DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
ENVIRONMENT & RESOURCES DIVISION

R/B 76/22

# CHRYSOPRASE AND MOSS AGATE DEPOSITS, MT. DAVIES AREA N.W. PROVINCE, SOUTH AUSTRALIA

Report No.

Client: Department of Aboriginal Affairs

by

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Rept.Bk.No.76/22
G.S. No. 5699
DM. No. 530/75

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DEPARTMENT OF MINES
SOUTH AUSTRALIA

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## ABSTRACT

Veins of chrysoprase and moss agate occur within jasperoidal layers which are part of a weathered profile developed over ultrabasic members of the igneous intrusive Giles Complex. Workings near Mt. Davies and also at Wingellina in Western Australia are described.

In South Australia No. 1 Mine near Mt. Davies has been the most important producer of chrysoprase. A visit from an Inspector of Mines is recommended to advise on its reopening.

Five exploratory costeans are proposed to determine the extent and quality of chrysoprase at No. 1 and No. 3 Mines.

An inspection is required of the area 6 km northwest from Mt. Davies around the site of Diamond Drill Hole A14 which intersected subsurface chrysoprase.

## INTRODUCTION

At the request of the Department of Aboriginal Affairs, the author inspected eight of the largest chrysoprase deposits in the vicinity of Wingellina in Western Australia and Mt. Davies in South Australia from 14th to 19th June, 1975.

The object was to determine the feasibility of mining at Mt. Davies. The deposit at Wingellina has been mined extensively by open cut.

## LOCATION

The chrysoprase deposits in South Australia occur at Gosses Pile, Claude Hills and in the Scarface and Mt. Davies massifs, (Pl.2 ) which are near the tri-state intersection of the Western Australian, Northern Territory and South Australian borders (see locality plan, fig. 1).

The deposits are grouped around the Pitjantjatjara settlement of Pipalyatjara, which is 200 km west from Amata along the Gun Barrel Highway. Most of the workings can be reached by four-wheel-drive vehicles.

## TENURE

The chrysoprase deposits near Mt. Davies lie within the North West Aboriginal Reserve. Under section 88(7) of the Community Welfare Act 1972, the provisions of the Mining Act do not apply.

## GEOLOGICAL SETTING

The Mt. Davies and Wingellina areas are located near the western end of the Musgrave Block in the region where the Mann Range gives way to the Hickley and Tomkinson Ranges. The high ground is composed of gneisses of granulite facies metamorphic grade which are host to a series of large layered gabbroic and olivine gabbroic intrusives (see geological plan, fig. 1). The latter comprise the Giles Complex. The topography is controlled by major west-north-westerly trending faults and shears, which disrupt both granulites and the Giles Complex.

Laterite has developed in places over the more olivine-rich phases of the Giles Complex. Nickeliferous ochre and jasper occur within the laterite profile. Veins of white to translucent chalcedony, chalcedony with manganese or iron-oxide dendrites (moss agate) and less commonly green nickeliferous chalcedony (chrysoprase) have formed within or are related spatially to the jasper.

## PRODUCTION

Recorded production figures of chrysoprase for both South Australia and Western Australia are as follows:-

TABLE 1

PRODUCTION OF CHRYSOPRASE

| Year | South Australia | | | Western Australia | | |
|---|---|---|---|---|---|---|
| | Quantity (kg) | Value ($A) | Unit value ($/kg) | Quantity (kg) | Value ($A) | Unit value ($/kg) |
| 1973 | - | - | - | - | - | - |
| 1972 | - | - | - | 19 555.6 | 17 156 | 0.88 |
| 1971 | - | - | - | 66 864.4 | 65 976 | 0.99 |
| 1970 | - | - | - | 25 397.0 | 37 000 | 1.46 |
| 1969 | ? | 1 100 | ? | - | - | - |
| 1968 | 1 564 | 8 000 | 5.12 | - | - | - |
| 1967 | 1 059 | 12 953 | 12.23 | 10 361.7 | 1 000 | 0.10 |
| pre 1967 | - | - | - | 5.0 | 10 | 2.00 |
| | 2 623+ | 22 053 | 8.68 | 122 183.7 | 121 142 | 1.09 |

The mineral claim (MC50P) at Wingellina, Western Australia was worked by the following:

1972 - Wingellina Nickel Australia Ltd.

