COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS

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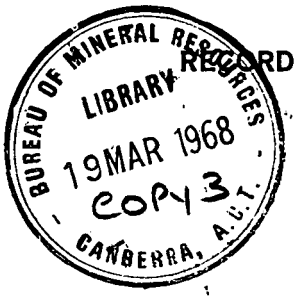

RECORD NO. 1968/37

PETROLEUM EXPLORATION OUTLOOK FOR 1968

by

L.W. WILLIAMS

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ABSTRACT

No change is expected in the trend which has developed over the last few years towards increasing interest in offshore areas, and in Papua-New Guinea.

The overall expenditure on petroleum exploration in Australia and Papua-New Guinea during 1968 will be approximately the same as in 1967.

Because of the greater expense which will be incurred through the increased use of offshore drilling vessels, a reduction in other exploration activities is expected. This reduction will occur mainly in geophysical operations and the biggest reduction will be in seismic surveys on land.

INTRODUCTION

The information on which this paper is based has been supplied by exploration companies during a recent series of meetings with the author. The co-operation of the companies is gratefully acknowledged but the author accepts responsibility for inferences which have been drawn from the information he was given. Permission to present this paper has been given by the Director, Bureau of Mineral Resources, Geology and Geophysics, Canberra.

TRENDS

Geographical

Several trends are apparent but probably the most important is geographical. Over the last few years we have seen a swing to offshore exploration and a renewal of interest in Papua and New Guinea. This trend is continuing and strengthening.

To give an indication of the magnitude of this swing, I expect at least six offshore rigs to be operating continuously in Australian waters before the end of 1968, and that at least as much marine seismic work will be carried out in 1968 as in 1967. This is important to ensure that sufficient targets are available to maintain drilling activities in the next two or three years.

In the Territory of Papua-New Guinea, expenditure will be mainly in Papua this year but, if we include offshore exploration, the total expenditure in 1968 could exceed that in any previous year.

This trend is obviously associated with the absence of any major oil discovery on the Australian mainland and has been aggravated by the recent absence of any significant oil discoveries which have been shown to be economic. Also, during the three years since the first offshore well was drilled in Australian waters, offshore drilling has been remarkably successful and even those wells which did not discover large quantities of hydrocarbons at least penetrated sections which gave promise of success in future wells.

The lack of success in the search for oil on the mainland does not necessarily mean that oil is not present. In fact there are still many attractive areas which have not been fully investigated and some which are virtually untouched. The discovery of a large oil field

on the mainland would result in renewed interest which would lead to the testing of structures which have been outlined by seismic methods but not yet drilled because of the decreasing enthusiasm which companies have for onshore basins.

However, the reason for the increased interest in offshore areas and in Papua is apparent if the results of the exploration in these areas is considered in more detail.

The results in the Gippsland Basin are outstanding. There is no doubt now that this is a major hydrocarbon province with large accumulations of oil and gas in Tertiary formations. The presence of gas in the Upper Cretaceous has also been shown. There appear to be other structures in the Tertiary which have not yet been tested and almost certainly deeper wells will be drilled to test the Mesozoic section more completely.

The Bass Basin is still largely unknown but one well encountered a small amount of gas and all the wells have penetrated good thicknesses of marine Tertiary sediments.

Drilling in the offshore Otway Basin has resulted in a minor gas show from the Mesozoic in Crayfish A-1 and a small gas flow from Pecten No. 1A, but no hydrocarbons were encountered in the other wells. The Tertiary is not as thick as in the Gippsland Basin but good thicknesses of prospective Mesozoic sediments have been encountered.

No offshore drilling has been carried out in the Perth or Carnarvon Basins but marine seismic results indicate that there should be a considerable thickness of prospective sediments in the Perth Basin. The wells which have been drilled on islands in the offshore Carnarvon Basin, together with the results of the Barrow Island wells, show the presence of some Tertiary section, but the main interest is in the Mesozoic.

The Ashmore Reef No. 1 well penetrated 8,000 feet of Tertiary-Upper Cretaceous marine sediments before entering an Upper Jurassic volcanic sequence at 8,175 feet. An interbedded sequence of Triassic clastics and occasional limestone, dominantly marine, was entered at 9,143 feet and the well was still in this sequence at over 12,000 feet at the time of writing. Although no hydrocarbons have been encountered, the section penetrated has not reduced interest in this vast offshore area.

