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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF
NATIONAL DEVELOPMENT

BUREAU OF MINERAL
RESOURCES, GEOLOGY
AND GEOPHYSICS

Record 1972/128

MINERAL RESOURCES BRANCH

ANNUAL SUMMARY OF OPERATIONS 1972

1972/128

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MINERAL RESOURCES BRANCH

ANNUAL SUMMARY OF OPERATIONS

1/11/71 - 31/10/72

HEADQUARTERS

The staff position improved during 1972 in that three positions vacant at the beginning of the period, one Mineral Economist, one Drilling Superintendent and one Petroleum Technologist, were reduced to two at the end of the year - one Drilling Supervisor and one Technical Officer - but with recruitment for both positions well in hand. The recruitment position for professional officers remains generally favourable although with expected resurgence of the mineral industry in 1973 recruitment of experienced professional officers will doubtless become more difficult.

There was considerable progress in all Sections during the year. Publications of the Branch were generally on time and the Mineral Industry Annual Review for 1970 was somewhat expanded and further improved. It proved a difficult year for the compilation of both Annuals and Quarterlies because of the commencement of the integrated census by C.B.C.S. and new procedures for printing through the Australian Government Printing Service; however, these difficulties were overcome by the efforts of the statistical group from C.B.C.S. and of the Publications Section of the Operations Branch. A noteworthy innovation was engineered by the Publications Section in the latter part of the year by which pre-printed chapters of the Annual are now prepared within the Bureau with consequent saving of time and expense.

The pressure of work on the Petroleum Technology Section continued to mount throughout the year with additional discoveries of natural gas, increasing company submissions under the Petroleum (Submerged Lands) Act and attention to policy matters concerning possible petroleum exports and processing. Submissions to the Barrier Reef Commissions also increased the work load during the first half of the year. The Petroleum Technology Laboratory recorded a very successful year with noteworthy progress in petrophysical investigations, arrangements for the installation of PVT equipment in 1973 and in studies of source rocks and levels of maturation in sediments of the Northwest Shelf. The 1972 field program included exacting drilling commitments mainly in very isolated areas.

The Mineral Economics Section built up to full strength during the year and coped with increasing requests by both Government and industry. Special studies for the Quarterly Review dealt with secondary recovery and consumption of lead and zinc, Australian mineral sands resources and mineral conservation in Australia; an article on the first Earth Resources Technology Satellite was contributed by W.J. Perry of the Geological Branch.

The initiation of studies of secondary metal supplies and of mineral conservation proved timely and significant. Progress was made in the assessment of mineral resources by the Mineral Economics and Mining Engineering Sections; the program of assessment calls for project teams involving members of both Sections although with present staff levels assessments have had to be carried

out mainly by one officer and have fallen heavily on the Mining Engineering Section. The assessment of mineral sands resources was completed and published during the year to join the previously published assessment of black coal resources and the Mining Engineering Section completed an assessment of tin resources and made good progress in the assessment of iron ore.

In addition the Mining Engineering Section handled a wide range of ad hoc inquiries and investigations ranging from the examination of feasibility studies to matters concerning taxation and legislation; further work was also carried out on the application of econometrics to the demand for minerals and to the investigation of latent resources.

The Branch continued to provide lecturers for Industrial Mobilisation Courses and for seminars in the Australian National University. Contributions to foreign aid also continued, with participation in a training course on mineral sands and assistance to many visiting trainees and fellows under the various Australian aid schemes. The Assitant Director continued as special adviser on detrital heavy minerals to CCOP and attended a meeting of that ECAFE Committee in Bandung as well as a meeting of CCOP for the South Pacific in Suva. He also served in the delegation to negotiate an offshore sub-sea boundary between Australian and Indonesia; negotations concluded in Djakarta in September with satisfactory results.

Information and advice on matters of Government policy continued as a major commitment of the Branch and involvement in papers for the Mineral Council, in uranium agreements in the Northern Territory, the MacArthur River project, phosphate rock, problems concerning petroleum, mining taxation and future commitments in New Guinea have proved interesting but time-consuming exercises.

MINING ENGINEERING SECTION

STAFF

Occupied Positions (as at 1 November 1972)

1 Mining Engineer Class 5
1 Mining Engineer Class 3

GOLD MINING ASSISTANCE

G.F. Mead visited four major Western Australian gold producers and obtained information concerning the operation of the subsidy. He also prepared comments on and replies to several submissions for increased rates of subsidy and other proposed amendments to the Gold Mining Industry Assistance Act.

ASSESSMENT OF TIN RESOURCES

W.G.B. Phillips visited Mines Departments and tin producers in Tasmania, Western Australia and New South Wales and obtained data which he prepared for computer processing. All field work and data preparation will be completed by the end of 1972. Arising from out of this work Mr Phillips also prepared a draft paper on the assessment of latent resources of tin.

ASSESSMENT OF IRON ORE RESOURCES

G.F. Mead visited Mines Departments and company headquarters in New South Wales, Victoria and Western Australia and obtained information relating to this project. Mr Phillips also obtained information about the Goldsworthy operations during his visit to the Pilbara tin-field.

CODE OF PRACTICE ON RADIATION PROTECTION IN THE MINING AND MILLING OF RADIOACTIVE ORES

Several meetings of the working panel which is preparing this code were held and substantial progress was made. It was hoped to have this code completed by the end of 1972 but this may not be possible. It is proposed that a meeting of the Interdepartmental Committee should be held this year to consider what further action should be taken.

SECTION 23A OF THE INCOME TAX ASSESSMENT ACT

A draft report on the effect on the mining industry of Section 23A of the Income Tax Assessment Act was prepared for the information of the Interdepartmental Committee which is considering this matter.