1971 - Wingellina Nickel Australia Ltd. and Cronulla Minerals Pty. Ltd.

1970 - Wingellina Nickel Incorp. Aust.

1967 - J. Gianni

In South Australia chrysoprase was extracted by the Pitjantjatjara people (between 1967 and 1969).

There is some doubt concerning the accuracy of the production figures. Firstly, some chrysoprase was sold unofficially so that the Mines Department record of sales is incomplete. Secondly, some material from Wingellina may have been sold as South Australian chrysoprase during 1967-1969 to take advantage of the higher price in South Australia (see Table 1, Unit value 1967 S.A. $12.23/kg, W.A. $0.10/kg).

Market value is very subjective to quality. The best quality chrysoprase and moss agate is worth many times the unit price indicated in Table 1.

## THE CHRYSOPRASE DEPOSITS

### Wingellina

A number of open cuts (Pl. 3) to depths of approximately 5 m have exposed irregular veins of chalcedony, moss agate and chrysoprase. The veins are either in jasper blocks (Pl.4) or in green nickeliferous clays (Pl. 5). The veins vary in thickness from a few millimetres to 5 cm. Colour of material not removed during mining is gradational from white to medium green. The high quality, even coloured, dark green chrysoprase and the thicker veins have been removed for sale, so that the remnant material observed in the open-cut workings would not be entirely representative.

The frequency of chrysoprase distribution is difficult to estimate but in the wall of one open-cut, veins of white chalcedony and chrysoprase of variable thickness were observed at a density of about five per metre.

Mt. Davies Area

The chrysoprase deposits in the Scarface massif (see fig. 1), which is about 15 km long, have been designated No. 1 Mine to No. 6 Mine, excluding No. 4 Mine which is at Claude Hills. None of the deposits around Mt. Davies appeared to be either as extensive or to contain as much chrysoprase as the Wingellina deposit. No. 7 Mine was not visited because it is at Gosses Pile, which is a sacred aboriginal site.

(a) No. 1 Mine

A number of pits are situated along a strike length of approximately 200 m (Pl. 6), within a band dipping at approximately 60° south-south-west (see fig. 2). The hanging wall is an unweathered gabbroic rock whilst the footwall is magnesite. The chrysoprase, the best of which appears to be evenly coloured, medium green, is associated with jasper. Vein material up to 5 cm thick was observed.

The workings appear to have been about 3 m deep but production ceased following collapse of the hanging wall.

(b) No. 2 Mine

Two small pits have been dug in green clayey material and magnesite. Thin veins of poor chrysoprase about 5 mm wide were observed.

(c) No. 3 Mine

The Mine is approximately 3 km due north of Pipalyatjara. A small creek draining northward from the Scarface massif separates a jasper cap-rock to the west from a gabbro to the east (see fig. 2). A number of pits have been dug at the contact or in the jasper near the contact, but due to the proximity of the creek, several of the pits have been

filled in by flood alluvium. Occasional veins of light green, poor quality chrysoprase have been worked and are up to 1.5 cm wide.

About 400 metres further west, jasper overlies magnesite with which are associated veins of moss agate and poor quality, patchy, light green chrysoprase about 2 cm wide.

(d) No. 5 Mine

No. 5 Mine is approximately 8 km eastward from Pipalyatjara and north of the Amata road (see fig. 1). A pit has been sunk in silicified serpentinite which has no value as a gemstone. However, to the north, chrysoprase veins occur in jasper by a small creek. The chrysoprase is of rather better quality than most which was seen in the area and the veins are up to 2.5 cm thick.

Chrysoprase was encountered sporadically to a depth of 200 m in Diamond Drill Hole A14 (Miller, P.G., 1969) which is about 1 km to the north-west of No. 5 Mine.

(e) No. 6 Mine

The No. 6 Mine workings are approximately 1 km west of No. 5. The excavated material contains fragments of veins up to 5 cm wide. The vein material is patchy white to light green and is porous due to the presence of numerous vughs.

(f) Occurrence 1,5 km north-northwest from Mt. Davies

Another occurrence is located approximately 1.5 km north-northwest of the summit of Mt. Davies. Veins of poor quality, patchy coloured chrysoprase up to 5 cm wide were followed by short tunnels 75 cm in diameter (Pl. 7).

