BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD

No 88/40

BMR SUBMISSION TO

1988 REVIEW OF BMR

PART I

RESTRICTED DISTRIBUTION

BMR SUBMISSION TO 1988 REVIEW OF BMR

1. SUMMARY AND GENERAL RECOMMENDATIONS

BMR has three main functions, undertaken in the national interest: strategic geoscience research, petroleum and mineral resource assessment, and national geoscience database development.

Like similar agencies throughout the world, BMR provides geoscientific information and advice to Government, and publishes geoscience information into the public domain.

The bulk of BMR's activity, including the resource assessment function (ca 10% of total) relates to the petroleum and minerals exploration industry; the balance (ca 20% of total) to groundwater, geophysical observatories and Antarctica.

In order to assist the comprehensive review of BMR's role and functions (first term of reference), this document describes the strategic aims which have been developed for all components of the program, and illustrates in some detail the manner in which the resource assessment function has been developed. The database function is closely intermeshed with the two other functions: its importance is demonstrated by the establishment by Government this year of the National Resource Information Centre (NRIC), involving both BMR and BRR.

BMR has developed programs in response to a number of Government initiatives, for example in the Continental Margins Program, nuclear monitoring and groundwater.

Relations with other government organisations

We have summarised BMR's complementary relationship to other government organisations, viz CSIRO, State Geological Surveys, Universities and other DPIE Bureaux. Basically BMR has a national geological survey role similar to that in many countries and having particular analogy with organisations in other federal systems, such as the US Geological Survey and the Geological Survey of Canada. ASTEC noted in its 1978 report that the title of Bureau was inappropriate to an organisation whose main function is strategic research.

We now believe that BMR's functions and the relations with other organisations would be better understood both in Australia and overseas if BMR were renamed the Australian Geological Survey.

The extent to which BMR activities reflect industry needs and priorities

In relation to the petroleum and mineral industries the aim of BMR is to help provide the framework within which successful and internationally competitive exploration programs can be mounted. This involves the synthesis of existing knowledge and the development of this framework through strategic programs. Thus the emphasis is on the acquisition, integration and interpretation of major geoscientific databases.

These functions serve both national and industry needs in helping to ensure the long term viability of the petroleum and mineral industries in Australia. The past record illustrates the importance of this role, which has been assessed by ASTEC to be of increasing importance in the future.

BMR does not undertake tactical research to meet immediate needs of the industry but its strategic research does have short, medium and long term benefits to the industry. Research into the development of exploration techniques is not undertaken by BMR, but by CSIRO.

BMR's strategic role is both complementary to, and an essential pre-requisite to, effective and efficient exploration by industry, in a strongly competitive international environment.

Overall, BMR's program is driven by national policy objectives rather than by immediate industry needs. For example, the Continental Margins program addresses the policy objective of encouraging private petroleum exploration investment offshore, particularly in areas where the level of activity has been inadequate.

There is however close consultation with industry in the development of program priorities and it is proposed that the formal mechanisms of consultation be strengthened (see below).

It is recommended that the need for strategic geoscientific research, for the increasing demand for mineral and petroleum resource assessment, and for the development of related databases be reaffirmed.

Capacity to meet national needs

The primary industries remain the bridge to the economic future of Australia. The need for strategic geoscientific research is increasing, and land use/environmental factors are becoming more prominent and needing support from high quality resource assessment. Nevertheless, it is the case that Government puts much less research funding into the mining sector in comparison to agriculture: a major part of that funding is to BMR.

We have discussed the appropriate level of BMR activity in terms of specific national needs and in terms of wider measures of the priority that should be given to those national needs. We have concluded that the present level of activity is low and that it should be enhanced both in relation to BMR's main role of stimulating exploration and its effectiveness; and in relation to the need for geoscientific databases required for the consideration of land-use issues, and against which environmental changes induced by mineral and energy usage can be measured.

Recent overall staff reductions and the need to transfer staff to the highest priority areas have forced reductions on many programs and have prevented the development of other high priority programs.

Much of BMR's budget in the minerals and petroleum areas is dedicated to the highest priority major geophysical programs, notably the offshore Continental Margins program and the onshore seismic program. Both of these areas need further support as do a number of other areas which perforce have had to operate with lower resources. Some of these, such as the application of remote sensing techniques to regional mapping programs of the weathered zone are in urgent need of development. More generally, in the minerals area there is a need to devote more resources to integrated geoscientific syntheses of Australia or major provinces within it, the products of which, using modern technology, can be presented in map form at various scales.

As the Federal Government's main agency in the geosciences BMR has strong international involvements. These are essential for the quality of BMR's domestic role but also extend to regional cooperative projects and to prosecution of specific aid projects. Such activities have the potential to bring considerable benefit to Australian industry. Some of these activities could lead to increased utilisation of, and national benefit from, major BMR facilities and expertise, such as that of the Rig Seismic. It is believed that BMR's national coordinating role in these activities should be strengthened.

Potential for cost recovery

We have also discussed the various possibilities for cost recovery in BMR in relation to the national interest nature of our programs, to the capacity to meet national needs, and to the particular characteristics of the mineral industry (eg. levies are not available to BMR as they are in the Agricultural Sector).

BMR accepts the need to maximise the level of cost recovery from the sale of products, consistent with its overall role. BMR continues to believe that any requirement for direct cost recovery from industry for long-term strategic programs in the national interest tends to negate the Government policy of encouraging investment in exploration and development; to drive BMR's program away from its national interest role; to reduce the value of BMR's work by limiting its availability; and to prejudice the very considerable free return flow of information from industry.

Nevertheless, we believe that there are opportunities for obtaining substantial cost recovery providing this is seen as support above the essential base-level of funding provided by government.

BMR has made significant progress in increasing revenue from products. The overall level of cost recovery, including aspects such as overseas aid, is approximately 5% of BMR's total funding. Our conclusions in respect of funding and cost recovery are:

(1) the present policy of maximising the revenue from the sale of products, consistent with BMR's overall objectives, should continue.

(2) any mechanisms proposed for increased cost recovery for BMR should not prejudice the public availability of BMR's results;

(3) in order to allow BMR programs to continue to be formulated in the national interest and without prejudice, the level of government funding should ensure the basic viability of the strategic programs, independent of any direct cost recovery;

(4) requests for additional government funding should be in terms of national interest projects, defined in terms of specific objectives over specific time periods and supported by additional <u>contract</u> staff.

(5) direct cost recovery from industry should be limited to support for the acceleration and enhancement of key programs above the guaranteed base level of government funding; and

(6) consequent on such support BMR should be permitted to recruit contract staff, additional to its present ASL, in order to implement the acceleration and enhancement of key programs.

The resource assessment role

The resource assessment function enables BMR to provide government, and others, with information, and independent professional advice on the mineral and petroleum industries in relation to both policy and regulatory functions. Thus the Resource Assessment Division provides functions in the geoscientific and engineering areas similar to those of BRR and the Australian Bureau of Agricultural and Resource Economics (ABARE) in other professional fields.

It is desirable to maintain and strengthen the linkages between BMR's research and resource assessment divisions, not only to maintain the quality of resource assessment advice, but also to assist in the determination of priorities for BMR's strategic research. It is also essential to develop NRIC in association with both the research and resource assessment functions.

It is recommended that the close linkages between research and resource assessment in BMR be maintained and strengthened, and that such linkages be an integral part of the development of NRIC.

Planning and programming

BMR's program formulation processes are comprehensive. They include a range of internal mechanisms, the BMR Advisory Council (established in 1985), and wide consultation, in particular with industry and the States.

It is suggested that the advisory body to BMR be strengthened by increased representation from industry, and from relevant policy areas in DPIE. An alternative to the existing Advisory Council (but with similar composition) would be the establishment of a Research Liaison Committee: such a committee may be more appropriate given the relationship in which the Director of BMR is responsible to the Secretary of the Department.

It is recommended that the major external body with concern for BMR's program be strengthened by increased industry and Departmental policy representation; and that further consideration be given to the form of this body.

It is suggested that subcommittees or intradepartmental committees, as appropriate, should be established to examine longer-term proposals within each of BMR's major programs; less frequent meetings are considered to be appropriate for these bodies.

It is recommended that subcommittees of the above advisory body be established to cover the petroleum and groundwater research, minerals research, geophysical observatories; and that intradepartmental committees be established for the mineral and petroleum resource assessment components.

Information is provided in this submission on the mass of data and publications resulting from BMR's program and on the relevance and quality of BMR's work. Notwithstanding this, we accept the need for each project to have a specific product strategy. Such a scheme is in process of implementation.

We also recognise that there is a need to develop further review and evaluation mechanisms.

Organisational structure and staffing

In 1987 BMR began a process of increased integration of multidisciplinary studies within the land-based strategic program, with a further aim of strengthening the intended focus on commodities in the program: most specifically by the transfer of seismic operations from the Division of Geophysics to that of Petrology & Geochemistry. It is now appropriate to continue this process in relation to seismic interpretation, and in the longer-term the aeromagnetic program and related geophysical sub-disciplines.

It is recommended that further multidisciplinary integration take place within BMR's research, and that divisions be renamed to place emphasis on relevant commodities.

BMR continues to seek ways to strengthen its corporate management, an aspect of which is to provide greater support to the Director. Although the operational model in BMR is of devolved responsibilities for the carriage of the program, the overall complexity of the organisation and the need for coordination require significantly greater support at the corporate level, and consideration of the linkage of corporate elements, such as information technology, geoscience planning and resource management, within BMR's management. The submission provides detailed suggestions on these points.

It is recommended that the need to strengthen BMR's corporate management and provide greater support to the Director be examined, and that the overall corporate management be further strengthened.

The present arrangements in BMR include merit assessment for research scientists. It is important and urgent that this principle be extended to the Science grades and potentially to technical grades as well.

We also believe that, as was always emphasised, the fuller development of the research scientist grades should now be implemented. In a scientific organisation this needs to be seen in conjunction with difficulties in matching necessary scientific skills with SES provisions in some positions.

Operating and management procedures

In response to its functions, BMR has undergone major change in its organisation, technological development, output and most fundamentally in program development and the delineation of priorities. It has done so as an outrider in a department, which is widely recognised as not the most satisfactory organisational status for the carriage of research.

A principal advantage of outrider status is that it may offer the best opportunities to make scientific and technical contributions as an aid to policy formulation. Assuming a continuation of this status, it is, however, vital to seek means of improving operational flexibility as an outrider, and ensuring an appropriate environment for the discharge of BMR's scientific and technical functions.

It is recommended that BMR continue to receive an independent appropriation for both operations and salaries and that measures to improve the effectiveness of BMR's operations as an outrider be developed.

2. GENERAL STATEMENT ON ROLE

(a) Overview of BMR role, program and costs

Role and Functions of BMR

Basically BMR has a NATIONAL GEOLOGICAL SURVEY role corresponding to similar roles in government agencies in more than 150 countries.

BMR has three main functions, undertaken in the national interest. These are strategic geoscience research, mineral and petroleum resource assessment and national geoscience database development.

The present strategy of the program as stated in the 1988 Corporate Plan of the Department of Primary Industries and Energy is as follows:

- Develop a publicly available, comprehensive and integrated geoscientific understanding of the Australian continent, the Australian offshore area and the Australian Antarctic Territory, as a basis for encouraging and improving the effectiveness of exploration for, and assessment of, Australia's endowment of petroleum, mineral and groundwater resources and for contributing to land-use planning and the mitigation of natural hazards.

- Provide independent and timely scientific and technical assessments, advice and information to Government, industry and the public to facilitate the formulation and implementation of policies necessary for the effective management of the land and its petroleum and mineral resources.

- Provide special national geoscientific capabilities, such as the geophysical observatory functions of seismic monitoring for both earthquake risk and underground nuclear explosions.

- Effectively collaborate and, where appropriate, co-operate with State Geological Surveys, the Commonwealth Scientific and industrial Research Organisation (CSIRO) and other geoscience organisations.

- Participate in appropriate multilateral and bilateral geoscientific programs to contribute to Australia's international policy objectives.

. Develop and co-ordinate national geoscience databases, and disseminate resulting information.

The functions of BMR are essential for:

. the formulation and implementation of policies related to the efficient exploration for and development of Australia's petroleum and mineral resources; and

. the formulation and implementation of policies related to land use planning, aspects of public safety, and various international obligations and responsibilities including boundary negotiations, nuclear monitoring, foreign aid, and the Antarctic Treaty.

The functions are in support of essential components of the Commonwealth Government's responsibilities and BMR is the sole agency equipped to meet these functions which are complementary to those undertaken by State Governments and private industry.

Nature of Program

The necessity for, and importance of, national geological survey type activities is recognised in almost all countries, and certainly all those which are important petroleum and mineral producers. There is great variation in the names of these agencies, but whether they are called a 'geological survey', a 'ministry of geology', an 'institute of geological sciences', or a 'bureau of mineral resources', they invariably serve two basic functions:

1. they provide geoscience information and advice to government; and

2. as a national responsibility, they develop a geoscientific information base which is made publicly available.

The first of these functions is essential for <u>formulation</u> of policies relating to economic development, national security and public safety - BMR is the Commonwealth's principal technical adviser on geoscience and on mining and petroleum engineering matters. The information it provides on resource availability, natural hazards and environmental constraints on development is fundamental to the formulation of sound policies.

The second of these functions is essential for the implementation of policies. In policies aimed at fostering mineral, energy or water resource development, a common strategy is to stimulate and improve the effectiveness of resource exploration and discovery through the public provision of appropriate geoscience information.

Geology is a global science and the principles established globally must be applied to each country. But the geological configurations within each country are unique and can only be established by regional research. Thus each country must have its own strategic research programs and it cannot rely, as it might in some disciplines, on simply making use of research carried out elsewhere.

For the petroleum and mineral industries, the planning of sophisticated and expensive exploration programs is highly dependent on the assessment of existing knowledge which determines the conceptual approach to the search for chosen targets, and provides the framework within which successful exploration programs can be mounted.

The synthesis of existing knowledge, and the development by strategic research of this framework, is the principal (but not the only) aim of government sponsored research in the geological sciences. In this respect the main thrust of BMR's strategic research is to provide the fullest understanding of the distribution, abundance, age and genesis of Australia's petroleum and mineral resources in the context of the structure, composition and evolution of the earth's crust.

In a country like Australia with a high degree of dependence on mineral exports, the continuing development of the geoscience knowledge base is essential for the maintenance of a vigorous and internationally competitive industry.

BMR was established in 1946 and played a major role in the basic 1:250 000 scale mapping of the continent and in early studies offshore. Industry has acknowledged the importance of the knowledge base provided by BMR which has directly and indirectly assisted in major additions to Australia's discovered mineral and petroleum resources.

ASTEC reviewed the role of BMR in 1978 and concluded that "future discoveries of subsurface deposits will need increasingly to rely on sophisticated research utilising advanced geophysical, geochemical and geological concepts and techniques, and the future BMR will be required to contribute the strategic research programs". This emphasises that, to be effective, the geoscience knowledge base must continue to be developed as an evolving aggregation of observations, concepts and interpretations.

Much of BMR's program is best described as strategic research, in that it is largely directed to providing "a broad base of knowledge necessary for the solution of recognised practical problems" in petroleum and minerals exploration. A substantial part of BMR's program could also be described as applied research, in that it is directed towards specific practical aims or objectives (eg. the identification and characterisation of petroleum source rocks in the regional framework), but in either case the work is designed to have long-term benefits.

The BMR program is driven by government policy objectives rather than by immediate needs of the petroleum and mineral exploration industries. For example, the Continental Margins Program (CMP) addresses our clear policy objective of encouraging private petroleum exploration investment offshore, particularly in areas where the level of activity has been inadequate. It is one of the very few ways in which the Government can promote exploration without having to countenance taxation concessions that could cost hundreds of millions of dollars.

In summary, essential characteristics of BMR minerals and petroleum related research are:

1. It is national interest research, the results of which should be in the public domain.

2. It is strategic, rather than tactical, with a strong emphasis on major database development. It is on a longer time-scale than that undertaken by industry.

3. It is designed to ensure that Australia is in the forefront internationally in the understanding of the occurrence of its mineral resources and of its resource potential.

Other programs, unrelated to the petroleum and minerals industries, such as those in nuclear monitoring and groundwater have been driven by other policy decisions. Also, in 1985, the Commonwealth and State Ministers who comprise AMEC determined that "BMR be given the responsibility for co-ordinating government geoscience activities and developing suitable standards".

Thus a key feature of BMR's activities, like that of other national geological surveys, is that it provides a geoscientific information base which is made publicly available both nationally and internationally to a wide variety of users. A corollary of this is that BMR, and hence Australia, receives a substantial flow of information from industry and from other geoscientific organisations both in Australia and overseas. The information obtained from this interchange is invaluable to geoscience in Australia and essential for the successful achievement of BMR's objectives.

General Research Strategy

Every effort is made to ensure that BMR's program is complementary to that of industry and other research organisations. Thus BMR focuses on projects which, because of their scope or the specialist expertise and equipment required, are best undertaken at the national level and the results of which need to be in the public domain. In particular BMR concentrates on regionally based strategic programs to study sedimentary basins and mineral provinces, in contrast to CSIRO which undertakes applied research (eg. in exploration techniques). A particular consequence of this strategy is that much of BMR's activity is devoted to major geophysical programs - onshore and offshore.

These include:

- offshore research over Australia's continental margins using the research vessel, Rig Seismic;
- Australia-wide coverage with aeromagnetic and radiometric data using a dedicated aircraft;
- monitoring of nuclear explosions, earthquakes and the geomagnetic field by BMR geophysical observatories; and
- onshore seismic surveys.

The major cost of these is for acquisition of major new data sets which form the basis for new interpretations and understanding.

BMR is the only Australian organisation with the range of skills, technology and resources to mount and/or coordinate the multidisciplinary task forces necessary to solve major regional problems and acquire integrated regional information sets. BMR's research strategy is based on the integration of the major geophysical programs with intensive geological investigation to achieve these ends. In addition to carrying out research in its own right, BMR's unique resource base means that it plays an important national coordination role for strategic research, evidenced by the large number of state, industry, university and CSIRO groups that collaborate directly in BMR programs.