CONFERENCE OF CHIEF INSPECTORS OF MINES

The Conference of Chief Inspectors of Mines, which was attended by G.F. Mead in his capacity as Secretary, was held in Wellington, New Zealand, from 6 to 9 March. Arising out of this Conference, Mr Mead prepared proposals for conversion into Standard International units of all quantities expressed in the basic code of safety rules.

WIRE ROPES RESEARCH COMMITTEE

Three meetings of the Committee were attended during the year. The research group at the University of New South Wales has constructed an instrument for the non-destructive testing of wire ropes that is said to have certain advantages over the commercially available Bochum and Bruce instruments. The AMIRA instrument is to be installed in at least one mine and will be of assistance to operators in monitoring the condition of their ropes. However, the instrument can only detect a fraction of the defects in a given rope and attempts

to correlate instrument readings with absolute breaking strain have not been very convincing. Experiments continue on various methods of signal enhancement and filtering and the use of A.C. fields to detect the effects of corrosion.

EXTRAPOLATION OF TIME SERIES

A program was written for the analysis of time series using Hilbert transform methods to derive the casual impulse response functions of a given system. A series of computations was performed on the CDC 3600 computer using economic time series data, i.e. the annual averages of zinc metal prices. The preliminary results were described in a paper on the "Extrapolation of Economic Time Series".

CONSERVATION OF MINERALS

Calculations were performed to find the "life" of the reserves of certain minerals given the current production and assuming a constant rate of growth. The results were incorporated in Noakes L.C. 1972 "Mineral Conservation in Australia."

CHARACTERISATION OF CLAYS

Several discussions were held and correspondence was prepared in connection with the future of this project which is conducted in co-operation with the Australian Mineral Development Laboratories. Recommendations were made regarding an appropriate computer-oriented system for the storage and retrieval of data on Australian clays which have previously been held on edge-punched cards.

STANDARDS ASSOCIATION OF AUSTRALIA IRON ORE COMMITTEE

The sampling subcommittee met three times and approved the final draft of the ISO proposal for incremental sampling of iron ore.

OTHER WORK

Other work included the preparation of the draft of a pamphlet for the guidance of mining investors, periodical calculations of uranium reserves, terms of reference for the coal section of the World Energy Conference, examination of Groote Eylandt reports, comments on proposed regulations to control marine mining of sand and gravel and attendance at meetings concerning computer applications within the BMR, uranium leasing in the Northern Territory and the Googong Dam.

MINERAL ECONOMICS SECTION

STAFF

Occupied Positions (as at 1 November 1972)

1 Mineral Economist Class 5
1 Mineral Economist Class 4
2 Mineral Economists Class 3
3 Mineral Economists Class 2
1 Clerical Assistant

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STAFF CHANGES

At the beginning of the year, a Mineral Economist Class 2 position remained vacant, following the transfer of a Class 3 officer to the Mining Engineering Section in 1970 and the subsequent promotion of a Class 2 officer from within the Section. The vacancy was filled by Mr B.G. Elliott, who commenced duty on 22 May 1972.

The broad function of the Mineral Economics Section is to maintain basic information on, and to maintain a continuing review of all aspects of Australian mineral resources and the mineral industry. Information on these subjects is provided in the Australian Mineral Industry Review, published annually and quarterly by the Section. Another important object of these studies is the preparation of advice for the Government on the utilization of Australia's mineral resources, and the provision of assistance in the formulation of Government policy relating to the development of such resources in the national interest. As the study of mineral commodities and the various sectors of the mineral industry requires a consideration of international as well as domestic factors, such aspects as mining, processing, transportation, utilization and marketing must be treated in the context of world requirements.

COMMODITY STUDIES

The Section continued to maintain close contact with the Australian mineral industry. Members of the Section attended industry conventions, and visited the offices of various companies as well as mining and treatment operations of particular interest. Information obtained on these occasions provides the basis of the Australian Mineral Industry Annual and Quarterly Reviews.

Mr J. Ward visited mineral sands operations in northern New South Wales and southern Queensland in March and June for discussions with companies and the Mines Departments. He also had discussions with companies in Brisbane in early October. During April and October, he discussed mineral developments with the Mines Department and companies in Perth. During his April visit to Western Australia, he inspected mining operations and prospects in the Bunbury and Greenbushes areas and mineral sands operations at Eneabba.

On 3 October, Mr Ward attended the Julius Kruttschnitt lecture, presented in Brisbane by Mr Simon D. Strauss, Executive Director of American Smelting and Refining Company (ASARCO), entitled "Stability of metal markets - is it likely?".

Dr Z. Kalix made several visits to Sydney and Melbourne during the period April - October, for discussions with Government Departments, C.S.I.R.O. and other authorities, and companies, on developments in asbestos, clays, other industrial minerals and construction materials. In May, he visited Adelaide and Perth for similar discussions, and an inspection was made of the new asbestos mine of Chrysotile Corporation Ltd at Woodsreef, N.S.W.

In June, Dr Kalix visited the Mines Department and the Regional office of the Bureau of Census and Statistics in Hobart. He also inspected the kaolin treatment project of Kaolin Australia Pty Ltd at Ballarat, Vic. Discussions were held in Brisbane in July with the Mines Department and companies concerning various industrial minerals and construction materials.

Mr A.J. Gourlay was in Adelaide in April, for discussions with the Department of Mines and companies concerning developments in industrial minerals and copper mining, and on mineral sands resources of South Australia. He also visited companies in Perth concerning developments in bauxite, alumina and industrial minerals. Inspections were made of bauxite and alumina projects in the Darling Range area. He was in Sydney in July, for discussions with bauxite and alumina producers and with the Aluminium Development Council of Australia Ltd. Discussions were also held with the Department of Mines on developments in the sapphire mining industry in New South Wales.

Mr Gourlay also visited Melbourne in June, for discussions with aluminium producers and companies concerning developments in industrial minerals, and in September, concerning future levels of production of alumina and aluminium.