Thin veins of dark green chrysoprase 1 cm wide crop out in hard jasper nearby and further up the creek.

Claude Hills

One deposit, No. 4 Mine, was inspected at Claude Hills. Rare discontinuous chrysoprase veins up to 2.5 cm wide have been worked from 3 small pits. The chrysoprase is of poor quality, its colour being medium to light green and patchy.

## CONCLUSIONS

Chrysoprase around Mt. Davies is widespread and associated with lateritic jasper. The individual deposits at Mt. Davies are much smaller and generally contain poorer quality chrysoprase than the deposit at Wingellina. However, providing the cost of mining is kept low, chrysoprase can be profitably extracted from the region.

## RECOMMENDATIONS

Five exploratory costeans are recommended at No. 1 and No. 3 Mines; two at No. 1 Mine and three at No. 3 Mine (see fig. 2). Ideally the costeans should be 2-3 m deep, 1 m wide and at least 6-8 m long.

At No. 1 Mine, costeans A and B are intended to expose:

(1) a clean profile free of scree and spoil,

(2) the contacts between the gabbroic 'cap-rock', jasper, magnesite and green clay.

(3) the location of chrysoprase in the weathering profile.

At No. 3 Mine, costean C is intended to expose the contact between the gabbro, east of the small creek, and the jasper to the west.

Costean D is intended to indicate, in conjunction with information gained from costean C:

(1) orientation of chrysoprase and chalcedonic veins,

(2) frequency of the veins,

(3) the quality of chrysoprase.

Costean E is intended to expose the magnesite-jasper contact and indicate the quality and quantity of chrysoprase and moss agate.

The area of Diamond Drill Hole A14 which intersected chrysoprase at depth, should be investigated.

A visit by an Inspector of Mines is required to advise on steps required for reopening No. 1 Mine.

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INDUSTRIAL MINERALS SECTION

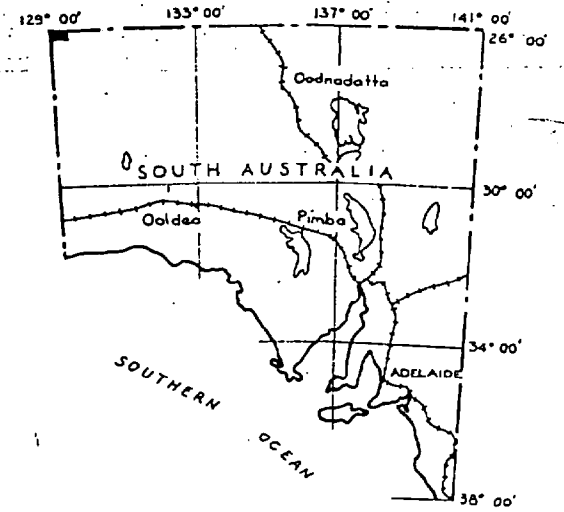
CHHC:FdeA
25/2/76

REFERENCES

Hiern, M.N., 1974. Semi-precious stones of South Australia. Unpublished report, S. Aust. Dept. Mines RB.74/38.

Miller, P.G., 1969. Final Report on Nickel Investigation, Northwest Province 1953-1967. Unpublished report, South Australian Department of Mines. RB.68/95.

