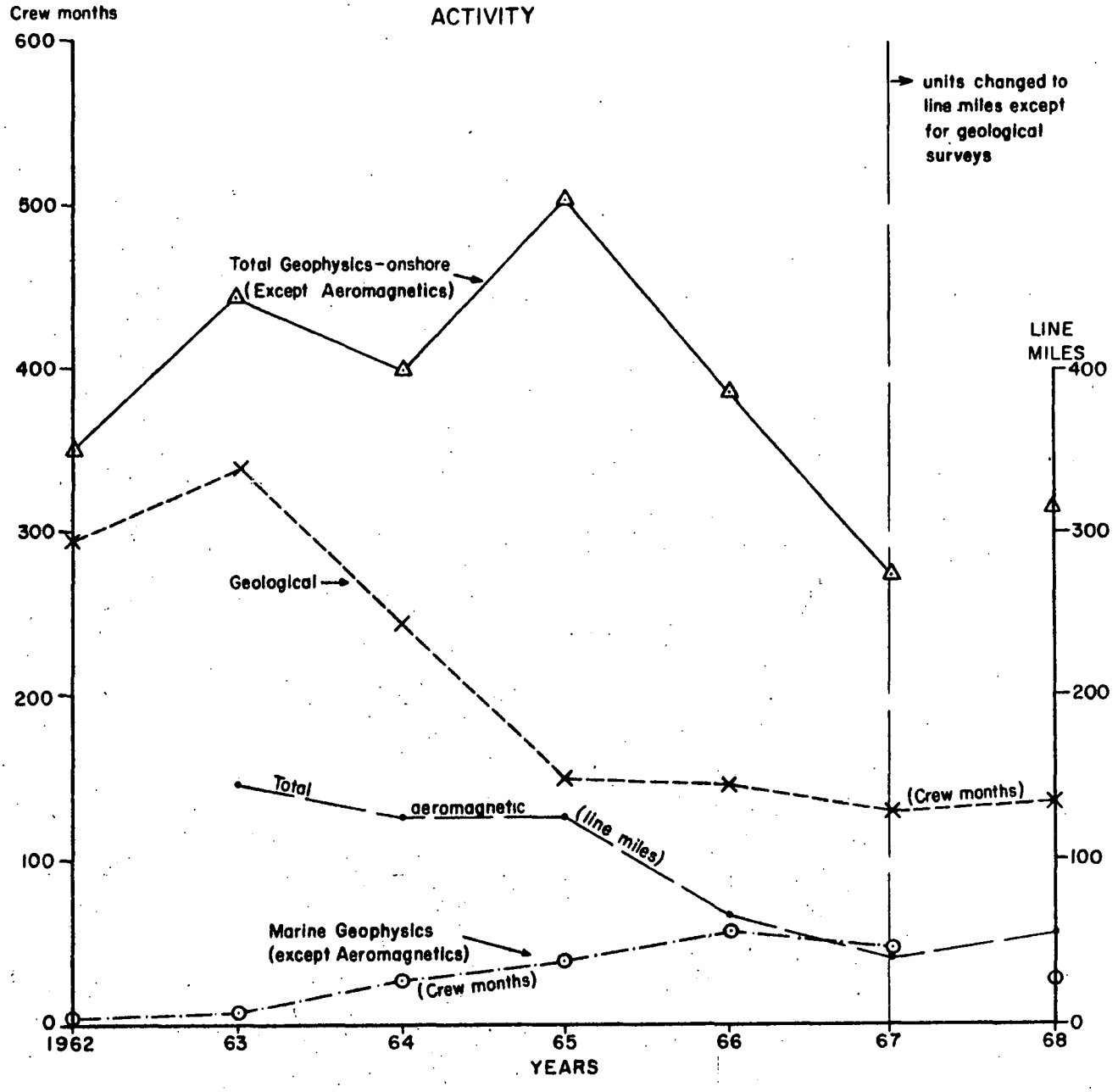
AUSTRALIA AND PAPUA & NEW GUINEA
PRIVATE ENTERPRISE EXPENDITURE
AND GOVERNMENT SUBSIDY

