DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

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MINERAL EXPLORATION, WESTERN FLANK OF THE HEYSEN RANGE, FLINDERS RANGES, S.A. (Text of paper presented at Geological Survey meeting 15 August 1986)

GEOLOGICAL SURVEY

by

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MINERAL RESOURCES

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INTRODUCTION

This text was prepared for the Seminar 'Multiple Land Use in the Flinders Ranges' organised by the District Council of Hawker and the South Australian Chamber of Mines and Energy at Hawker, South Australia on 16 July 1986, but was not presented.

BACKGROUND

Mining was undertaken in the Flinders Ranges long before European settlement. For centuries, ochre was mined by the Aborigines from pits and underground workings at several localities, including the National Park (Plate 1 and 2).

From 1860 to 1900, copper and silver-lead have been mined from many places.

Today, the Flinders Ranges is an important source of minerals supplying:

- coal from Leigh Creek, since 1943
- barite from Oraparinna - the State's largest underground mine until development of Olympic Dam (Plate 3)
- talc - including all of Australia's cosmetics from Mount Fitton
- slate - from several quarries
- zinc at Puttapa
- ornamental banded calcite
- magnesite from Myrtle Springs (Plate 4)
- scholzite crystals and other specimen material which makes the Flinders Ranges a mecca for mineral collectors
- Mountain of Light copper, about to reopen.

The first tenement in the Flinders Ranges National Park was pegged in 1890 over an outcrop of manganese (Plate 5).

SADM INVESTIGATIONS 1960-65

From 1960 to 1963, a detailed study of the abandoned Ediacara lead-silver mines was conducted by the South Australian Department of Mines (SADM) with follow-up diamond drilling. Lead mineralisation was concluded to be of Mississippi Valley - type (MVT) and potential of the Cambrian limestone host rocks (in blue on Plate 6) elsewhere in the Flinders Ranges was highlighted (Nixon, 1967; Drew and Both, 1984; and Robertson, 1984).

In 1963, the Department undertook geochemical sampling of Cambrian limestone throughout the Mount Lofty and Flinders Ranges (Thomson, 1962). Anomalous concentrations of lead and zinc were disclosed in a number of areas and zones of high grade limestone and dolomite were indicated.

As a major new metal smelter was proposed at the Head of the Gulf at this time both were followed up:

- metals would provide feedstock
- high grade limestone would be needed as flux

Late in 1963, further sampling was undertaken by SADM in the search for limestone and dolomite along the western flank of the Ranges from Edeowie Gorge to Parachilna Gorge (Johns, 1967).

The frontal range shown on Plate 7.

In 1964, followup detailed mapping and sampling outlined two potential deposits south of Brachina Gorge (Olliver & Cramsie, 1967a and 1967b).

In 1965, the southern of these two deposits was drilled with four diamond core holes. Large reserves of high grade limestone were confirmed (Cramsie, 1967).

Finding the flux material was relatively easy, now the search was on for base metals.

METALLIC EXPLORATION 1966-71

In 1966-69, Mines Exploration Pty Ltd conducted base metal exploration under tenure of Special Mining Leases over the area from Edeowie Gorge to Parachilna Gorge in the north (Plate 8). This included 4 diamond drill holes at the old manganese mine but no mineable deposit was found (Roberts, 1966; 1968a; 1968b; 1968c; 1969a;1969b).

In 1969-72, Electrolytic Zinc Co. of Australasia Ltd (EZ) continued exploration over the southern half of this region.

In October 1970, Oraparinna National Park was proclaimed. The proclamation provided for the Mining Act to apply. EZ continued their work using small portable diamond rigs to drill four shallow holes at the Toondana Area (Plate 8).

Results were not sufficiently encouraging to justify the problems and cost of bringing in a larger drill rig and work was abandoned (Horn, 1972, Muller, 1970a; 1970b and 1972).

