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REPORT No. 4/90

EL 6372

EXAMINATION OF THE ZIRCON POTENTIAL IN THE MUD TANK CARBONATITE AREA, STRANGWAYS RANGES, NORTHERN TERRITORY.

ANNUAL REPORT

Prepared for Carrington Holdings Pty. Ltd.

G.Lee
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SYNOPSIS

1. AIM

To determine if the area surrounding the Mud Tank Carbonatite contains industrial quality zircon in sufficient quantity to be a potential source of supply.

2. REASON

The carbonatite outcrops at Mud Tank contain large zircon crystals, many of which have dimensions exceeding 10 mm. Highest concentrations are contained in the regolith overlying the carbonate-magnetite zones.

While the carbonatite outcrops are under title MR 303, the areas surrounding which contain alluvium derived from the carbonatite may contain concentrations of zircon which would be mostly free of the accompanying rock and of sufficient size to be useful for industrial purposes. Exploration Licence 6372 was obtained over the prospective area surrounding the carbonatites.

3. SUMMARY & CONCLUSIONS

3.1 A review of the available published literture and company exploration reports for the E.L. and surrounding area was undertaken.

3.2 An airphoto study of the E.L. and surrounding area was completed.

3.3 Field investigations included limited stream sediment sampling, with follow-up testing.

3.4 Zircon was only found in one stream sample, a tributary of Mud Tank Creek, which carries most of the drainage from the carbonatite.

3.5 There is a dominant NE trend in both airphoto lineaments and magnetic lineaments. This is reflected in stream trends.

3.6 The area north of the carbonatite outcrops is a plain with possible palaeochannels which could be prospective sources of alluvial zircon.

4. RECOMMENDATIONS

4.1 Possible alluvial deposits to the north of the carbonatites would be amenable to a programme of drilling or pitting combined with seismic refraction.

4.2 Carbonatites other than the known Mud Tank occurrence would require a programme of:

- aeromagnetics
- Landsat and airphoto studies
- ground reconnaissance
- mineralogical study,

followed by a detailed investigation programme. Carbonatites beneath younger cover may occur.

REPORT

5. INTRODUCTION

Exploration Licence 6372 is located approximately 90 km direct line north east of Alice Springs. Access to the area is 70 km north along the Stuart Highway, and thence 80 km east along the Plenty Highway. Figure 1. The licence is situated in the northern part of the Strangways Ranges a sequence of high grade Proterozic metamorphic rocks forming part of the Arunta Block.

The Exploration Licence surrounds MR 303 which encompasses the Mud Tank Carbonatite outcrops, which are reported to contain magnetite, apatite, hydrobiotite and zircon in a carbonate rich host. The EL is considered to be a prospective target for coarse grained industrial zircon:

- contained in alluvial deposits originating from the carbonatite and/or
- contained in carbonatites previously unrecorded and possibly obscured by alluvial cover

6. REVIEW OF PAST WORK - MUD TANK CARBONATITE

6.1 Occurrence

The carbonatite consists of an irregular northeast - southwest trending occurrence of crystalline carbonate rocks. Maximum dimensions are 2000m long by 700m wide.

Outcropping rocks are banded, altered and in part ferruginised. Banding trends north easterly and is parallel to the long axis of the carbonatite and the schistosity of the enclosing host rocks.

The host rocks are schists, gneisses, calc-silicates and basic igneous rocks of the Early Proterozoic Arunta Block.