Mr R.Z. de Ferranti had discussions with companies in Melbourne in January, concerning the recovery of secondary lead and zinc.

In Sydney, he attended a seminar in April at the United States Trade Centre on the control of automobile emissions. During this visit, he had discussions with companies on the consumption of zinc. He was also present at a seminar on uranium processing, organized by the AAEC at Lucas Heights (Sydney) in July. At this time, further discussions were held with major lead and zinc producers.

In April, Mr de Ferranti, with Mr S.J. Storm, Statistical Officer (Mining), inspected the smelting and refining facilities of the Electrolytic Refining and Smelting Company of Australia Ltd at Port Kembla. In June, he accompanied the Assistant Director (Mineral Resources) and Dr R.G. Dodson, Geological Branch, on an inspection tour of uranium prospects and deposits in the Darwin and Alice Springs areas.

Mr R. Pratt attended the Annual Conference of the Australasian Institute of Mining and Metallurgy, held in Newcastle from 29 May to 2 June. Later in June, he accompanied Mr J.E. Morris, Senior Advisor - Coal, Department of Energy, Mines and Resources, Canada, and Mr D. Browne, Canadian High Commission, on a visit to Queensland coal mining projects and coal organizations. In Brisbane, he had discussions with the Mines Department, Queensland Coal Board and companies.

Mr G. Hillier visited nickel mining, treatment and prospecting operations and gold mining operations in the Kalgoorlie area during the period 17-31 July. He also had discussions with companies in Perth, and visited the nickel refinery of Western Mining Corporation at Kwinana.

Mr B.G. Elliott visited Sydney, Cobar and Port Kembla during the period 17-28 July. He had discussions with the Copper and Brass Information Centre (CABIC) in Sydney, and inspected the operations of Cobar Mines Pty Ltd and the Electrolytic Refining and Smelting Co. of Australia Pty Ltd. He made a further visit to CABIC in October, as well as to Austral Bronze - Crane Copper, in Sydney, for discussion on the proposed collection of statistical data relating to secondary recovery and consumption of copper in Australia.

WORLD STUDIES

During the year members of the Section continued to be occupied with international commodity considerations. In this regard, work done by officers was confined mainly to attendance at interdepartmental meetings dealing with international agreements and study groups on specific mineral commodities, and the preparation of briefs relating to these.

Mr Ward represented the BMR on interdepartmental committees on tin, tungsten and mineral sands. In March he attended a meeting with Trade and Industry, Bureau of Census and Statistics and BMR concerning the approach to and completion of mineral questionnaires of the Organization for Economic Co-operation and Development (OECD).

In June, Mr Ward prepared specific replies to a questionnaire in connection with the forthcoming meeting of the Seabeds Committee of the Law of Sea Conference; other meetings attended included:

- an interdepartmental meeting in July concerning the brief for the 8th Session of the Working Group of the United Nations Committee on Tungsten;
- an interdepartmental discussion on the possible introduction of export controls on tin, and a Tin Advisory Committee meeting in August;
- discussions in September with Head Office on the October meeting of the International Tin Council in Indonesia, and on the possible imposition of export quotas.

Dr Kalix prepared briefing material in January for the UNCTAD meeting on phosphate. In February, he prepared a paper for the Secretary in connection with an international meeting on sulphur, held in Ottawa on 14 and 15 February.

Mr Gourlay collated data on production of aluminium, alumina and bauxite for the period 1960-1975, and on aluminium prices, in relation to an OECD questionnaire.

Mr de Ferranti prepared notes on lead and zinc as briefing material for the 32nd Session of the International Lead-Zinc Study Group to be held in Geneva, and discussed the brief with Head Office and Department of Trade and Industry. He also attended a meeting in Melbourne on 22 September with representatives of companies and the Departments of National Development and Trade and Industry concerning this Session.

Mr Pratt prepared material in reply to an OECD questionnaire on the Australian iron and steel industry. In March, he attended a meeting at Head Office, concerning the marketing of iron ore in Europe and in September, he attended a meeting at Head Office concerning the Australian contribution in the World Energy Survey.

BASIC INVESTIGATIONS

Studies of long-term trends in production and consumption of mineral commodities continued throughout the year. Members of the Section kept themselves informed on new techniques in mineral extraction, processing and utilization during the course of commodity study tours outlined above and in discussions with industry representatives.

A continuing study of costs involved in mining, treatment, smelting and refining, and freight is maintained by the individual commodity specialists, to assist in policy advice to the Government on minerals development and in assessment of the industry's contribution to gross national product.

SPECIAL INVESTIGATIONS

In recent years, Australia has become a major world producer of several of the more important minerals, and it seems likely that for some of these Australia will meet the bulk of future world demand. Accordingly, a stocktake is being undertaken as part of a current BMR program of assessment of Australian mineral resources.

During 1972, Mr Ward visited mineral sands operations on the east and west coasts of the continent, and had discussions with Mines Departments and companies with reference to the assessment of Australia's national resources of mineral sands. He visited northern New South Wales and Southern Queensland during March and southwestern Western Australia in April. On these occasions he was accompanied by Mr A.R. Jensen of the Sedimentary Basins Section, Geological Branch.

While in Adelaide on 13-14 April, Mr Gourlay obtained data on mineral sands resources on Kangaroo Island on behalf of Mr Ward.

The results of this survey were incorporated in an article by Mr Ward, "Australian Resources of Mineral Sands", published in the A.M.I. Quarterly Review, Vol. 25, No. 1, September 1972.

Dr Kalix was engaged during the year in the collection of data on the clay resources of Australia. Visits were made to Mines Departments and companies in State capital cities and to mining and treatment operations during the course of this survey. An article on kaolin in Australia was prepared for inclusion in the A.M.I. Quarterly Review.

