1980/82





# BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

## RECORD

RECORD 1980/82

MURRAY BASIN HYDROGEOLOGICAL PROJECT

PROGRESS REPORT 4

for half year ending 30 September 1980

Compiled by W.J. Perry

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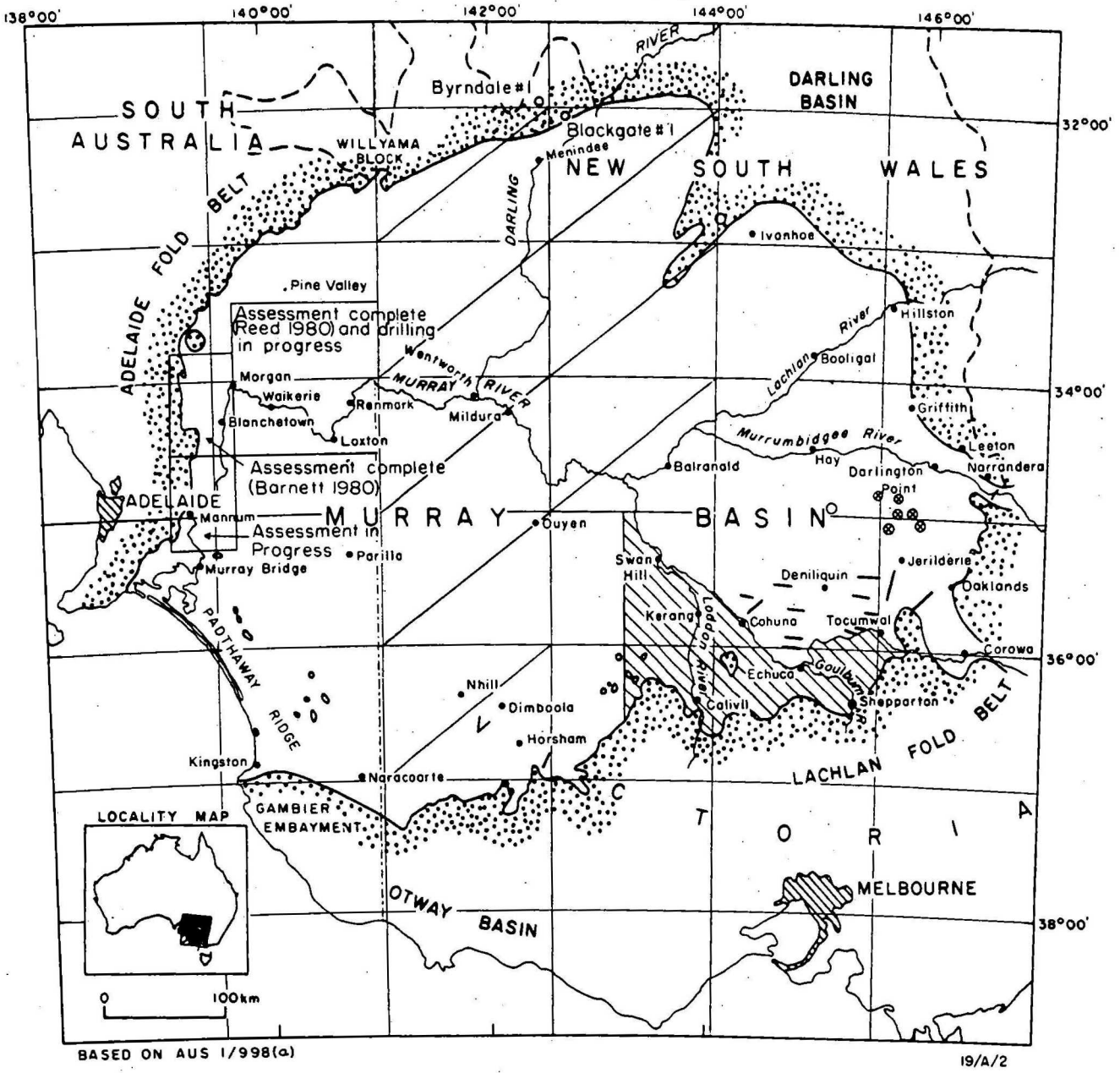
FIGURE 1 - LOCALITY DIAGRAM

