COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1968 / 114

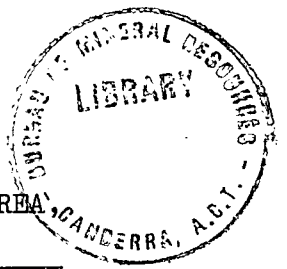
Probable Carbonatites in the Strangways Range Area, Central Australia

by

P.W. Crohn and D.C. Gellatly

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1968/114



PROBABLE CARBONATITES IN THE STRANGWAYS RANGE AREA, CENTRAL AUSTRALIA.

by

P.W. Crohn and D.C. Gellatly

Contents

PROBABLE CARBONATITES IN THE STRANGWAYS RANGE AREA, CENTRAL AUSTRALIA

INTRODUCTION

A carbonatite origin is suggested for a group of crystalline carbonate rocks containing apatite, magnetite, and zircon, which occur in the Strangways Range at about 23°01'S, 134°16'E, 60 miles north-northeast of Alice Springs, Northern Territory. No carbonatites have previously been recognized in Australia.

Attention was first drawn to this locality by the detrital magnetite, apatite, and zircon, which are widely scattered over the areas underlain by the carbonates. The first known reference to the locality is by Owen (1944), who examined it as a possible source of phosphate, and considered the carbonate rocks to be metamorphosed sedimentary limestones. In 1965 a low-level aeromagnetic survey of the area was made by the Bureau of Mineral Resources (Tipper, 1966). In 1966 Geopeko Ltd, who named the carbonate lenses Enterprise 2, 3, 4, and 5, carried out diamond drilling on the two eastern lenses (Williams, 1967).

FIELD OCCURRENCE

Three lenses of crystalline calcitic and dolomitic carbonate rocks and gneissose micaceous carbonate rocks occur in a northeast-trending zone 1½ miles long, with a fourth lens 1½ miles to the west-southwest. The most easterly lens, with a surface extent of about 2,000 by 2,000 feet, is the largest.

The carbonate rocks are highly altered and in part ferruginized at the surface. In places they show banding due to differences in texture and variations in the contents of non-carbonate minerals, mainly mica, apatite, and magnetite. The trend of this banding is north-east at Enterprise 3 and 4, but variable at Enterprise 2. Individual bands range from a few inches to several feet in width.

Apatite occurs generally as massive aggregates, some of which are up to two feet in diameter, and individual grains of more than one inch are not uncommon. Magnetite forms twinned octahedra up to three inches in diameter and occasional irregular aggregates of even larger size. Zircon typically occurs as relatively squat prismatic crystals up to two inches long and one inch across.

The rocks surrounding the carbonate lenses are schist, gneiss, and basic igneous rocks of the Arunta Complex. The complex has generally been regarded as Archaean, but probably includes some younger rocks. In places biotite schist and mylonite can be traced to within 50 feet of the carbonates, but the actual contacts are not exposed. The schist locally contains augen of feldspar and less commonly garnet, but these are not restricted to the vicinity of the carbonate rocks.

Small lenses and irregular masses of basic rocks and aegirine-augite- and sodic amphibole-bearing pegmatite, generally less than ten feet across, occur within the carbonates, but their contacts again are not exposed.

The shape and intensity of the magnetic anomalies obtained by the B.M.R. aeromagnetic survey (Tipper, 1966, Plate 6) suggest that the three eastern lenses dip steeply to the northwest. Mapping by Williams (1967) suggests that Enterprise 3 and 4 are part of a continuous band, and are separated from Enterprise 2 by a fault striking northwest.

The carbonate lenses lie on the axis of a regional gravity high, which includes the Papunyah Gravity Ridge to the west and the Illogwa Gravity High to the east (Flavelle, 1965).