Fig. 7



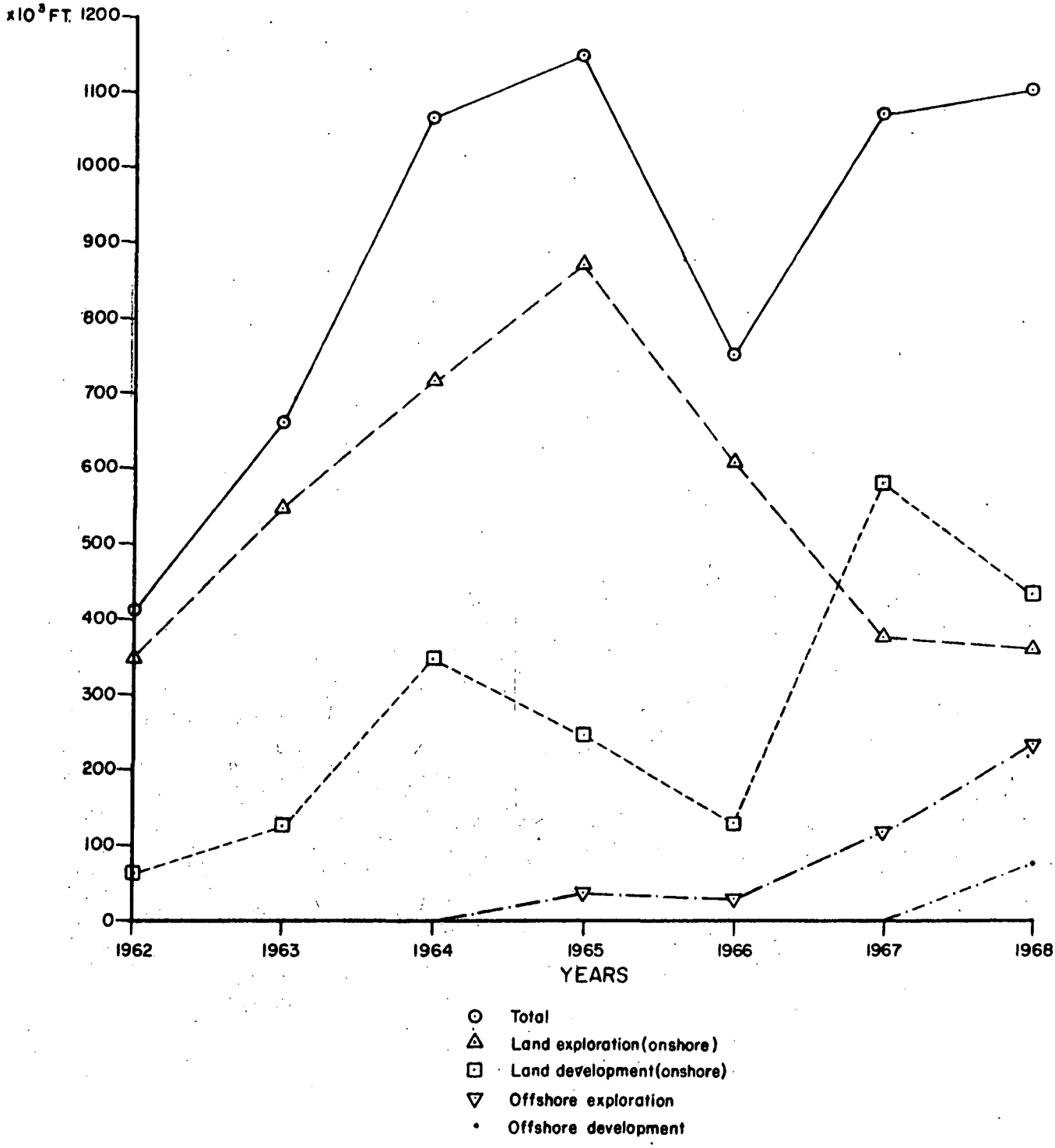
AUSTRALIA AND PAPUA & NEW GUINEA
GEOLOGICAL AND GEOPHYSICAL
ACTIVITY

Fig. 8