Resource Assessment

Resource Assessment involves the analysis of the occurrence, exploration for, extraction and future availability of Australia's petroleum and mineral resources in the context of global supply, competing land use demands and environmental considerations. This permits the provision of information and advice to government, industry and the public (eg. investors).

The analysis of the availability of resources involves analysis of quality and quantity of demonstrated resources and the economics of discovering, developing and mining of individual commodities. This is a form of applied research involving the combination of professional geoscientific, engineering and commodities studies in the Resource Assessment Division of BMR. The studies are dependent on the collection and, interpretation of basic data from all available sources, especially industry and State geological surveys. Ready access to large amounts of industry and other data is required for the resource assessment function and provision is made for the collection and storage of such data (eg. well completion reports, seismic survey reports, cores and cuttings, etc).

These data are also essential for the assessment of potential resources which require close collaboration between the Resource Assessment Division and other divisions in BMR, using sophisticated methodologies.

The Resource Assessment function enables BMR to provide government with independent, professional advice on the mineral and petroleum industries in relation to both policy and regulatory functions, and is also important in the determination of priorities for BMR's strategic research.

Geoscience Database Development

BMR develops databases in both its research and resource assessment programs (such as the aeromagnetic database in the airborne geophysics component). It also has a wider database activity as the primary national source of geoscience data and has the responsibility from AMEC for "coordinating government geoscience data base activities and developing suitable standards". A major current activity in collaboration with the Bureau of Rural Resources is the development of the National Resource Information Centre (NRIC), which will permit a wide range of resource and environmental data to be brought together in a common Geographic Information System (GIS) framework.

Program Organisation

The most important elements of BMR's program for planning purposes have been the components, each of which has its own objectives and performance indicators, defined through a planning process which involves forward planning of at least 3 to 5 years. Each component is the responsibility of one of BMR's Divisions. These Divisional responsibilities are summarised on the list of components in Table 2.1. The rationale, objectives, programs and products of each of these components are discussed in detail in Part II of this submission. Major conclusions and recommendations from Part II are summarised in Part I, Section 2(d).

Resource Allocation

The total financial and human resources for 1988/89 are as follows:

BMR Staff (ASL)	595.0
Salaries and Overtime	$19.36 million
Operational/Admin Funds	$23.51 million
External Funds	$ 1.31 million
Less Revenue Offsets	$ 0.52 million
Total BMR Budget	$43.66 million

Table 2.2 shows the allocation of these resources to program components.

Table 2.1.

DPIE SUBPROGRAM 3.1 NATIONAL GEOSCIENCE RESEARCH AND RESOURCE ASSESSMENT

FOSSIL FUELS AND MINERALS RESEARCH		
Component	110 Controls on Fossil Fuels Occurrence	Cont
Component	120 Onshore Sedimentary Basins	Cont
Component	130 Offshore Sedimentary Basins	Marine
Component	140 Overseas Basins	Marine
Component	150 Mineral Province Studies	P&G
Component	160 Regolith, Related Resources and Remote Sensing	P&G
Component	170 Regional Structure and Tectonics	P&G
Component	180 Geophysical Mapping - Continental and Offshore	Geoph
GROUNDWATER RESEARCH AND ASSESSMENT		
Component	210 Basin Hydrogeology	Cont
NATIONAL GEOPHYSICAL OBSERVATORIES AND ANTARCTIC SURVEYS		
Component	310 Earthquake and Volcanic Hazards	Geoph
Component	320 Monitoring of Nuclear Explosions	Geoph
Component	330 Geomagnetism	Geoph
Component	340 Antarctic Onshore Surveys	Geoph
Component	350 Antarctic Offshore Basins	Marine
PETROLEUM AND MINERALS RESOURCE ASSESSMENT		
Component	410 Petroleum Resource Assessment and Availability	RAD
Component	420 Mineral Resource Assessment and Availability	RAD
NATIONAL GEOSCIENCE DATABASES		
Component	510 Databases Coordination, Research & Operations	RAD
Component	520 Geoscience Maps, Cartography and Image Processing	GPIB
BMR MANAGEMENT AND INFORMATION		
Component	610 Geoscience Management & Coordination	GPIB
Component	620 Publications	GPIB
Component	630 Library	GPIB
Component	640 Resources Management and Services	RMB
Component	650 International Agreements and Project Coordination	GPIB
Component	660 Information and Museum	GPIB

Divisions and Branches

Resource Assessment Division (RAD)
Division of Continental Geology (Cont)
Division of Marine Geosciences and Petroleum Geology (Marine)
Division of Petrology and Geochemistry (P&G)
Division of Geophysics (Geoph)
Geoscience Planning and Information Branch (GPIB)
Resource Management Branch (RMB)

BMR: 1987/88 ALLOCATIONS AND 1988/89 PROPOSED ALLOCATIONS

Component	BMR ASL 87/88	BMR ASL 88/89	BMR Salaries & Overtime 87/88 $'000	BMR Salaries & Overtime 88/89 $'000	Other BMR Expenditure 87/88 $'000	Other BMR Expenditure 88/89 $'000	External Funds 87/88 $'000	External Funds 88/89 $'000	Total Expenditure 87/88 $'000	Total Expenditure 88/89 $'000
110	36.9	22.2	1 177	737	907	696	50	140	2 134	1 573
120	18.0	32.8	579	1 089	345	907			924	1 996
130	83.9	90.5	2 660	3 006	7 844	8 215			10 504	11 221
140	0.2	0.1	6	3			111	170	117	173
150	33.5	29.4	1 000	977	764	621			1 764	1 598
160	5.0	5.4	187	179	146	242			333	421
170	63.5	69.9	2 103	2 322	1 366	1 528			3 469	3 850
180	32.5	38.5	1 008	1 279	1 671	2 210			2 679	3 489
210	15.6	26.7	494	887	475	759	463	400	1 432	2 046
310	25.0	21.6	794	717	667	905			1 461	1 622
320	13.0	11.4	386	379	862	560			1 248	939
330	24.0	21.4	779	711	481	562			1 260	1 273
340	3.0	3.1	94	103	26	20			120	123
350	0.2	0.1	6	3					6	3
410	46.0	44.0	1 448	1 462	513	423	40		2 001	1 885
420	34.5	34.5	1 086	1 146	356	292			1 442	1 438
510	22.0	22.2	694	737	674	482			1 368	1 219
520	36.9	18.0	1 178	598	1 647	2 190			2 825	2 788
530		6.0		200		670				870
610	9.5	8.0	323	266	143	204			466	470
620	9.0	8.0	314	266	370	116			684	382
630	11.6	11.0	395	365	260	130			655	495
640	33.5	49.7	1 617	1 651	1 585	1 608			3 202	3 259
650	1.0	1.0	34	33	50	50	1 027	600	1 111	683
660	8.5	7.5	281	249	111	120			392	369
TOTAL	566.8	583.0	18 643	19 365	21 263	23 510	1 691	1 310	41 597	44 185

Table 2.2

About 57% of BMR's total budget is directed to research, resource assessment and database activities related to the Petroleum industry and about 23% to those activities related to the Minerals industry. This reflects the priority given by government to increasing the level of Australia's petroleum self-sufficiency. The remaining 20% of total budget is devoted to activities unrelated to the petroleum and mineral industries - mainly Observatories and Groundwater.

The three main geophysical programs referred to account for a very large proportion of BMR's total research budget (Fig. 2.1). The Continental Margins Program alone, including its allocation of corporate services, accounts for about ~~17~~ 32% of BMR's total budget and about ~~17~~ 46% of the total fossil fuels and minerals program budget. The onshore seismic program accounts for about 15% of the fossil fuels and minerals program budget while the airborne program accounts for about ~~6~~ 13% . Thus the remaining 5 components of the fossil fuels and minerals research program, which include the main geological studies, account for only ~~15~~ 24% of the program or ~~10~~ 16% of the total budget.

The resource assessment program, including its allocation of corporate services, accounts for about 10% of BMR's total budget.

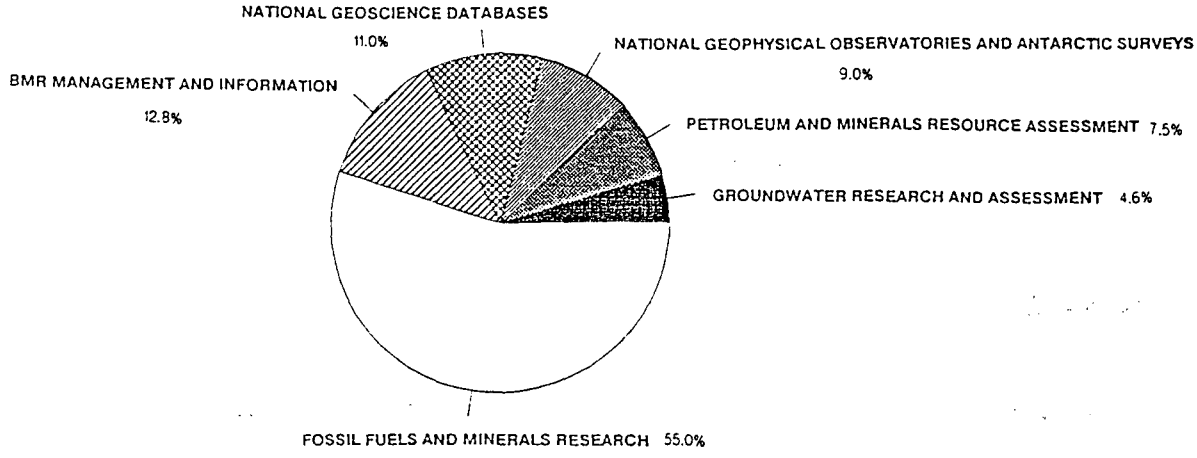
The corporate aspect of the database function accounts for about 3.5% of BMR's total budget.

(b) Importance of Role - Historical Evidence

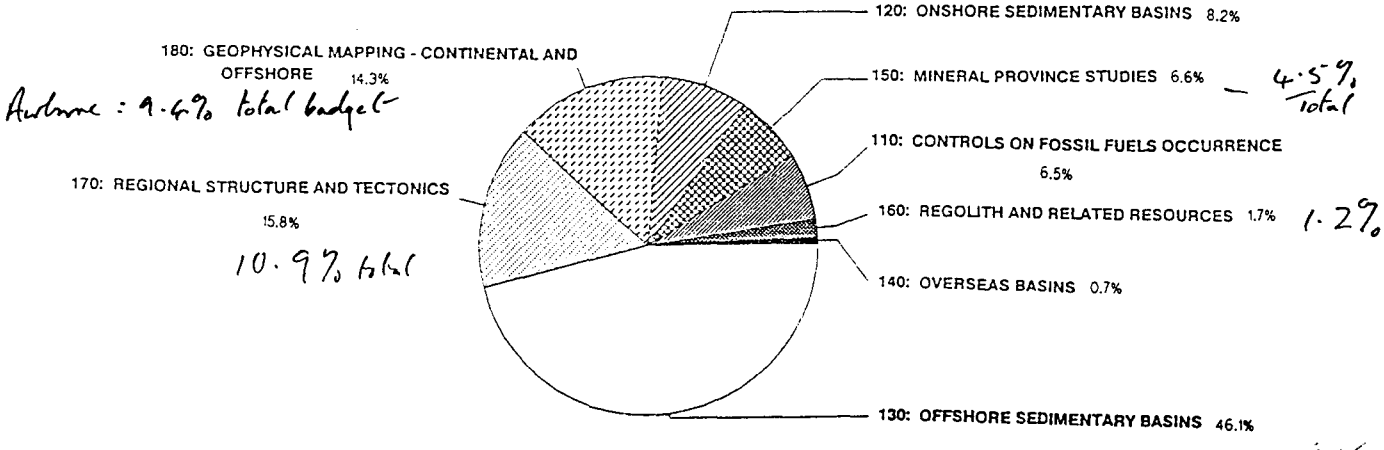
In this country, as in most of the western world, the business of finding and developing petroleum and mineral resources is carried out by private industry. It is also recognised, however, that it is the responsibility of government, on behalf of the community as a whole, to provide the appropriate environment for the industry to flourish. The provision of the appropriate economic environment and legislative framework is usually emphasised in this context. But, also of great importance, is the provision of what may be called the 'knowledge incentive' to exploration and development.

ALLOCATION OF RESOURCES FOR 1988 - 1989

NATIONAL GEOSCIENCE RESEARCH AND RESOURCE ASSESSMENT - $44 185 000



FOSSIL FUELS AND MINERALS RESEARCH - $24 321 000



Aust share : 9.4% total budget

10.9% total

4.5% total

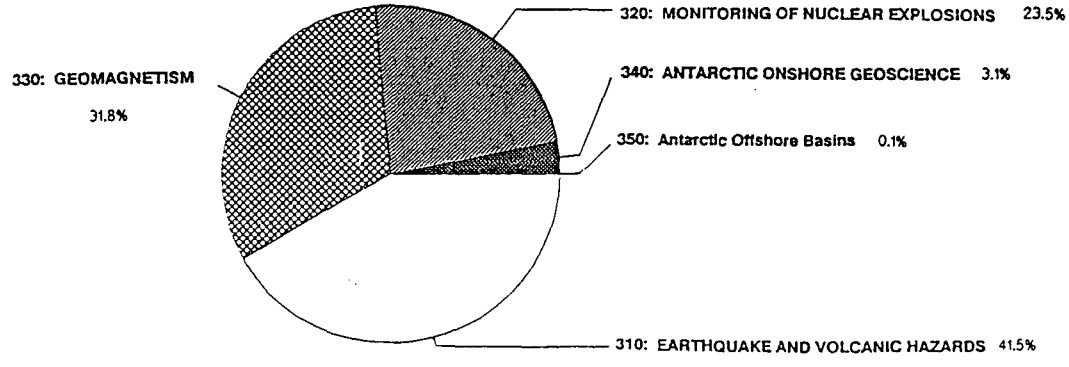
1.2%

GROUNDWATER RESEARCH AND ASSESSMENT - $2 046 000

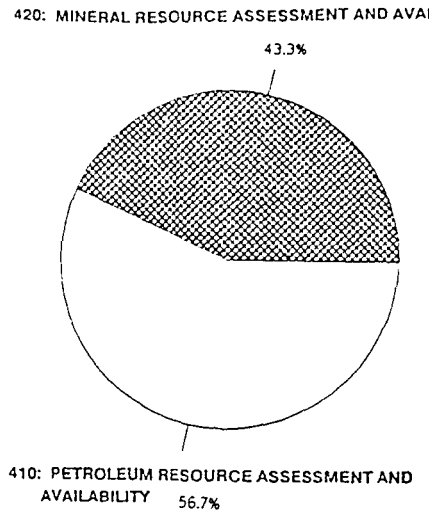
210 Basin Hydrogeology 100%

1.8
4.5
1.2
15.5

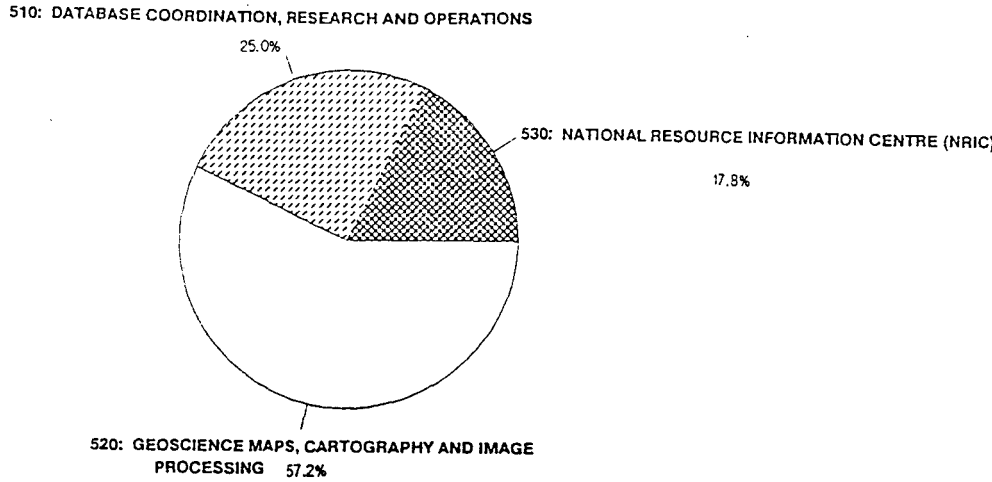
NATIONAL GEOPHYSICAL OBSERVATORIES AND ANTARCTIC SURVEYS - $3 960 000



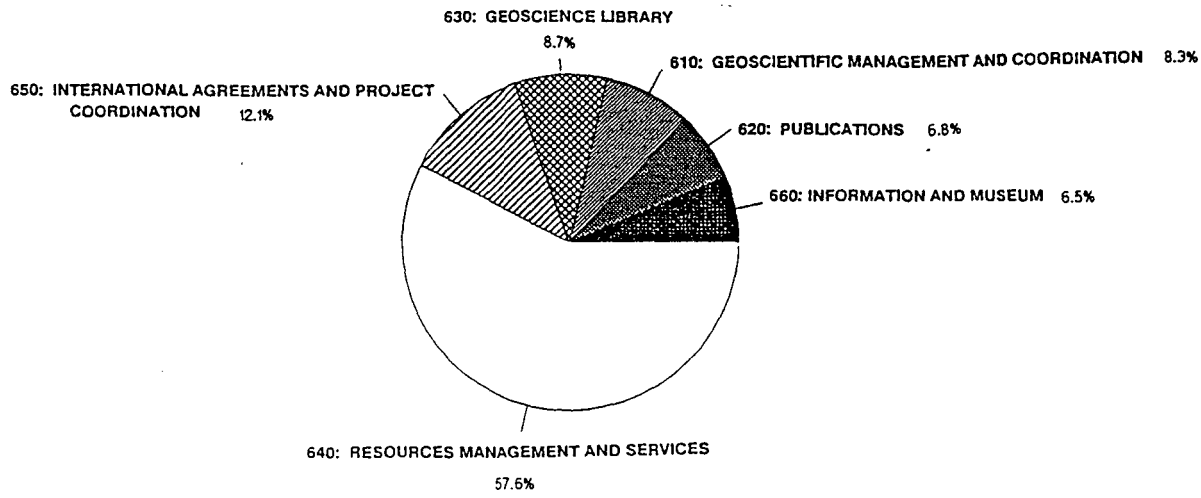
PETROLEUM AND MINERALS RESOURCE ASSESSMENT - $3 323 000



NATIONAL GEOSCIENCE DATABASES - $4 877 000



BMR MANAGEMENT AND INFORMATION - $5 658 000



As previously noted, the planning of sophisticated and expensive exploration programs is highly dependent on the assessment of existing knowledge which determines the conceptual approach to the search for the 'chosen targets ' and provides the framework within which successful exploration programs can be mounted.