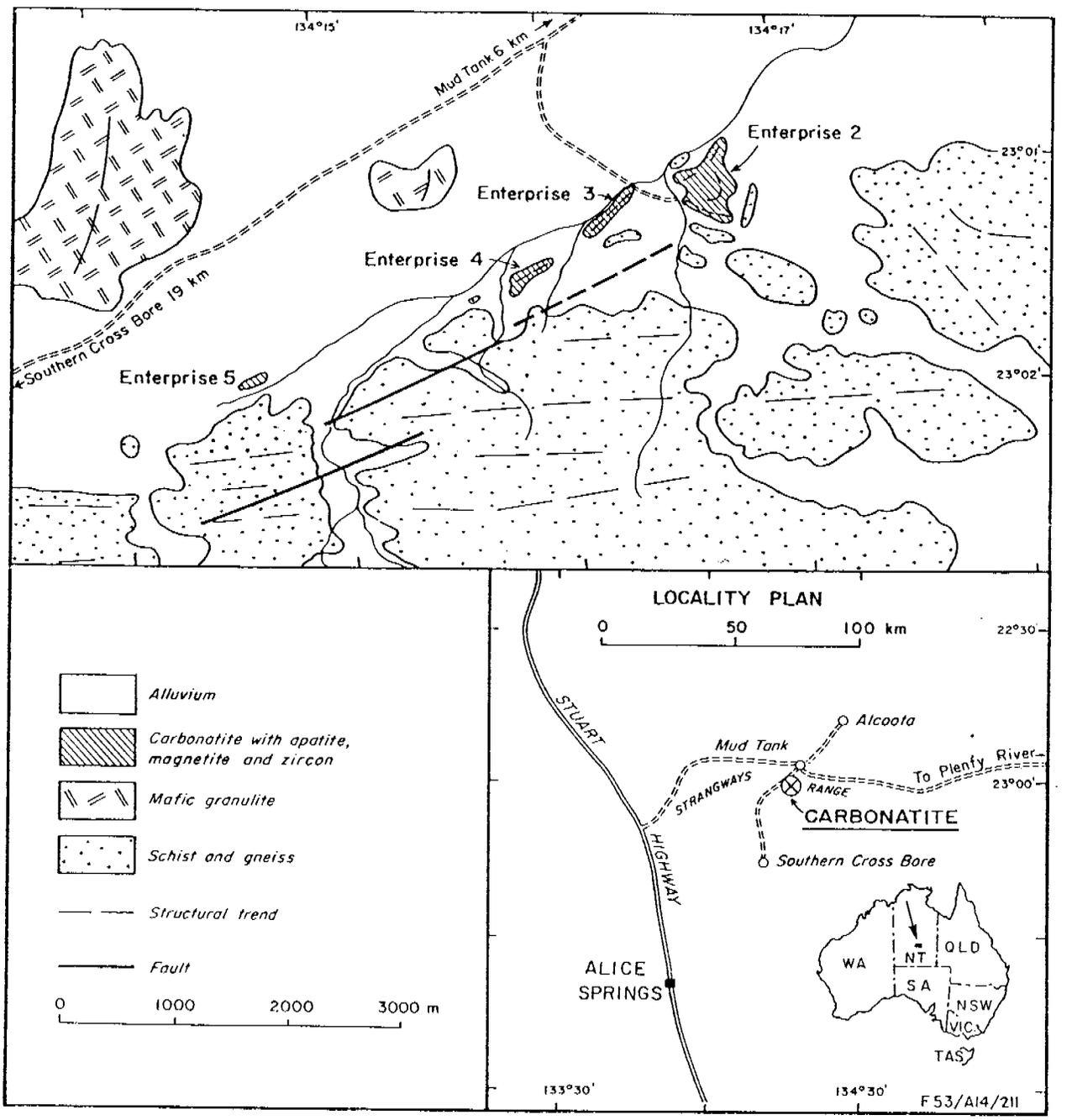

Figure 1. Locality map of the Mud Tank Carbonatite (after Crohn & Gellatly, 1968).

In drill holes the contact between carbonatite and country rock is highly sheared and weathered.

Age dating by Black and Gulson (1978) has shown the carbonatite to be 730 million years.

6.2 Structural Geology

The carbonatite lies along the axis of a major regional gravity high extending east-west for 600 km.

The Woolanga Lineament (Fig. 2) is a major structural feature, which can be traced for several hundred kilometres in a NW-SE direction, just to the west of the exploration licence.

Immediately surrounding the carbonatite the host rocks show evidence of shearing and recrystallisation, suggesting a shear zone with a north easterly trend and parallel to the long axis of the carbonatite. Crohn & Moore (1984) suggest this may predate and have controlled the carbonatite emplacement.

Faulting subsequent to the carbonatite emplacement has resulted in the eastern block being displaced about 300m. to the north.

6.3 Geophysical Surveys

The Bureau of Mineral Resources carried out a detailed low level aeromagnetic survey of the Mud Tank area in 1965.

In 1979 Woyzbun (1980) undertook a detailed ground magnetometer survey over the area principally directed towards locating the boundary of the carbonatite under areas of alluvial cover.

The aeromagnetic survey has indicated that the carbonatite occurs near an intersection of some pronounced lineaments,

particularly the Woolanga lineament, a magnetic and gravity geophysical feature.

These magnetic lineaments are shown on Figure 2.