The wells drilled at the southern end of the Great Barrier Reef have not been successful in discovering hydrocarbons but have shown the presence of marine Tertiary sediments.

In the Gulf of Papua we have heard of a large gas flow from a Tertiary reef. The presence of reefing certainly enhances the prospects in this part of the Gulf and on the neighbouring mainland.

In Papua gas and some small amounts of oil have been discovered in Miocene sediments. The wells have also shown the Tertiary section to be very thick. There is no doubt that far more exploration would have been carried out before this except that the terrain makes any sort of exploration very expensive.

This very brief review shows that the offshore drilling has been extremely successful and that generally the offshore basins and Papua have thick sections of marine Tertiary sediments that are absent on the mainland. These are prime targets for petroleum exploration and account for the increasing interest in these areas.

Objectives

Another trend which has become clear is a change in the objectives of exploration. There will be practically no reconnaissance geophysical work carried out this year. This applies particularly onshore but even in the large offshore areas most of the seismic surveys will be concentrated on detailing structural leads which have been found during the last two years.

There will be very few onshore wells which will drill unknown section. The majority will be aimed at formations which have had shows and will be drilled in what are hoped to be more favorable structural positions.

This is a fairly logical development in the onshore exploration in view of the limited amount of success which has been achieved, but we must not forget the size of the Australian basins. Much more exploration is required in many areas before they can be considered to be adequately evaluated. The work to date has been concentrated in the areas which are considered to be the most prospective on the basis of incomplete knowledge.

Tenement Position

There are no obvious signs of any general easing in the tenement situation but some areas will become available during the year. One possibility is through titles which will expire and I expect that there will be some relinquishment associated with the renewals. Another possibility is offshore areas which may become available later in the year.

A third possibility is through farm-outs. We have seen farm-outs given over parts of large tenements and it is reasonable to assume that this practice will continue. It is quite apparent that some of the areas held by companies or groups are far too large to allow the areas to be adequately investigated in a reasonable time, unless parts of them are made available for other interested companies to explore.

Techniques

There have been rapid developments in all aspects of seismic exploration including energy source, recording, and processing. We have seen in Australia increased use being made of digital techniques, particularly in processing, and it is reasonable to expect this trend to continue as more detailed information is sought.

The number of land crews using surface input methods as an energy source has fluctuated a little but was about the same in 1967 as in 1965. During this period the total number of land crews fell by about two-thirds, so that the percentage of surface input crews increased. In fact, during 1967 about 30% - 40% of the land crews were using these methods.

However it is in marine seismic work that the main developments in energy sources other than conventional explosives are taking place. We have seen several different systems used in Australia but the main disadvantage has been lack of sufficient penetration to obtain deep data except in exceptional areas. Some of the later methods may overcome this problem and this would lead to increased use of these non-explosive sources because of the lower cost.

Another possibility is that the early wells drilled in what are at present unknown areas will show that the deep data are not essential to the evaluation of the economic possibilities of the areas. In this event the cheaper non-explosive sources would be used for further investigation of these particular areas.

I expect to see a reduction in the use of conventional explosives as an energy source for marine seismic work.

LEVEL OF ACTIVITY

In general we can expect that the overall level of activity in 1968 will be down somewhat on 1967, but that the expenditure on exploration will be about the same because of an increase in offshore drilling.

In this paper I am considering exploration costs only and not development drilling or production. Also, I have made no allowance for possible major discoveries which could stimulate exploration and lead to greater expenditures.

The graph (Fig. 1) shows that the number of rigs operating on land decreased steadily from a peak in mid-1965 and then levelled out at about 10 or 12 during 1967. It is expected that the number of active rigs will stay at about this level or a little lower during 1968.

The number of active offshore rigs increased during 1967 to six at one stage, and was five at the end of the year. During 1968 there will be up to at least six rigs operating at any one time with an average of five during the year. So there will not be a marked increase in the number of active rigs in spite of the new ones coming in, but certainly more offshore wells will be drilled during 1968.

The number of land seismic crews fell from a peak during the second half of 1965 until early in 1967. There was a small recovery during 1967 but the number is falling again and I cannot see any real indication that this fall will not continue. In fact it looks as though there will be less seismic work done on land this year than in any year since 1959. This will lead to a lack of drilling targets being discovered and consequently to a further fall in drilling activity on land in 1969 or 1970.