As Professor David Boyd, as President of the Geological Society of Australia, recently pointed out:

> "Discoveries do not come directly from published data. They are the result of the combination of the results of long term systematic investigations by the government departments with the special insight provided by the mineral exploration groups: success usually depends on the contribution from both parties, though often more credit goes to the explorers. The future is not likely to be so different from the past; the mineral and the oil discoveries which we need to carry us into and through the next century will depend on the work which has been done over the last three decades and which must be continued; for the time between the basic mapping and related studies and the discoveries is often long and to neglect the basic work now will hazard the success of the next generation."

In 1969 and 1982 analyses of BMR's contribution to the discovery and development of mineral and petroleum occurrences in Australia were summarised in Hansard (Appendix 2.1). The record is a highly impressive one.

This contribution is widely acknowledged in the industry as was documented in the ASTEC report on BMR (pp 10-11) which concluded that BMR would be required to play an even more important role in future.

The contributions by BMR since 1980, in adding to the geoscientific information base and developing concepts, provide the continuing support that is needed for Australia to maintain its competitive position. In many cases the basic information and concepts provided by BMR will have made a contribution to successful exploration. Each Division has provided detailed comments on the relevance and quality of its programs in this regard in Part II of this submission.

BMR'S CONTRIBUTION TO THE DISCOVERY OF PETROLEUM AND MINERAL DEPOSITS

(1) Extract from Hansard February 16 1982 summarising BMR contribution to the discovery of petroleum and mineral deposits

(2) Extract from Hansard February 26 1967 summarising BMR contribution to the discovery of petroleum and mineral deposits

Dr Robert W. Boden	IUCN Commission on Ecology
Ms Elizabeth Bourne	Queensland Conservation Council
Mr Bruce Davis	Australian Heritage Commission, Australian Conservation Foundation—reserve delegate
Mr H. C. Dorman	National Parks Association of N.S.W.
Dr Peter Ellyard	Observer
Mrs Pamela J. Eiser	Project Jonah
Mr Russell Gluck	IUCN Commission on Ecology
Mr Dewar W. Goode	Conservation Council of South Australia
Ms Annette E. Greenall	IUCN Commission on Education
Mr Brian P. Guilfoyle	Australian Council of National Trusts National Trust of Australia (N.S.W.) IUCN Species Survival Commission
Mr Eddie Hegerl	IUCN Commission on Ecology Chairman, COE Working Group on Mangrove Ecosystems
Mr David A. T. Holmes	Forestry Commission of N.S.W.
Mr Donald A. Johnstone	National Parks and Wildlife Service (N.S.W.) IUCN Commission on National Parks
Dr R. Jones	Tasmanian Wilderness Society
Mr Graeme G. Kelleher	Great Barrier Reef Marine Park Authority
Mr Michael Kennedy	Friends of the Earth Australia Funds for Animals Ltd Australia
Dr John H. Leigh	IUCN Species Survival Commission
Mr Goff A. Letts	Conservation Commission Northern Territory
Dr Donald F. McMichael	Department of Home Affairs and Environment IUCN Treasurer and Regional Councillor
Professor Harry Messel	IUCN Species Survival Commission
Dr J. Geoff Mosley	Australian Conservation Foundation
Dr Ken Myers	IUCN Species Survival Commission Lagomorph Specialist Group
Professor J. Derrick Ovington	Australian National Parks and Wildlife Service Chairman, IUCN Commission on Ecology
Mr Thane Riney	Observer
Dr Graham W. Saunders	National Parks and Wildlife Service, Queensland
Mr John Sinclair	Fraser Island Defenders Organisation Ltd Australian Conservation Foundation IUCN Commission on Environmental Planning
Ms Hilary E. J. Skeat	Australian National Parks and Wildlife Service IUCN Commission on Ecology
Dr Leonard J. Webb	IUCN Commission on Ecology
Mr Murray Wilcox	Australian Conservation Foundation
Dr George R. Wilson	Department of Home Affairs and Environment IUCN Species Survival Commission

(2) Those receiving Commonwealth Government assistance were Dr D. F. McMichael, Professor J. D. Ovington, Dr G. R. Wilson, Dr R. Boden, Ms H. Skeat and Mr G. Kelleher.

(3) Dr McMichael and Dr Wilson from the Department attended, their travel and expenses were paid by the Government.

(4) The Secretary of the Department, Dr McMichael and the Director of the Australian National Parks and Wildlife Service, Professor Ovington, attended the conference. Their expenses were met by the Commonwealth Government.

Convention on the Elimination of All Forms of Discrimination against Women

(Question No. 3239)

Mr Hayden asked the Minister for Foreign Affairs, upon notice, on 24 September 1981:

(1) Further to the answer to question No. 1 (*Hansard*, 24 February 1981, page 46), which countries have now ratified the Convention on the Elimination of All Forms of Descrimination Against Women.

(2) When did or will the Convention enter into force.

(3) Which States have agreed to Australia ratifying the Convention.

(4) When is it expected that Australia will ratify the Convention.

Mr Street—The answer to the honourable member's question is as follows:

(1) The following countries have ratified or acceded to the Convention: Cuba, Sweden, Portugal, Poland, Hungary, German Democratic Republic, China, Guyana, Barbados, Dominica, Cape Verde, USSR, Byelorussian SSR, Rwanda, Ukrainian SSR, Mexico, Norway, Haiti, Mongolia, St. Vincent and the Grenadines, the Philippines, Bhutan, El Salvador and Laos.

(2) The Convention which requires the ratification or accession of 20 States Parties to come into effect entered into force on 3 September 1981.

(3) The Convention is being examined in detail by the Commonwealth and States through the medium of the Meeting of Ministers on Human Rights. To date no decisions have been reached as to the basis on which Australia might ratify the Convention, although a good deal of progress has been made.

Bureau of Mineral Resources: Mineral and Petroleum Discoveries

(Question No. 3254)

Mr Hayden asked the Minister representing the Minister for National Development and Energy, upon notice, on 13 October 1981:

(1) Which mineral and petroleum discoveries, and extensions to known deposits, have been made since 1960 (a) by the Bureau of Mineral Resources, (b) after the BMR found strong evidence of mineralisation, or of the locality being highly prospective, (c) using results of geophysical or other

surveys conducted by the BMR or (d) with other assistance from the BMR.

(2) What is the size and value of each of these discoveries and what stage of development has been reached in each case.

Mr Anthony—The Minister for National Development and Energy provided the following answer to the honourable member's question:

(1) and (2) The petroleum and mineral exploration industries have acknowledged the importance of the Bureau of Mineral Resources' (BMR) role in providing the basic scientific framework in which private exploration efforts are undertaken. However, it is not generally possible to attribute specific mineral discoveries to basic geological work published by the Bureau.

The link between BMR's geophysical surveys and discoveries of particular mineral deposits is sometimes more specific. BMR's magnetic, radiometric, and gravity surveys, and subsequent publication of maps, have resulted in some of the indicated anomalies being drilled and deposits outlined by private enterprise. Examples include the Savage River (Tasmania) iron ore deposits, the Galilee Basin (Queensland) coal deposits, Olympic Dam (Roxby Downs, South Australia) copper-uranium-gold deposit, the Nabarlek and Ranger (Northern Territory) uranium deposits, the Yeelirrie (Western Australia) uranium deposits, and the Agnew-Mount Keith (Western Australia) nickel deposits. In 1968, BM identified, by a marine seismic survey, most of the petrolet structural trends on the North West Shelf and the Exmou Plateau, subsequently tested by private companies and, in t case of the North West Shelf, now in the process of develc ment. A large number of Australia's petroleum discover were also assisted through subsidies paid under the Petrolet Search Subsidy Act which operated from 1957 to 1974. T BMR was responsible for examining and recommendi applications for subsidy under the Act and for oversight subsidised operations.

Major mineral and petroleum discoveries are shown in t table below together with estimates of reserves prior to co mencement of production. No 'category (D)—BMR pr vided other assistance' has been shown on the table becau the use of basic information provided by BMR would be a fa tor, directly or indirectly, in most Australian discoveries minerals and petroleum. The value of the petroleum and m eral deposits, in the discovery of which BMR has had some volvement, is difficult to quantify, and depends on facto such as location, grade, size of orebody or reservoir, pr duction and initial treatment costs, world metal and fu prices, and the world political and economic situation. Ho ever, with the 1980 production of minerals and petroleu alone valued at 7.5 billion dollars, the overall value of su discoveries can conservatively be placed at several billi dollars.

BMR ASSISTED PETROLEUM DISCOVERIES SINCE 1960

Locality and details (fields)	Initial recoverable identified resources[a] (gas—billion (10^9) m^3 natural gas liquids[b]—million kilolitres crude oil—million kilolitres)	BMR contribution[c]	Stage of development
Queensland—			
Pickanjinnie (gas)	0.358	(C)	Production
Glentulloch (gas)	n.a.	(C)	N.C.
Moonie (oil)	oil and natural gas liquids—3.74	(C)	Production
Bony Creek (gas)	0.605	(C)	Production
Blyth Creek (gas)	V.S.	(C)	N.C.
Snake Creek (gas and oil)	0.037	(C)	S.I.
Black Creek (gas)	0.011	(C)	N.C.
Oberina (gas)	0.054	(C)	N.C.
Yanalah (gas)	0.03	(C)	Production
Raslie (gas)	0.155	(C)	Production
Trinidad (oil)	oil and natural gas liquids—0.017	(C)	N.C.
Pine Ridge (gas)	0.111	(C)	S.I.
Maffra (gas and oil)	oil and natural gas liquids—0.018; gas—0.014	(C)	Production
Cabawin (gas and oil)	oil and natural gas liquids—0.008; gas—n.a.	(B) (C)	Production
Tarrawonga (gas)	0.315	(C)	Production
Lydon Caves (gas)	0.055	(C)	N.C.
Duarran (gas and oil)	oil and natural gas liquids—0.002; gas—0.013	(C)	S.I.
Walumbilla (gas)	0.062	(C)	S.I.
Victoria (offshore)—			
Barracouta (gas)	oil—3.1, natural gas liquids—14.0, gas—50.3	(C)	Production
Marlin (gas and oil)	oil—0.2, natural gas liquids—38.6, gas—77.9	(C)	Production
Halibut (oil)	oil—112.0, natural gas liquids—6.2, gas—1.0	(B) (C)	Production
Kingfish (oil)	oil—196.0, natural gas liquids—20.8, s—8.2	(B) (C)	Production
Western Australia (onshore)—			
Yardarino (gas and oil)	gas—0.04; oil is negligible	(B) (C)	Production (gas only

Locality and details (fields)	Initial recoverable identified resources[a] (gas—billion (10^9) m^3 natural gas liquids[b]—million kilolitres crude oil—million kilolitres)	BMR contribution[c]	Stage of development
Dongara (gas)	oil—0.323, natural gas liquids—0.047, gas—11.12	(C)	Production
Gingin (gas)	n.a.	(B)	Abandoned
Bonaparte (gas)	n.a.	(C)	Still being assessed
(Offshore)—			
Barrow Island (oil)	oil—40.65, natural gas liquids—0.61, gas—13.44	(C)	Production
Pasco Island (gas and oil)	n.a.	(C)	Suspended
Scarborough No. 1, (Exmouth Plateau) (gas)	not known	(C)	Plugged and abandoned
Blina Nos. 1 and 2 (oil)	n.a.	(C)	Long-term production testing
North Rankin (gas)	natural gas liquids—40.5; gas—233.0	(C)	Production platform being built. The field will produce in 1984
Northern Territory—			
Mereenie (oil and gas)	oil—9.5-15.9[d]; gas—14.2-24.07[d]	(B) (C)	Suspended for possible future production
Palm Valley (gas)	2.8	(B)	Suspended for possible future production

BMR ASSISTED NON-PETROLEUM DISCOVERIES SINCE 1960

Locality and details	Initial identified resources[a] (tonnes)	BMR contribution[c]	Stage of development
Queensland—			
Kings Plains (tin)	65 million m^3. Average grade: 136 g/m^3 cassiterite (cut-off grade 89 g/m^3)	(A)	Feasibility study underway
Blackwater district (coal)	about 6,500 million	(C)	Production
German Creek-Goonyella district (coal)	about 5,000 million	(C)	Production
Galilee Basin (coal—sub-bituminous)	Alpha area—1260 million. Pentland area—large reserves mineable by open-cut methods, and thick underground mineable seam	(C)	Exploration
Springsure (bentonite)	Probable 16 million	(A)	Not worked
Miles (bentonite)	n.a.	(A)	Production
Yuleba (bentonite)	n.a.	(A)	Not worked
Greenvale (nickel)	45 million, 1.57 per cent Ni, 0.11 per cent Co	(A)	Production
Duchess (phosphate)	1370 million, (18 per cent P_2O_5 cut-off)	(B)	Production
Yelvertoft-Lady Annie (phosphate)	Lady Annie 480 million (18 per cent P_2O_5 cut-off), Yelvertoft n.a.	(C)	Feasibility studies under way.
Tasmania—			
Savage River (iron ore)	100 million	(C)	Production
South Australia—			
Olympic Dam (Roxby Downs) (copper-uranium-gold)	n.a., but greater than 500 million tonnes of mineralisation	(C)	Exploration and metallurgical investigations under way
Western Australia—			
Darling Range (bauxite)	about 500 million	(C)	Production
Kambalda (nickel)	about 36 million, 3.28 per cent Ni	(C)	Production
Widgiemooltha (nickel)	0.9 million, 1.23 per cent Ni	(C)	Exploration
Scotia (nickel)	1.25 million, 3.07 per cent Ni	(C)	Worked out
Nepean (nickel)	0.45 million, 4 per cent Ni	(C)	Production

Locality and details	Initial identified resources[1] (tonnes)	BMR contribution[4]	Stage of development
Agnew (nickel)	45 million, 2.05 per cent Ni	(C)	Production
Mount Keith (nickel)	(high-grade ore) n.a.	(C)	Exploration
Yeelirrie (uranium)	47,000 contained U_3O_8	(C)	Exploratory drillin and metallurgica test work under wa A pilot plant operating at Ka goorlie
Mayningee (uranium)	n.a.	(C)	Testing continues
Lake McLeod (potash)	n.a.	(C)	Mine closed
Northern Territory—			
Rum Jungle Creek South and district (uranium)	about 3,500, contained U_3O_8	(B)	Worked out
Warrego-Tennant Creek (copper and gold)	about 7 million: approx grades 2.8 per cent Cu, 6 g/t Au, 0.3 per cent Bi	(C)	Production
Woodcutter's, Rum Jungle (lead and zinc)	n.a.	(A)	Exploration
Nabarlek (uranium)	12,000, contained U_3O_8	(B)	The deposit has bee mined out and th ore stock piled Yellowcake (U_3O_8 production has com menced
Groote Eylandt (manganese)	490 million	(A)	Production
Ranger (uranium)	124,700, contained U_3O_8	(B)	Production

Notes—

(1) Initial identified recoverable resources comprise estimates of total identified resources with no allowance for depletion b production.

(2) Initial identified resources comprise estimates of total identified resources with no allowance for depletion by mining resource losses during extraction and processing.

(3) Natural gas liquids comprise condensate and liquefied petroleum gas (LPG).

(4) BMR Contribution: (A) discovery made by BMR; (B) BMR found strong evidence of the locality being 'highly pr spective'; (C) BMR provided results of geophysical or other surveys.

(5) Actual recoverable resources will depend on the recovery factor to be determined by testing.

n.a. not available.

N.C. not connected for production: well(s) drilled and production tested but no gathering system (e.g. flow-meters intra-well pipelines etc) in place.

S.I. shut in: well(s) drilled and production tested; gathering system (e.g. flow-meters, intra-well pipelines, etc) in place; ma be activated for production at short notice.

V.S. very small.

Uranium Enrichment Group of Australia

(Question No. 3294)

Mr Hayden asked the Minister representing the Minister for National Development and Energy, upon notice, on 13 October 1981:

(1) Has the Uranium Enrichment Group of Australia reported to the Government.

(2) Will the report of the Group be made public; if not, why not.

(3) What were the findings, conclusions and recommendations of the Group on its pre-feasibility study on the establishment of a commercial enrichment industry in Australia.

(4) In particular, what findings, conclusions and recommendations were made with regard to (a) enrichment technologies, (b) available markets for enrichment services, (c) the costs of establishment of such an industry, (d) the employment effects of such an industry, (e) suitable sites for its establishment, (f) when a local industry could begin production, (g) the environmental consequences of such an industry, (h) the possible ownership arrangements of technology used, and of any producing operation, (i) the future price of enrichment services, (j) nuclear non-proliferatio safeguards, safety and security aspects of the establishment a uranium enrichment industry and (k) Commonwealth an State responsibilities in the ownership, control, regulation an monitoring of such an industry.

(5) What assistance was provided by the Australian Atom Energy Commission in the UEGA study and report, what w the cost of this assistance and was the UEGA required to pa for this assistance.

Mr Anthony—The Minister for National D velopment and Energy has provided the followi answer to the honourable member's question:

(1) (2) (3) and (4) The Uranium Enrichment Group Australia (UEGA) presented its Pre-Feasibility Study Rep for the establishment of a Uranium Enrichment Industry Australia to the Government on 30 April 1981, which Rep was tabled in the Senate 26 November 1981.

(5) The Government made available to the UEGA t Technical advice of the AAEC for the Pre-Feasibility Stud Topics on which advice was given included assessment of t world demand for and supply of enrichment services, status enrichment technologies, comparison of information provid

C of A. Parliamentary Debates. 26 Feb. 1969

DUMPING

Senator KEEFFE—My question is directed to the Minister for Customs and Excise. How many charges currently are being preferred against overseas firms and/or Australian firms for the alleged dumping of cars and other manufactured goods on the Australian market? Can the Minister inform the Parliament of the various categories of goods being dumped?