Ground magnetic survey results showed major gradient features near the interpreted shearline. Each gradient feature is centred near the interpreted plug part of the carbonatite and comprises a high-low dipole with a secondary high to the north east. These magnetic features are distinctive. In addition the magnetic survey is interpreted to included carbonatite sills extending north of the pipes, there is some drill hole evidence to support this interpretation.

6.4 Mineralogy/Petrology

The most abundant rock type consists of foliated micaceous carbonate with pale brown phlogopite being a major component. Lesser Na amphibole and minor apatite and magnetite are also present. This rock type easily weathers and does not often outcrop, however it represents two thirds of drill core.

The most abundant outcropping rock type is a crystalline carbonate rock comprising either calcite or dolomite with apatite, magnetite, phlogopite, chlorite and Na amphibole. Zircon is a minor constituent of this rock type.

Rocks containing Na plagioclase as well as carbonates are the third most abundant. These rocks also contain amphibole, biotite and clinopyroxene, with minor apatite, magnetite and pyrite. Pegmatitic phases with this mineral composition also occur.

6.5 Zircon Occurrence

Testwork on drill core obtained by Geopeko gave Zr assays between 0.01% and 0.07%.

Observations from both surface outcrop and drill core indicates that zircon concentrations are highest in the carbonate-magnetite rocks. To date the Mud Tank carbonate has been worked to recover zircon of specimen and gem qualities. However much of the zircon recovered is cracked and flawed, and therefore unsuitable as a gem stone. Furthermore there are significant quantities of zircon too small in size to be suitable as gem stones. This finer grained zircon would be suitable for industrial purposes. Most of the zircon from Mud Tank shows bright yellow fluorescence under short wave UV light.

6.6 Previous Company Investigations

Most investigations previously undertaken by companies within the vicinity of the Mud Tank Carbonatite have concentrated their exploration towards locating diamonds, and particularly the kimberlitic host rocks. However the most comprehensive investigation into the carbonatite was carried out by Geopeko in 1966, Williams (1967), who directed their attention towards locating an economic source of phosphate (apatite). The Geopeko exploration included four (4) diamond drill holes and provided much of the base information and samples for other later investigations.

Exploration in the region by BHP and CRA, for diamonds, provided little useful information with respect to the current exploration for industrial zircon. Cohen (1984) for Negri River Corporation Ltd undertook amongst other activity, a stream sediment mineralogical study in the Mud Tank area, directed toward the location of diamond indicator minerals in the +0.355 mm fraction.

The Negri River investigation sampled 3 sites on tributaries of the Anamarra Creek which drains an area generally to the east of the Mud Tank Carbonatite. In all samples zircon was recorded in the -1.0 +0.355 mm fractions. However the zircon is recorded as a number of grains and is not related to the total original sample as a weight %. No zircon is

reported as occurring in the +1.0 mm fraction of any of the samples examined.

Moore (1984) undertook investigations directed towards locating hydrobiotite (vermiculite) of commercial quality, however his work has little bearing on the current work.

7. AIRPHOTO INTERPRETATION

Airphoto coverage of the exploration licence and surrounding area was obtained from the Northern Territory Department of Lands and Housing. Details of the coverage are:

Project: Alice Springs Regional

Film No: NTC 1074

Run No:	Frame No's:
8	8 to 23
9	91 to 105
10W	176 to 190

Date Flown: 3.9.88

Flight Altitude: 8290m AMSL

Approx. Scale of Prints: 1:50,000

The interpretation study was directed towards establishing lineaments which may represent structural controls on the emplacement of carbonatites. As well the study sought to locate drainage and paleo drainage which may contain detritus derived from the Mud Tank carbonatites.

Results of the airphoto interpretation are presented on plan as Figure 2 of this report. The figure shows:

- Plenty Highway and other significant cultural features,
- Major drainage from the licence area, which is the head waters of the Sandover River,
- The Woolanga Fault, a regional NW-SE trending fault to the west of EL 6372,

- Lineaments of greatest extent (mostly greater than 2.5 km),

- Regional trends, representing bedding or foliation of the Proterozoic basement rocks,

- Magnetic Lineaments as shown by Woyzbun (2980) are included to show the relationship of these interpreted features to carbonatites and other features which may be significant to their emplacement,

- The Mud Tank carbonatites,

- Other circular features, most likely to be intrusive, but not necessarily carbonatites,

- The location of sampling sites during recent reconnaissance ground studies,

Figure 2 was prepared as an overlay on the photo prints. It therefore contains distortions due to variations between adjoining photographs. The tenement boundaries have been superimposed as a best fit representation.