AUSTRALIA AND PAPUA & NEW GUINEA
PETROLEUM EXPLORATION AND DEVELOPMENT
FOOTAGE DRILLED

Fig. 9

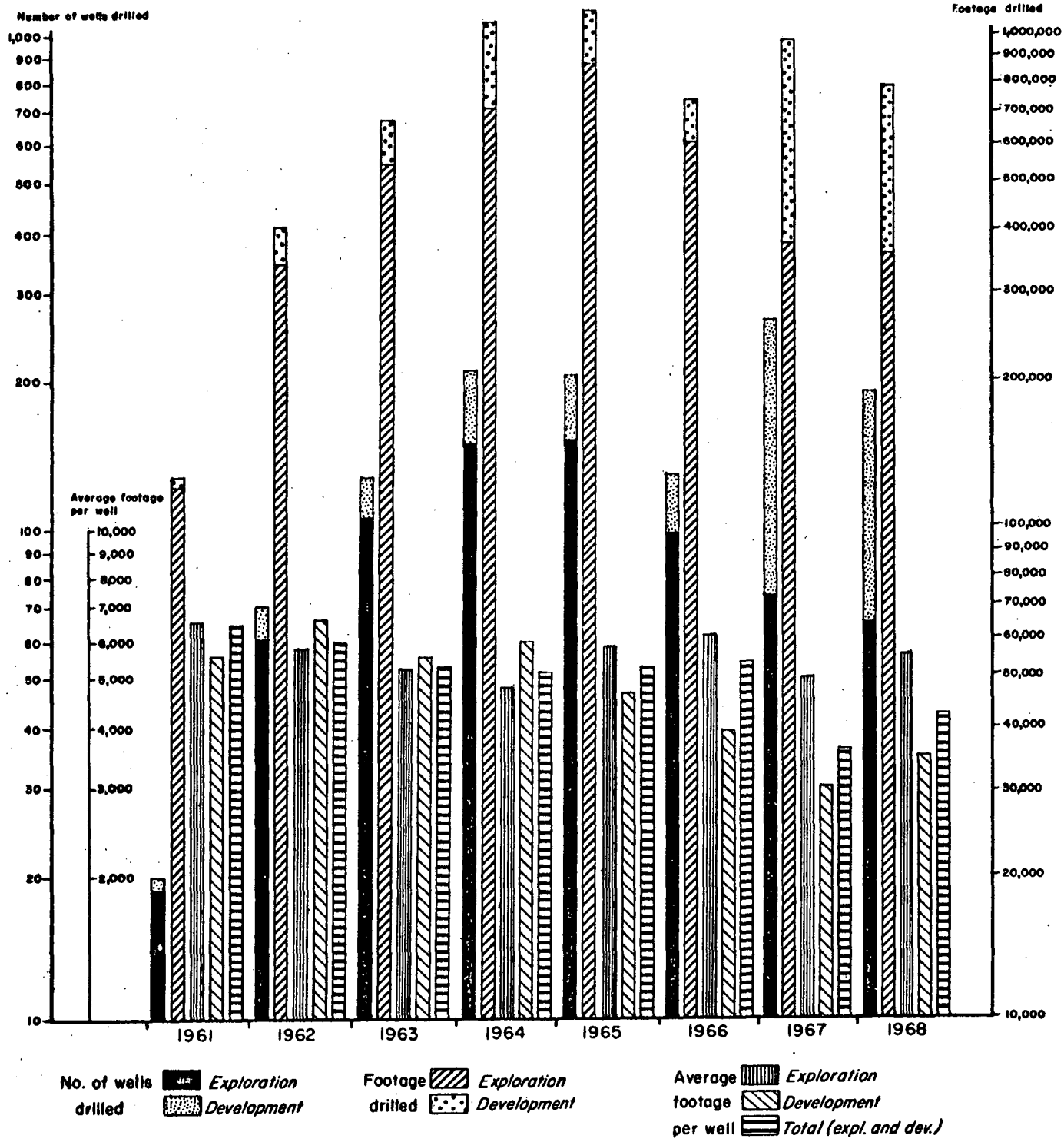


