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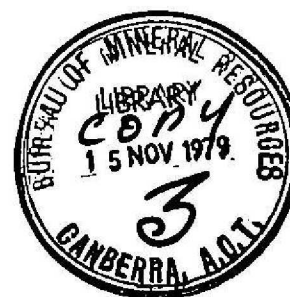
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BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

RECORD 1979/72



MURRAY BASIN HYDROGEOLOGICAL PROJECT:
PROGRESS REPORT, SEPTEMBER QUARTER 1979

Compiled by C.M. Brown

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TABLE OF CONTENTS

	Page
Preface	
INTRODUCTION	1
GENERAL STATEMENT	1
PROGRESS REPORTS	3
BUREAU OF MINERAL RESOURCES	3
Murray Basin Bibliography	3
GEOLOGICAL SURVEY OF NEW SOUTH WALES	4
WATER RESOURCES COMMISSION OF NEW SOUTH WALES	5
Murray Valley	5
Seismic refraction traverses	
Exploration drilling	
Water level measurement	
Murrumbidgee Valley	5
Drilling	
Water level measurements	
DEPARTMENT OF MINES AND ENERGY, SOUTH AUSTRALIA	6
GEOLOGICAL SURVEY OF VICTORIA	7

MURRAY BASIN HYDROGEOLOGICAL PROJECT
PROGRESS REPORT

September Quarter 1979

Preface

This is the first issue of the Murray Basin Hydrogeological Project progress report which it is hoped will provide a medium for communication between individuals and organisations contributing to the project.

Initial contributions are likely to publicise current and future work programs being undertaken by the participating organisations. These are the Geological Survey of New South Wales, the Water Resources Commission of New South Wales, the Geological Survey of Victoria, the State Rivers and Water Supply Commission of Victoria, the Department of Mines and Energy South Australia, and the Bureau of Mineral Resources.

However, as the project gathers momentum it is hoped that contributions by individuals will include results reported under topic headings (e.g. drilling, palynology, geochemistry, coal, etc). The progress report will also list maps, published and unpublished reports in preparation or completed during the quarter, and in addition will have a newsletter role in publicising abstracts of papers or talks previously given or planned for future symposia. Individuals and organisations are requested to send contributions to BMR by the 28th of the last month of each quarter (i.e. December, March, June, September).

INTRODUCTION

The objectives of the Murray Basin hydrogeological project are to collect, analyse and interpret geological and hydrogeological data with a major aim of developing and applying a model which, if feasible, can be used to simulate the groundwater hydrodynamics of the Murray Basin as an aid to the management of its ground water resources.

Following preliminary discussions in September 1978, between officers of BMR and representatives of the Geological Surveys and Water Authorities of New South Wales, Victoria and South Australia, a meeting of interested parties was convened in May 1978 to discuss a project proposal prepared by BMR. It was agreed that the project be expanded to include a review of resources other than water and that a steering committee be established with responsibility for overall coordination of the project. The first meeting of the steering committee was held in Canberra in July 1979 to discuss current work programs. It was agreed that progress reports be issued quarterly and that a general statement describing the project be prepared. The statement below was subsequently endorsed by the participating organisations.

This first report describes both work in progress and some intended programs in phase 1 of the Project.

GENERAL STATEMENT

This project is a long-term study which is being undertaken jointly by South Australian, Victorian and New South Wales geological surveys and water authorities and by the Commonwealth Bureau of Mineral Resources, Geology and Geophysics. It will be co-ordinated by a Steering Committee comprising members of those organisations.

The Murray Basin is a geological structure with an areal extent of some 300 000 km². In each of the three States the basin sediments contain very large groundwater reserves. Where the groundwater has a low salinity it is increasingly being used for irrigation and town water supply purposes. In much of the basin, the groundwater is suitable only for stock use and is extensively used for this purpose. In other parts of the basin the groundwater is too saline for any use. There is a complex interaction between groundwater and surface water which may be beneficial, as in recharge areas in some parts of the basin, or harmful as in areas of saline

groundwater discharge to rivers. In recent years, the States involved have stepped up the rate of assessment of the groundwater regime in the basin.

The primary aim of the Project is to improve the understanding of the groundwater regime of the basin by examining it as a single entity, unencumbered by State boundaries. Since a knowledge of the geology of an area is basic to the understanding of groundwater occurrence, a geological study of the basin is an essential part of the Project and as a consequence it will also be possible to make an assessment of other mineral resources.