In 1971, results of base metal exploration in the Flinders Ranges were compiled into a summary report by the Department (Johns, 1972). The potential of the lower Cambrian rocks was emphasised.

PLANNING ASPECTS

On 8 February 1973, the Flinders Ranges Planning Area Development Plan was authorised bringing in the concept of three classes of Environmental Areas.

Class A was

- either of high scenic value (Plate 9)
- or its size and appearance were suitable for conservation.

'No mining activities should take place in these areas except in localities where mineral deposits are of paramount significance and their exploitation is in the State or National interest'.

Eight such localities were listed with provisions to add others.

The authorised plan then went on to say that.

Future geological investigations by the Department of Mines would be permitted on behalf of the Government or other interested parties in consultation with the State Planning Authority to provide scientific evaluation of mineral resources in particular areas'.

The importance of the limestone and dolomite deposits and the potential for lead/zinc were clearly acknowledged in this authorised development plan as *'the western face of the Heysen Range'* was one of the eight designated localities.

In 1976, when the National Park was extended and renamed 'Flinders Ranges National Park', application of the provisions of the Mining Act was omitted. This meant that mining tenements could no longer be granted over the Park.

When the Flinders Ranges was reexamined under the South Australian Planning Act, 1982, Flinders Ranges National park was designated an Environmental Class A Zone (S. Aust. Planning Act, 1982). The western face of Heysen Range is a locality where no mining operations should take place except where:

- *'the deposits are of such paramount signifciance that all other environmental, heritage or conservation considerations may be overriden;*
- *the exploitation of the deposits is in the National or State interest;*
- *investigations have shown that alternative deposits are not available on other land in the locality outside the Zone; and*
- *the operations are subject to stringent safeguards to protect the landscape and natural environment'.*

INVESTIGATIONS 1977-86

In 1977, AMDEL were commissioned for a literature review of MVT lead-zinc deposits. They confirmed the prospectivity of the Cambrian rocks in the Flinders Ranges (Moeskops, 1977).

In 1978, BHP Minerals Limited (BHP) began studies of Cambrian rocks for MVT lead-zinc in Australia. In 1980, when BHP were granted five Exploration Licences in the Flinders Ranges, the National park was excluded.

In mid 1981, BHP proposed that the South Australian Department of Mines and Energy (SADME) undertake geological investigations inside the Park.

Most of the prospective rocks in EL 1080 outside the Park are concealed by alluvium. In contrast, there is excellent outcrop within the Park. (Fig. 1).

On 11 May 1983, the Minister of Mines and Energy announced that Cabinet had approved geological investigations by SADME along the western flank of the Heysen Range within the National Park (Fig 1).

Reserves of lead-zinc ore from Broken Hill were expected to be depleted by about the year 2000 and this Departmental work was expected to assist in the search for Pb-Zn in SA.

SADME investigations inside National & Conservation Parks are considered to be within the provisions of the National Parks & Wildlife Act (Olliver, 1984). As such we have worked in several other Parks in the State.

There were no objections from the Director, National Parks & Wildlife Services.

The program approved by Cabinet was of 2 stages

Stage 1
- geological mapping (Plate 10) of the target zone - 25 km long and 300-700 m wide,
- soil sampling
- rock chip sampling - small chips are collected from outcrop (Plate 11) bulked and assayed,
- stream sediment sampling. Creek sediment is collected, sieved on site (Plate 12) and assayed.

Stage 2
- detailed mapping and sampling of anomalous areas.
- ground geophysics (Ivic, 1986).
- Induced Polarization (Plate 13)
- Sirotem

Only existing tracks were used.

In several letters to the Conservation Council of South Australian (Conservation Council of South Australia Inc., 1983) who has expressed concern, the Minister invited representatives to inspect SADME activities at regular intervals. Meals, accommodation and if possible, transport were to be provided by SAMDE.

This offer was not accepted.