AUSTRALIA AND PAPUA & NEW GUINEA

Fig. 10

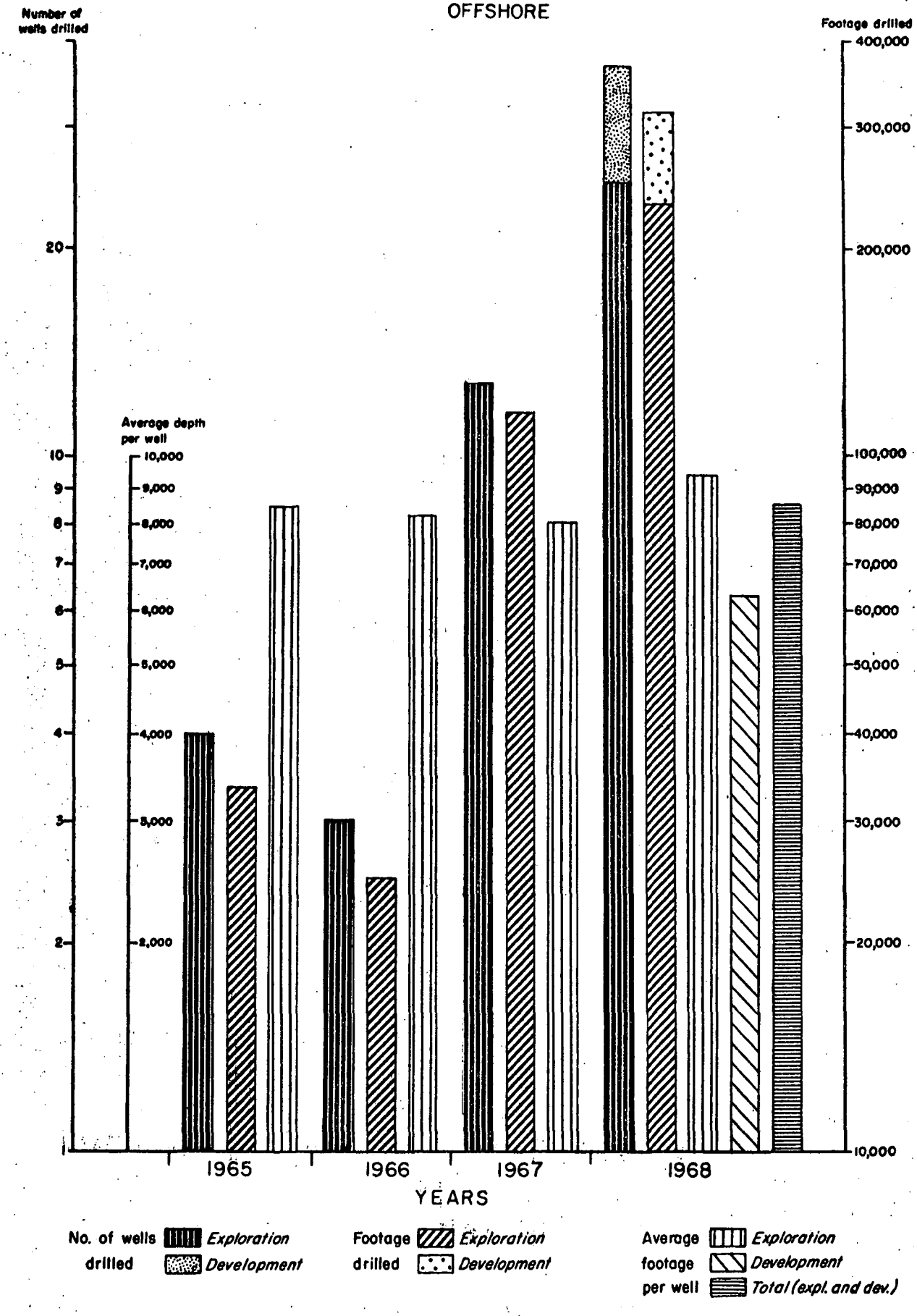
ONSHORE

NUMBER OF WELLS DRILLED PER YEAR AND FOOTAGE