## LOCALITY



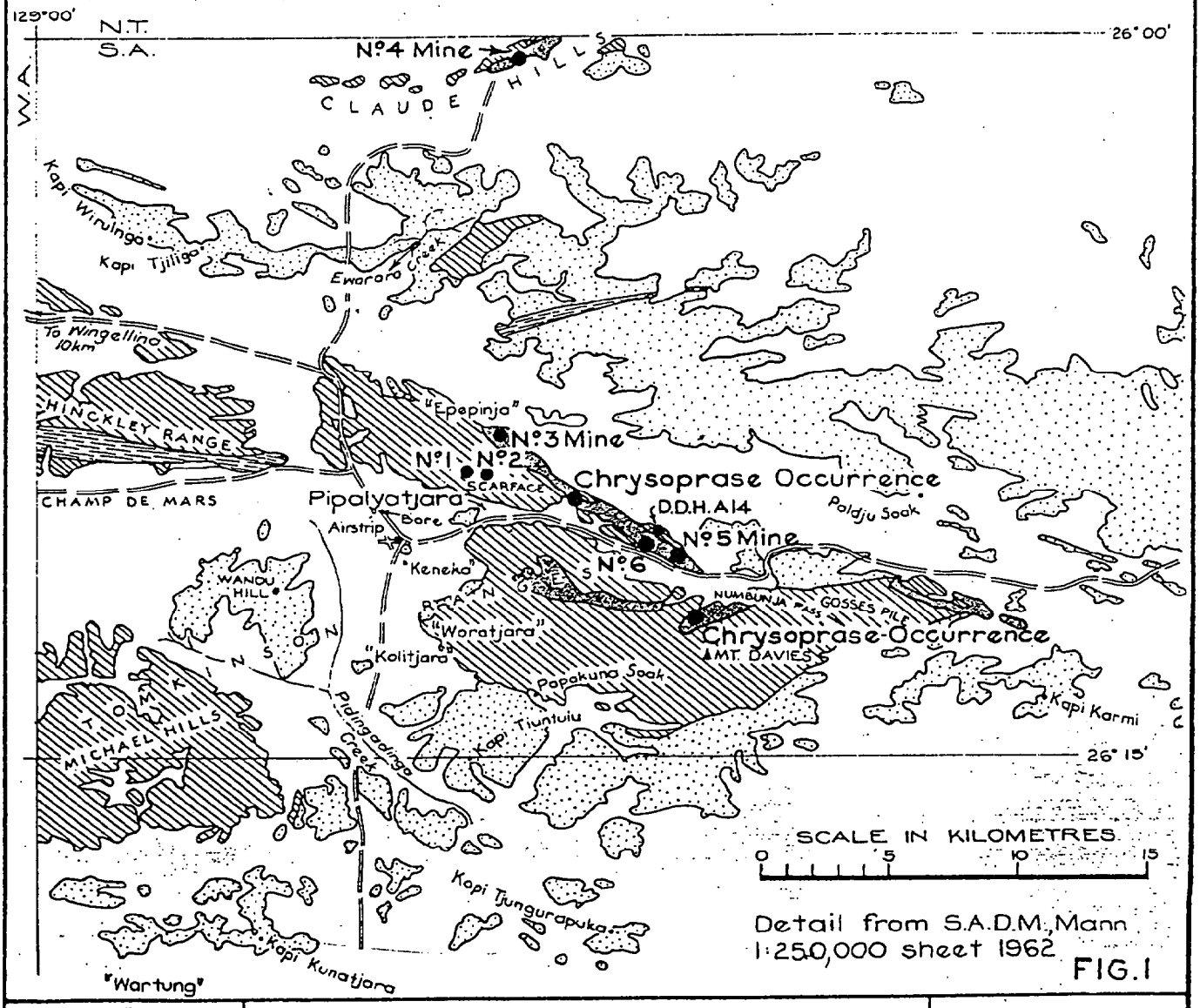

## LEGEND

NICKELIFEROUS JASPER
Associated with green clays and magnesite and in places veined by chalcedony and chrysoprase. (Weathering products of Giles Complex).

FAULT ZONE

GILES COMPLEX of basic and ultramafic intrusions.

MUSGRAVE - MANN METAMORPHICS
High grade gneisses and granulites.