Mr de Ferranti carried out research into the secondary recovery of lead and zinc, and prepared an article on this subject which was published in the Quarterly Review, Vol. 24, No. 4 for June 1972.

During the latter part of the year, Mr Elliott began a survey of the domestic situation of the recovery and consumption of secondary copper in Australia. This work involved visits to Sydney for discussions with CABIC and companies, as already mentioned.

The Section prepared estimates of production, consumption and the contribution of the mineral industry to export income by fiscal years for the period 1971/72 - 1981/82. These data are revised annually for use by the Minister and Government in consideration of longer term fiscal policy measures. Short-term estimates of export income were also made for the year 1972/73 for the Department of Trade and Industry. These estimates are revised at half-yearly intervals.

GENERAL

The preparation of advices, briefs, papers, etc on specific subjects to the Secretariat and to other Departments continued throughout the year. The more notable topics in this regard included -

- preparation of briefing material and attendance at inter-departmental discussions concerning International Tin Council, United Nations Tungsten Committee and International Lead-Zinc Study Group meetings;

- interdepartmental discussions on the possible introduction of export controls on tin;

- advice to Tin Advisory Committee meeting;

- classification and categorization of mineral exports;

- discussion on transport costs within Australia;

- advice on development of northwest Queensland phosphates, and on Commonwealth Government support for same;

- advice to Secretary concerning proposals for the establishment of a central selling authority and controls on sapphire sales;

- comments on proposals regarding controls on the production and sale of opal;

- critique on report on "Zinc" by International Technical Services;

- provision of background material on iron ore export contracts for UNCTAD meeting on world market problems for iron ore and manganese;

- details of steel operations of BHP Co. Ltd in Western Australia;

- advice on c.i.f. coal prices, landed in Japan, from Australia and United States;

- comments to Secretary on proposals by CIPEC countries on copper price stabilization, and on the form of co-operation between CIPEC and other copper producers.

Ad hoc enquiries from industry, the public and overseas continued to occupy a large part of the time of members of the Section during the year. The volume of enquiries reflected a continuing strong interest in Australian mineral developments, particularly affecting mineral sands, iron ore, aluminium, tin, tugnsten, gemstones, and industrial minerals.

VISITORS

Visitors to the Section during 1972 numbered about 170, and included representatives of local and overseas companies, government authorities, research organizations, universities, etc. In particular, visitors from overseas included representatives of -

United States Bureau of Mines,
Charter Consolidated Ltd, London;
Mitsui Mining & Smelting Co. Ltd, Tokyo;
Aninoil Inc., New York;
Urangesellschaft, West Germany;
American University of Beirut, Lebanon;
International Bank for Reconstruction & Development, Washington, D.C.;
Chevron Exploration Corporation, Canada;
B.P. Exploration, U.K.;
N.L. Industries Inc., New York;
Associated Lead Manufacturers Ltd, U.K.

LECTURES

Mr Ward delivered two lectures during March to advanced economics students in the School of General Studies, A.N.U. entitled "Demand for Australian Minerals" and "Pricing and Marketing Mechanisms in World Mineral Markets".

He also participated in a lecture course on 24 April at the University of New South Wales, Sydney, in connection with an international training course on mineral sands mining.

In late August, Mr Ward delivered a lecture on minerals pricing and demand at a Seminar on Minerals Policy and Problems, organized by the Economics Department of A.N.U. Representatives of Commonwealth and State Departments and mining companies were among those who attended this Seminar.

Mr Ward presented an address entitled "Mineral Resources of Australia" on 29 May at Victoria Barracks, Melbourne and at Pearce R.A.A.F. Base, W.A. in September, as part of an Industrial Mobilization Course.

Mr de Ferranti delivered a lecture on "Uranium" at the Seminar on minerals policy held at the A.N.U. in August.

The Section also participated in the BMR Wednesday morning lecture series, and the following addresses were delivered on 26 April:-

"The significance of Eneabba" - J. Ward
"Bauxite and alumina developments in the Darling Range" - A. Gourlay
"Developments in the iron and steel and black coal industries" - R. Pratt
"The gold mining industry in Western Australia" - G. Hillier

Dr Kalix delivered a lecture in the BMR series during May, on asbestos mining and treatment operations at Barraba, N.S.W.

Mr De Ferranti also presented a lecture in this series during May on the lead market with special reference to the effects of automotive emission controls.

PUBLICATIONS

The Australian Mineral Industry 1971 Review was prepared and four issues of the A.M.I. Quarterly Review - Vol. 24, Nos 3 and 4, and Vol. 25, Nos 1 and 2 - were published. Articles appeared in the Quarterly Reviews on the following topics:

Australia and the First U.S. Earth Resources Technology Satellite - W.J. Perry (Geological Branch)

Secondary Recovery and Consumption of Lead and Zinc in Australia - R.Z. de Ferranti

Australian Resources of Mineral Sands - J. Ward

Mineral Conservation in Australia - a Preliminary Analysis - L.C. Noakes

Eleven chapters of major interest in the A.M.I. 1971 Review were published as pre-prints - namely Part I - General Review, Aluminium, Zinc, Copper, Black Coal, Iron Ore, Lead, Titanium, Petroleum, Nickel, and Tin.

PETROLEUM TECHNOLOGY SECTION

STAFF

Occupied Positions (as at 1 November 1972)

1 Petroleum Technologist Class 5
1 Petroleum Technologist Class 4
3 Petroleum Technologist Class 3
2 Chemist - Class 2

1 Boring Supervisor
2 Driller Grade 2
5 Driller Grade 1
4 Drill Assistant
1 Technical Officer (Science) Grade 1
1 Technical Assistant Grade 2
*1 Clerk - Class 5
*1 Clerical Assistant Grade 2

*These positions are seconded from the Operations Branch

Unoccupied Positions (as at 1 November 1972)

1 Technical Officer (Science) Grade 2
1 ?Senior Boring Supervisor (Rotary) - Action is in progress to reclassify the position from that of Engineer Class III which became vacant in 17 September 1971, to that of Senior Boring Supervisor (Rotary) or some other relevant designation acceptable to the Public Service Board).