Senator SCOTT—I cannot give that information off the cuff. I ask the honourable senator to place his question on the notice paper and I will obtain a detailed reply for him. This sort of thing is going on all the time.

TAXATION

Senator WHEELDON—I address my question to the Minister representing the Treasurer. Has favourable consideration yet been given by the Treasurer to the request by the Royal Agricultural Society of Western Australia, whose value to the primary industries of that State is well known, that it be granted assistance by the Government allowing all donations to the Society to be regarded as deductions for income tax purposes, and by the granting to the Society of the same exemption from the payment of sales tax as is allowed in the case of payments made by the Society for printing?

Senator ANDERSON—I have not the information. I will seek to get it for the honourable senator.

REPATRIATION

Senator McKELLAR—Yesterday Senator Poyser asked me a question relating to the Central Training Committee. He wanted to know whether it was possible for an applicant to appear personally before the Committee. I told him that I did not think so but I would make inquiries. I have done so and I find that no provision is made for an applicant to appear in person. There was no such provision in civil cases during the 1939-45 war and the Korean war.

LUBRICATING OILS

Senator GEORGES—I direct my question to the Minister for Customs and Excise. I remind him that on 13th February he issued a statement that a small increase is likely in the price of petrol. Will the Minister assure Australian motorists that spectacular rises expected soon in the prices of lubricating oils will not seriously offset the advantage of the control achieved in petrol prices?

Senator SCOTT—I am not able to answer off the cuff as to increases in the prices of lubricating oils. However, I can tell the honourable senator that because of recent negotiations between the Prime Minister and Esso-BHP it is not expected that the travelling public will have to pay large increases in the price of motor spirit. Until 17th September 1970 the price of crude oil produced by Esso-BHP will not exceed $2.47 a barrel, whereas under the previous agreement reached after negotiations the price would have been $3.17 or $3.19. The difference in those prices indicates that there will be a very small increase, if any, in the price paid for petrol by the Australian travelling public.

QUESTIONS ON NOTICE

Senator ANDERSON (New South Wales—Minister for Supply)—I remind honourable senators that there are many questions on the notice paper. It seems to me that except where an honourable senator particularly indicates his preference to have a question on notice and the answer read, the questions and answers might be incorporated in Hansard. I would be prepared to move that that practice be followed.

Senator COHEN (Victoria)—I am aware that that practice has been followed before, but some honourable senators of the Opposition have specifically desired to have questions and answers read. I do not know whether that is the case with any questions to which answers are to be supplied today.

The PRESIDENT—Is the Senate agreeable to the course proposed by the Leader of the Government in the Senate? There being no objection, that course will be followed.

MINERAL, OIL AND GAS DISCOVERIES

(Question No. 518)

Senator COHEN asked the Minister representing the Minister for National Development, upon notice:

1. How many major discoveries of various mineral deposits, oil and gas were made in 1960-61 and each subsequent financial year?

2. What, approximately, were the increases in various estimated reserves, in each of the above years, as a result of these discoveries?

3. To how many of these discoveries did officers of the Bureau of Mineral Resources contribute by way of (a) making the discovery itself, (b) finding strong evidence of mineralisation, or other evidence that the discovery locality was likely to be highly prospective, and (c) provision of results of geological, geophysical or other surveys?

Senator SCOTT—The Minister for National Development has supplied the following answers:

1. There is difficulty in deciding where the line should be drawn when considering what mineral discoveries should be classified as 'major'; and also between categories (b) and (c) of part 3 of question on the area of contribution of the Bureau of Mineral Resources towards discoveries. In addition there are a number of ore bodies that are currently being developed, or are in production that cannot really be described as completely new discoveries. They are adjacent to or extensions of ore bodies discovered and worked many years ago. Other deposits were known for many years but were not, until recently, exploited because of their situation as regards export markets, transport, technology, etc. Also the question on allocating a date for a discovery is not easy. This is particularly so when, as in the Tennant Creek area, magnetic anomalies from a survey carried out one year may have to wait several years to be tested, and several more years of testing may be required to demonstrate that a mineable ore body does in fact exist. In Tasmania, substantial increases in ore reserves have been achieved at Mount Cleveland, Renison, Mount Lyell and Savage River as a result of drilling prospective areas which have been covered by Bureau of Mineral Resources geophysical surveys. These surveys played a substantial part in the selection of successful drilling targets.

A schedule of 'major' mineral discoveries is tabulated below and explanatory material added where necessary. The level of additional reserves resulting from these discoveries are shown where known.

Under the schedule detailing petroleum discoveries, only those gas discoveries whose tested rates are greater than 1 million cubic feet per day are listed. The Bureau of Mineral Resources' contribution to these discoveries is indicated, although; apart from physical and operational contributions, subsidy payments have also played a major role in the history of petroleum discoveries. Of the fifty-one discoveries listed, twenty-nine (57%) were assisted by the Petroleum Search Subsidy Act. The Bureau examined these subsidy applications and recommended them for Ministerial approval. The subsidised operations were subsequently overseen by the Bureau.

One of the Bureau's main contributions in mineral discoveries has been by way of the provision of basic and detailed information through geological, geophysical and other scientific and technical surveys on which the exploring companies drew heavily in planning and executing their exploration and development programmes. Most, if not all, companies have discussed their exploration programmes with Bureau officers, and consulted the Bureau's published and unpublished information on the areas in which they were interested.

SCHEDULE OF MAJOR MINERAL DISCOVERIES SINCE 1960-61

Year	Locality and details	Reserves	B.M.R. contribution	Remarks
1960–61	Groote Eylandt (manganese), N.T.	Substantially larger than any other Australian source	(A)	Occurrence noted during regional mapping—economic potential subsequently pointed out
	Darling Range (bauxite), W.A.	Large tonnages—of the order of 500m	(C)	Occurrence described in B.M.R. Bulletin 24 in 1954
	Moura (coking coal), Qld	Large reserves—Moura-Kianga area 1,380m tons (inferred)		
	Rum Jungle Creek South (Uranium), N.T.	650,000 tons 0.4% U_3O_8	(B)	..
1961–62	Port Curtis (ilmenite), Qld	Substantial		
	Warrego–Tennant Creek (copper and gold), N.T.	3.5m tons, 2.6% Cu, 1.2 dwt Au	(C)	Magnetic surveys
	Mount Tom Price (iron), W.A.	500m tons, 64% Fe		..
	Robe River (iron), W.A.	About 1,000m tons, 40–60% Fe		..
	Mount Whaleback (iron), W.A.	Very large, high grade		..
	Kings Plains (tin), Qld ..	74m cu yd 5.6 oz/cu yd including 29m cu yd 7 oz/cu yd	(A)	Overburden 40-50 ft. Not being developed

Year	Locality and details	Reserves	B.M.R. contribution	Remarks
1963–64	Bougainville (copper), T.P.N.G.	500m tons 0.51% Cu 0.4 dwt Au	(B)	The Panguna copper-go prospect was recon mended for examinatic as a porphyry copper in Bureau Record
1963–64	Blackwater (coal), Qld ..	Measured and inferred reserves 803m tons	(C)	..
	German Creek-Goonyella (coal), Qld	Indicated 2,300m tons ..	(C)	..
1964–65	Admiralty Gulf (bauxite), W.A.	Reserves in excess of 100m. tons	..	Economic studies continu
	Springsure (bentonite) Qld	Probable reserves 16m tons	(A)	..
	Juno, Tennant Creek (gold) N.T.	200,000 tons 55 dwt Au, 0.75% Bi, 0.5% Cu (proved)	..	From drilling magnet anomaly, Aerial Geol gical and Geophysic Survey of Northern Aus ralia Surveys
	Woods Reef (asbestos) N.S.W.	25m tons of ore ..	..	White asbestos ne Barraba N.S.W.
1965–66	Woodcutter's, Rum Jungle (lead and zinc), N.T.	Small-Medium size order of 1m tons	(A)	To be further evaluated Peko-E.Z.
	Kambalda (nickel), W.A.	1,429m tons 3.4% Ni ..	(C)	B.M.R. Magnetic Survey
	Greenvale (nickel), Qld ..	45m tons 1.55% Ni, 0.1% Co	(A)	Economics being evaluat Noted by BMR 1958/5
	Rockhampton (nickel), Qld	Large quantities in scattered deposits. Grade sub-economic at present	..	Investigated by BHP—a International Nickel
	Jamieson Range (vanadium), W.A.	100m tons, 2.42–0.8% ..	..	Discovered by West Au ralian Department Mines officers
1966–67	Duchess (phosphate), Qld	1,100m tons proved (18% P_2O_5 cut-off)	(B)	Economics being evaluat
	Lake McLeod (potash), W.A.	2,000m tons NaCl 70m tons KCl	(C)	Production 200,000 to KCl/year by 1971; b product NaCl.
1966–67	Dingo (anthracite), Qld ..	30m tons (inferred) ..	..	..
	Widgiemooltha (nickel), W.A.	Significant	(C)	B.M.R. Magnetic Surve
	Yuleba (bentonite), Qld ..	Not yet established ..	(A)	..
1967–68	Scotia (nickel), W.A. ..	1.25m tons 3.07% Ni, 0.25% Cu; 0.25m tons 1.13% (oxidised) 0.5m tons, 0.64% (disseminated)	(C)	B.M.R. Magnetic Surve
	Yelvertoft-Lady Annie (phosphate), Qld	Significant. Lady Annie 250m tons (18% P_2O_5 cut-off), Yelvertoft 500m tons plus	(C)	..
	Miles (bentonite), Qld ..	Not yet established ..	(A)	..
	Nepean (nickel), W.A. ..	Not yet established ..	(C)	B.M.R. Magnetic Survey
	Beltana (zinc), S.A. ..	730,000 tons 37% Zn, 2.9% Pb; 97,000 tons 24% Zn, 12% Pb measured. Over 1m tons inferred	..	..
1968–69	Ora Bunda–Kununalling–Broad Arrow (nickel), W.A.	Not yet determined ..	..	Lateritic type occurrenc

Note: (A)—discovery made by B.M.R.
(B)—B.M.R. found strong evidence of mineralisation or of the locality being 'highly prospective'.
(C)—B.M.R. provided results of geophysical or other surveys.

SCHEDULE OF PETROLEUM DISCOVERIES SINCE 1960-61

Year	Locality	Nature of discovery	Recoverable reserves	B.M.R. contribution	Remarks
1960–61	*Bwata, T.P.N.G.	Gas—43 MMFD	N.A.	..	..
	*Iehi, T.P.N.G.	Gas—32.6 MMCFD	N.A.	..	..
	*Pickanjinnie, Qld	Gas—6.5 MMCFD	†25,390 MMCF	(C)	To be commercially productive
1961–62	*Glentulloch, Qld	Gas—7.1 MMCFD	N.A.	(C)	..
	*Moonie, Qld	Oil—1265 BPD	†27.5 MMBBL	(C)	First commercial oilfield
1962–63	*Bony Creek, Qld	Gas—2 MMCFD	†33,360 MMCF	(C)	To become commercially productive
1963–64	*Richmond, Qld	Gas—0.12 MMCFD Oil—300 BPD	†17,800 MMCF †0.087 MMBBL	..	To become small commercial producer
	*Rolleston, Qld	Gas—43 MMCFD	†32,954 MMCF	..	To become commercially productive
	*Gidgealpa, S.A.	Gas—11.6 MMCFD Oil—42 BPD Cond.	†460,000 MMCF	..	To become commercially productive
	*Mereenie, N.T.	Gas—4.8 MMCFD Oil—N.A.	‡1,000,000 MMCF	(B) (C)	..
	*Blyth Creek, Qld	Gas—8.1 MMCFD	N.A.	(C)	To become commercially productive
	*Yardarino, W.A	Gas—13-15 MMCFD Oil—66 BPD	†500,000 MMCF	(B) (C)	..
	*Alton, Qld	Oil—480 BPD	†2.5 MMBBL	..	Second commercial oilfield
	*Snake Creek, Qld	Gas—No. 1 4.6 MMCFD No. 2 12.5 MMCFD Oil—No. 3 70 BPD	†10,180 MMCF	(C)	..
	Back Creek, Oberina, Qld			(C)	March 1964 February 1965
1964–65	*Barrow Island ..	Oil—985 BPD	†200 MMBBL ..	(C)	Third commercial oil field
	*Yanalah, Qld ..	Gas—No. 1 3.2 MMCFD No. 3 1.4 MMCFD	N.A. N.A.	(C)	
	*Conloi and Bennett, Qld	Oil	†0.412 MMBBL ..	..	Single-well oil producers, Bennett, October 1965
	*Gilmore, Qld ..	Gas—7.3 MMCFD ..	†41,000 MMCF ..	..	
	*Bonaparte, W.A. ..	Gas—1.54 MMCFD ..	N.A.	(C)	
	*Rashe, Qld ..	Gas—4.1 MMCFD ..	N.A.	(C)	
	*Barracouta, Vic. ..	Gas—6.85 MMCFD ..	†1,800,000 MMCF	(C)	To become commercially productive
	*Mount Horner ..	Oil—23.5 BPD	N.A.	..	
	Trinidad, Qld ..	Oil—129 BPD	†0.107 MMBBL ..	(C)	
	*Palm Valley, N.T. ..	Gas—14 MMCFD ..	†13,200 MMCF ..	(B)	To become commercially productive
	Pine Ridge, Qld ..	Gas—4.6 MMCFD ..	†12,760 MMCF ..	(C)	
	Mafira, Qld ..	Gas—7.3 MMCFD ..	N.A.	(C)	
		Oil—45 BPD	N.A.	..	
	*Gingin, W.A. ..	Gas—12 MMCFD ..	N.A.	(B)	
	*Arrowsmith W.A. ..	Gas—4 MMCFD ..	N.A.	..	
	Major, Qld ..	Gas—2 MMCFD ..			
	Leichhardt, Qld ..	Cond. 79 BPD	†5,531 MMCF	..	Cabawin 1960, Leichhardt 1966
	*Cabawin, Qld ..	N.A.		..	
		N.A.	..	(B) (C)	
1965–66	Tarrawonga, Qld ..	Gas—3 MMCFD ..	†9,260 MMCF ..	(C)	
	*Marlin, Vic. ..	Gas—11.5 MMCFD ..	†3,500,000 MMCF	(C)	To become commercially productive
		Oil—1,182 BPD ..	‡107 MMBBL ..	..	Fourth commercial oilfield to become productive
	Moomba, S.A. ..	Gas—5.8 MMCFD ..	†600,000 MMCF ..	..	To become commercially productive
	Lyndon Caves, Qld..	Gas—2.5 MMCFD ..	N.A.	(C)	
1966–67	Dongara, W.A. ..	Gas—7 MMCFD ..	†500,000 MMCF ..	(C)	
	Pasco Island, W.A...	Gas—1.7 MMCFD ..	N.A.	(C)	
		Oil—N.A.			
	*Duarran, Qld ..	Oil—(No. 2) 1,000 BPD ..	†0.210 MMBBL ..	(C)	
		Gas—(No. 5) 3.6 MMCFD	†850 MMCF		
	Walumbilla, Qld ..	Gas—20 MMCFD ..	†3,900 MMCF ..	(C)	
	Kingfish, Vic. ..	Oil—1,500 BPD ..	‡1,060 MMBBL ..	(B) (C)	Fifth oil field to become commercially productive
1967–68	Halibut, Vic. ..	Oil—3,230 BPD ..	‡440 MMBBL ..	(B) (C)	Sixth oil field to become commercially productive
	Hope Creek, Vic. ..	Gas—2 MMCFD ..	†2,350 MMCF		
	Pringle Downs, Qld..	Gas—3.4 MMCFD ..	N.A.		
		Oil—20 BPD			
	Yarrawonga, Qld ..	Gas—1.5 MMCFD ..	N.A.		
	Daralingie, S.A. ..	Gas—7 MMCFD ..	N.A.		

Year	Locality	Nature of discovery	Recoverable reserves	B.M.R. contribution	Remarks
1968–69	Barracouta, Vic. ..	Oil—3,200 BPD ..	N.A.		Seventh oil field to become commercially productive
	Flounder, Vic. ..	Oil—N.A.	N.A.		
	*Pasca, T.P.N.G. ..	Gas—7.2 MMCFD .. Cond.—2,450 BPD	N.A.		
	Legendre, W.A. ..	Oil—1,014 BPD ..	N.A.		

N.A. — not available; MMCF — million cubic feet; MMCFD — million cubic feet per day; MMBBL — million barrels; BPD — barrels per day; * — subsidised operation; † — proved; ‡ — proved and probable; (A) — discovery made by B.M.R.; (B) — B.M.R. found strong evidence of the locality being 'highly prospective'; (C) — B.M.R. provided results of geophysical or other surveys.

SCHOOL DENTAL SERVICES

(Question No. 569)

Senator COHEN asked the Minister representing the Minister for Education and Science, upon notice:

1. How many Australian States have school dental services?

2. What services are available to children in States that have such services?

3. In each State, how are the services financed and what charges are made to parents?

4. What was the cost of these services in each of the Australian States in each year since 1960?

5. What is the number of qualified dentists employed in these services in each of the Australian States?

Senator WRIGHT—The Minister for Education and Science has provided the following replies to the honourable senator's questions drawn from information he has received from the State Departments of Education:

1. All the States of the Commonwealth of Australia have school dental services.

2. New South Wales—The service is a partial one only. Only one-eighth of the school population is examined each year. Dental treatment is still primarily the responsibility of the parent.

Victoria—Dental treatment is limited to primary school children. In the country, priority is given to areas of scattered population remote from dental facilities, and these children are treated in mobile dental units. Limited numbers of metropolitan children are treated at school dental centres. Country and metropolitan children's institutions are also visited. No child is treated unless parental consent has been previously given.

Queensland—The school dental service carries out dental inspections and gives treatment to primary school children where the written consent of the parents is given. Throughout the State, primary schools beyond a radius of 15 miles of a hospital dental clinic are visited by school dental services.