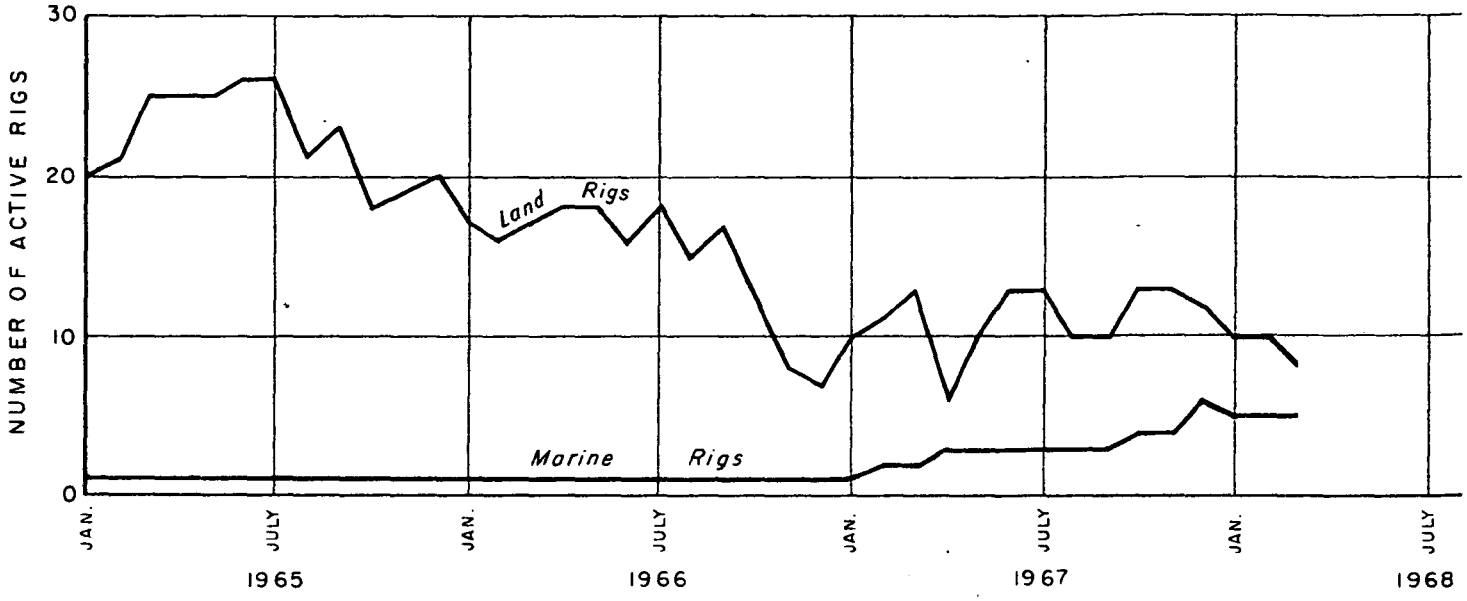
However the marine seismic activity will continue at about the 1967 level, although a much higher percentage of the work will be of a more detailed nature than in 1967.

It is likely that less time will be spent on gravity surveys this year and that the level of aeromagnetic activity will be about the same with only an occasional survey being carried out.