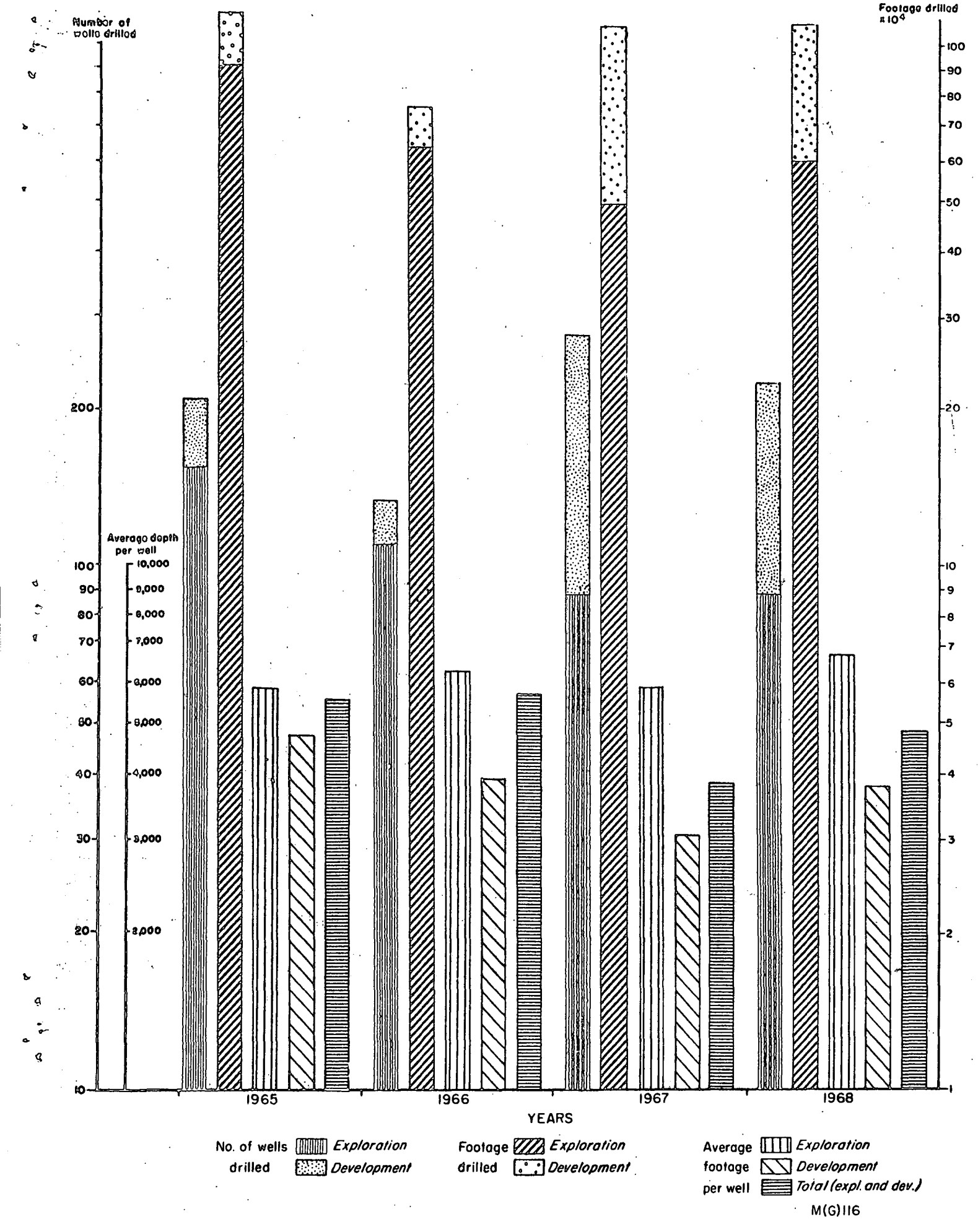
AUSTRALIA AND PAPUA & NEW GUINEA
NUMBER OF WELLS DRILLED PER YEAR AND FOOTAGE
OFFSHORE