The only people who were shown our work were
- the Oraparinna Ranger and two SADEP officers on our first day on site, 19 July 1983.
- the Acting Ranger in Charge on 18 July 1985.

Field work involved 10 trips of 2-3 weeks duration during the field seasons in 1983, 1984 and 1985 as follows

1983 - 18 July - 7 November
1984 - 28 May - 20 September
1985 - 12 June - 7 November.

RESULTS OF SADME INVESTIGATIONS 1983-85

Results are detailed in Morris (1985) and (1986) and summarised in Horn & Morris (1986).

STAGE 1 exploration located 8 prospective areas near the top of Cambrian Wilkawillina Limestone (Fig. 2).

Outcrops of zinc gossan not previously known were found with the best assay of 43% Zn and 1 700 ppm Pb (Plate 14).

The largest prospect, Manga, is 2 km by 700 m.

STAGE 2 exploration indicated that only four of the eight areas are worthy of further work - Southern, Manga, Concert and Willa prospects.

The next stage in any normal evaluation of a mineral deposit would be drilling.

However, for the National Park, this requires another submission to Cabinet.

This submission has not been prepared and will not be prepared for some time - if ever.

Because the emphasis has switched to all types of lead-zinc deposits and the whole State.

The current industrial dispute at Broken Hill forced the lead smelter at Port Pirie to close on 20 July.

In June 1986, the Lead/Zinc Task Force was created within SADME.

At this stage, Senior Geologists from three Branches (Mineral Resources, Mineral Exploration and Mineral Development & Economics) are involved.

Later, officers from two other Branches (Regional Geology and Geophysics) will be added to the team.

Their task is to determine the potential for lead-zinc deposits throughout SA.

This will involve us in:

- direct field work as in the Flinders Ranges National Park
- encouraging and assisting mineral companies to increase their efforts in SA.

CONCLUSIONS

Departmental officers who have worked up here love the Flinders Ranges as much as any one (Plate 15).

What the Department has done inside the National park in 1983, 1984 and 1985 has:

- contributed significantly to the geological knowledge of the Flinders Ranges.
- enhanced the chances of finding Pb/Zn deposits in Cambrian rocks not only in the Ranges but elsewhere in the State.
- been completed with little or no environmental impact.

Contrary to recent media comment, drilling in the Flinders Ranges National Park is not planned in the near future.

A submission to Cabinet on drilling is not being prepared.

The new Lead/Zinc Task Force is reviewing all data on lead/zinc in the State. Their recommendations will determine areas of interest and priorities.

In may well be that MVT lead-zinc deposits in the Lower Cambrian rocks (Plate 16) in the Flinders Ranges will not be top priority, even though four prospects exhibit most surface features diagnostic of MVT deposits supported by geochemical and geophysical anomalies.

We may well be north of Olary looking for a concealed Broken Hill type orebody - or somewhere else.

Hopefully, the hard decision on whether to drill or not to drill in the National Park will not have to be made.

BUT if it does, then let us make that decision with as much information as possible.