PETROGRAPHY

The carbonate rocks range from non-foliated dolomitic and calcitic rocks to gneissose rocks composed largely of calcite and biotite. The bulk of the magnetite, apatite and zircon occurs in the non-foliated rocks, in which dolomite generally forms large irregular grains, whereas calcite typically occurs as smaller interstitial grains. Small scattered ovate grains of apatite and small euhedra of magnetite are preferentially associated with calcite. Rare large aggregates of apatite and large euhedra of magnetite are also present. Minor constituents comprise zircon, ilmenite, pyrite, amphibole and phlogopite; the latter shows reverse pleochroism, i.e. maximum absorption normal to (001). One specimen contains aggregates of pale grey-brown microcrystalline highly birefringent material, thought to be columbite after pyrochlore.

GEOCHEMISTRY

Trace element determinations by Australian Mineral Development Laboratories, Adelaide, on 13 samples of drill core from Enterprise 3 indicate the following values:

Nb	20 to	450 ppm	Ga	1 to	8 ppm
Cu	10 to	250 ppm	Ba	250 to	1,000 ppm
Zn	-100 to	100 ppm	Sr	800 to	1,500 ppm
Pb	2 to	6 ppm	La	-100 to	700 ppm
Co	8 to	60 ppm	Pr	-100 to	100 ppm
Ni	10 to	120 ppm	Nd	-300 to	300 ppm
V	10 to	600 ppm	Y	80 to	200 ppm
Cr	10 to	60 ppm	P	-100 to	+10,000 ppm
Ti	200 to	+10,000 ppm	Rb	-3 to	15 ppm

- indicates "less than"
+ indicates "more than"

Several of the elements, notably niobium and the rare earths, and to a lesser extent barium and strontium, are present in amounts greater than those normally found in sedimentary carbonates, and the assemblage as a whole is comparable with that from known carbonatites. However, all the values are well below economic concentrations.

The highest result for Nb was obtained from the specimen containing suspected pseudomorphs after pyrochlore. Cu, Zn, Co, Ni, V, Cr, and Ti are higher than average in magnetite- and pyrite-bearing specimens; barium and strontium are moderately high in all samples. Rare earths (La, Pr, Nd, and Y) have maximum concentrations in anapatite-rich sample, but there is no consistent relation between rare earths and apatite contents.

CONCLUSIONS

Many of the petrographic and geochemical features of the Strangways Range carbonate rocks suggest that these rocks are carbonatities. These features include the presence of apatite, magnetite, zircon, and possible pseudomorphs after pyrochlore; the

ovate form of the apatite; the reversed pleochroism of the phlogopite; the association with aegirine-augite- and sodic amphibole-bearing pegmatite; the high niobium and rare earth contents; and to a lesser extent the moderately high barium and strontium contents.

Further work on this occurrence is in progress.

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance of Geopeko Limited, who supplied drill core material, and of Mr. B.T. Williams for permission to include data from his map of the area.

REFERENCES

CROHN, P.W. - In prep. Probable carbonatites in the Strangways Range area, Central Australia. Part 1. Field occurrence. Bur. Miner. Resour. Australia Record (unpubl.)