2 - PETROLEUM EXPLORATION TENEMENTS




— *Seismic refraction traverse (total 61 km) Water Resources Commission of NSW*

⊗ *Drill hole completed* } *Murray Infrabasins Drilling Program* } *Geological Survey of NSW*

○ *Drill hole proposed*

▨ *in progress* } *Plotting of borehole localities and tabulation of downhole stratigraphic information BMR*

▨ *completed*

*Fig. 1 LOCALITY DIAGRAM*
*MURRAY BASIN HYDROGEOLOGICAL PROJECT*
*Half yearly report, September 1980*

# MURRAY BASIN HYDROGEOLOGICAL PROJECT

PROGRESS REPORT 4

for the half year ending 30 September 1980

## INTRODUCTION

The Project Steering Committee at its meeting on 19 June agreed that accounts of progress should be issued every six months rather than quarterly; consequently this fourth report covers the period from April to September 1980. As a result of discussions at the meeting the Committee decided to investigate the possibility of attempting a preliminary groundwater model of the whole basin at an early stage instead of leaving any modelling till the final phase of the Project as originally planned. A sub-committee (convenor, Franz Kalf WRC NSW) was set up to consider how this objective might be achieved; its recommendations will appear in the fifth progress report.

## PROGRESS REPORTS

### DEPARTMENT OF MINES AND ENERGY, SOUTH AUSTRALIA

by J. Selby

The drilling program to better define the shallow aquifer systems (Murray Group limestones and Pliocene sands) and their influence on the river in the area bounded by Morgan, Loxton, Renmark, and Pine Valley Station is over half complete. So far, 44 out of a proposed 72 holes have been drilled and completed as observation wells. A sampling program for stable isotopes has been commenced by the CSIRO using these wells. A report by Reed (1980) assessing existing data in this area has been published.

A data assessment on the west margin (northern portion) has been completed (Barnett, 1980) and a similar report on the southern portion is in preparation (see Fig. 1).

A preliminary map showing Cainozoic units in the Murray Basin is being prepared by Regional Geology Section; this will form part of the proposed 1:2 million Cainozoic map of the State (contact: R. Dalgarno).

Exploration for brown coal by private companies will provide useful stratigraphic information when available on open file. A deposit has already been located northeast of Kingston by Western Mining Corporation, and hydrogeological studies into the possibility of dewatering an open cut are in progress.

## WATER RESOURCES COMMISSION OF NEW SOUTH WALES

by D.R. Woolley

### Drilling

No drilling was carried out during the peiod. All Commission rigs have been diverted to contract drilling work for landholders and Councils, as a drought relief measure. No date can be set for the resumption of drilling in the Murray Basin.

### Geophysical exploration

Refraction seismic surveys were completed in the Ovens Graben area, and the field crew moved into the Deniliquin-Finley area where work is continuing (Finley is ome 55 km east of Deniliquin). Some resistivity depth probes were conducted in association with seismic traverses (61 km) (fig. 1).

### Compilation of data

Data from private water bores and petroleum/mining exploration holes were extracted and examined, to assist in the compilation of the stratigraphy for the western and northwestern parts of the Basin in N.S.W.

Modelling studies have been conducted which examine the movement of groundwater and likely effects of new withdrawals in the Murray area near Corowa (to be presented at the IEA/HSSA Hydrology Symposium in Adelaide in November) and in the Darlington Point area.