Fig. 11



AUSTRALIA AND PAPUA & NEW GUINEA
COMBINED ON AND OFFSHORE
NUMBER OF WELLS DRILLED PER YEAR AND FOOTAGE

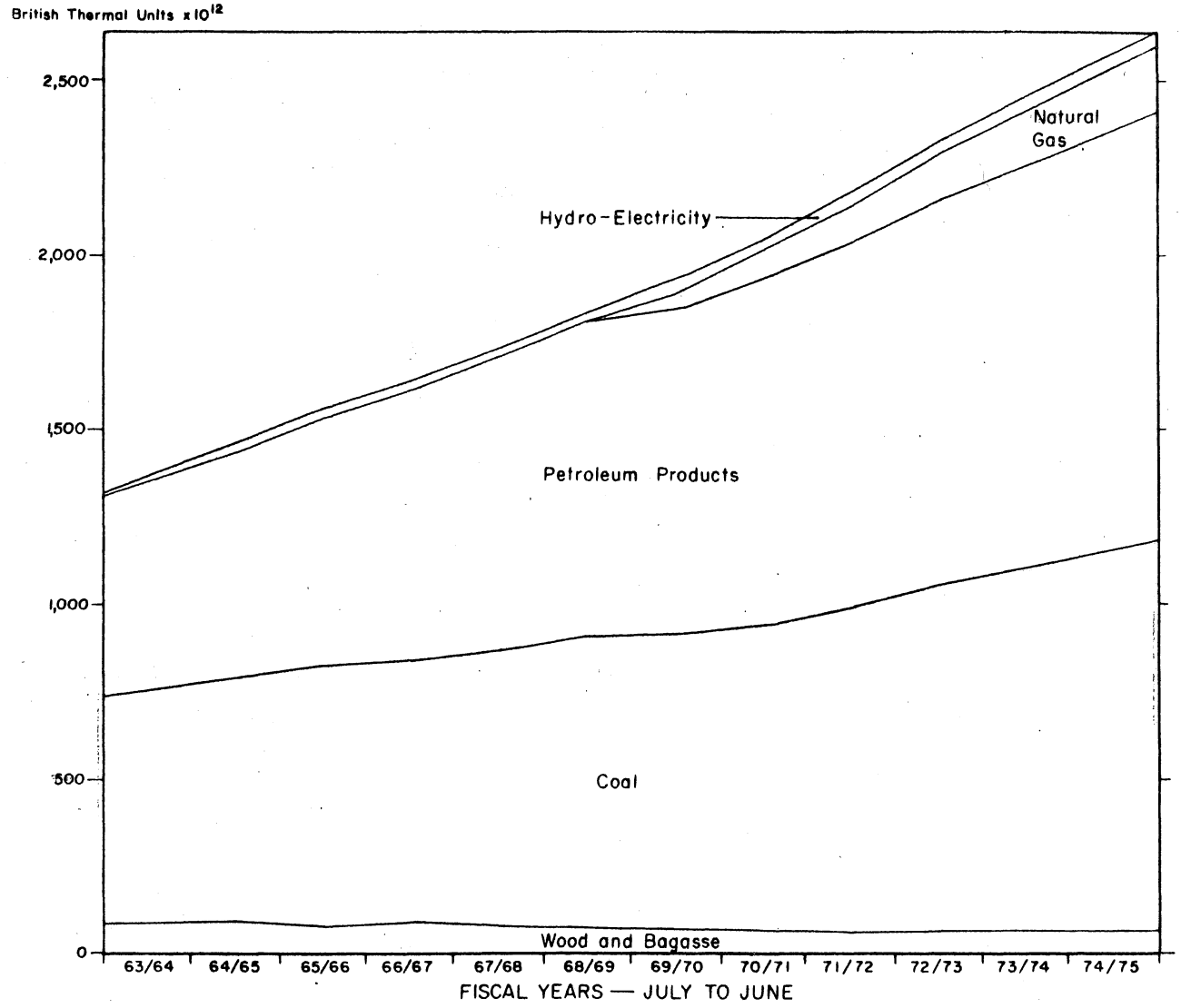
Fig. 12