8. INVESTIGATIONS

Reconnaissance field investigations were carried out with a view to obtaining an initial indication as to the likelihood of finding zircon of the required particle size in economic concentrations. To this end a brief field inspection was undertaken with particular emphasis to be placed on sampling of streams draining from the Mud Tank Carbonatite.

The location of samples collected is shown on Figure 2, and listed in Table 1.

Two samples were obtained from fossickers -5mm screen undersize heaps, one from Specimen Hill and one Zircon Hill for comparative purposes and to provide reference zircon samples. These two samples are labelled Nos. 13 and 14 respectively in Table 1.

8.1 Testwork

All samples were subjected to the following test programme:

i) Weigh sample for testing,

ii) Sieve on 2.5 mm, and wash if necessary,

iii) Hand sort +2.5 mm fraction to recover zircon, using shortwave UV light to aid identification. Weigh zircon,

iv) Wash -2.5 mm fraction and wet screen on 0.5 mm sieve to produce a -2.5 + 0.5 mm fraction,

v) Dry and weigh -2.5 mm +0.5 mm fraction,

vi) Separate heavy minerals in bromoform,

vii) Remove magnetite and ilmenite with a very strong hand magnet,

viii) Weigh non magnetics,

ix) Optically examine non magnetics and determine zircon content,

x) Calculate -2.5 +0.5mm zircon as a percentage of raw feed.

8.2 Results

Results of test work are shown in Table 1.

TABLE 1

TEST RESULTS FOR SAMPLES FROM E.L.6372 AREA

SAMPLE NO.	DESCRIPTION	ORIGINAL WT (Kgs)	ZIRCON WT +2.5mm(gms)	ZIRCON WT -2.5+0.5mm (gms)	TOTAL % ZIRCON IN SAMPLE	FLUORESCENCE IN -2.5mm FRACTION
1	Creek near MR303	4.42	1.6	3.2	0.1	Yes
2	Mud Tank Ck	2.30	Nil	NT		None
3	Mud Tank Ck, Coarse Lag Deposit	2.18	Nil	NT		Yes
9	Mud Tank Ck	1.90	Nil	NT		Trace only
4	Gillen Ck, Sand	1.94	Nil	NT		Trace of very fine zircon
5	Gillen Ck, Sand + Gravel	2.30	Nil	NT		None
6	Gillen Ck, Coarse Gravel, Deepest Sample	4.90	Nil	NT		None
10	Gillen Ck	2.42	Nil	NT		None
7	Anamarra Ck, Top Sand	1.96	Nil	NT		None
8	Anamarra Ck, Sand to Water Table	2.32	Nil	NT		None
13	Specimen Hill, -5mm Fines	1.86	12.5	≈5	0.9	Not examined
14	Zircon Hill, -5mm fines	2.54	11.9	≈15	1.0	Not examined

NT = Not Tested

9. DISCUSSION

Investigations to date have highlighted a number of avenues worthy of further investigation, in order to locate a source of coarse grained industrial zircon. Listed below are points of significance.

9.1 Examining reports from previous investigations it is apparent that the primary carbonatite contains relatively low levels of zircon of less than 0.2%. Upon weathering and erosion the coarser and heavy zircon is concentrated in the regolith to levels exceeding 1% in some areas.

9.2 The association of zircon with carbonate-magnetite rocks allows for geophysical exploration using magnetics, to locate other carbonatite targets.

9.3 There has been only limited previous investigation carried out in the quadrant north and east of the Mud Tank Carbonatite. Detailed airborne geophysical studies and ground magnetometer work concentrates around known surface features. The regional magnetic setting shown by Woyzbun (1980) covers large areas to the south and west, with only limited coverage to the north and east of Mud Tank.

9.4 Woyzbun (1980) shows regional magnetic lineaments with:

i) a strong NE-SW trend,

ii) a NW-SE trend parallel to the Woolanga Fault.

9.5 Airphoto studies forming part of the current investigation have shown lineaments with:

i) a strong NE-SW trend as the dominant lineament direction,

ii) a subordinate NW-SE trend which is parallel to the Woolanga Fault,

iii) a subordinate set of lineaments trending NNE,

iv) one long east-west lineament 1 to 1.5 km south of the carbonatite outcrops,

v) a number of circular features in addition to the carbonatite outcrops. These circular features are generally more prominent than the carbonatite and probably represent intrusive igneous bodies.