South Australia—The present policy of the South Australian school dental service provides a service for government primary school children (Grade I-VII) in country areas where there are no resident dental practitioners. The range of treatment is generally confined to prophylaxis, fillings, extractions and minor orthodontic cases. The service also provides dental health education to children and mothers' clubs. The children at six Social Welfare Department institutions in Adelaide are treated during the school vacations. An emergency service is offered to pre-school and secondary school children in regions visited.

Western Australia—Examination and treatment services are provided to selected children. The age group treated is generally under 9, but in small outlying schools all children are treated. In the north-west all children are treated free of cost.

Tasmania—All school children in Tasmania are treated irrespective of the schools they attend. At the present time comprehensive treatment for new patients is limited to the pre-school and grades I, II and III, but this is only until the situation is brought under control when it will then be the aim of the service to treat all children up to school leaving age.

3. New South Wales—The services are financed mainly from consolidated revenue. Of the $400,000 per annum expended, approximately $30,000 is from loan funds for builings, etc. The service, which includes orthodontic treatment and dentures, is entirely free of charge.

Victoria—The cost is met by the Department of Health. No charges are made to parents.

Queensland—The school dental service is financed by the State Government. No charge is made.

South Australia—The service is financed by the State Government and the children receive free dental treatment.

Western Australia—The service is provided free of cost.

Tasmania—The service is provided free of cost.

4. New South Wales—The cost of the dental service in each year since 1960 has been approximately $400,000 per annum including approximately $30,000 per annum capital expenditure for buildings, mobile clinics, etc.

(c) Relations with Other Organisations

CSIRO

Relations between DPIE and CSIRO are different in the mineral and petroleum area from those in the renewable resources area. The great bulk of Government research in primary industry is carried out in CSIRO, principally in the Institutes of Animal Production and Processing, and of Plant Production and Processing. Other matters including land management issues are undertaken in the Institute of Natural Resources and Environment; the relevant assessment function is a responsibility of the BRR.

In the minerals area, by contrast, a substantial part of government funded research is carried out by BMR within DPIE.

When BMR was established in 1946, a deliberate decision was taken not to place it in CSIRO.

As a result, DPIE has vertical integration with respect to mineral and petroleum resources from policy considerations through resource assessment (Resource Assessment Division in BMR) to strategic research relating to exploration (research divisions in BMR). This allows close integration between research and resource assessment, and the provision of comprehensive, independent advice concerning the exploration industry.

However, this integration does not extend to exploitation-related research, that is in mineral beneficiation and processing which is largely carried out in CSIRO Institute of Minerals, Energy and Construction. Indeed, substantial exploration related research is also carried out in CSIRO.

In 1979 there was an agreement between the Department and CSIRO which effectively meant that CSIRO would restrict itself to exploitation related research whilst BMR would undertake all exploration related research.

. In 1982 the implementation of this agreement was modified at Ministerial level in recognition of the fact that CSIRO was very well established in exploration technique development and that it would not be possible for BMR to take over that role in the foreseeable future.

. A Minerals (Exploration) Research Liaison Committee (MERLCO) was set up at this time to oversee the necessary functional rationalisation and also to examine programs so as to avoid overlap and promote cooperation. Its terms of reference were:

(1) To propose the mechanisms and the timetable of functional rationalisation in the light of the functional rationalisation and demarcation guidelines agreed between BMR and CSIRO.

(2) To examine proposed research programs before they are implemented, in order to avoid overlap and to promote cooperation.

(3) To report annually (and at other times if necessary) to the Chairman of CSIRO and the Secretary, Department of Resources and Energy on appropriate action arising from the discussions in 1 and 2.

. Subsequent discussions in 1984 involving the Chairman of CSIRO and the Secretary of the Department of Resources and Energy led to broad concurrence that the 1979 Agreement would remain the basis for cooperation between the two organisations.

. In BMR's view functional rationalisation has not proceeded as far as desirable, whereas CSIRO considers that all necessary functional rationalisation has occurred. (See Part I Section 5 of this submission.)

State Geological Surveys

The AMEC meeting in August 1982 approved arrangements for consultation on programs between BMR and the State Geological Surveys to ensure that duplication is avoided and that satisfactory programs are developed. In accordance with these arrangements:

. About March each year BMR advises the appropriate Department of each State, for information and comment, of BMR's proposed research program relevant to that State for the following financial year and gives an indication of work proposed for the following two years.

- BMR has discussions as appropriate with State Geological Surveys on new BMR project proposals so that there is no overlap of effort and in order to explore the possibility of joint ventures.

- The Director, BMR is a member of the Geological Survey of Western Australia Liaison Committee.

Responses from the States to BMR's recent programs indicate that these arrangements are continuing to work satisfactorily.

AMEC has agreed that closer cooperation should be developed to allow more accurate assessments of Australia's resources, particularly petroleum.

Following a recommendation from the Government Geologists' Conference and endorsed by AMEC that BMR "be given the responsibility for coordinating Government geoscience data activities and developing suitable standards", a National Geoscience Databases Policy Statement prepared by BMR was endorsed by AMEC in November 1986. The statement is designed to encourage and coordinate Australia-wide geoscientific and mineral databases.

The State Governments of Queensland and South Australia are closely involved in BMR's earthquake monitoring program. In South Australia the Sutton Institute of Earthquake Physics has some financial support from BMR.

Universities

Universities have an important role in basic research. They also often house expertise which enables them to provide consulting services to industry in applied research fields. They are not equipped to carry out major strategic programs in the national interest, but there is great mutual benefit to be obtained from their participation in BMR's strategic programs. For BMR, this allows additional manpower and expertise to be brought to bear on important projects; for the universities, these projects provide excellent training for honours and post-graduate students. In particular, these projects generally provide training in the basic skills of geological mapping, an aspect which is greatly welcomed by the exploration industry.

Universities have formal involvement with BMR through the BMR Advisory Council and through the National Coordinating Committee for Marine Geosciences, chaired by the Director of BMR. There are also many informal contacts and, wherever practicable, BMR seeks to involve universities in its program. In recent years this has been particularly fruitful in BMR's major study of the Mt Isa metallogenic province, through the Tripartite marine geoscience program in the SW Pacific, and through the operation of BMR's post-doctoral fellowship scheme. It is expected that most Australian universities will become involved in the international Ocean Drilling Program and this will bring great benefit to BMR's Continental Margins Program and also provide excellent training for future recruits to BMR's program.

Universities are also closely involved with BMR in the Observatories program. A number of stations in the seismic network are operated by universities and BMR supports part of the costs by contract. This is a most cost-effective arrangement with mutual benefits.

Other DPIE Bureaux

The Bureau of Rural Resources (BRR) was established to monitor, evaluate and promote science and technology and resource management activities in agriculture, forestry and fisheries and to assist in the development of appropriate policies at the federal level. BRR does not carry out strategic research but it provides a link between DPIE and the research carried out in CSIRO. Thus it has rather similar functions to those of the Resource Assessment Division of BMR.

The role of the Australian Bureau of Agricultural and Resource Economics (ABARE) is to enhance the economic performance of the Australian agricultural, forestry, fishing and mineral industries and the Australian economy by providing independent and objective economic analyses and informing the public of the economic and policy issues facing these industries.

Thus ABARE provides economic analysis of both the mineral and agricultural sectors of primary industry. BMR's Resource Assessment Division provides scientific and technical analysis of the former, and BRR of the latter.

As was noted in the ASTEC report on BMR (p.35) there is no analogue of BMR's principal strategic geoscientific research role elsewhere in the Public Service. The analogue to this is to be found in CSIRO, which has both strategic and applied research functions.

(d) Appropriate Level of Activity

The appropriate level of activity for BMR is best determined directly in response to specific national needs. However there are also other criteria which provide useful indications. These include

. The onshore and offshore areas over which Australia has jurisdiction compared with the areal responsibilities of other countries with federal systems such as USA and Canada.

. The importance of the Mining Sector to the Australian economy.

. The level of research support which the Government provides to the Mining Sector compared with that provided to the Manufacturing and Agricultural Sectors.

Comment is made against each of these criteria before returning to the question of specific national needs.

1. Areal Responsibilities

Australia has responsibilities for onshore areas roughly similar to those of Canada and the United States, and its offshore responsibilities are as large as those of any country in the world. It also has substantial responsibilities in Antarctica.

The effort which Australia puts in to geoscientific studies of its areas of responsibilities is extremely small by comparison with that of other countries such as the United States, USSR and China. It is also small in comparison with Canada and the level of effort seems to relate more closely to the size of the population and GNP rather than to areal responsibilities.

2. Importance of the Mining Sector to the Australian Economy

The Mining Sector makes a large direct contribution to GDP (8.1% in 1985/86) and a very large additional indirect contribution. It also is of overwhelming importance in its contribution to Australian exports (47% of the total in 1985/86) and the balance of payments.

3. Current level of support compared with that for Agricultural and Manufacturing Sectors.

Available data show that much less government funded research is devoted to the Mining Sector than to the Manufacturing and Agricultural Sectors.

1984/85 Figures (latest available)

Agriculture	- total	$387 m
	- Commonwealth	$180 m
Mining	- total	$102 m
	- Commonwealth	$54 m

The recent trend has been to direct more funds to support of the Manufacturing Sector in the hope of developing a more balanced economy with less dependence on the Mining Sector.

While the Manufacturing industry may be able to fill the gap in the present imbalance of trade, it is clear that Australia will remain heavily dependent on the Mining Sector for the foreseeable future. It is necessary to ensure that the resource base is maintained through the continued discovery and development of new, internationally competitive deposits. As this task becomes increasingly difficult the strategic research effort must be intensified - as was pointed out by ASTEC and as has been recently re-emphasised by the Hon. John Kerin, MP in a paper to EPAC.

Thus these national and international comparisons provide a very strong a priori argument that BMR is currently under-resourced. It may be noted that similar comparisons were recently made at the State level in a review of the Geological Survey of Western Australia. The reviewer did indeed find that the Geological Survey was under-resourced and recommendations for very substantial strengthening of activity are being prepared. (See also Fig. 4.1)

Specific National Needs

Since 1980 BMR's program has been completely restructured to meet the new role determined by Government on the basis of the ASTEC report.

Large additional responsibilities have been assumed. In particular the very great increase in the level of activity of the Mining and Petroleum Industries has required significant development of the resource assessment and database functions. The offshore marine geoscience "Continental Margins" program has been developed in response to the government policy objective of increasing Australia's level of petroleum self-sufficiency by encouraging private petroleum exploration investment offshore. This program has required the allocation of 57 staff from other areas of BMR and is still under-resourced.

In addition, specific programs in nuclear monitoring and groundwater hydrogeology have been developed in response to government policy requirements.

While some staff increases have been granted for particular initiatives (eg. 27 of the total 84 staff of the Marine Division) these have not prevented substantial reductions in the number of staff available for BMR's basic geological onshore programs. Recent overall staff reductions and the need to transfer staff to the high priority areas referred to above have forced reductions on many programs and have prevented the development of other high priority programs.

BMR's Advisory Council has recently observed "... that every possible effort should be made to ensure that the level of Government funding in support of the geosciences is consistent with the significant current and potential financial contribution made by the mining and petroleum industries to the nation. In this regard the Council is lending particular support at this time for initiatives by BMR for increased activity or development by BMR in the fields of groundwater and remote sensing".

An important view in the mineral industry is that more emphasis should be given to geological mapping in Australia, and in particular that BMR should devote more resources to the production of map syntheses of tectonic, energy resource, metallogenic, and geophysical maps of Australia, or major provinces within it, at a suitable scale. The detailed presentations by the Petrology and Geochemistry Division and of the Geophysics Division show that such activities are their main priority. However the shift of overall BMR priorities to petroleum related studies has necessarily meant that less resources have been available for minerals related activities.

In Part II of this submission, where BMR's program and objectives are discussed in detail, a number of specific deficiencies in present capabilities are identified.

(1) The need to develop regional regolith mapping programs from the present very low level of activity. This is a very high priority in order to assist exploration in the very large areas covered by regolith (ie. weathered material and superficial sedimentary deposits). It is also very important for broader issues of land management and land use. The technology has recently been developed for such studies to be carried out efficiently and effectively but there is a critical shortage of trained personnel.

In the existing major components of BMR's program there is a need to strengthen

(2) The Continental Margins program - additional support is required to ensure speedy release of data and interpretations, and for the enhancement of activities relating to prospectivity assessment.

(3) The onshore seismic program - a national committee has developed a program which could be carried out using present equipment at twice the present rate if additional operational resources were available.

(4) The Groundwater program - significant initiatives have been taken for the production of hydrogeological maps of the Murray-Darling Basins but much more needs to be done continent-wide.

Other deficiencies identified in Part II include

(5) Onshore basin analysis - much more could be done to encourage onshore petroleum exploration by a more comprehensive synthesis of all existing data and by carrying out research in identified key areas, particularly in sedimentary facies analysis.

(6) National gravity database - the current resources do not permit appropriate maintenance and augmentation of the database to meet national requirements.

In addition to these deficiencies in existing program capabilities, there is a need to enhance BMR's ability to assist in the assessment of environmental impact statements. This requires the collecting and collating of geoscience data in areas of environmental sensitivity and other areas where land-use issues arise. This also includes the Australian Antarctic Territory. BMR's geoscientific expertise can also be applied to analysis of the effects of resource development on global systems (since changes in the atmosphere and oceans are closely coupled to the lithosphere and to the utilisation of mineral resources).

Geoscientific input is needed

(1) To establish the natural base against which man-made changes can be measured (eg. natural rates of climatic and sea-level change revealed in the geological record; natural levels of 'pollutants').

(2) To help measure and assess the changes that are taking place (eg. in the natural geochemical systems, including the greenhouse effect).

Such activities are particularly relevant in view of the wider responsibilities of the DPIE portfolio and the need for geoscientific inputs to NRIC.

It is therefore recommended that formal recognition should be given to BMR's role in this area. The appropriate formal function would be:

. to help establish and coordinate the national geoscientific data base required for the consideration of land-use issues and against which environmental changes [induced by mineral and energy usage] can be measured. omit ?

In addition, there are two broad areas where shortages of particular skills/resources seriously limit BMR's ability to mount effective regional mineral province and sedimentary basin programs, and to generate a range of flexible, modern integrated products that maximise their value for exploration.

BMR field programs require a pool of young geoscientists to cope with their inherent labour-intensity. They also provide an excellent training ground for recent graduates planning a career in exploration. Contract funding to enable temporary (say 2-3 years) employment of young field geoscientists (with ASL accountability) would substantially improve output from the major field programs, and would provide valuable training that would greatly assist exploration (see article by Ian Johnson, CRA Exploration, President of the Geological Society of Australia - Appendix 2.2).

BMR is currently acquiring the technology to develop and produce a greatly enhanced range of data/information products. Optimum utilisation of this equipment requires effective technical and computer science support, to enable the huge quantity of existing and new data/information to be implemented on this technology. Internal training programs are being implemented to meet this need, but more support staff (predominantly on contract) are required, particularly to cope with the huge backlog of maps, numerical and attribute data, and other published information that need to be translated to electronic media.

It is believed that all of BMR's current program components are essential to the carriage of functions. All possible redeployment has been carried out to give maximum support to the highest priority areas. It is evident therefore that the deficiencies identified above can be remedied only through the provision of additional resources.

Two avenues for such support appear to be possible:

(1) additional government appropriation for specific additions to program, defined in terms of specific objectives over a specific time period;

(2) industry support for specific additions to program.

The opportunities for industry support are discussed in Part I Section 7 of this submission on cost recovery, and our conclusions with respect to appropriate levels of funding are given there.

The Australian Geologist

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FROM THE PRESIDENT

Geological mapping is fundamental to our science. It provides the basic knowledge on the distribution and relationship of the rocks and minerals we study. All our work can ultimately be traced back to field observations recorded in geological maps.

Traditionally we have learnt our geological mapping at universities or colleges and practised it in government surveys and in industry. Generally government mapping is regional in nature and industry mapping is more detailed. It is my understanding that universities and colleges as they always have done are still teaching mapping with greater or lesser enthusiasm; but the amount of mapping done by government and industry is in decline.

The change in character of the BMR has seen the termination of the regional mapping program which so characterised the earlier years of this fine institution. Under the new arrangements, Geological Surveys have full responsibility for mapping within individual States and Territories. Government financial restrictions and employment policies have meant that State Surveys have been doing less rather than more mapping. The control of staff numbers necessitated by tight budgets has been met by not hiring, rather than retrenchment. Our younger geologists have borne the brunt of this and the older staff retained have had less money for field work. The nett effect of these government policies, no matter how logical or justified they may appear in theory, is that less government mapping is being done and very few of our young geologists are obtaining regional mapping experience. They are the poorer for this and the science is the poorer for not having their output.

In industry there is an increasing tendency to large scale mining techniques, whether open cut or underground, which reduce the amount of mapping. It is now often physically impossible to enter an underground stope once production has commenced. A "stope round" for a geologist in such a mine typically involves observation of production draw points and drill core. Rocks are not seen in-situ and no mapping is possible. Similarly, large open cuts provide outstanding opportunities to study rocks in three dimensions by careful mapping. This is rarely done however, as the critical factors in mine planning are now judged to be drill and blast hole information. The emphasis is on assays, not geology.

A geologist who has not done geological mapping during his career is surely incomplete. A solution to any geological problem is not sound unless a geological map is part of the data. Non-mapping geology, whether it be taught or practised, is a technology rather than a full science. The end result of the non-mapping mode unfortunately, seems to be some of our highest research. One cannot question the exactness of the end measurements of such research, but one must wonder very seriously about the starting points.

The solution to this problem is I believe for each of us firstly to become aware of it. We should actively lobby our employers as to the necessity for geological mapping. Most importantly, as we are confronted with each geological problem we should question whether it is soundly based, ie that there is a sound geological map. If there is not, we should get one.

Ian Johnson

APPENDIX TO SECTION 2(d)
BACKGROUND TO DISCUSSION OF APPROPRIATE LEVEL OF ACTIVITY

Background

BMR's antecedents can be traced back at least to 1927 when a Geological Adviser was appointed to the Department of the Interior. The Geological Adviser's office was expanded during the War and, in 1942, under the Department of Supply and Development, became the Mineral Resources Survey. In March 1946 its functions were greatly expanded and the BMR came into being in June of the same year.