Fig. 1

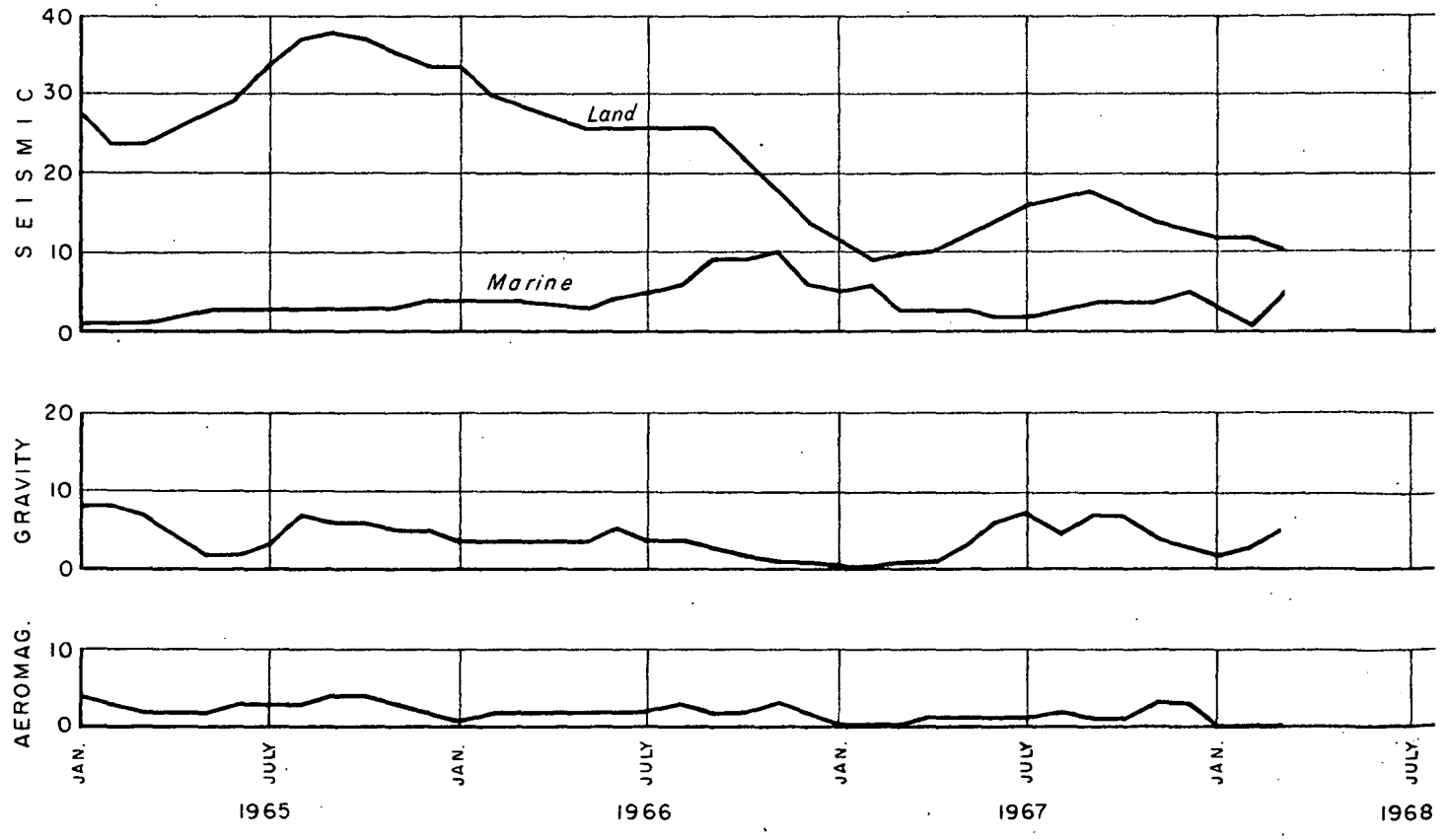
DRILLING RIG ACTIVITY

ON PETROLEUM EXPLORATION IN AUSTRALIA & P – N.G.



GEOPHYSICAL CREWS

ON PETROLEUM EXPLORATION IN AUSTRALIA & P – N.G.



B.M.R. P.E.B. February 1968.

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An interesting aspect of this year's programme is the introduction to Australia of magneto-telluric surveying for petroleum purposes. This method has not been largely used except in Europe where most of the developments in the technique have taken place. The progress and results of the survey to be undertaken will be watched with very close interest to see how effective the method is in the area in which it is to be tried. The results in this area cannot, of course, be taken as proof that the method will or will not be effective in other areas but the results may indicate that it will be effective in some areas at least. If the method is successful it could make a significant contribution to exploration in Australia by giving more accurate information on basement and sediment configuration than is normal with gravity and magnetic methods, and at a lower cost than for seismic work. The method will not be as accurate as seismic but may allow better selection of areas over which the more expensive seismic method can then be used.

CONCLUSIONS

In general we can expect about the same level of activity in 1968 as in 1967, except for seismic work onshore which will probably be much reduced, and offshore drilling which will be increased.

A major discovery early in the year could change this position and the granting of more offshore titles could also result in an increase in geophysical activity.

However, even the limited programme which will be carried out includes some interesting wells. Seismic work has shown that many of these will be in different provinces from earlier wells which have been drilled in the same basin. Others will be in areas which have not previously been tested.

The introduction of new and improved geophysical techniques will lead to a better understanding of many areas. This will lead to better sited wells being drilled in future years.

Although the level of exploration will not be as high as many people would like to see it, we can look forward to another very interesting year.