JGO:AM

J.G. OLLIVER

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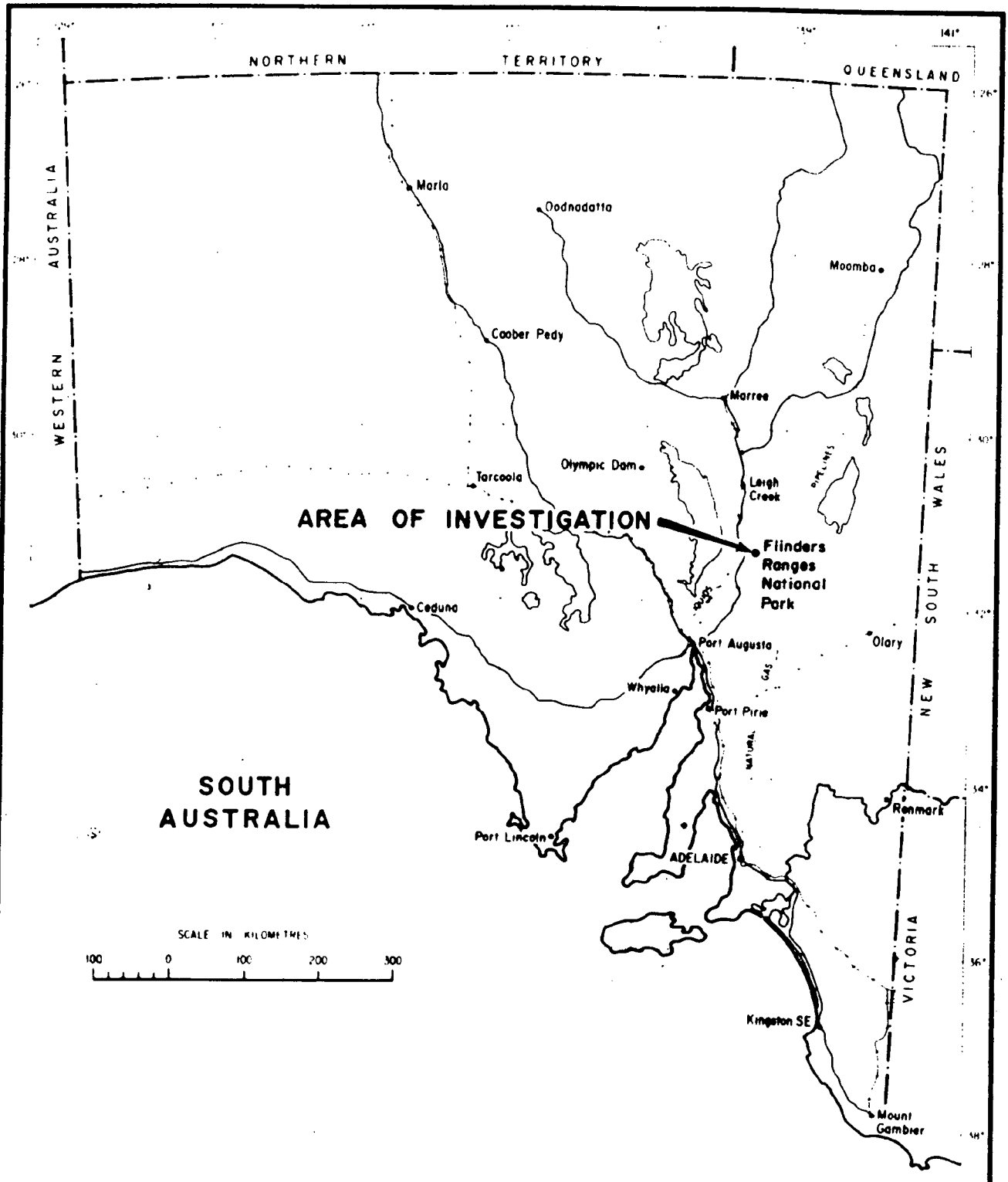