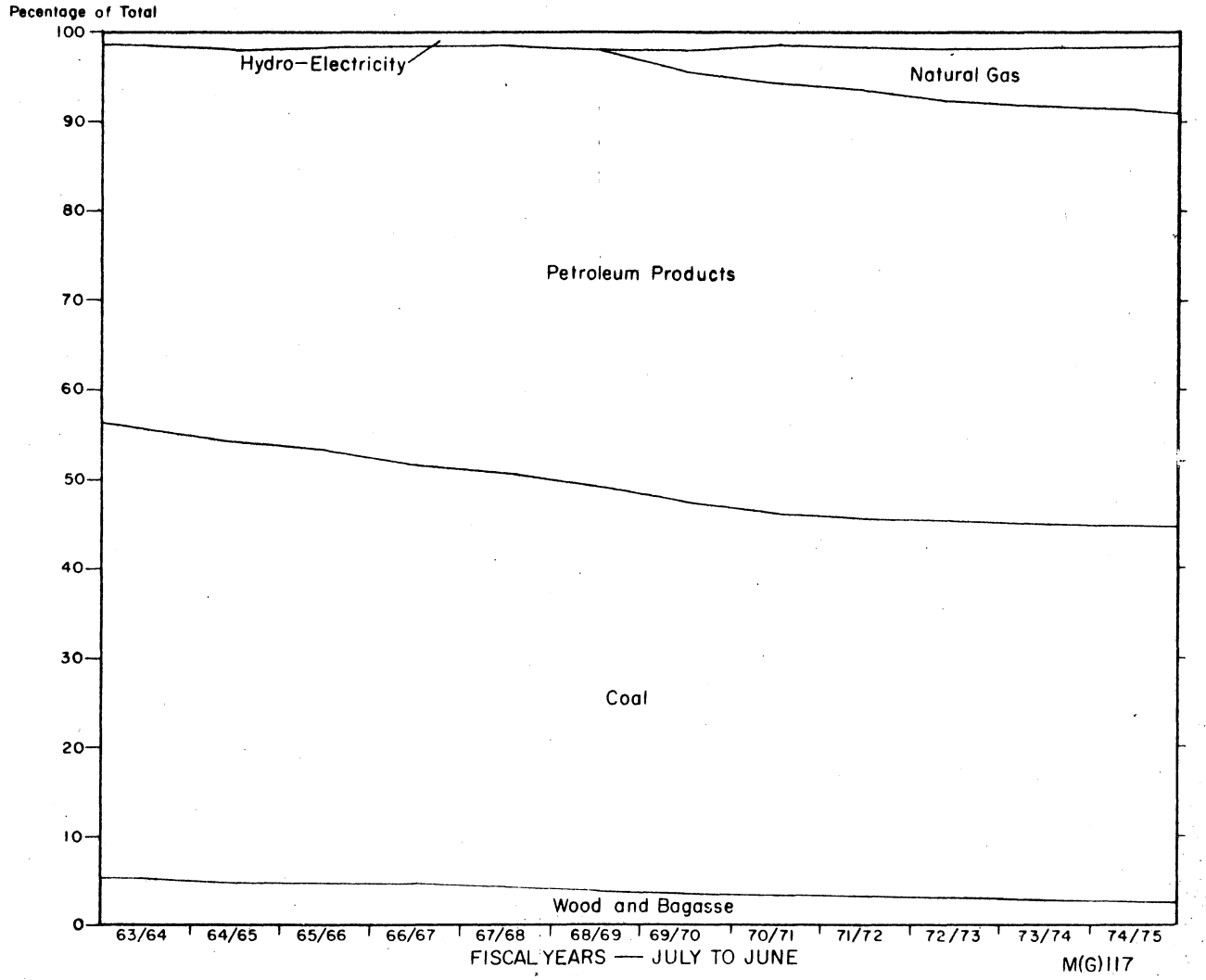


M(G)116

AUSTRALIAN CONSUMPTION OF PRIMARY FUELS

Fig.13





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