## GEOLOGICAL SURVEY OF NEW SOUTH WALES

by D.H. Probert

### 1. Murray Infrabasins Drilling Program

This program plans six holes in the Jerilderie area and one

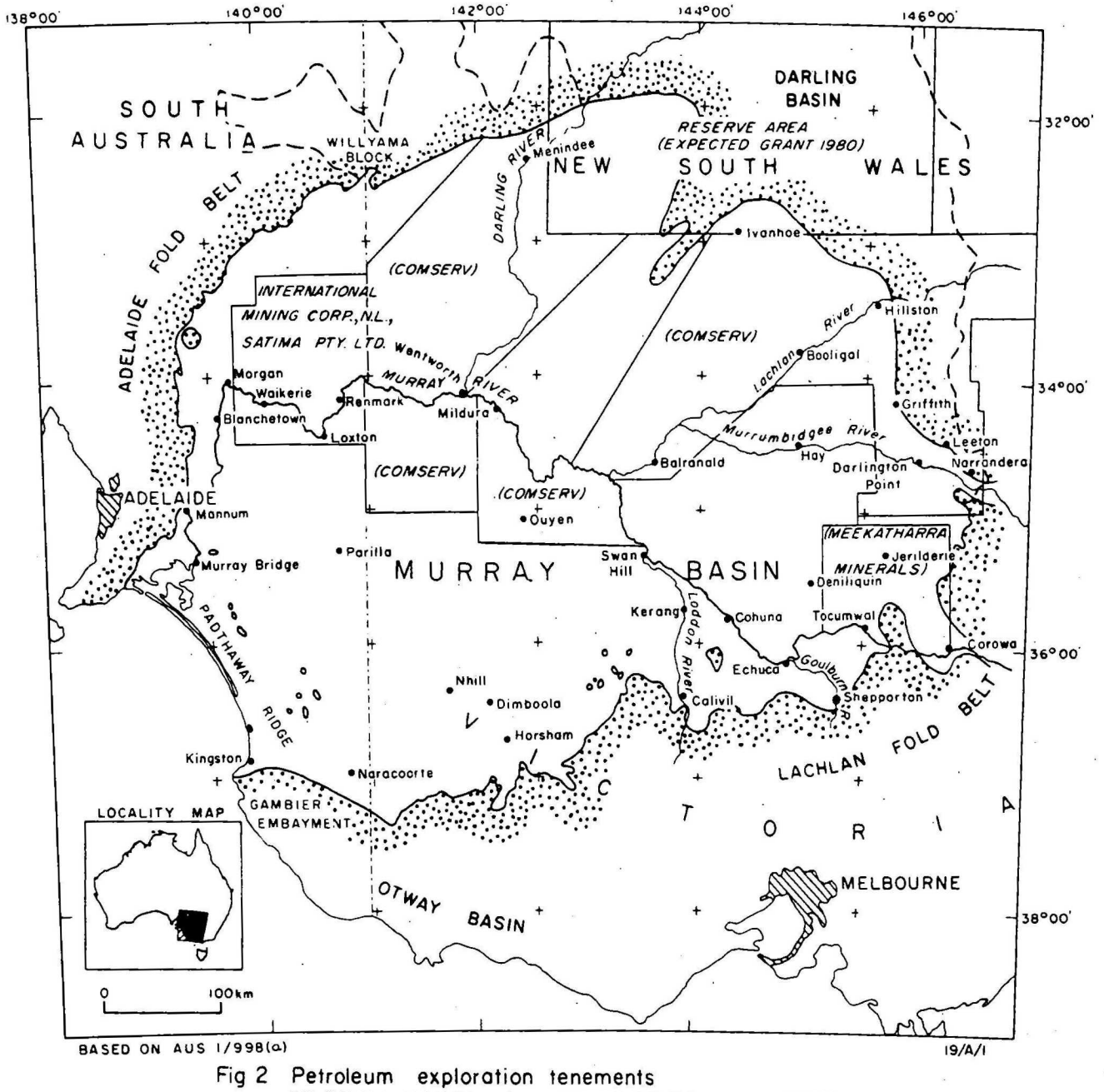



Fig 2 Petroleum exploration tenements
MURRAY BASIN HYDROGEOLOGICAL PROJECT
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ending 30th September 1980

hole near Hay and Ivanhoe to intersect possible coal-bearing Permian sediments beneath Murray Basin cover (Fig. 1). The holes are being drilled by reverse circulation methods to depths of between 250 and 500 m.

Three holes of the program have been completed and a fourth is nearing completion. These are DM Wood No. 1 (346 m), DM Cadell No. 1 (277 m), DM Yanko South No. 1 (277 m), and DM Bundure No. 1 (277 m).