FIG. 1

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

BASE METAL EXPLORATION
FLINDERS RANGES NATIONAL PARK
LOCALITY PLAN

COMPILED D. Ivic	C.D.O. 10.12.85 DATE
DRAWN E. Calabio	SCALE 1:7 500 000
DATE Feb. '85	PLAN NUMBER S 18318
CHECKED	

3406

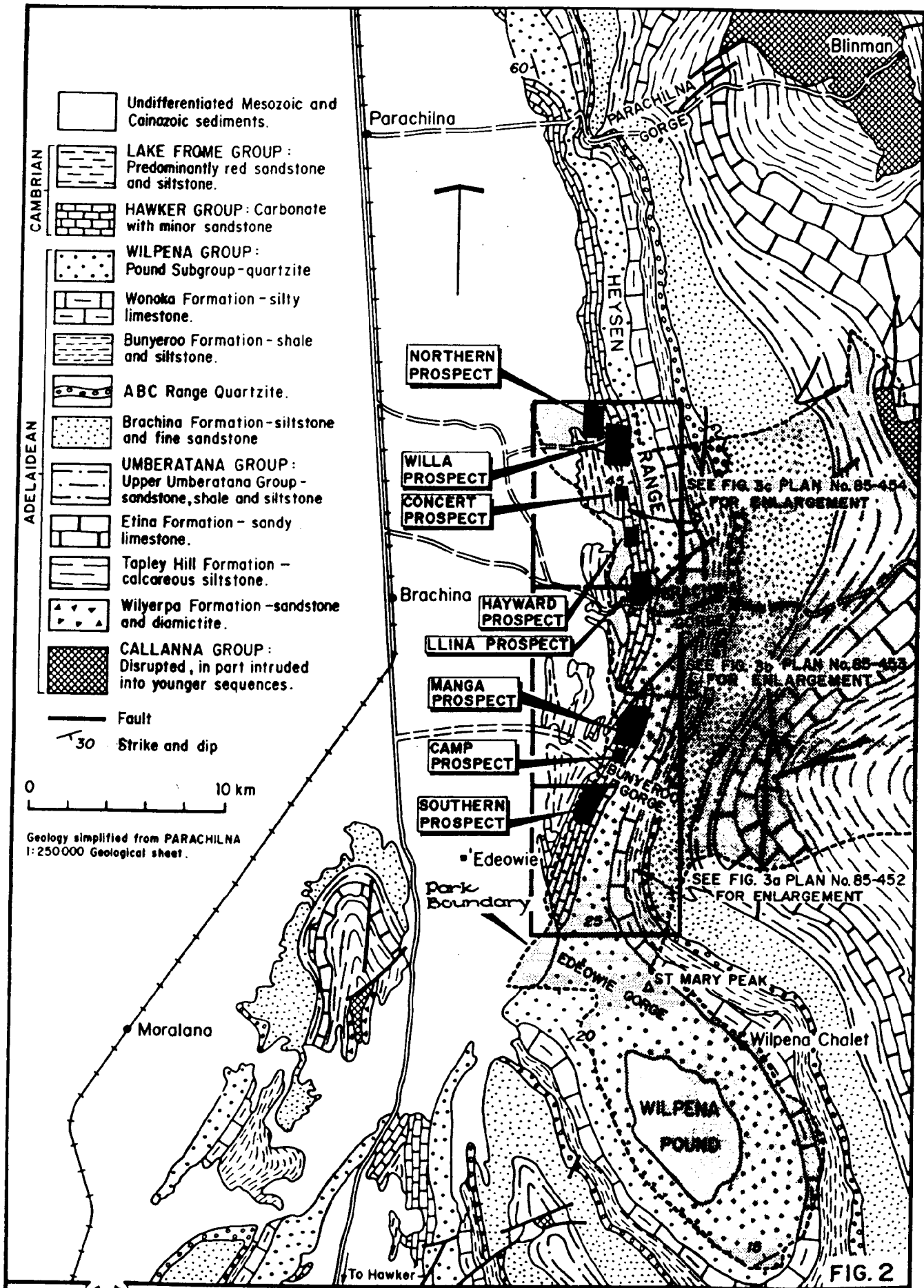

FIG. 2

DEPARTMENT OF MINES AND ENERGY
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COMPILED J.K.	C.D.O. 10·12·85 DATE
DRAWN A.F.	SCALE 1:250000
DATE 29-8-84	PLAN NUMBER S18319
CHECKED	

BASE METAL EXPLORATION
FLINDERS RANGES NATIONAL PARK
REGIONAL GEOLOGY AND LOCATION OF PROSPECTS

PLATE 1 Bookartoo ochre deposit. View north of collapsed ochre workings. November 1983. Slide No. 24686