The Project is planned initially to last five years and will be organised in five phases:

- (1) Geological synthesis, using all available geological and geophysical data.
- (2) Hydrogeological assessment, on the basis of available data.
- (3) Documentation of deficiencies in geological and hydrogeological information and formulation of proposals for appropriate work programs.
- (4) Additional work as approved which could include stratigraphic drilling, aquifer testing, biostratigraphic analysis and isotope hydrology studies.
- (5) Development of numerical model(s), if found to be appropriate in the light of the data then available.

Investigations currently being undertaken by State authorities will continue, and data generated by them will be used for the joint Basin Project. Collection, collation and compilation of data during the first phase, and interpretation and documentation of the second and third phases, will be undertaken by officers of BMR with assistance from officers of the State authorities. Additional work required in Phase 4 (e.g. stratigraphic drilling, geophysical investigations) may be conducted by BMR or by appropriate State authorities. The development of a numerical model (Phase 5) if found to be feasible, may be undertaken by BMR. The Project will depend on the close co-operation of staff from all organisations

involved, and some movement of staff between organisations for short periods will be necessary. Throughout the study, individuals and organisations will be encouraged to publish results of various aspects of the work. Results of the overall Project will be incorporated into joint publications.

PROGRESS REPORTS

BUREAU OF MINERAL RESOURCES

by C.M. Brown

Preliminary work on the Murray Basin Project has been concerned mainly with data acquisition and with an assessment of the availability and form of geological data which could be contributed to Phase 1 of the project by participating organisations. C.M. Brown and D.E. Johnstone visited Sydney in July and Shepparton, Melbourne and Adelaide in September, and discussions were held with counterpart geologists concerning the availability of existing structure contour and isopach maps, bore locality maps, basic borehole data, petroleum and mineral exploration borehole data, the geology of pre-Tertiary infra basins, biostratigraphy, stratigraphic problems, geophysics and use of Landsat.

In BMR, work commenced on the following:-

- (i) compilation of a 1:1 000 000-scale geologic map.
- (ii) plotting of borehole localities on 1:250 000-scale base maps preparatory to compilation of structure contour and isopach maps depicting the Cainozoic geology.
- (iii) compilation of existing geophysical data.
- (iv) compilation of existing hydrocarbon exploration data.

Murray Basin Bibliography

When the Murray Basin Project was first envisaged it was recognised that the lack of a common BMR data base would create problems and delays in the identification and acquisition of the large volume of published and unpublished data on the geology of the Murray Basin. It was therefore decided that a bibliographic data base would be established using the Geodx data base, designed by C. Watt of BMR, using the IMAGE 1000 data base management system for use on the BMR Hewlett Packard computer. Compilation

of references involved extensive library research in the BMR Library, supplemented by visits to State Geological Survey libraries and archives. The bibliography was initially compiled on a card index system (currently 800 references) and information is now being transferred to the ADP system. In September a further 200 references to published and unpublished reports on South Australian earth sciences were obtained from the Geological Survey of South Australia bibliographic data base (SADMEB) and will shortly be incorporated in the system.

GEOLOGICAL SURVEY OF NEW SOUTH WALES

(prepared by BMR from information supplied by J.N. Cramsie)

During the period work has been limited to a brief review of available information in survey records, particularly in relation to making information available to C.M. Brown and D.E. Johnstone of BMR. J.N. Cramsie listed the major publications dealing with the NSW part of the Murray Basin, reviewed past and current activities of the Geological Survey in the basin and discussed the availability of data which the Geological Survey could contribute to the project. He also arranged for relevant reports to be photocopied, and assembled a set of the available geological maps.

The following summary is an outline of the survey's proposed contribution to the project:-

The Survey will undertake an assessment of the resource potential of coal, sedimentary uranium and non-metallic minerals in the NSW section of the basin, and is also reactivating its Petroleum Section which may investigate the petroleum potential of the Palaeozoic rocks underlying the Murray Basin. The Survey will consider supporting proposals to obtain stratigraphic information if drilling could be justified as investigations for mineral resources, and may be able to offer assistance with geophysical logging and palynology. In addition, although the Survey has no staff available to undertake geological mapping of those 1:250 000 sheets which have not yet been published, it would be prepared to consider publishing these sheets if sufficient information becomes available as a result of the project.

WATER RESOURCES COMMISSION OF NEW SOUTH WALES

by D.R. Woolley

Investigation work by the Water Resources Commission is being conducted in two main areas at present. These are:-

1. Murray Valley

(a) Seismic refraction traverses

A second stage survey is in progress, following previous work in part of the area. The current program is directed towards a better definition of the pre-Tertiary surface within an area extending from Corowa to west of Deniliquin. Some indication of the distribution of Permian strata is being obtained from this work. Electrical resistivity depth soundings are being conducted on some of the traverses.