Poorly consolidated sands and gravels from 50 to 80 m thick were encountered in all four holes between 130 and 300 m. No palynological results are yet available nor was it possible to test aquifer potential of these sands and gravels at this time.

2. Kembla Coal and Coke (Pacific Coal) Pty Ltd

Investigation continued by Pacific Coal Pty Ltd on Exploration Permit No. 5 in the northern Oaklands area. Some 16 reverse-circulation holes ranging from 95 to 214 m deep have been drilled.

The holes have intersected Tertiary sediments comprising poorly consolidated sand, gravel, silt, and clay overlying Permian coal-bearing sediments. The Tertiary sequence ranges from 50 to 150 m thick.

A scattered network of six PVC-cased drill-holes is being used to monitor groundwater levels at weekly intervals. S.W.L. depths measured to date range from 33 to 55 m.

3. Mitsubishi Pty Ltd

Work on Exploration Permit No. 3 is nearing the final assessment stage. A good deal of groundwater testing and monitoring have been carried out in the area.

Petroleum Exploration, Murray Basin

Ten petroleum exploration licences are still inforce. Reporting to date has been mainly statutory and interpretative. Further airborne geochemical work will be carried out in the area. A further drill-hole- Comserv Byrndale No. 1 - is programmed in the Menindee area whilst Comserv Blackgate No. 1 is programmed for deepening.

Some 206 metres of Tertiary sediments was encountered in this latter well.

## GEOLOGICAL SURVEY OF VICTORIA

by C.R. Lawrence

An unpublished report 1980/71 has been prepared by S.J. Tickell and W.G. Humphreys entitled "Preliminary report on the hydrogeology of the Victorian part of the Riverine Plain". This report describes aquifer systems which are subdivided into:

(a) Sand and gravel of the Shepparton Formation.

(b) Deep aquifers comprising sand and gravel of the Calivil Formation and Renmark Group.

It also discusses the systems of vertical groundwater flow, horizontal groundwater flow, down-valley groundwater flow, recharge zones, discharge zones, and water level fluctuations. Groundwater salinity and groundwater usage are briefly mentioned, and the report includes a series of related maps, for which the originals are at 1:250 000 scale.

Work continues on the discharge zones of northwestern Victoria where P.G. Macumber is unravelling the complexities of present and past patterns of groundwater movement and chemical trends.

Drilling in the basement rocks to the immediate south of the Murray Basin is being undertaken in conjunction with the Soil Conservation Authority. This work is to determine the groundwater resources and the influence of the groundwater regime on the occurrence of dryland salting.

## BUREAU OF MINERAL RESOURCES

by C.M. Brown

During the period under review, problems associated with the transfer of data requested by BMR from participating State organisations were largely resolved. Work continued on the plotting of borehole locality maps and tabulation of down-hole stratigraphic information. Preliminary work was done on a joint BMR/NSW Water Resources Commission compilation of subsurface data from western New South Wales, and work

commenced on the compilation of the geology of Permian infrabasins underlying the Cainozoic Murray Basin. Preparation of a 1:2 million scale Landsat mosaic and compilation of a 1:1 million Bouguer gravity map were completed. Initial logging of BMR Manara Nos. 1 and 2 was completed in July/August and 40 samples were submitted in September to the Water Resources Commission of NSW for palynological work. During the period, the project received a further contribution on the hydrogeology of the Victorian part of the Riverina Plain by Tickel & Humphrys (1980) and reports on the geology and hydrogeology of the northern and western margins of the basin in South Australia by J.A. Reed (1980) and S.R. Barnett (1980).

Work has not yet commenced on the hydrogeological phase of the project although some preliminary work was done by E. Anderson of the ADP Group, in collaboration with M.A. Habermehl, on the design of a data base system for handling hydrogeological data on the BMR Hewlett-Packard computer.