PLATE 2 Bookartoo ochre deposit, closeup. Entrance to shallow underground workings. November 1983. Slide No. 24686

PLATE 3 Oraparinna barite underground mine. High grade barite being loaded on No. 7 level. February 1983. Slide No. 35424

PLATE 4 Myrtle Springs magnesite open cut. Mechanised pneumatic rock breaker working one of a series of steep magnesite beds. December 1984. Slide No. 34407

PLATE 5 Manganese outcrop Manga prospect. Abandoned pits in Flinders Ranges National Park. October 1983. Slide No. 35425

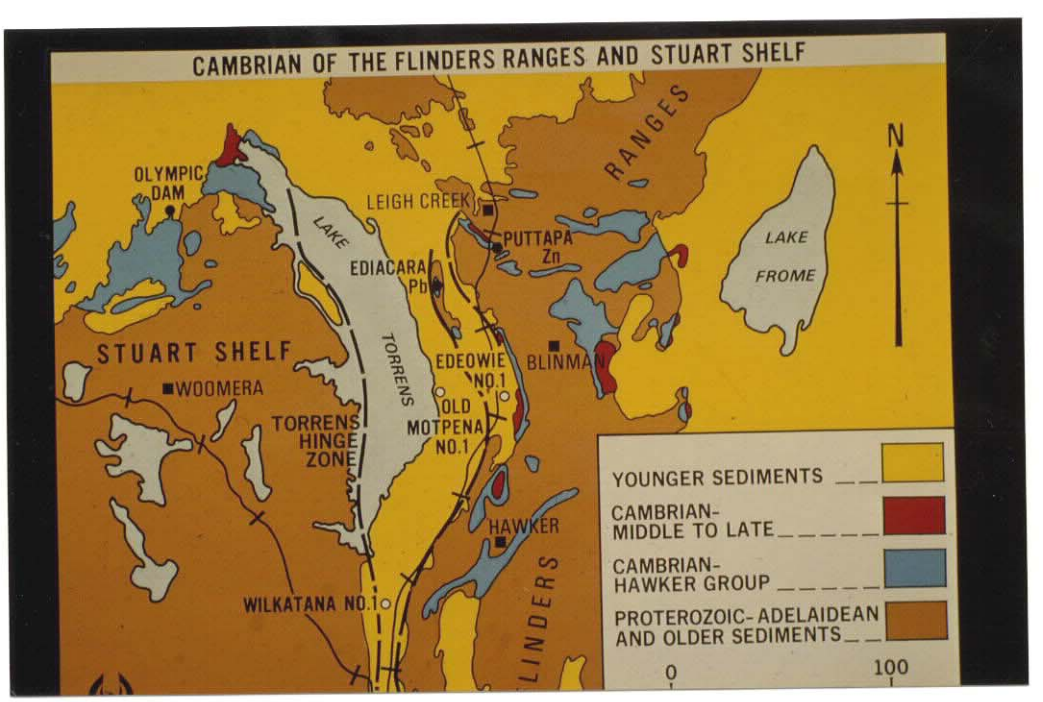

PLATE 6 Regional geology plan. Cambrian of the Flinders Ranges and Stuart Shelf. Slide No. 24343

PLATE 7 Heysen Range, north of Brachina Gorge, Flinders Ranges National Park. View northeast. Lower Cambrian rocks form frontal range. November 1983. Slide No. 24357