The Bureau's task was to provide information on, and an understanding of, the geology of Australia as a basis for the informed search for mineral resources; for this purpose, it took as its first objective the systematic geological and geophysical mapping of the Australian continent and territories. This mapping was carried out at 4 miles to the inch, later changed to a scale of 1:250,000. The systematic geophysical mapping of the entire continent on this scale has remained an important part of the work of the Bureau to this day.

The Bureau expanded during its first 20 years, as did the mining industry. In 1965 an Interdepartmental Committee reviewed the BMR in order to clarify its role and functions in relation to industry and to the State Geological Surveys. This Interdepartmental Committee made recommendations to the Government and rewritten functions of BMR were approved in 1971.

BMR staff reached a peak of 606 in 1974; in the ensuing period (the later 1970s), BMR staff declined to 496. These reductions were in response to Government constraints and Departmental adjustments.

In March 1977 a Departmental Committee (the Townsend Committee) was appointed to consider BMR's objectives and the priorities which should attach to these objectives. The Committee completed its report in April 1978. On 19 May 1978 the Prime Minister wrote to the Chairman of the Australian Science and Technology Council (ASTEC) to ask the Council to "provide advice on the future role of the Bureau of Mineral Resources, Geology and Geophysics and the appropriate level of activity, taking as a starting point the report of the Review Committee of BMR".

ASTEC reported that some of the BMR's present (that is, in 1978) activities seemed to be low in priority and some activities, such as service work, should be terminated. Nevertheless, ASTEC believed that the level of activity would need to be increased above that with the (then) present staff ceiling. "The Bureau needs to fulfil an even more important role than it does at present."

ASTEC went on to say that the staff ceiling should be maintained until priorities of work had been determined. "Notwithstanding this, the new Director should be assured that he or she will be granted some new positions so that adequate plans can be made, staff with special, needed, expertise engaged and the BMR generally upgraded as a matter of urgency."

In 1983 the then Minister, Senator Walsh, wrote:

> "I note that there has been a substantial decline in Bureau staffing since 1975-76; I also note that according to the Budget papers, despite the previous Government's June 1979 announcement of an upgraded role for the Bureau, the total employment remains below the level of four years ago.
>
> Would you please provide me with some comment on any consequences for the Bureau's work of the current staff level, in particular, whether the lower than June 1979 level of employment has had any effects of the planned upgrading of the Bureau's role."

Professor Rutland responded to this, stating inter alia:

> "Staff ceiling constraints have limited the rate at which the upgrading process could proceed because staff recruitment to meet objectives has been limited by staff wastage in relatively low priority areas. In particular, it has not been possible to meet objectives which require not only the introduction of new leadership, but also the recruitment of new groups with specialist expertise.
>
> These objectives include:
>
> (a) development of resource assessment and geoscience data base functions;
>
> (b) new research initiatives for continental margins (marine geoscience), groundwater and remote sensing studies."

In the ensuing period up to 1986/87 BMR received an increase of 27 in ASL support of the marine initiative, and 43 for the development of the resource assessment and database functions. In addition, on the initiative of Foreign Affairs, a further increase of 10 in ASL was provided in support of nuclear monitoring. These figures should not of course be seen in isolation from overall or specific staff losses during this period.

In the prior period of the early 1980s, BMR's program had been completely recast to reflect its new mandate and upgraded role. It was only after the maximum amount of redeployment possible at that time had been undertaken that support for the above initiatives was sought. As an example, BMR provided 40 staff to form the core of the marine program (only 27 were provided under new initiative provisions), and by 1988 the number has increased to 57.

Completion of additional support for the resource assessment function in 1986/87 involved consideration of individual positions at all levels, including by the then Minister, Senator Evans.

As a contribution to more general staff reductions and "efficiency dividends", BMR has, between 1986/87 and 1988/89 had its ASL reduced by 37; in 1986/87 BMR's personnel function was transferred to the Department, which involved a further 14 positions. These are not net figures, but specific losses.

3. PROGRAM FORMULATION

The processes of program formulation in BMR are comprehensive. Discussion of the 1989/90 program is already underway (July 1988) within the context of longer term program objectives.

Each Component has a specific committee; this structure is designed to ensure wide consultation within BMR and a concerted approach to objectives. The responsibilities of the Component Committees are:

1. To consider and recommend any changes in the overall objective of the component.

2. To consider relationships to other program components.

3. To consider the merits and productivity of current projects within the component and recommend any changes which would improve the integration and/or effectiveness of the component.

4. To consider the need for new projects and to prepare options for consideration by the Board of Management giving general indications of the staff and financial resources required.

5. To report via the relevant Chief to the BMR Research Committee (consisting of the Board of Management and the chairpersons of each Component Committee).

The BMR Research Committee meets annually for initial consideration of the overall program. The subsequent development of the program, and thereafter of its management, is the responsibility of the Chiefs of Division. The Director, with the Board of Management, is responsible for the overall strategy of the program.

Each Division has very numerous informal linkages with industry; these involve visits, attendances at conferences, technological and information exchanges, and collaboration. In some instances, the linkages are more formalised: thus, the Continental Margins Program is discussed with the APEA Offshore Committee, priorities for the aeromagnetic program have been developed in consultation with industry.

The program is referred to the States each year for comment under procedures endorsed by AMEC (see 2(c)).

A major change in the planning process was the establishment of the Advisory Council in October 1985. The Terms of Reference of the Council are:

To advise the Minister and the Director of BMR on:

- the objectives and priorities of BMR's research programs
- the initiation, and termination, of aspects of the program
- industrial and economic policies which impinge on BMR activities
- community interests in relation to BMR activities.

It should be recalled that BMR sought the introduction of the Council.

The Council consists of a Chairman, four appointed members, a representative of the Chief Government Geologists, a nominee of the Secretary of the Department, the Director BMR and an elected staff representative.

The appointed members are Ministerial appointments made from nominations submitted by:

- the Academy of Science (2)
- the Australian Petroleum Exploration Council (1)
- the Australian Mineral Industry Council (1)

The Chairman, Mr Bruce Webb, has an extensive background in the mineral industry and as Director General of the South Australia Mines Department, and is currently Executive Director of the Australian Mineral Foundation.

So far, Council has met two to three times a year and ensures that its meetings are timed for maximum interaction in the program formulation cycle.

Early in 1987, the Council established some principles which it recommended in the preparation of BMR's program. Significant aspects of these principles are:

. "Council recognises the importance of public funded geoscientific research in the national interest and believes that every possible effort should be made to ensure that the level of Government funding in support of the geosciences is consistent with the significant current and potential financial contribution made by the mining and petroleum industries to the nation."

. Restriction of BMR programs to projects of high priority and the need to reallocate resources where additional funding for new initiatives is unavailable.

. Continuing consultation to ensure BMR research is appropriate to its national role and that it neither competes with nor duplicates work elsewhere; wherever possible, having a complementary relationship to related research carried out elsewhere.

In further consideration of the program, it is appropriate to view the process in terms of:

. Defining national needs and translating them into appropriate strategies and priorities.

. Implementation of the program.

. The appropriateness and timeliness of the resulting data and publications.

. Review and evaluation of projects.

Whilst BMR's program is itself a strategic document, we recognise that there is a need to articulate our longer-term strategies more clearly. This submission, in particular in the comments on each operational component, aims to address that point.

Proposals for Improvements

The Carlson Report suggested that improvements might be made in the effectiveness of the Advisory Council and that it might be supported by subcommittees covering particular areas.

The Advisory Council was set up on the lines recommended by ASTEC which had also recommended that BMR be established as a Statutory Authority. The arrangement may not be the best one for BMR as an outrider of a Department where the Director of BMR is responsible to the Secretary of the Department, and where program development tends to be driven by specific government policy decisions reflecting the national interest.

An alternative arrangement has recently been adopted by the Geological Survey of Western Australia. In that arrangement, which is proving effective, a Liaison Committee with wide external representation has been established under the Chairmanship of the Director and subcommittees also deal with particular aspects of the program.

Adoption of a similar arrangement for BMR would suggest a rather larger committee than at present, with subcommittees dealing with each of BMR's major programs as follows. The subcommittees might need to meet only once or twice a year in connection with the program planning process and, as a result of this additional input, the main committee would probably need to meet only twice or three times a year, as at present.

<u>BMR Research Liaison Committee</u>

- Director, BMR (Chairman)
- Two representatives of the petroleum industry nominated by APEA
- Two representatives of the minerals industry nominated by AMIC
- Two representatives of the geoscientific community, nominated by Academy of Science
- One representative of the State Geological Surveys
- Two representatives of DPIE policy areas nominated by the Secretary
- Deputy Director, BMR

This represents an increase of three compared with the present Advisory Council. If reciprocal arrangements could be agreed, a representative of CSIRO could also be included. Two representatives of DPIE have been included in order to reflect the wide range of interactions between BMR and policy areas (see sub-committee membership below).

It would probably be desirable to establish three subcommittees in relation to BMR's research programs.

Petroleum and Water Research Sub-committee

- Deputy Director, BMR (Chairman)
- Chiefs of two BMR Divisions (onshore and offshore petroleum)
- Head of BMR petroleum assessment Branch
- FAS, Natural Resource Management Division, or nominee
- FAS, Petroleum Policy Division, or nominee
- FAS, Energy Policy and Programs Division, or nominee
- Two petroleum industry members of Advisory Council
- Two additional petroleum industry representatives
- Director, BMR

Minerals Research Sub-committee

- Deputy Director, BMR (Chairman)
- Chief, BMR Minerals and Environmental Geoscience Division
- Head of BMR minerals assessment Branch
- FAS, Minerals Commodities Division, or nominee
- FAS, Natural Resource Management Division, or nominee
- FAS, Coal and Nuclear Division, or nominee
- Two mineral industry members of Advisory Council
- Two additional mineral industry representatives
- Director, BMR

Geophysical Observatories Sub-committee

- Deputy Director, BMR (Chairman)
- Chief, Geophysical Observatories Branch
- Chief, Division of Minerals and Environmental Geoscience
- Geophysical representative from Advisory Council (Academy of Science nominee)
- University representative on behalf of contract observatories
- One representative of Department of Foreign Affairs
- One representative of DPIE from Advisory Council
- One representative of State Geological Surveys from Advisory Council
- Director, BMR

In addition, the Resource Assessment programs could be dealt with by intra-departmental committees as follows:

Minerals Resource Assessment Committee

- Director, BMR (Chairman)
- Deputy Director, BMR
- FAS, Minerals Commodities Division, or nominee
- FAS, Coal and Nuclear Division, or nominee
- FAS, Natural Resource Management Division, or nominee
- Representative of ABARE
- Branch Head, Minerals Assessment Branch
- Section Heads, Minerals Assessment Branch
- Chief, BMR Division of Minerals and Land Use

Petroleum Assessment Committee

- Director, BMR (Chairman)
- Deputy Director, BMR
- FAS, Petroleum Division, or nominee
- FAS, Energy Policy and Programs Division, or nominee
- FAS, Natural Resource Management Division, or nominee
- Representative of ABARE
- Branch Head, Petroleum Assessment Branch
- Section Heads, Petroleum Assessment Branch
- Chief, Marine Geoscience & Petroleum Geology Division
- Chief, Onshore Petroleum & Groundwater Division

Arrangements of this kind should ensure wider participation in the formal development of BMR's programs and a wider understanding of them in relevant policy areas.

The mass of data and publications resulting from BMR's program should not be underestimated. But BMR accepts the need for each project to have a specific product strategy, which in all probability will continue to change. Such a scheme is in process of implementation.

We also recognise that there is a need to develop further review and evaluation mechanisms. The recent establishment of an independent Resource Management Branch and the proposed establishment of a Corporate Division of Geoscience Management & Information Technology will greatly facilitate such development.

4. ORGANISATIONAL STRUCTURE AND STAFFING

BMR's current structure is of four research-based Divisions (Marine, Geophysics, Continental, Petrology & Geochemistry), a Resource Assessment Division, and two corporate Branches (Geoscience Planning & Information, and Resource Management). The corporate Geoscience Computing & Database Branch is at present within the Resource Assessment Division. The structure, and overall staff numbers are shown on Appendix 4.1.

The current structure reflects a number of changes from that established early in the 1980s:

- The disbandment of the joint BMR/CSIRO Baas Becking Geobiological Laboratory.

- The establishment of the Geoscience Computing & Database Branch (foreshadowed in the original proposal).

- Functional moves within the research divisions, most notably the transfer of the total seismic operations (from Geophysics to Petrology & Geochemistry).

- Some strengthening of BMR's corporate management with, in particular, the establishment at this time of an (administrative) Resource Management Branch.

Following initial appointments focused on the provision of leadership in specific disciplines, there have been major changes in BMR over the last 6-7 years, undertaken within a specialised organisation. Most notably, but not entirely restricted to, the establishment of the Continental Margins Program (27 staff were allocated to BMR in a New Policy Proposal and the Marine Division's ASL is now 85), the development of the resource assessment function, the database function, and the groundwater research and assessment. Underlying these changes has been upgrading of technology throughout the organisation; this has called for considerable skill development by BMR scientists and technicians.

The Research Scientist classification and merit assessment for these grades have been introduced. The initial criteria have been broadened. The merit principle has been rigorously applied and is beneficial to the overall carriage of the program. All other groups in BMR are within the APS position-based system. It is contended strongly that the merit principle indeed has a wider application in a scientific organisation such as BMR.

Suggestions for Improvement

In recent deliberations, the following points have emerged:

- The need for further integration of Geophysics with land-based geology.
- The need to further strengthen the intended focus on commodities in the land-based Divisions.
- The need to provide appropriate support to the Director and, related to this, to consider the most appropriate structure related to information technologies (including geoscience computing, the development of computerised drafting and of image processing applications).
- Consideration of the relationship between resource assessment and research.

Research Divisions

When the new structure of BMR was established in 1981, all offshore activities were integrated in the Marine Division, but on land it was considered desirable to develop geophysical activities from a discipline base. This was partly because strong geophysics research leadership was required and also because geophysical activities were applicable to both minerals and petroleum research and because they embraced the observatory functions. It was also envisaged in the original proposal that there would be a Deputy Director, Research to coordinate the activities of the onshore research divisions. In the event, the latter post had to be sacrificed and it is recognised that there have been problems in coordinating geophysical activities with geological activities.

It can now be argued that the basic research capacity has been established in the various geophysical sub-disciplines and that it is now appropriate to divide the geophysical functions on a program basis.

This has already taken place with BMR's major seismic operations, which have been transferred from the Division of Geophysics to that of Petrology & Geochemistry.

It is now proposed that the geological and the non-observatory functions be reorganised into two land-based Divisions, which are more strongly oriented towards commodity and program foci.

. Onshore Petroleum and Groundwater Division

. Minerals and Land Use Division

Both Divisions would comprise the full range of specialist skills necessary to accomplish their function, necessitating splitting of certain specialist groups, and a more flexible approach to the allocation of human and other resources to Divisions. Because each Division would be responsible for a major segment of the program, shifts in corporate program priorities would require a mechanism for reallocating resources between Divisions.

This reallocation also leads to the balance of the present Division of Geophysics focusing on the Geophysical Observatories and the national gravity and airborne geophysics databases.

The Resource Assessment/Research Linkage

When the present structure was established it was considered that the overriding argument was that the resource assessment function was an overview function directed towards the government, industry and the public for the provision of independent advice and information in the national context, while the research function required focus on specific projects and was directed towards the exploration industry. The complementarity of RAD activities and those of other BMR divisions is discussed in Part II Section 2 dealing with the resource assessment function.

The increasing demand for the assessment of the resource potential of particular areas in relation to land-use issues was there recognised as requiring increasingly close cooperation between the research and resource assessment functions. Indeed the main carriage of such studies of particular regions must be with the research divisions both onshore and offshore, with appropriate input from the resource assessment division. This has led to further consideration of appropriate structural arrangements for the resource assessment programs.

Two basic options are:

1. retain the present separate status of research and resource assessment functions in the organisational structure; and

2. transfer Petroleum and Minerals Branches 'in toto' to other divisions in BMR to form combined resource assessment/research divisions.

The strongest argument for the separate status of the research and resource assessment functions is that resource assessment is a specialised activity which has different objectives and methodologies from those of strategic research. However the advantages of combining the petroleum and mineral assessment branches in a single division are limited. The divisional structure strengthens the overall management of the resource assessment function and provides a focus for policy development in this area. However interactions of the petroleum and minerals assessment areas is with research divisions on one hand or policy divisions on the other, which deal with <u>either</u> petroleum or minerals. It seems more important to ensure that the leadership in each of the petroleum and minerals assessment areas is of the highest possible quality to ensure the highest possible quality of advice arising from the resource assessment function.

For this reason it has been proposed that the position of First Assistant Director, Resource Assessment Division, be abolished in order to upgrade the level of the leaders of minerals and petroleum resource assessment areas. These leaders require a combination of scientific and/or engineering expertise with substantial industry experience, as well as management skills, and it was therefore suggested that they be reclassified as Chief 1. The high degree of professional expertise and desirable continuity of leadership does not apparently fit the current concept of the SES service with its emphasis on mobility. Further advice on this point has been sought from the Department of Industrial Relations.

The introduction of Chief Scientist positions to head these areas would also allow a strengthening of the subordinate positions.

It was originally proposed that the separate minerals and petroleum resource assessment functions should have Divisional status partly because there were two minerals Branches in existence. However it is now proposed that these two minerals Branches be combined so that the petroleum and minerals assessment areas could each have Branch rather than Divisional status.

Because of their specialised functions it is considered important that for planning and operational purposes these Branches (or Divisions) should operate independently, and in Part I Section 3 of this submission separate formal planning mechanisms have been proposed for them. It is therefore considered to be simpler and more efficient for the two Branches to be independent for administrative purposes also.

The alternative option would be to place the petroleum resource assessment branch within the Division of Onshore Petroleum and Groundwater, or the Division of Marine Geosciences and Petroleum Geology, and the minerals resource assessment branch in the Division of Minerals and Land Use. This would allow strengthening of the cooperation between the resource assessment and research functions in undertaking assessments of resource potential (undiscovered resources) either as part of the resource assessments necessary for the development of policies by government and for the development of research and exploration strategies; or in relation to land-use issues. However in view of the different nature of the strategic research and the broader resource assessment functions (dealing mainly with analyses of the industry and of identified resources) it is not considered feasible for individual Division Chiefs to provide appropriate leadership in both areas.