Staff Changes

Mr R.A. Moon, Technical Officer (Science) Grade 1 resigned on 6 October 1972.

TECHNICAL AND SCIENTIFIC VISITS, CONFERENCES, ETC

Mr H.S. Taylor-Rogers attended nine meetings of the Oil Advisory Committee and prepared correspondence relating thereto. He also attended two Program Meetings, three Departmental meetings on data storage, Australian Minerals Council matters and on future of natural gas exploration, development and conservation respectively. Six Interdepartmental meetings in which he took part were concerned with the pricing of Mereenie crude oil, proposals for the Alice Springs refinery, the application of American proposals for the sub-division of deep sea areas, and the disposal of Palm Valley gas. He attended meetings including one of the offshore Petroleum Regulations Committee, one with Parliamentary Counsel on drafting of offshore Petroleum Regulations, one with the officers of the Victorian Mines Department on Directions issued under the Petroleum (Submerged Lands) Act, and one with the Director, A.P.E.A. and A.M.C. representatives on the release and classification of information submitted in accordance with the terms of the offshore petroleum legislation.

With Mr J.M. Henry he had discussions with Mr K. Duncan of Marine Operations Control Centre, Canberra, concerning operations under the Petroleum (Submerged Lands) Act. With other Bureau officers he attended a meeting in May with the officers of the Australian Water Well Drilling Association. Finally between 6 and 17 March he gave evidence in Brisbane at the Royal Commissions on Drilling on the Great Barrier Reef. Mr J.M. Henry also attended to assist him and the Queen's Counsel for the Commonwealth.

Mr M.C. Konecki attended a meeting of the officers of Departments of National Development, Interior and Trade with the Japanese LPG Survey Mission on 27 January 1972. He prepared a "background" paper and answers to a questionnaire and gave a talk on natural gas reserves and production in Australia

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In February 1972 he visited with Mr K. Blair and officers of C.B.C.S., the Fuel Branch, Victorian Mines Department and Hematite Petroleum Pty Ltd in Melbourne and discussed problems and details of collection, preparation and publication of statistics on production and output of crude oil, natural gas liquids and natural gas. In April 1972 he participated in the APEA 1972 Conference in Sydney, and presented a paper.

Mr J.M. Henry attended three meetings of the Publication Review Committee as Branch and Section representative. He attended the Supervisor 1973 Program Meetings and participated in discussions concerning the drilling requirements of the various programs and to advise on the availability and suitability of drilling plant. He also attended several Departmental and Interdepartmental meetings concerning various aspects of petroleum exploration, development and production, statistics, and the exchange of information. He had discussions with officers of the Charting Branch of the New South Wales Department of Mines concerning petroleum titles and while in Sydney attended a monthly meeting of the Professional Division of A.P.E.A. to hear a paper on developments on the Northwest Shelf by B.O.C. of Australia Ltd.

Mr K. Blair visited in March the Petroleum Information Bureau in Melbourne to discuss presentation of petroleum statistics and in June, the offices of B.O.C. of Australia Ltd, West Australian Petroleum Pty Ltd and the Western Australian Mines Department. The purpose of the latter visit was to resolve certain reservoir engineering queries in regard to the Northwest Shelf and Barrow Island. In September and October he visited Adelaide to confer with officials of Delhi-Santos, on the Cooper Basin hydrocarbon reserves. On 25-27 September he attended the Australian Gas Association's conference in Sydney.

Mr B. McKay visited in August the National Standards Bureau, and two laboratory supply firms in Sydney and discussed details of construction of a gas compressibility apparatus. In Perth, W.A. from 30 October to 2 November he had discussions with the officers of West Australian Petroleum Pty Ltd and B.O.C. of Australia Ltd regarding laboratory gas displacement tests and P.V.T. studies.

Dr T. Powell attended in April the A.P.E.A. Conference and presented a paper.

In July he visited the C.S.I.R.O. Mineral Chemistry Division for discussions with Dr G. Taylor regarding petroleum geochemical work in Western Australia. Together with Mr B. McKay he visited the offices of West Australian Petroleum Pty Ltd, and B.O.C. of Australia Ltd and discussed the results of and further arrangements for petroleum geochemistry studies in the Perth and Northwest Shelf basins.

PETROLEUM LEGISLATION

During late 1971 and early 1972 a comparison was made of the O.C.S. Orders for the Pacific Coast Region, Louisiana and Texas Gulf areas of the U.S.A. and those parts of the draft instructions to the Parliamentary Counsel (Draftsman) concerning exploration, appraisal and development drilling and related operations in the offshore areas of Australia. This comparison was presented as evidence by Mr H.S. Taylor-Rogers before the Royal Commissions on Drilling on the Great Barrier Reef in March 1972, as Exhibit No. 464.

The transcripts of evidence given before the Royal Commissions on Drilling on the Great Barrier Reef were perused regularly and comments were prepared or data checked for the assistance of Queen's Counsel representing the Commonwealth.

During the year, a considerable amount of time was spent in the preparation of material and briefs for the Australian Mineral Council and A.M.C./APEA sub-committee meetings dealing with the proposed Regulations under the Petroleum (Submerged Lands) Act, in particular with those parts and sections dealing with the preparation and submission of information, reports and material.

The receipt and storage of material submitted under the terms of the Petroleum (Submerged Lands) Act and the ordinances and directions under that Act continued throughout the year. Additional storage space has been obtained and when security arrangements have been completed better storage and access will be provided.

INFORMATION AND STATISTICS

The Section prepared for publication and distribution the following:-

(i) Petroleum Exploration and Development Titles Map and Key (half yearly as at 30 June and 31 December).