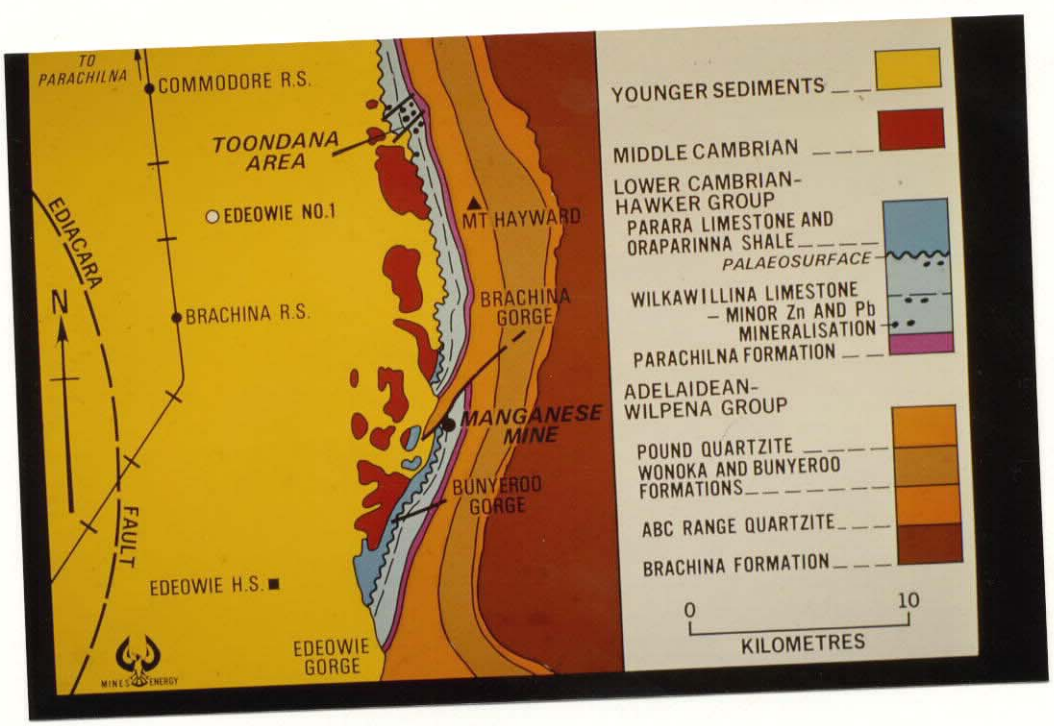

PLATE 8 Geological plan, Edeowie Gorge to Commodore. Slide No. 24347

PLATE 9 Flinders Ranges National Park, Northern prospect. Major westerly draining creek. July 1985 Slide No. 35063