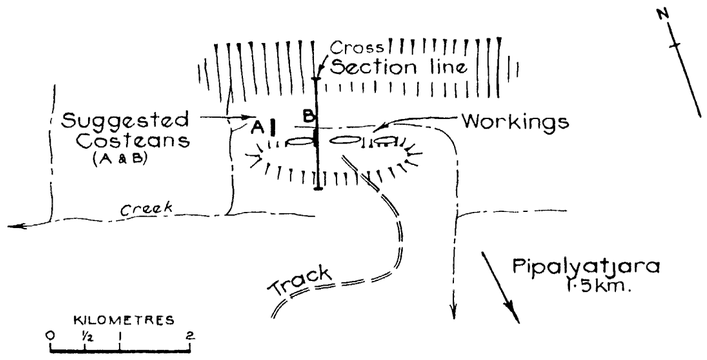



Detail from S.A.D.M., Mann 1:250,000 sheet 1962

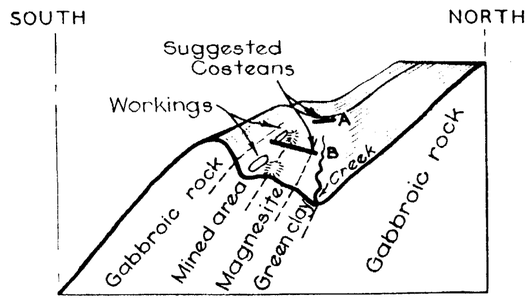
FIG. 1

| | | |
|---|---|---|
| ENVIRONMENT AND RESOURCE DIVISION | DEPARTMENT OF MINES — SOUTH AUSTRALIA | Scale : 1:250,000 |
| Compiled : C.H.H. CONOR | NORTH WEST ABORIGINAL RESERVE | Date : 22nd JULY 1975 |
| Drn. A.G.R. \| Ckd | PIPALYATJARA, MT. DAVIES AREA | Drg. No. |
| | PRELIMINARY INSPECTION CHRYSOPRASE DEPOSITS | S11611 |

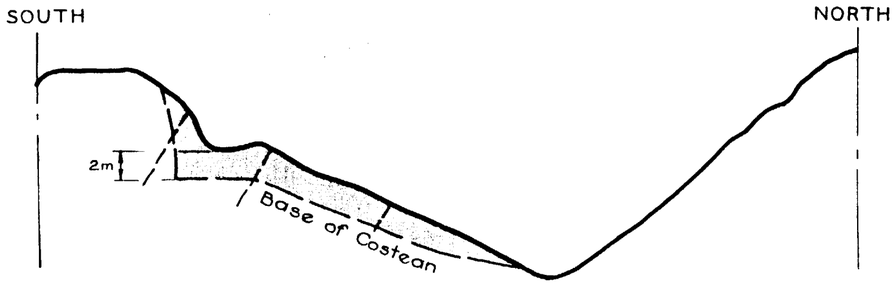
# MINE No1
## SCARFACE PLAN
(Sketch Diagrams)




## MINE No1
## GEOLOGICAL BLOCK DIAGRAM




## MINE No1
## CROSS SECTION AT SUGGESTED COSTEAN B




# MINE No3
## SCARFACE

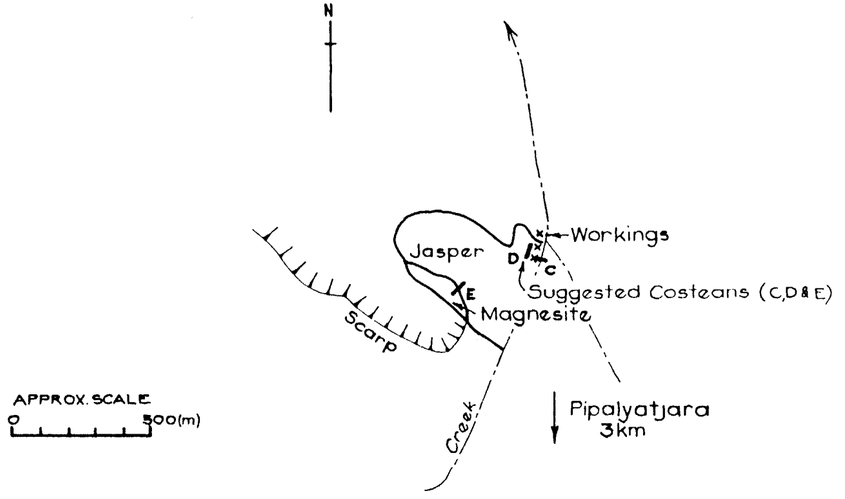



FIG.2

| | | |
|---|---|---|
| ENVIRONMENT & RESOURCE DIV. | **DEPARTMENT OF MINES – SOUTH AUSTRALIA** | Scale: DIAGRAMMATIC |
| Compiled: C.H.H. CONOR | MT. DAVIES AREA | Date: 11TH AUG. 1975 |
| Drn. A.G.R. Ckd. | NO.1 & NO.3 CHRYSOPRASE MINES | Drg. No. |
| | SCARFACE MASSIF | 75-734 |

4745 IM-2,70 A1831

# Regulations under the Mines and Works Inspection Act, 1920-1970

*At the Executive Council Office, at Adelaide, this 5th day of July, 1973*

BY virtue of the provisions of the Mines and Works Inspection Act, 1920-1970, and all other enabling powers, I, the Governor of the State of South Australia, with the advice and consent of the Executive Council, hereby make the following regulations.