(ii) Petroleum Newsletters-quarterly. (Nos. 47, 48, 49 and 50 issued).

(iii) Rig Activity - monthly.

(iv) Wells and Footage Drilled - quarterly.

(v) Breakdown of Petroleum Exploration, Development and Production Activity and Expenditure - annually.

(vi) Statistics and information on petroleum exploration, development, production, resources etc. in Australia for various publications, e.g. World Oil, Oil and Gas Journal, the petroleum chapter in Australian Mineral Industry Review, Australia in Facts and Figures, various yearbooks and pamphlets.

PETROLEUM AND RESERVOIR ENGINEERING

Office Studies

Inventory of Petroleum Reserves

Australia's petroleum reserves and resources, both on and offshore were recorded throughout the year, and adjustments made relative to the indigenous oil, natural gas liquids and natural gas production statistics received from official sources. The national inventories were published in Petroleum Newsletters 47, 48 and 49, and 50. A study was also carried out on the allocation of hydrocarbon reserves to their stratigraphic (age group) position.

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Compilation of Production Histories

Tabulation and graphical presentation of production figures from individual fields continued throughout the year. These figures are recorded each month and are broken down into monthly, daily and cumulative productions for each field, and for each hydrocarbon phase. Extraordinary events (fires, blow-outs, strikes etc) which create anomalies in the production profiles, are also recorded. Where possible, pressure histories for each field are being compiled and studied, findings will be prepared by Messrs M.C. Konecki and K. Blair.

Natural Gas Analyses

The compilation of natural gas analyses (Messrs M.C. Konecki and K. Blair) was issued as Record No. 1970/76, and distributed to petroleum companies and the State and Territory Departments of Mines. The compilation was well received, confirming the need for keeping a continuous and complete record of Australian natural gas analyses. This will be done by issuing annual supplements. The first such supplement has been drafted and will be released shortly.

Other Studies

Additional calculations of the recoverable gas reserves, based on pressure and production profiles from Palm Valley Nos 1 and 2, were prepared. The petroleum potential of the Cooper Basin area in South Australia is still being analysed. Further drilling in the Basin has revealed structural and depositional complications necessitating closer evaluation of the petroleum potential.

Laboratory Investigations

Basic Core Analysis

During the period under review, basic core analyses were carried out on material from the following sources:

Wells drilled under the Petroleum Search Subsidy Act 1959-1969; and the Petroleum (Submerged Lands) Act 1968; wells drilled by the BMR and State Mines Departments; outcrops sampled by BMR field survey parties and external bodies.

The parameters measured included gas and liquid permeability, effective porosity, dry bulk and apparent grain density, and rock fluid saturations. In all, 1,091 drilled plugs from 466 core samples in 40 wells were examined. Additionally, 33 outcrop samples were examined for porosity and permeability while bulk density measurements were determined in a further 165 outcrop samples.

Non-Routine Core Analysis

Special core analyses was carried out in 40 samples from 5 wells in the Northwest Shelf area of Western Australia during the year. These studies included capillary pressure (mercury/air) pore size distribution, gas-oil relative permeability, electrical resistivity, equivalent liquid permeability and gas recovery tests. Fresh water permeability measurements were carried out on 55 samples from the Artesian Basin for a BMR hydrological study.

Natural Gas Analysis

Thirty seven samples of natural gas from 24 wells were examined by gas-chromatography during the year. All of these samples were derived from wells drilled under the Petroleum (Submerged Lands) Act or the Petroleum Search Subsidy Act.

Crude Oil and Condensate Analysis

During the period under review, 63 oil and condensate samples were examined. These included liquid hydrocarbons from the Cooper, Perth, Papuan, Browse and Northwest Shelf Basins. A standard geochemical approach to this analysis was followed as in the previous year; this included distillation, viscosity density determination, sulphur determination, column and gas liquid chromatography.

Bitumen Investigations

Four bitumen samples were studied during the year. These included three seepage samples taken from beach localities and a sample from a inland (Western Australian) location. Various techniques including gas chromatography were used to identify the possible origins of these samples.

Formation Fluid Analysis

Thirty three samples of formation water from 24 wells were examined by chemical analysis during the year. This included preliminary determination of chloride, salinity, pH, electrical resistivity and total solids content by the Petroleum Technology Laboratory, as well as a further more complete water analysis of the same samples by AMDEL. The analysis of interstitial water from a pressured core (Brolga No. 1) and 4 samples of water from a Fijian water well were also carried out.

Drilling Fluid Investigations

These included the testing of 5 native clay samples, 10 processed clays and the testing of 3 clay slurries. Standard American Petroleum Institute specifications were followed in this analysis; in addition, the nature and processed clays were subject to x-ray diffraction in order to determine their mineral assemblages.

Petroleum Geochemistry

The following projects were essentially brought to completion during the year under review.

(1) A study of the degree of diagenesis of organic matter and the relationship to the oil and gas occurrences on the Northwest Shelf.

(2) A geochemical classification of crude oils derived from seeps and wells located in Australia and Papua.

The following new geochemical projects are currently being introduced:

(1) A study of the diagenesis of sedimentary material (Precambrian to Lower Palaeozoic) in the Amadeus Basin and the relationship to oil and gas occurrences in this area.

(2) A study of the organic matter in phosphorites and the role this plays in hydrocarbon generation.

Particular attention is being paid to phosphorite occurrences in the Amadeus Basin for this project.

Continuing Geochemical Projects

(1) Kerogens: A study was continued of the structure of kerogen, (the insoluble organic material in sediments as a source of petroleum hydrocarbons). During the year, 23 kerogen samples from various localities were examined using x-ray diffraction methods; attempts to utilize differential thermal analysis in this analysis were unsuccessful.