It is therefore recommended that

(1) the present minerals and petroleum resource assessment functions be reorganised into two Branches headed by Chief 1 officers.

(2) formal planning mechanisms be provided to ensure appropriate input into planning of both research and resource assessment programs and to ensure appropriate coordination of the assessment of undiscovered resources.

The proposed planning mechanisms are outlined in Part I Section 3 of this submission.

The Need for a Deputy Director Position

Revised arrangements as discussed above should allow Chiefs of operational divisions and branches to have an even clearer responsibility for major segments of BMR's program. However, it is considered that there is a case for further support to the Director at the corporate level. The present arrangements allow inadequate time for the Director to interact with the Department, industry and States; and positions of Deputy Director do exist, for example, in BRR and ABARE.

The principal need is for a more comprehensive high level coordination of the strategic planning and resource allocation. It would be appropriate for a Deputy Director to overview the corporate planning process (eg by attending all component planning meetings) and to chair the major resource allocation committees subordinate to the BMR Board of Management.

It is suggested that this could be achieved without increasing the number of senior positions by having Chiefs of Division (Chief 2) act in rotation as Deputy Director (Chief 3). Back-filling below the level of Acting Chief would not be required, so that the cost would be limited to the differential between Chief 2 and Chief 3, and the differential between SPRS and Chief 2.

By this mechanism, each Chief of Division would obtain valuable experience at the corporate level and overall coordination of BMR programs would be improved. The present flat organisational structure would be retained.

Integration of Corporate Responsibilities

Whilst the recent moves to establish a separate Resource Management Branch and a parallel Geoscience Planning & Information Branch undoubtedly will strengthen BMR's corporate management, the position of information technology in the structure requires consideration.

There is a need to integrate information technologies within BMR and this requires that the present Geoscience Computing & Database Branch be brought together with the Drafting Office computerised drafting and image processing in an enlarged Information Technology Branch. Detailed background to this is provided in BMR's contribution to the DPIE 1988-89 Corporate Information Technology Strategic Plan. In view of the compatibility of the disciplines,

one possibility is to place the information technology branch with the Observatories under the existing Chief of Geophysics position. It is believed, however, that information technologies, which are essentially corporate services, should form a branch along with the Geoscience Planning & Information Branch in a Corporate Division of Geoscience Management and Information Technology. Both these branches require professional geoscientific leadership.

The proposed revised structure is shown in Appendix 4.2. This structure also incorporates the recommendations made above concerning the Resource Assessment Division.

Staffing

A major concern, emphasised by ASTEC, in establishing the present role of BMR was the need to provide an appropriate environment for a predominantly strategic research organisation. This involved the provision of appropriate conditions for the scientific staff. It was agreed that Research Scientist classifications and career opportunities should parallel those in CSIRO and to a large extent this has been achieved.

It was also expected that a merit advancement scheme, similar to that in CSIRO, would be introduced for the Science Grades, and perhaps for technical grades also. As a result of the long delays in completing arrangements for research scientists and of the perception that similar arrangements for Science grades could not be isolated from service-wide implications, it has not so far been possible to introduce appropriate arrangements for Science grades. This has been damaging to staff morale, as well as to the effectiveness and efficiency of the organisation.

We believe strongly that BMR's special position as a strategic research organisation within the departmental structure should be recognised and that special arrangements should be made so that all scientific and technical staff can operate under similar conditions to those obtaining in CSIRO.

With respect to research scientists, in all discussions and in the current document on the operation of the merit advancement scheme, BMR has foreshadowed that after some period of time it would wish to see a fuller development of the CSIRO classification involving the introduction of other Chief Scientist grades (ie. Grade 1 and 3).

In the CSIRO system there are four grades of Chief Scientist. Chiefs of Division are at Levels 2, 3 and 4. Advancement is on merit, with most CSIRO Chiefs on Grades 2 and 3.

A Chief Scientist, Level 1, in CSIRO may:

(a) be in charge of an independent section

or

(b) be an Assistant Chief of a Division or the senior officer in charge of a Branch Laboratory

or

(c) have attained such world eminence in a significant field of research to warrant this level without any formal management structure.

The Chief Scientist Grade 1 in BMR would be for similar purposes. The introduction of the Chief 1 category will allow greater flexibility in the organisation and management of BMR's scientific activities. It will also allow the replacement, as opportunity occurs, of certain SES positions with Chief 1 positions.

At present BMR has a mix of scientific and SES positions at senior management levels. All these existing positions (Chiefs of Research Divisions and SES positions) require a high degree of professional expertise (as well as management abilities) which does not fit the SES concept of mobility. BMR has encountered difficulties in advertising such SES positions, that is in stating essential requirements of geoscientific qualifications and experience within a generalist management service; obversely, attempts to have the SES package made applicable to BMR Chiefs of Division have been unsuccessful.

The case for establishing Chief 1 positions in place of certain SES positions has been put to the Public Service Commission, and remains under discussion. As discussed above, implementation of the proposal to establish the position of Deputy Director would require a Chief 3 position in addition.

It is also believed that the redesignation of the position of Director, BMR should be considered at some stage. It would be appropriate to convert this position from the SES to one analogous to that of a CSIRO Institute Director.

. We would also like to see the introduction of a performance appraisal scheme for individuals. The introduction of such a scheme would involve discussion with relevant staff associations, but it is felt that corporate goals can only be met as a collective of the achievement of the programs of the individuals involved.

Staffing Numbers

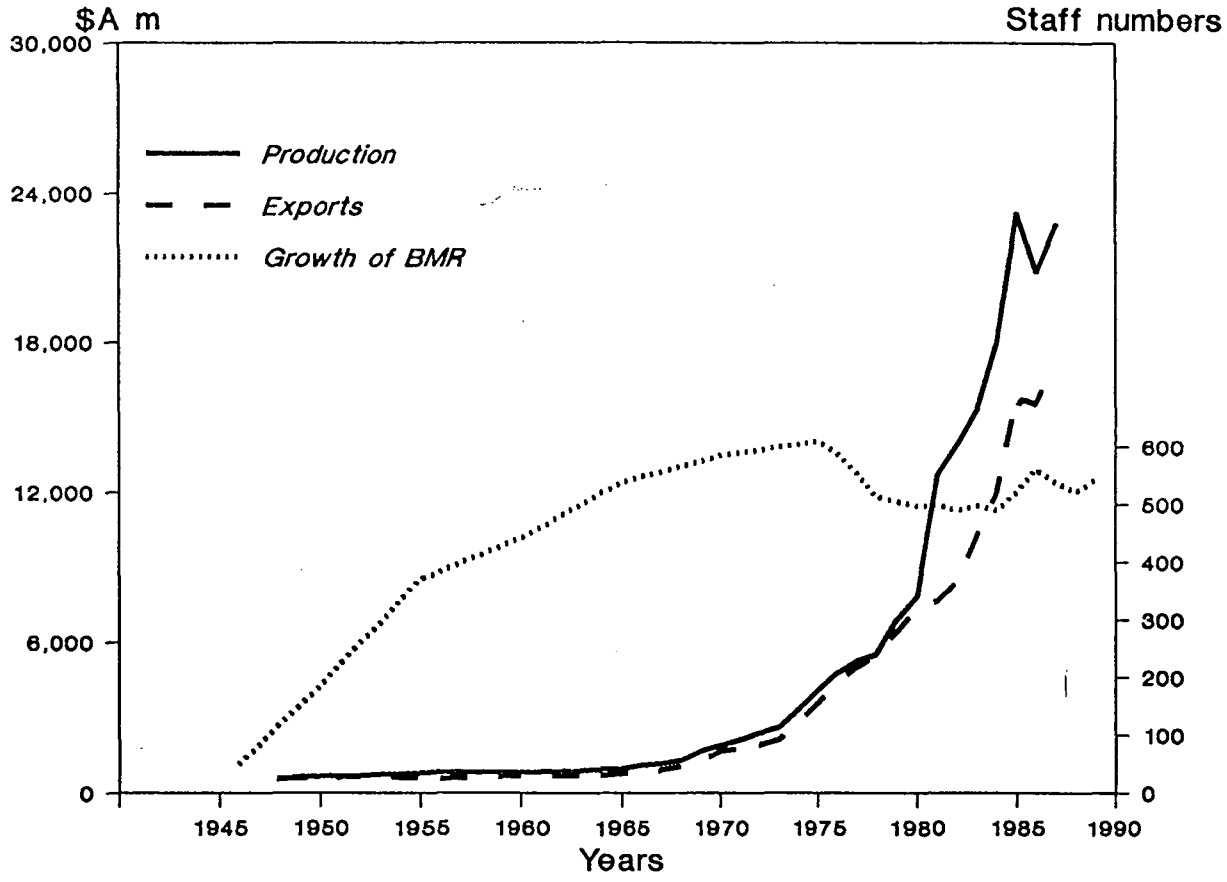
Staff reductions over recent years, as a result of 'efficiency dividends' and other decisions, have placed great stresses on the organisation.

Recruitment has not been possible except in positions where natural wastage has occurred. Although all possible redeployment has been undertaken, the result has been that some areas have been working under undue pressure. There remains an imbalance between scientific and support staff but it is impossible to redress this while numbers continue to fall and while BMR has been required to assume new responsibilities without corresponding increases in staff.

It is regarded as essential that the staff numbers be stabilised at at least the present level and that when new responsibilities are undertaken provision be made to employ additional staff. This could be on a contract basis to maintain longer term flexibility.

As a background, Fig 4.1 shows staffing levels in BMR since the establishment of the organisation in 1946, against the level of Australian mineral and petroleum exports as one index of activity in the industries.

Fig 4.1



Australian Minerals, Petroleum Exports, Production and BMR Staff numbers, 1946 - 1988

Operational Structure and Senior Officers

DIRECTOR
Prof R.W.R. Rutland
(2)

Geoscience Planning & Information Branch
Dr J.F. Truswell
(52)

Resource Management Branch
Vacant
(54)

Division of Petrology & Geochemistry
Dr M.A. Etheridge *
(103)

Division of Continental Geology
Dr P.J. Cook
(82)

Division of Marine Geosciences & Petroleum Geology
Dr D. Falvey
(89)

Division of Geophysics
Dr D. Denham *
(95)

Resource Assessment Division
Dr R. D. Lowden *
(101)

Geoscience Computing & Database Branch
E. P. Shelley *
(22)

Mineral Project Evaluation Branch
G. Battey
(11)

Petroleum Branch
C.S. Robertson *
(41)

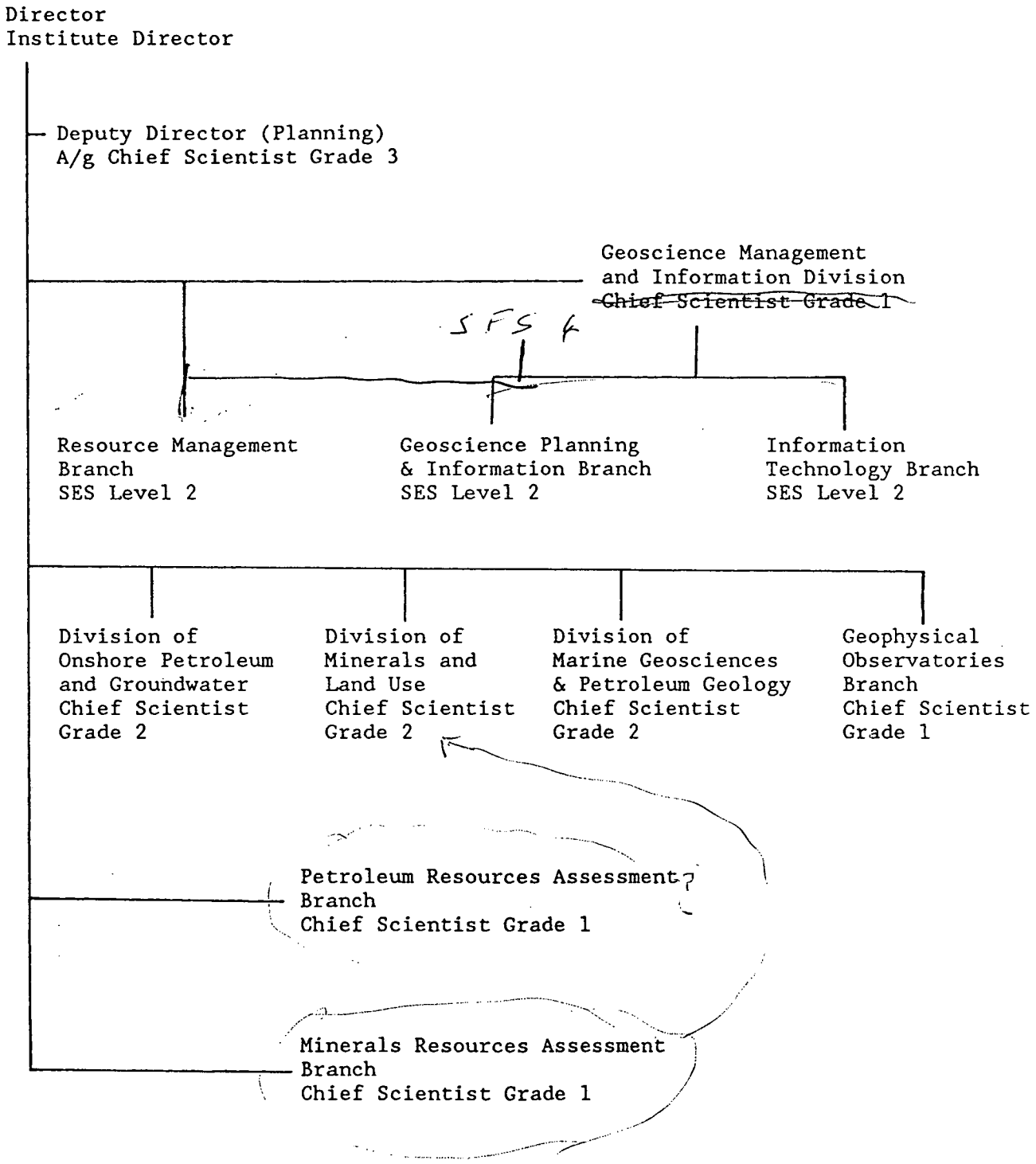
Mineral Commodities Branch
I. McLeod *
(21)

* *Acting*

The staff figures given above include allocations of 58 engineering and 58 cartographic staff as well as 19 field hands. The figures do not include staff for NRIC (6) or inoperatives (12).

BUREAU OF MINERAL RESOURCES

PROPOSED ORGANISATIONAL STRUCTURE



5. OPERATING AND MANAGEMENT PROCEDURES

BMR operates as an "outrider" of DPIE.

Within BMR carriage of the program is devolved to the relevant Division. In February this year BMR reorganised its corporate management arrangements and now operates a two-tier committee structure:

1. Board of Management: Director (Chairman), Chiefs of Division, First Assistant Director. Secretariat: Assistant Director, Geoscience Planning & Information and (on arrival) Assistant Director, Resource Management. The Board is responsible for all major issues and policies.

2. Coordinating Committee: Assistant Director, Resource Management (on arrival), Resource Managers of Divisions, Branches and units. The Committee is for coordination matters in implementation of policy and programs.

The complexity of BMR's operations calls for strong corporate management alongside devolved operations.

Implicit in "outrider" status is sufficient autonomy for effective operations. This is the case with program formulation, but has only been partially addressed in relation to management matters.

In 1983 an independent report (the Heydon Report) drew attention to the inadequacy of management support in BMR. However, in 1984 a major proposal to upgrade BMR's corporate management was not supported. At that time the most senior administrative officer in BMR, with its complex operations and staff over 550, was a then Cl.Ad.8. A more limited proposal to introduce two Cl.Ad.11 positions (one in Finance and General Services, one in Staffing) was supported, but later that year the total staffing function was transferred to the Department. Although some staff savings were effected at that time, the result was inevitably a marked loss in the level of service in this area. Equally inevitably, key staff in BMR themselves became involved in personnel policies and specific issues.

Following the Block Report, there has been a re-emphasis on devolution. In recent months, accounts processing, purchasing and stores have been transferred to BMR; and the establishment of a Resource Management Branch, headed by an SES Level 1 officer, has been established. These changes are

expected to lead to much more efficient resource management within BMR. In particular, it is expected that purchasing and tendering procedures can be expedited and Divisions will have more timely information on the expenditure of funds than has been possible hitherto.

The commitment to devolution in DPIE is welcomed.

Options for Improvement

(a) Statutory Authority

In 1979 the (then) Department supported an ASTEC recommendation that BMR be reorganised as a Statutory Authority responsible to the Minister.

Although the then Government supported the thrust of the ASTEC report on BMR, it did not agree to such organisational status for BMR.

ASTEC had noted that all the Commonwealth's major mission-oriented research other than the Defence Science and Technology Organisation with its special security requirements, have statutory form: this basically reflects the necessary flexibility required for the carriage of research.

ASTEC also recognised that:

> "A distinction needs to be drawn between the BMR and the six other Commonwealth Bureaux. The BMR is the only Bureau whose primary function will be to carry out strategic mission-oriented research in natural science. The Bureaux of Agriculture, Industry and Transport Economics collect and analyse economic data as an aid to policy formulation. The Australian Bureau of Statistics collects and provides, but does not interpret, statistical information. The Bureaux of Animal Health and Meteorology are service organisations with a small percentage of their efforts devoted to research. There seems little doubt that the BMR will have more in common with CSIRO and the Australian Atomic Energy Commission than with these other Bureaux."

This is undoubtedly true.

There can be no doubt that BMR could operate more efficiently and cost-effectively if it operated under arrangements similar to those of other government research organisations. In respect of cost recovery, industry has made it clear in the past that it has reservations about cooperating with BMR in research while it remains within the departmental structure. It has no such reservations about cooperating with CSIRO as a Statutory Authority. On the other hand, the nature of the national geological survey functions which BMR undertakes also require close interaction with the formulation and implementation of Government policies. This should be assisted by operation within the departmental structure, provided that the special requirements of a research organisation are recognised. Thus the advantages of the present organisational arrangement need to be balanced against the losses in effectiveness and efficiency.