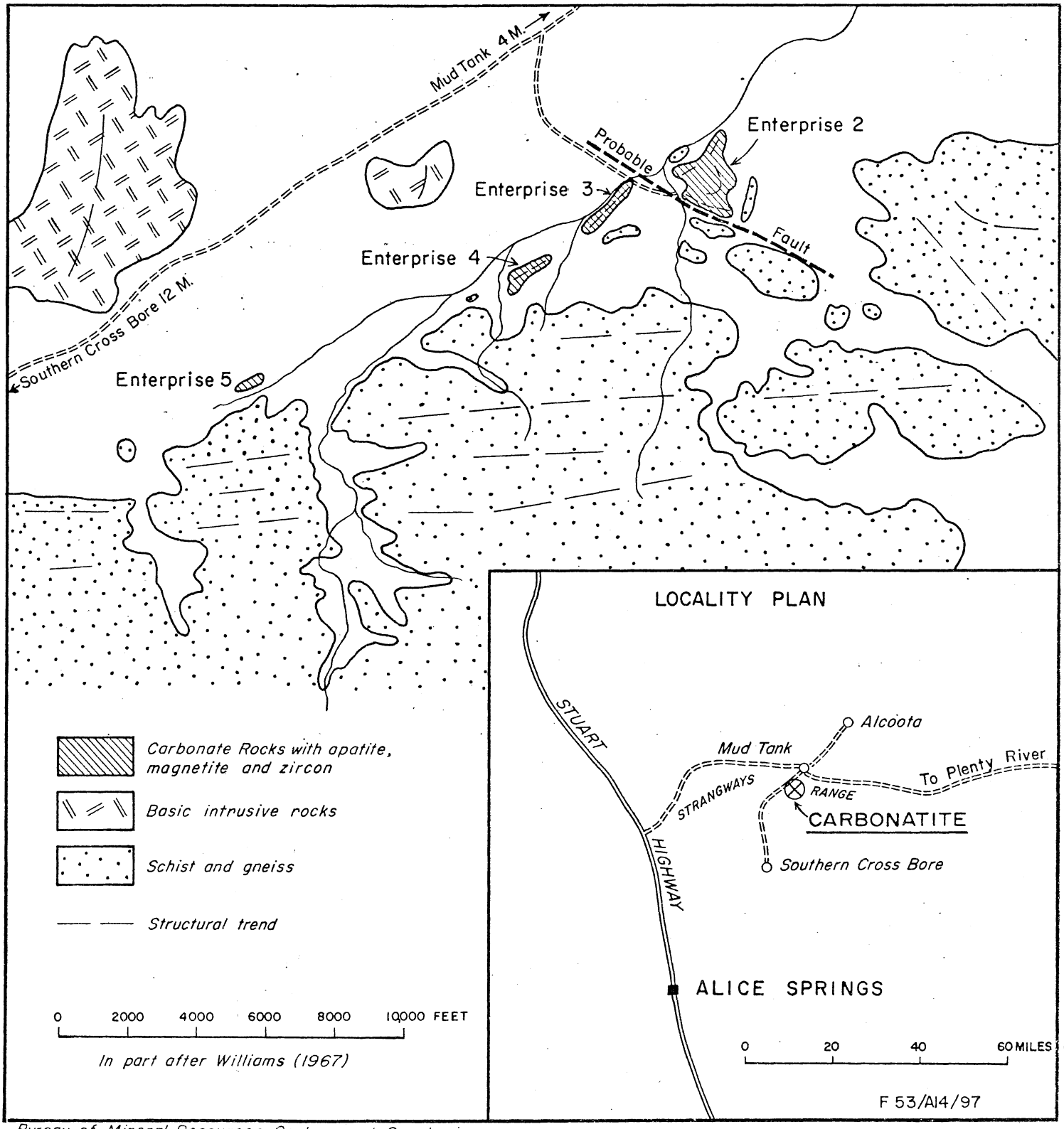
FLAVELLE, A.J., 1965 - Helicopter Gravity Survey by Contract - Northern Territory and Queensland, 1965. Bur. Miner, Resour. Australia. Record 1965/212 (unpubl.).

GELLATLY, D.C., - in prep. Probable carbonatites in the Strangways Range area, Central Australia. Part 2. Petrography and Geochemistry. Bur. Miner. Resour. Australia, Record (unpubl.).

OWEN, H.B., 1944 - Report on an occurrence of apatite on Alcoota Station, Alice Springs district, Northern Territory. Bur. Miner. Resour. Australia Record 1944/44 (unpubl.).

TIPPER, D.B., 1966 - Strangways Range Aeromagnetic Survey, N.T., 1965. Bur. Miner. Resour. Australia Record, 1966/60 (unpubl.).

WILLIAMS, B.T., 1967 - Report on the Investigation of the Enterprise 2 Group of Prospects, Strangways Range, Northern Territory. Geopeko Limited. Unpublished Report.



Bureau of Mineral Resources, Geology and Geophysics