Phase 1 - Geological Synthesis

(1) Bore locations and borehole data sheets - During June-July-August BMR received microfiched data comprising borehole locality maps, unpublished reports and geological/hydrogeological details for 27 000 boreholes from the Geological Survey of South Australia. In September the project received 35-mm film copies of borehole localities in New South Wales and microfiched summaries of coded lithological data from the Water Resources Commission of NSW. Microfiched copies of open-file mineral exploration reports and a computer print-out containing borehole co-ordinates and total depths were received from the Geological Survey of Victoria. Work continued on the plotting of borehole localities on 1:250 000 scale transparencies and on the tabulation of down-hole stratigraphy (Fig. 1). From 15-19 September C.M. Brown and R.M. Williams of the Water Resources Commission of NSW examined borehole data from western New South Wales and revised the interpretation of the stratigraphy to allow correlation between South Australian and New South Wales sectors of the basin.

(2) Geophysical compilations - A 1:1 million scale Bouguer gravity anomaly of the Murray Basin area, contoured at 5-milligal intervals, was compiled by A.S. Murray using data held by the Geophysical Branch, BMR.

The map extends from 31-38°S and 138-147°E and uses a Lambert conformal conic projection similar to that of the standard base map being used by the project.

(3) Compilation of 1:1 million scale geological map - The project received a copy of the recently published Pinnaroo 1:250 000 geological sheet and accompanying explanatory notes by P.A. Rogers (1980) and a preliminary unpublished 1:1 million scale compilation of the Cainozoic geology of the Murray Basin in South Australia, also by P.A. Rogers. Map sheet boundary problems within South Australia are largely resolved but some problems remain along the South Australia/Victoria state border. No work was done on upgrading the geological content of the 1:500 000 scale map sheets available for western New South Wales.

(4) Landsat mosaic - Compilation of a 1:1 million scale Landsat mosaic using digitally enhanced CSIRO scenes was completed by D.E. Brentnall during the period and prints will be available in November. Some gaps in the coverage were infilled using low-quality ERTS scenes and it is hoped that these may be replaced some stage in the future. Features seen on 1:500 000 and 1:250 000 scale enlargements of Landsat scenes, as reported in the last progress report, are not as readily apparent at 1:1 million scale, and initial comparisons indicate the Landsat interpretations may best be made at 1:500 000 scale.

(5) Murray Basin bibliography - All references available to BMR have been entered into the computerised bibliographic data base established within BMR for use by participants in the Murray Basin Project. A print-out of the bibliography will be distributed to the participating organisations for additions and amendments in early November. Retrievals may be made on the basis of keywords, authors, State, basin, year, document type, and 1:250 000 and 1:100 000 Sheet areas. When complete, the bibliography will be issued as a BMR microfiche record and will contain a keyword listing to facilitate retrievals.

(6) Permian infrabasins - P.E. O'Brien commenced compilation of the geology of Permo-Triassic sediments beneath the Murray Basin in July. Core and cuttings from the available petroleum exploration wells were examined to improve the sedimentological understanding of the early Permian marine sediments and late Permian coal measures. Thin sections of Permian glacial sediments were also examined and described. Revised bore columns illustrating the Permian stratigraphy were drafted and the distribution of concealed Permian in the Ovens Graben were plotted.

## RECENT PUBLISHED AND UNPUBLISHED REPORTS ON THE GEOLOGY AND HYDROGEOLOGY OF THE MURRAY BASIN

TICKELL, S.J., & HUMPHRYS, W.G., 1980 - Preliminary report on the hydrogeology of the Victorian part of the Riverina Plain. Geological Survey of Victoria, Report 1980/71 (unpublished).

REED, J.A., 1980 - Murray Basin hydrogeological investigation, data assessment, Upper Murray and Northern region. South Australian Department of Mines and Energy Report 80/42 (unpublished).

BARNETT, S.R., 1980 - Murray Basin hydrogeological investigation, data assessment, western margin (north). South Australian Department of Mines and Energy Report 80/58 (unpublished).

ROGERS, P.A., 1980 - Pinnaroo, South Australia, Explanatory Notes, 1:250 000 Geological Series Sheet SI/54-14. Geological Survey of South Australia 1:250 000 Geological Series.

# APPENDIX

## General Statement - Murray Basin Hydrogeological Project

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 & Geophysics. It will be co-ordinated by a steering committee comprising members of those organisations.

The Murray Basin is a geological structure with an area of 300 000 $km^2$. 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 or town water supply. 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 reivers. 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 from 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 might 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 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.