(2) The role played by micro-organisms in the generation and alteration of petroleum is a study which is being continued, in co-operation with the Baas-Becking Geobiological Laboratories.

The results of the laboratory investigations have been transmitted to companies concerned and to the relevant State and Territory Departments of Mines. Whenever necessary and appropriate they were also used or incorporated in the open file records, reports and papers prepared by the officers of the Section. Core analysis data and chemical composition of hydrocarbons are essential in the estimation of petroleum reserves. Porosity, permeability and density determinations on material submitted by the Geophysical and Geological Branches have been used in the gravity and hydrological studies.

DRILLING ENGINEERING

Modifications and Adaptation of Drilling Equipment

Modifications were made to the installation and working pressures of the Mobile B-40L hydraulic control banks, to enable easy removal and greater flexibility of torque.

Modifications were made to shafts and clutch mountings on the compound drive assembly of the Fox and Mayhew drilling units.

Drilling Workshops, Stores and Vehicles

Seven drilling units were completely overhauled, rust-proofed and painted. Repairs to core barrels and all drilling equipment have been carried out by the drilling personnel, and the machining of various items of equipment was carried out by the Department of Works, A.C.T.

All vehicles were fully overhauled by Truck and Car Sales (Canb) Pty Ltd, Fyshwick, A.C.T.

The reconciliation of stores was carried out prior to the departure of the parties going into the field.

Drilling Operations

A drill party was formed to undertake shothole drilling in the Officer Basin, W.A. Another four (4) Drill Parties were formed to carry out drilling in support of hydrological investigations in the A.C.T., stratigraphic drilling in Western Australia, diamond coring and drilling and coring in North Queensland. On two of these operations, water bores were drilled to supply water for drilling, but in the case of the Officer Basin stratigraphic party, there was no water to be found, contrary to expectations, and it was necessary to haul water for a round trip of 580 miles.

A considerable amount of drilling time has been lost because of changes in drilling programmes by some Branches just prior to and after the arrival of parties in the field; moves of up to 1000 miles which were not in the original program, had to be made to meet the changes.

Table 1, which follows, summarizes the results of drilling and coring for the period 1.11.71 to 31.10.72.

7. PAPERS, REPORTS, RECORDS

(i) Papers

H.S. Taylor-Rogers
"Petroleum" chapter for the Australian Encyclopedia, In Press.

M.C. Konecki
"The Depletion and Provision of Petroleum Reserves in the Light of Growing Demand - the Next Thirty Years"

Proceedings 1972 Conference on Fuels and the Growing Community Canberra, 1-3 November, 1972.

The Institute of Fuel (Australian Membership).

M.C. Konecki, C.F. Gartland and A.G. Skeggs
"Australia's Petroleum Resources, Production and Demand in the 1970's".

A.P.E.A. Journal, 1972

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

A.M.I. 1970 Review, B.M.R. 1971

T.G. Powell and D.M. McKirdy
"Geochemical Characterization of Australian Crude Oils"

A.P.E.A. Journal, 1972.

T.G. Powell and D.M. McKirdy
"Effects of Source Material, Rock Type and Diagenesis on the n-alkane Content of Sediments"

- Geochimica Cosmochimica Act - in press, November 1972

T.G. Powell and D.M. McKirdy
"Relation of Petroleum Composition to Source Maturation and Migration in Australia"

Geological Society of Australia Joint Specialists Groups Meeting; Canberra, Feb. 1972

Abstract J17

D.M. McKirdy
"Eometamorphism of Organic Matter in Precambrian and Cambrian Sediments"

Geological Society of Australia Joint Specialists Groups Meeting; Canberra, Feb. 1972

Abstract J20

B. Bubela and T.G. Powell
"Effect of Copper on the Composition of Bacterial Cell Wall Peptids"

Journal of Bacteriology, In press, November 1972.

VISITORS

During the period under review 148 visitors were received in the Section, 31 of whom visited the Petroleum Technology Laboratory.

TABLE 1.