9.6 Woyzbun (1980) shows a number of NNE trending faults interpreted from geophysical data which parallel the airphoto lineaments of 9.5 iii) above.

9.7 Drainage within the EL area is generally in a north easterly direction. This dominant northeasterly trending drainage persists for in excess of 20 km downstream from the northern boundary of the E.L. and is almost certainly controlled by faulting and other lineaments.

9.8 To the north of the carbonatite outcrops, the E.L. is dominated by flat plains which are traversed by minor shallow drainage courses which are not easily distinguished on the ground. These features are consistent with an alluvial flood plain which may conceal underlying palaeo-stream channels containing sand and gravel.

9.9 Calcrete occurs in places through this plain area and in some creek and road cuttings is underlain by sand and gravel.

9.10 The headwaters of Mud Tank Creek drain the plain due north of the carbonatite. Any palaeo-drainage channels

occurring beneath the plain in this area could be prospective as a source of alluvial zircon.

9.11 The eastern tributary of Mud Tank Creek which receives most of the modern drainage from the carbonatites was sampled and found to contain zircon as shown for sample 1 in Table 1.

9.12 No coarse zircon was found in the samples from further downstream where Mud Tank Creek crosses the Plenty Highway. Several points arise from this as a result:

i) The samples taken were too small to provide sufficient probability for coarse zircon to be collected if it were present in this part of the stream. A significant level of dilution would have occurred.

ii) It is possible that the low gradient and therefore stream velocity is not high enough to carry the coarse zircon to the Plenty Highway crossing.

iii) The heavy zircon by this stage may have worked down to the stream bed, which was not sampled.

9.13 Considering the regional situation beyond the coverage of E.L.6372 it is possible that:

i) zircon bearing carbonatites occur beneath Quaternary alluvial cover or lithified and weathered Tertiary sediments,

ii) alluvium derived from other carbonatites contain zircon,

iii) a more detailed investigation may locate previously unknown carbonatites.

9.14 Geophysical data and airphoto interpretation both suggest a dominant NE trend. However the area to the north east of Mud Tank for some 20 to 30 kms has not received any detailed investigation for other carbonatite occurrences. It is a potential target area.

10. FUTURE INVESTIGATIONS

10.1 Alluvial Deposits

The prospective area for alluvial zircon bearing deposits derived from the Mud Tank carbonatite is to the north of the carbonatite outcrops. This is a flat plain area traversed by Mud Tank Creek and its tributaries.

Investigation of this area could be undertaken by a programme of drilling or pitting carried out in conjunction with a seismic refraction programme designed to locate palae stream channels in the bedrock. It is recommended that a programme of limited RAB drilling or pitting be completed before any seismic work is commenced. This will provide some basic data as to depth, sediment typ and bedrock type which can be used to fine tune the seismic programme. At the same time the samples could provide sufficient mineralogical data so that the detailed study area is reduced to a minimum.

10.2 Other Carbonatite Deposits

It is likely that other carbonatite deposits occur in the Strangway Ranges and nearby region. An exploration programme directed to locate other deposits would include:

i) detailed aeromagnetics with interpretation,

ii) Landsat imagery and airphoto interpretations,

iii) ground reconnaissance including:
- . ground magnetics
- . stream sediment sampling
- . outcrop mapping,

iv) mineralogical study of samples.

The fact that carbonatites may be buried beneath younger sediment cover should not be overlooked.

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EL 6372

New Well

Mud Tank Creek

Mud Tank

ALCOOTA H.S.

Stuart Highway /Alice Springs

PLENTY HIGHWAY

WOODIANGA FAULT

Gillen Creek

Creek

2,3,9

4,5,6,10

1

MR 303

Harts Ranges

7,8

Anamarra

Plug ?

LEGEND

- Stream Course
- Roads
- Tracks
- Fence
- Airphoto Fault
- Airphoto Lineaments
- Airphoto Trends
- Regional Magnetic Lineament (Woyzbun 1980)
- Carbonatites
- Stream Sediment Sample Site & Sample No.

SCALE (Approx.)

1:50 000

0 1 2 3 4 5km.

N

CARRINGTON HOLDINGS P/L

EL 6372

MUD TANK NORTHERN TERRITORY AIR PHOTO INTERPRETATION

AUTHOR: G. LEE | DATE: MARCH '90 | FIGURE No.

CR90/305