M. L. OLIPHANT, Governor

*Regulations under the Mines and Works Inspection Act, 1920-1970*

1. These regulations may be cited as "The Restriction or Prohibition of Surface Mining Operations Regulations".

2. These regulations shall apply to the area or areas of the State specified in the schedule hereto.

3. (1) No person shall, in an area to which these regulations apply, commence or extend any mining operation, or any operation or practice incidental thereto, which interferes with the surface of any land, without the written consent of the Minister being first obtained.

(2) Subject to Regulation 4 of these regulations, the Minister may grant his consent either unconditionally or subject to such conditions as he thinks fit, or may refuse his consent.

(3) Subregulations (1) and (2) of this regulation shall not apply to mines lawfully existing at the time these regulations come into operation and which are being worked in conformity with the requirements of the Mines and Works Inspection Act, 1920-1970, and all regulations made thereunder.

4. The Minister may refuse his consent or impose conditions upon his consent if such refusal or conditions are necessary or desirable:—

(*a*) to reduce or prevent any impairment of the amenity of any area or place by mining operations or practices, or

(*b*) in order to ensure or encourage the orderly mining of mineral deposits in such a manner or in such stages that the amenity of any area or place is either preserved or the impairment thereof is reduced as much as is reasonably possible.

5. (1) Any person who commences or extends any mining operation, or any operation or practice incidental thereto, in contravention of Regulation 3 of these regulations shall be guilty of an offence against these regulations.

(2) Any person who conducts any mining operation or any operation or practice incidental thereto in contravention of Regulation 3 of these regulations shall be guilty of an offence against these regulations for each day upon which such mining operation or operation or practice incidental thereto is conducted.

(3) Any person guilty of an offence against these regulations shall be liable to a penalty not exceeding, for a first offence, $40.00 and for a subsequent offence, $200.00.

THE SCHEDULE

1. Sections 140, 141, 142, 143, 150, 151, 152 and 153 of the Hundred of Willunga.

2. The Hills Face Zone as defined by the Metropolitan Development Hills Face Zone Planning Regulations, 1971, which were made on the 16th day of December, 1971, and published in the *Government Gazette* on the same day at page 2513.

And the Honourable the Minister of Development and Mines is to give the necessary directions herein accordingly.

S.P.O., 93/1972 K. FLEMING, Acting Clerk of the Council


27628

Plate 1.
Aboriginal artifact of chrysoprase found near No. 3 Mine, Mt. Davies area, South Australia.

27629

Plate 2
Mt. Davies, N.W. Province, South Australia.

27630

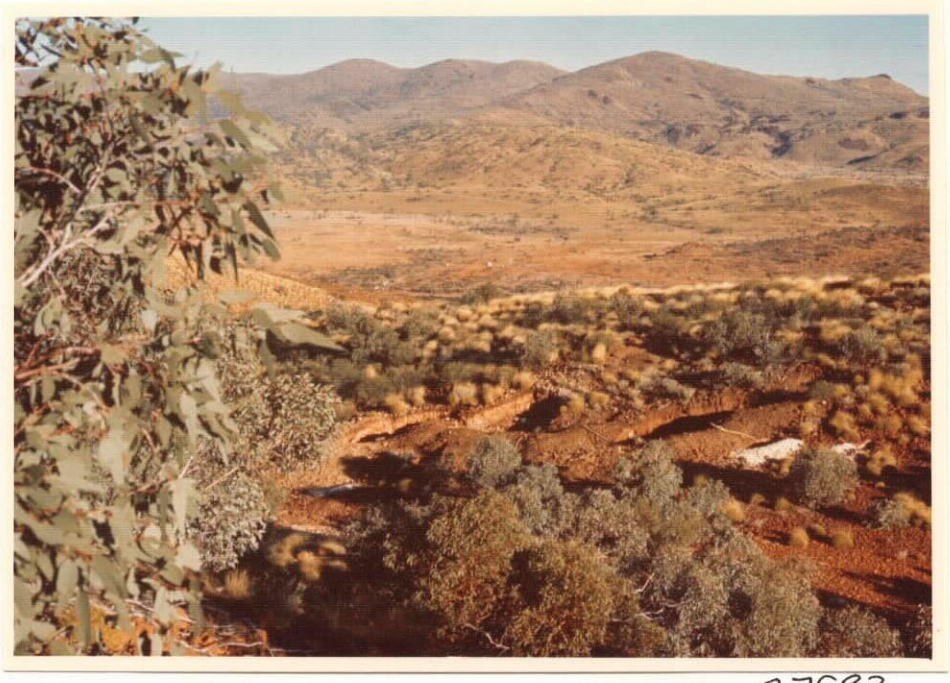
Plate 3.
One of several pits bulldozed into nickeliferous clays at Wingellina, Western Australia. The trenches expose veins of moss agate and chrysoprase fragments of which can be seen in the photograph littering the surface.