BMR DRILLING OPERATIONS 1-11-71 - 31-10-72

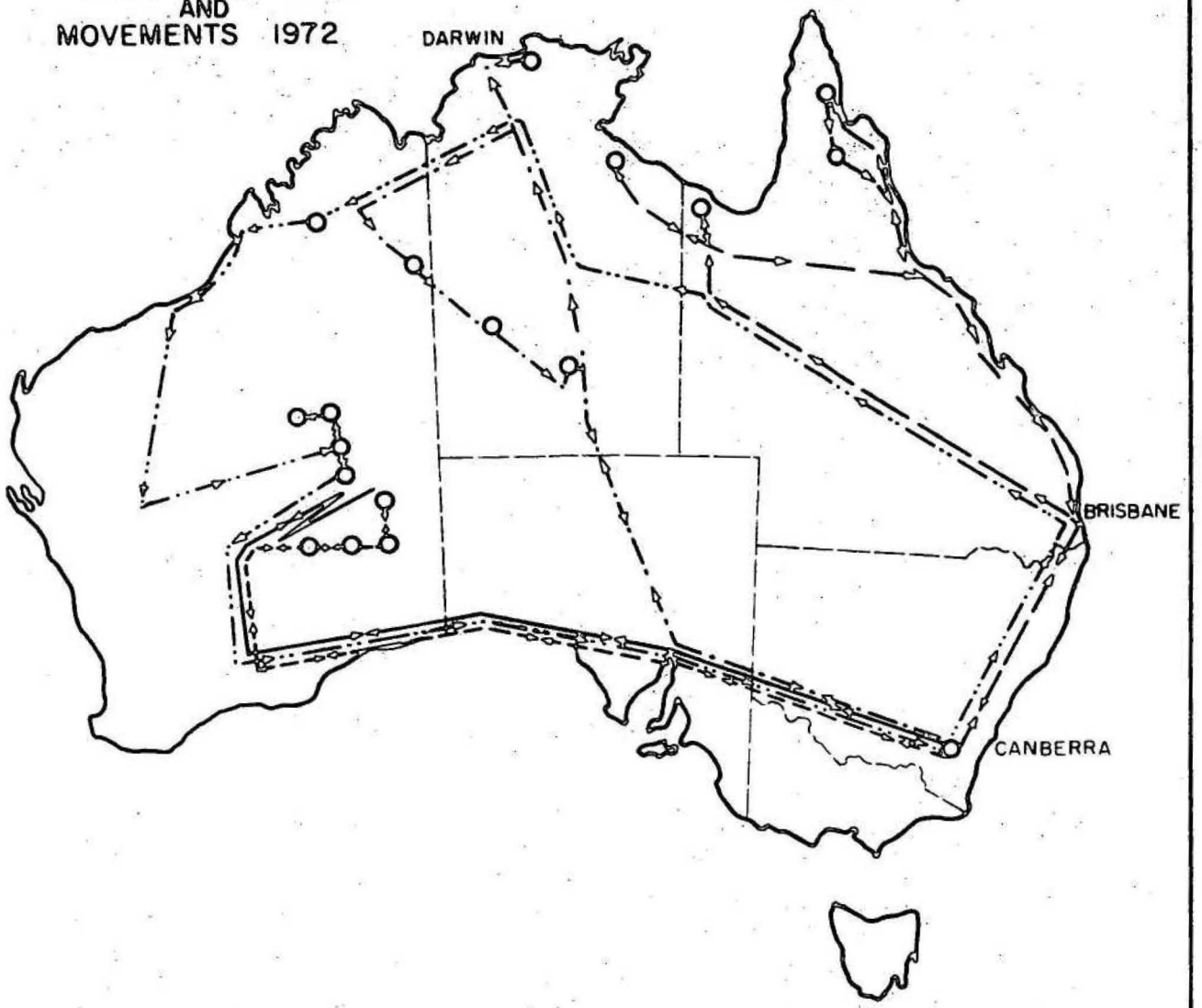
OPERATIONS	AREA	LOCATION	PERIOD From	PERIOD To	No. of HOLES	AVERAGE HOLE DEPTH (feet)	TOTAL FOOTAGE DRILLED & CORED (feet)	TOTAL FOOTAGE DRILLED (feet)	TOTAL FOOTAGE CORED (feet)	No. of CORES	AVERAGE CORE RECOVERY (percent)	TIME USED FOR DRILLING (hours)	TIME USED FOR CORING (hours)	AVERAGE PENETRATION RATE DRILLING (feet/hour)	AVERAGE PENETRATION RATE CORING (feet/hour)
ENGINEERING GEOLOGY AND HYDROLOGY	A.C.T.	Black Mountain	22.11.71	24. 3.72	10	183.8	1838	1438	400	59	78.39	352.5	137	4.08	2.9
		Yass River No.1.	25.11.71	2.12.71											
		Yass River No.2.	2.12.71	3.12.71											
		Lake Ginninderra	9.12.71	17.12.71											
		Pine Island	1. 3.72	10. 3.72											
		Kambah	13. 3.72	22. 3.72											
		Point Hut	6. 4.72	17. 4.72											
		Tuggeranong No.4.	19. 4.72	29. 4.72											
		" No.5.	2. 5.72	6. 5.72											
		" No.6	8. 5.72	10. 5.72											
		" No.7	12. 5.72	22. 6.72											
		" No.8	23. 5.72	2. 6.72											
GEOLOGICAL - METALLIFEROUS	N.T.	Alligator River	10. 6.72	31. 7.72	43	108.42	4662	4276	386	88	86.68	130	126.5	32.89	3.05
		Balgo Mission	23. 8.72	21. 9.72											
		Chilla Wells	29. 9.72	2.10.72											
		Aileron	30.10.72	31.10.72											
GEOLOGICAL - SEDIMENTARY	N.A.	Officer Basin	9. 5.72	30.10.72	18	286.3	5153.5	4179	974.5	110	81.36	280.5	166.5	14.9	5.85
GEOLOGICAL - SEDIMENTARY	N.A.	Boonkanbah	14. 6.72	31.10.72	9	299.66	2697	1317	1380	160	84.69	137	260	21.7	5.31
		Lennard													
		Mount Ramsay													
		Barri													
GEOLOGICAL - SEDIMENTARY	Qld	Westmoreland	30. 5.72	31.10.72	8	445.13	3561	2794.5	766.5	97	85.84	181.25	189.5	15.42	4.05
		Lawn Hill													
		Hann River													
	N.T.	McArthur River													
GEOPHYSICAL - SEISMIC	Qld	Clermont	1.11.71	25.11.71	282	81.58	23,005	23,005	-	-	-	241	-	95.46	-
	N.S.W.	Hay	30. 5.72	1. 6.72	8	92.50	740	740				20.5	-	36.10	-
	N.A.	Officer Basin	14. 7.72	31.10.72	1314	65.82	86,490	86,488	2.0	2	100.00	592	2	146.10	1
		TOTALS			1692	75.74	128,146.5	124,237.5	3909.00	516	86.16	1934.75	881.5	64.21	4.43

SUMMARY

Total footage drilled - all surveys : 124,237.5 feet
Total footage cored - all surveys : 3,909. "
Total footage drilled and cored - all surveys: 128,146.5 "
Total number of holes drilled : 1,692
Average all surveys - core recovery : 86.16 percent

MINERAL RESOURCES BRANCH
PETROLEUM TECHNOLOGY SECTION

BMR DRILL PARTIES DRILLING LOCATIONS AND MOVEMENTS 1972



- Drilling locations
- Seismic Drill Party
- North Queensland Drill Party
- Northern Territory Drill Party
- Canning/Officer Basin Drill Party
- Officer Basin Strat. Drill Party