(b) Exploration drilling

One rotary rig is operating in this area, generally on sites selected from the refraction seismic work. An extensive occurrence of deep aquifers containing low salinity water is indicated in the area north of Corowa, and in the Ovens Valley graben area between Corowa and Mulwala. There are indications that this area may provide a key to the stratigraphic relationship between the Calivil Formation and the Lachlan Formation.

(c) Water level measurement

The observation bore network in this area has only recently been established, and no long-term measurements are available. The network is being extended as the exploration holes are completed, and by using private bores to a limited extent.

2. Murrumbidgee Valley

(a) Drilling

A drilling program is in progress which is designed to augment the water level observation network around the high pumpage area developing in the Darlington Point vicinity. The drilling is also extending knowledge of the aquifer distribution in this area.

(b) Water level measurements

Records for some bores now extend for 10 years. Hydrographs and potentiometric surface contours are being prepared, and information from the observation bore network is being searched for evidence relating to the large scale pumpage which has developed in recent years.

Lack of surveyed levels for the measuring points is a problem at present. A primary aim is to establish the response of the aquifer system to the high, and increasing level of pumping concentrated in the general vicinity of Darlington Point.

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

by R.G. Shepherd

Drilling to provide additional stratigraphic and hydrogeologic data has been in progress near the River Murray, west of Renmark. The aim of this work is to provide a greater understanding of the relationship between groundwater and the water of the River Murray. The data obtained will provide additional information for phases 1 and 2 of the Murray Basin Project. This year, 6 deep and 13 shallow bores have been drilled and geophysically logged.

The deep bores, ranging from 280-300 m in depth were designed to intersect the confined aquifer of the Renmark Group. Water samples and standing water levels were taken and the bores were then completed in Morgan - Mannum limestone as observation bores. Water levels and salinities were also recorded for the latter formation.

Standing water levels of the confined aquifer were generally found to be considerably above that of the unconfined aquifer. Salinity of the confined aquifer was usually at least 20 000 mg/l while the unconfined aquifer was slightly less.

The thirteen shallow bores were completed in the unconfined aquifer at a depth of approximately 60 m. These were disposed in several lines at right angles to the direction of the river. Salinity of the groundwater intersected ranged from 1600 to 25 000 mg/l.

All holes were geophysically logged, including gamma, neutron, S.P., Caliper, and density. Each bore was pumped for 2-3 hours in order to obtain a representative sample of the groundwater. Other work currently in progress in the Murray Basin includes monitoring of the groundwater resources of the Angas-Bremer area adjacent to the northwestern boundary of the Lake Alexandrina. Monitoring is also in progress in a marginal area near Keith in the southwestern part of the basin.

Basic information on groundwater has been obtained through well surveys. However, the only recent data (post-1976) covers CHOWILLA and OLARY 1:250 000 sheets.

GEOLOGICAL SURVEY OF VICTORIA

by C.R. Lawrence

1 Auger drilling has commenced for the preparation of 1:100 000 scale hydrogeological map of the shallow sand aquifers at Shepparton.

In order to obtain reliable samples it has been necessary to take cores as frequently as possible.

2 The Shepparton office is well advanced in examining logs and samples of all known official and private bores in the eastern part of the basin. For that area 1:250 000 maps of the potentiometric surfaces, as well as structural and isopach contours have been drawn.

A physical 3-D stratigraphic model is being prepared.

3 The Groundwater Advisory Committee has approved a program of 25 boreholes for the eastern part of the Murray Basin. This program will commence early in 1980 and is intended to fill gaps in our knowledge of the hydrostratigraphic units; included are 6 pumping tests and a number of holes to basement.

4 Drilling is at present being undertaken at Lake Tyrrell to determine values of the hydraulic conductivity of the Parilla Sand. From these values and the water table configuration, which is known, the groundwater inflow to Lake Tyrrell will be calculated, thus assisting in accurately determining its evaporative capacity.

5. Drilling has commenced at Beau's Lagoon, a groundwater discharge point in the Loddon valley.

6. Two papers have been prepared for the conference on aeolian landforms to be held by the Soil Science Society of Australia at Mildura in October.

"The influence of groundwater discharge on the Mallee landscape" by P.G. Macumber

"Aeolian landforms of the Lowan Sand and Woorinen Formation" by C.R. Lawrence

7. Some shallow investigation drilling is being carried out for brown coal near Dadswells Bridge in the southwest Murray Basin by the Department combined with the SEC.