27631

Plate 4
Veins of poor quality chrysoprase and moss agate in brown, nickeliferous jasper at Wingellina, Western Australia.

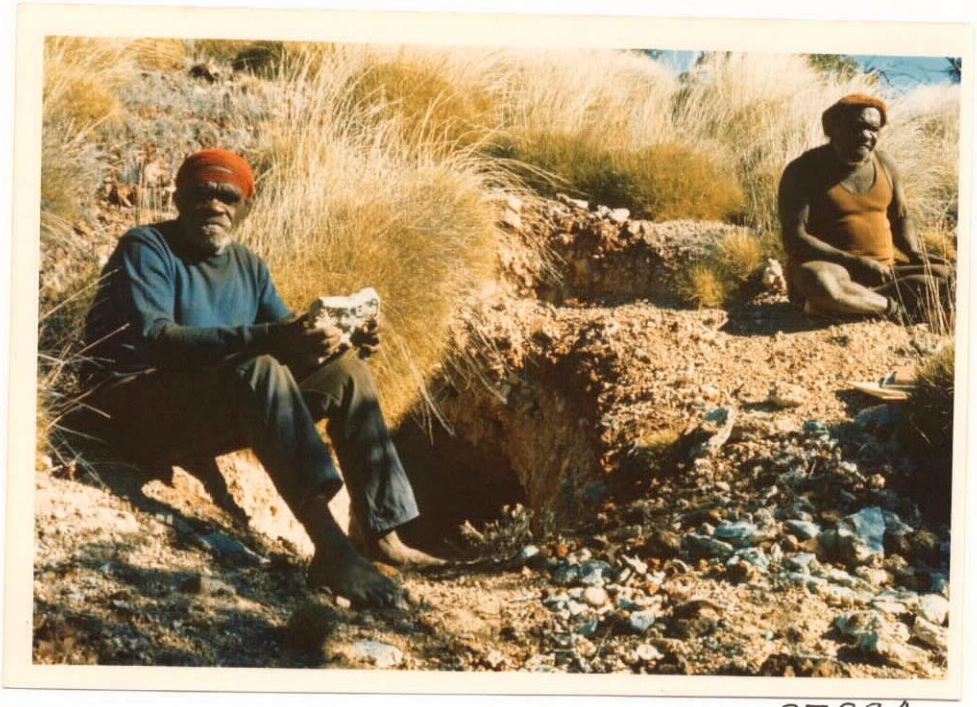
27632

Plate 5.
Veins of moss agate protruding from soft nickeliferous clays which form the wall of an open cut at Wingellina, Western Australia.



27633

Plate 6.
Some of the large collapsed pits at No. 1 Mine, Mt. Davies area South Australia. Much of the best South Australian chrysoprase has been extracted from this site. The deposit dips away from the viewpoint under gabbroic rock.
The settlement of Pipalyatjara is visible in the middle distance on the plains to the south.



27634

Plate 7.
An unnumbered chrysoprase working near Mt. Davies, South Australia. Fragments of poor quality chrysoprase litter the ground in the bottom right hand corner of the photograph. The material was extracted from the burrow-like adit by the feet of the aboriginal guide to the left.