A single example may illustrate the practical problems we face: In 1982 BMR introduced the Research Scientist grades. It was agreed that a merit assessment process would be introduced for these grades. After considerable negotiation, a formal proposal was put to the then Public Service Board in 1983. BMR has run annual assessments since then on an informal basis but, at the time when the Public Service Board was disbanded, it had failed, despite endless discussions, to formalise the scheme.

Under the present arrangements whereby exploration related research in the geosciences is shared between BMR and CSIRO there is potential for duplication of functions, staff and resources and for problems in addressing national priorities. Integration of the exploration related research in BMR and CSIRO would be expected to be more effective and efficient than current arrangements and would avoid present complications in relationships with private industry.

Remote sensing research is a good example where CSIRO has been an international leader in the development of techniques and has a relatively large group, but where owing to lack of resources BMR has been severely limited in its capability to apply these techniques to the regional analyses that are required as a basis for mineral exploration and in relation to land-use issues.

ASTEC recognised that the arrangements for strategic research between BMR and CSIRO were not ideal. It suggested as one possibility that:

> ... the BMR should merge with the CSIRO Divisions of Mineral Physics and Mineralogy to form a new statutory authority which would report to the Minister for National Development. This suggestion is particularly attractive because the two CSIRO Divisions would complement and support the work of the geoscientist in BMR. If a BMR were being established de novo it would almost certainly be formed with this combination of expertise.

There is a case therefore for combining BMR and appropriate elements of CSIRO (eg. the Exploration Geoscience Division) in a single body. This would need to be a Statutory body but in order to preserve and guarantee the necessary linkages with DPIE it should be a separate Statutory Authority answering to the Minister of Primary Industries and Energy.

However, in recent years the relevant areas of CSIRO have moved to more tactical applied research in direct support of industry, while BMR has focused on its national strategic role. The balance of opinion in industry has favoured this arrangement and it is now believed that continuation of this arrangement, with BMR remaining as an outrider of DPIE, may be most appropriate in view of BMR's wider responsibilities.

(b) More Effective Outrider Status

ASTEC considered the possibility that BMR would remain a part of the Department, and made a number of provisos (ASTEC Report on BMR pp 34-35). These included the view that "the Bureau would need to be recognised as an 'outrider' organisation with substantial independence" and that "the Director would need to be accorded Chief Officer status and given considerable power to organise and manage the Bureau independently of the Department". These provisos have been broadly satisfied, and BMR has a separate appropriation and ASL negotiated with the Department of Finance. This is essential, but further measures are desirable to provide the degree of organisation flexibility required for a scientific research organisation.

More specifically, the following measures would improve the effectiveness of BMR's operations as an outrider:

- Increased flexibility to deploy funds across staffing, capital equipment and operational segments.

- Provision of funding on a three-year rolling basis in recognition of the strategic nature of BMR's program.

- Completion of the devolution of management functions through the return of personnel staff, including recruitment and management review.

- Provision of authority to employ a percentage of staff (say 10%) on fixed term contracts.

- The closer involvement of the Director in DPIE management matters affecting BMR. The Director is responsible to the Secretary, but it is at present not clear how BMR is represented in the Executive or on DPIE corporate management matters.

- More effective communication with elements of Corporate Services and Coordination, in particular with Financial Planning.

- Delegations to the Director BMR (Level 6) equivalent to those of a Deputy Secretary, for BMR matters.

- Recognition that BMR's complex operations require more commercially oriented practices, for example the establishment of a Tender Board for equipment purchases.

6. OVERSEAS PROGRAMS AND INTERNATIONAL COOPERATION

Geology is, by definition, a global science, which cannot be pursued in isolation. In addition to its role in strategic geoscience research on the Australian continent, in the Australian offshore area, and in the Australian Antarctic Territory, BMR maintains international scientific contacts, both for ensuring high standards in its Australian work, and for advising or assisting with Australia's international geoscientific responsibilities; it also contributes to appropriate international maps.

BMR, as the Commonwealth's principal technical adviser on geoscience matters, represents Australia in various international geoscientific organisations, notably those under United Nations auspices aimed at assisting developing countries, and also assists in various bilateral and multilateral projects initiated through the Department of Foreign Affairs and Trade. Current international commitments include:

. Global Geoscience - contributions to, or participation in, global geoscience and international research arising from BMR's specialised knowledge obtained from the Australian region:

- The production of international maps: the Circum-Pacific map project; the Commission for the Geological Map of the World.

- Participation in the Ocean Drilling Program: consortium membership with Canada is anticipated in the near future.

- Involvement in international research programs, such as the International Lithosphere Program and the International Geological Correlation Program.

- Representation on major international geoscience fora, eg. the Director of BMR is currently a member of the Circum-Pacific Council for Energy & Mineral Resources, and the Chairman of the Advisory Board for Research Development of the International Union of Geological Sciences.

- Cooperation under existing S&T Agreements, eg. with the USSR, France, Federal Republic of Germany, USA.

- The Joint Geological and Geophysical Research Station at Alice Springs is managed jointly by the USA and BMR under an agreement.

- Cooperation under more specific agreements, such as the MOU with the Chinese Ministry of Geology and Mineral Resources and the China Non-Ferrous Metals Corporation.

- An agreement has been signed between Australia and New Zealand on seismic monitoring cooperation in the context of both Governments' commitments to the early conclusion of a Comprehensive Nuclear Test Ban Treaty. BMR is the Australian organisation responsible for the implementation of the agreement.

- The BMR represents Australia on the Governing Council of the International Seismological Centre. This is a non-government organisation charged with the final collection, analysis and publication of standard earthquake information from all over the world.

- Monitoring of nuclear explosions as a contribution to the attainment of a comprehensive test ban treaty and the provision of earthquake and geomagnetic data to International Data Centres.

- Exchange of scientists under agreements between BMR and the Geological Surveys of Canada, the United States and Britain.

Regional Cooperation - projects which, although aid-oriented and funded, bring substantial benefit to BMR programs:

- Participation in marine geoscience cruises: in the Southwest Pacific under a Tripartite Agreement between the USA, New Zealand and Australia; and under the Japan-Australia Science and Technology Agreement.

- The provision of technical advice, eg. a Special Adviser to CCOP, a Technical Adviser to CCOP/SOPAC, ESCAP Committee on Natural Resources.

. Aid Projects - funded by aid agencies, mainly AIDAB; these projects may have potential benefits in terms of foreign policy or commercial activity, but generally have little bearing on BMR's Australian programs:

- Assistance to Indonesia through a major geological and geophysical mapping and training program in Kalimantan and Irian Jaya, the Indonesia-Australia Geological Mapping Project.

- Activities in specific fields such as engineering geology, groundwater, geological hazards (the Rabaul volcano alert, the Mount Galunggung volcano in Indonesia).

- Assistance with in-house training of scientific and technical staff from developing countries under UNDP and other schemes.

In 1988/89 AIDAB will review the mining and energy sector of the aid program: BMR will contribute a geoscience component to this review.

Geoscience aid projects undertaken by Australia have been effective: as indicated, the amount of geoscience in aid is low; there is also an ad hoc nature leading to the undertaking of specific projects.

In 1982 the Government established the Australian Centre for International Agricultural Research: the centre, located in the Department of Foreign Affairs and Trade, encourages research aimed at identifying agricultural problems in developing countries and finding solutions to such problems.

We believe that it would be appropriate to propose a similar centre for the geosciences. Such a centre could have great catalytic value for the activities of the Australian petroleum and mineral industries overseas. If this is impractical, then BMR's lead role in international interactions in the geosciences should be recognised, and this role should be formally reflected in BMR's organisational structure.

It is recommended that consideration be given to establishing an Australian Centre for International Mineral and Petroleum Resources Research similar to that already established for Agricultural Research.

7. COST RECOVERY

When all costs are taken into account, about 70% of BMR's budget is devoted to strategic programs undertaken as a basis for petroleum and minerals exploration. (The remaining 30% is devoted to: resource assessment 10%; Observatories 12.5%; and Groundwater and environmental programs 7.5%)

BMR's present level of cost recovery is achieved through

(1) Sale of products

(2) Contracts for aid programs

(3) Grants from research funds and from industry towards specific projects in order to accelerate and enhance existing programs.

The following table summarises the situation.

	Revenue Estimates	Real	Anticipated	Outside Funding	% Cost Recovery
1986/87	468 000	188 000		2.43m	6.7%
1987/88	493 000		473 000	1.64m	4.8%
1988/89	600 000		668 000	1.36m	4.9% *

* The Indonesia-Australia Geological Mapping Project has been extended from end 1988 through calendar year 1989. This will lead to an increase not yet determined.

The potential for increased cost recovery has been considered in great detail in recent years. It has been concluded that revenue from sale of products should be maximised but that direct cost recovery from industry is inappropriate to BMR's strategic role (eg. internal report by 'Carlson' Committee). These two aspects are considered below.

COST RECOVERY FROM SALE OF PRODUCTS

Until 1986/87 BMR's cost recovery related to products was $200,000. A number of significant measures have taken place since then:

. In July 1987 there was a significant increase in the price of products. Revenue has increased significantly, in particular from aeromagnetic data.

. Cabinet has recently approved the extension of the Continental Margins Program for a further ten years. The program now has a cost recovery target level of 5% from the sale of products. The first volume of a new folio series, a high cost publication assembling all data and interpretation on areas of specific interest to petroleum explorers, has just been released. It remains to be seen what sales will eventuate.

. The Copy Service, previously carried out by AGPS, was transferred to BMR early in 1988. Revenue from this service is now credited to BMR revenue.

There is considerable industry reaction to the new price structure. It must be remembered that the market for BMR products is not only the relatively few major companies, but, in the minerals field, a much greater number of smaller operators.

Nevertheless, we are confident that the revenue estimate for 1988/89 of $519,000 will be significantly exceeded.

We also believe that it is possible that over the next few years revenue may increase towards $1,000,000. We do, however, note indications of consumer resistance to the recent price increases. The scale of charges should not inhibit exploration.

To effect this, BMR has established a high-level committee to develop and implement a corporate strategy on cost recovery.

DIRECT COST RECOVERY

Direct cost recovery is appropriate for tactical research which is undertaken for specific customers. Indeed, where individual companies are the sole beneficiaries of tactical research, it can be argued the cost recovery should be 100%. In the geosciences the Commonwealth currently funds CSIRO to carry out research into exploration techniques and related studies. This work ranges from strategic to tactical and some could be regarded as consulting work. Such work permits significant cost recovery. It involves close collaboration with individual companies and sometimes involves the utilisation of confidential company information. During a review of CSIRO research in this field some companies made it clear that they would be reluctant to enter into similar arrangements with BMR, since BMR's organisational status and wider role raised the fear that confidential information might be used by government against their interests.

In its national geological survey role, however, BMR has always dedicated its effort to strategic programs, the results of which should be in the public domain.

It is estimated, for example, that about five hundred companies in Australia, as well as many large overseas companies, make use of the basic geoscientific information gathered and published by BMR; and investment depends on the assessment of prospectivity and technical risk as well as on the assessment of after-tax profitability of a successful discovery.

Thus the value of BMR's work for future mineral exploration and development is maximised when it is made as widely available as possible to potential explorers and investors in exploration both in Australia and overseas.

Australia also receives a very substantial reciprocal flow of information at very low to zero cost from industry and from other geoscientific organisations both in Australia and overseas. The information obtained from this interchange is essential for maintaining the quality of its advice to government, and can be regarded as an effective cost saving to government. The value of the information received by BMR is difficult to quantify, but is clearly well in excess of its total revenue from sale of products.

A normal condition for company support of projects is that the resulting information be available only to the subscribing companies for a considerable period. Thus a 20% contribution to costs gives subscribing companies control over the direction of the programs and also limits the availability of the results. In some instances where confidential company information has been employed, there is a more permanent embargo on the release of results. This may be acceptable in the case of tactical research where specific customers can be identified. In the case of strategic research, however, the loss of value of the work resulting from it not being in the public domain is likely to far outweigh the limited cost recovery.

A major argument in favour of partial direct cost recovery has been that it would ensure the relevance of BMR's programs. This argument we believe is false. Cost recovery would tend to ensure the relevance of BMR's programs to immediate industry needs rather than to the strategic programs which should be undertaken in the longer term national interest and which cannot be undertaken by the industry itself. Industry has been encouraged to undertake its own tactical research through the 150% tax incentive for research and it would be inappropriate to distort BMR priorities in that direction.

The relevance of BMR's programs is best assured through wide consultation on priorities and through careful definition of proposed strategic programs and their objectives and outputs. Proposals to this end are made elsewhere in this submission.

The value of BMR's strategic work for the development of the Australian mineral and petroleum industries is widely recognised, not least by the industries themselves, and the evidence is summarised in Section 2(b) of this submission. However it is also recognised that since the geoscientific information has wide potential application over a long period specific beneficiaries can be identified only retrospectively.

Thus we believe that any mechanism for increased cost recovery for BMR should not prejudice the public availability of BMR's results.

It is unlikely that individual companies will waive their insistence on obtaining commercial advantage if they give direct financial support for projects. It appears therefore that cost recovery which would not prejudice the availability of results could only readily be achieved through some form of levy. Such levies, with their matching Commonwealth funds, provide a considerable proportion of funding for government research institutions (mainly CSIRO) in the Agricultural Sector but no such levies are available as a source of funding to BMR.

The industry view, however, is that indirect cost recovery is already achieved, at a very high level, through royalties, excises and taxes (including resource rent tax) on developments from successful exploration. The industry also argues that resources do not become national assets until they have been identified as a result of very costly exploration programs by private industry.

The assessment of the appropriateness of the current level of government support for research related to the petroleum and mineral industries must also be taken into account in considering the desirability of direct cost recovery. This was discussed in Section 2(e) where a number of objective criteria were used to demonstrate that the current level of support is very low. It is only about one quarter of the level of support for the Agricultural Sector although the Mining Sector (including petroleum) has at least comparable importance to the national economy.

The current Commonwealth investment in stimulating investment in petroleum and mineral exploration programs, and improving their efficiency, through the public information base which BMR provides, amounts to only a few percent of total exploration expenditure by industry. In real terms BMR Budget is slightly less than it was in the early 1970s. Since then there have been great increases in exploration and development of the industry and increased demands on BMR. BMR's Budget on petroleum and mineral related programs as a percentage of exploration expenditure has fallen to as little as 1.4% in years of high exploration (1983-84) and remains below 4% in years of low exploration expenditure (1986-87).

The exploration industry is subject to cycles of activity. It is important that the levels of strategic programs in the national interest be at least maintained during the periods of depressed exploration activity, in order to provide a springboard when opportunities again develop. Indeed industry has often argued that Government should increase its level of activity during such periods. Undoubtedly the reservoir of trained personnel in BMR has been of great value to the industry during previous periods of increased activity. It must be recognised however that the periods of depressed exploration activity are the periods when industry is least able to contemplate direct cost recovery for strategic programs by BMR.

In other countries strategic programs such as those undertaken by BMR are seen as an essential contribution to the future viability of the petroleum and mineral industries, and to the level of public benefit therefrom. The recently published Mineral and Metal Policy of the Government of Canada, for example, states "Government support of basic geoscientific information and mapping will continue as a means of reducing exploration risks and avoiding costly duplication of efforts by the private sector". Such a policy of encouraging exploration and investment tends to be negated by direct cost recovery.

It must also be recognised that BMR, in its research programs, is being called upon increasingly to contribute to the assessment of areas which are the subject of conflicting land use claims. It is important in all its research and resource assessment activities that BMR be seen as an independent body. It may on occasion provide advice which is contrary to the immediate interests of particular companies or sections of the industry. It follows that the basic funding of BMR's research and resource activities should be independent of industry.

BMR's Advisory Council has stated

> "Council recognises the importance of public funded geoscientific research in the national interest and believes that every possible effort should be made to ensure that the level of Government funding in support of the geosciences is consistent with the significant current and potential financial contribution made by the mining and petroleum industries to the nation. In this regard the Council is lending particular support at this time for initiatives by BMR for increased activity or development by BMR in the fields of groundwater and remote sensing."

We conclude that requirements for direct cost recovery would tend to

(1) negate the basic government policy of encouraging investment in exploration and development

(2) drive BMR's program away from its national interest role

(3) prejudice the independence of BMR's advisory role

(4) reduce the value of BMR's work by limiting its availability

(5) prejudice the present free return flow of information from industry which is essential for government policy formulation

(6) lead to overlap with CSIRO's present research activities.

Nevertheless we believe that there are opportunities for obtaining substantial industry support for BMR's programs, providing this is seen as support above the essential base-level of funding provided by government - that is, it would be support provided for the enhancement and acceleration of particular programs.

We also believe that the effectiveness of BMR's programs could be greatly increased at relatively small extra cost if additional staff and resources were available for the highest priority programs. Specific instances have been argued in Part II of this submission. The principal deficiencies (with respect to groundwater, regolith studies, and onshore and offshore seismic studies in particular) were summarised in Part I Section 2(d) of this submission.

We recognise, however, that it is difficult for government to increase the level of support for BMR programs at the present time.

We therefore suggest that

(1) the present policy of maximising the revenue from the sale of products, consistent with BMR's overall objectives, should continue.

(2) any mechanisms proposed for increased cost recovery for BMR should not prejudice the public availability of BMR's results;

(3) in order to allow BMR programs to continue to be formulated in the national interest and without prejudice, the level of government funding should ensure the basic viability of the strategic programs, independent of any direct cost recovery;

(4) requests for additional government funding should be in terms of national interest projects, defined in terms of specific objectives over specific time periods and supported by additional contract staff;

(5) direct cost recovery from industry should be limited to support for the acceleration and enhancement of key programs above the guaranteed base level of government funding (see recommendations in discussion of appropriate level of activity); and

(6) consequent on such support BMR should be permitted to recruit contract staff, additional to its present ASL, in order to implement the acceleration and enhancement of key programs.

This would ensure that industry would be able to offer support without the danger that equivalent government support would be withdrawn. It would also allow BMR programs to continue to be formulated in the national interest and without prejudice.