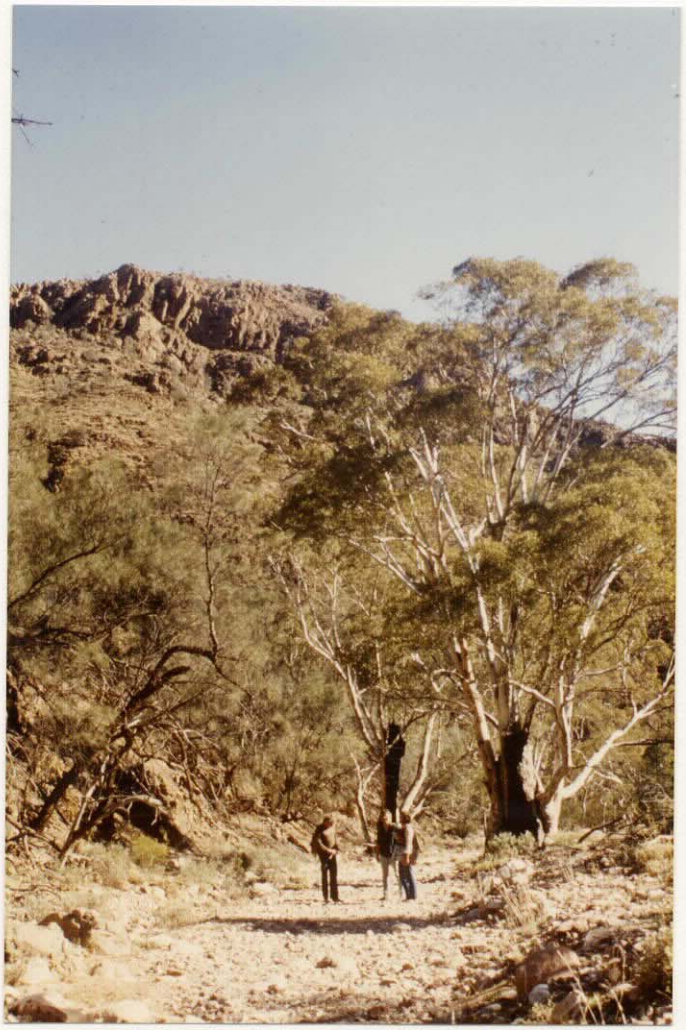

PLATE 10 Geological mapping, Northern prospect. November 1983 Slide No. 24769

PLATE 11 Rock chip sampling, Northern prospect. October 1985
Slide No. 35426

PLATE 12 Stream sediment sampling. Willa prospect Sieving of sample. July 1985
Slide No. 35064

PLATE 13 Induced polarisation survey, Manga prospect. September 1984.
Slide No. 24972

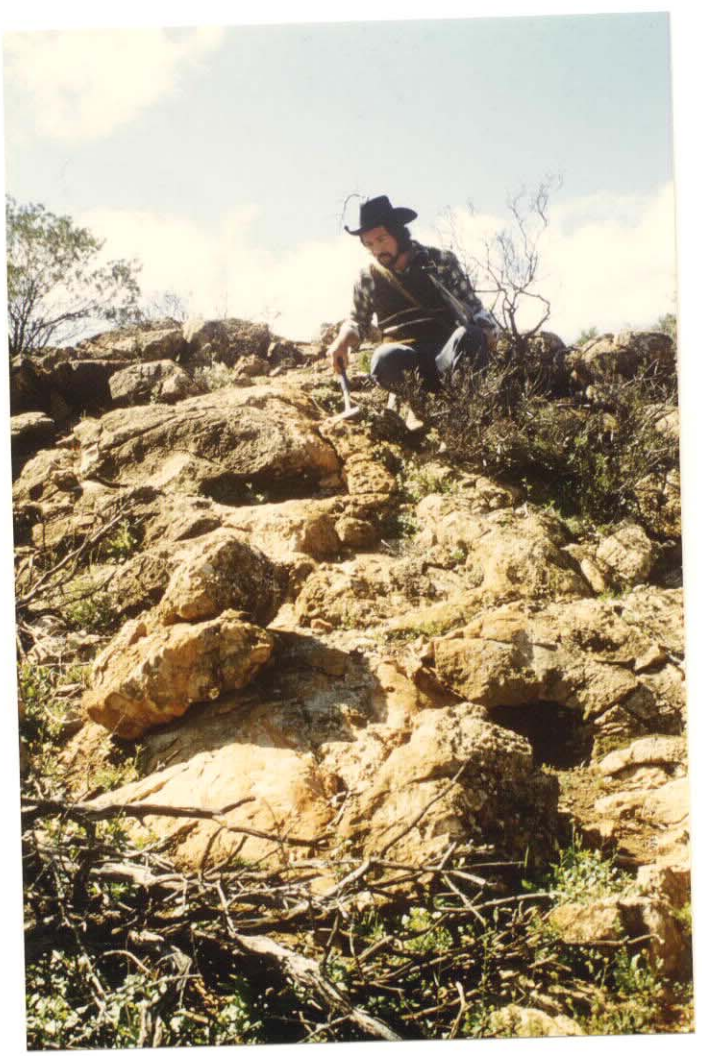

PLATE 14 Smithsonite gossan, Southern prospect.
September 1983
Slide No. 35427

PLATE 15 Willa prospect, view west. November 1983
Slide No. 35428

PLATE 16 Heysen Range, Flinders Ranges National Park. Rawnsley Quartzite forms the range at the back with Lower Cambrian rocks in the frontal range. October 1983.
Slide No. 24348