EXPLORATION LICENCE 4868

ANNUAL REPORT FOR FIRST YEAR OF LICENCE

May, 1986 to May 1987

by

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for

HARLOCK PTY LTD

June 1987

Batchelor 1:100,000

NORTHERN TERRITORY GEOLOGICAL SURVEY

CR 87/ 166
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INTRODUCTION

Exploration Licence 4868 is located 100km south of Darwin and 10km east of Batchelor (Figure 1). It is accessible to the north via the sealed Batchelor road and to the east via the Stuart Highway (Figure 2).

The licence area, which covers the host stratigraphy of the nearby Rum Jungle uranium-base metal deposits and Sundance gold mineralisation, has not been intensely explored for any of these commodities.

This report describes the first year's exploration programme which has included a literature survey of previous exploration, a detailed geological study of the Sundance gold mine, a literature survey of deposits similar to the Sundance mineralisation, some reconnaissance sampling and an aerial photographic survey.
2 SUMMARY
The first year's programme has included:-

(i) A literature survey to identify relevant data obtained in previous exploration.

(ii) A study of the Sundance mineralisation, including detailed geological mapping, thin and polished section petrography, a multi-element scan and a literature survey of similar mineralisation styles. This work has recognised the mineralisation as karst-related, and thus identified a number of criteria useful for exploration, for example, carbonate host rock, evidence of karstic collapse and presence of quartz ironstone outcrops.

(iii) Reconnaissance sampling. A gossanous outcrop was sampled in one locality.

(iv) Quasco Northern Surveys Pty Ltd completed a low level aerial photography survey over the licence and surrounding area.
3 CONCLUSIONS

(i) The mineralisation at the Sundance gold mine is karst related. It is similar to the gold-antimony mineralisation at Bau, West Sarawak, some of the gold mineralisation at Kuranakh, U.S.S.R. and the lead-barite deposits of Arenas, Sardinia.

(ii) The licence area contains extensive outcrops of carbonate and outcrops of siliceous gossan. These features the area has potential for discoveries of Sundance-type mineralisation.
4 RECOMMENDATIONS

(i) The Coomalie Dolomite/Whites Formation should be mapped within the licence area.

(ii) Areas over carbonate which contain ironstone-quartz breccia outcrops, sandstone outcrops and evidence of karstic collapse should be followed up with a programme of:-

a) detailed geological mapping and chip sampling.

b) detailed ground radiometry.

c) costeaming.

d) percussion drilling.
5 TENURE

Exploration Licence 4868 was granted on 28th May, 1986. The licence area covers an area of 4 blocks, or about 13 square kilometres.

The licence holders, Mr P Purich and Mr N Byrne, have joint ventured the licence to Harlock Pty Ltd, the trustees for the Mount Bonnie Gold Unit Trust.
EXPENDITURE
The proposed expenditure for the first year of the licence was $7,500.

Actual expenditure is listed below:-

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<th>Hours/Count</th>
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<td>¼ day @ $200/day</td>
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<td>Analysis</td>
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<td>Literature survey of previous exploration</td>
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<td>Detailed mapping and literature survey of Sundance Mine</td>
<td>(This is 20% of the total work, which is apportioned between EL4845 and EL4868).</td>
<td>3 days @ $350/day</td>
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<td>Sundance scan analysis</td>
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<td>Aerial Photographic Survey</td>
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It is estimated that a minimum of $15,000 will be spent on the area in the coming year, as outlined in Section 4 of this report.
7 WORK COMPLETED

7.1 Literature Research

Exploration in the area was mainly restricted to B.M.R. work which included:

(ii) Ground Radiometry in 1964.
(iii) Geochemistry and mapping in 1965.

7.2 Sundance Mine Research

The Sundance mineralisation was initially discovered during a ground radiometric survey conducted by Pancontinental in the late 1970's. Follow up chip sampling and costeaming produced disappointing uranium grades accompanied by some high gold grades. Detailed exploration was then carried out by Mt Bonnie Mines immediately prior to mining in late 1986.

The licence occurs 3km alongstrike from MLN 542 and MLN 543, which covers the Sundance gold mine (Figure 2). The workings at Sundance were mapped in detail during mining in an attempt to elucidate the controls to mineralisation and thereby maximise the efficiency of exploration in the surrounding area.

Mining at Sundance mainly occurred within two pits (Figure 3). Both pits were underlain by a carbonate karst surface (that is, the upper surface of bedrock is extremely irregular in shape due to solution and collapse processes).

In the eastern pit the overall orientation of the karst surface is horizontal, although the depth to the top ranges from 0.5 to 10 metres (figure 3). The carbonate is overlain by pockets of yellow clay, which in turn overlain by ironstone and euhedral quartz. The ironstone, which contains ore grade concentrations of gold, is generally dense and massive textured. It occurs as subrounded masses 0.05 to 5m
in diameter. Clay material between the ironstone masses contains grey, zoned euhedral quartz crystals up to 10cm in length. The ironstone-quartz is covered by recent soil.

In the western pit the karst surface forms an irregular basin 60m wide (east-west) by 100m long (north-south) by up to 50m deep. The basin is mainly filled by yellow-white clay and sand. This material contains fragments of quartz, ironstone and sandstone which range from 10cm to 5m in diameter. The sand/clay is bedded. The bedding is defined by bands of sand and silt and is irregularly folded and faulted. Within the basin of clay/sand are two smaller basins of massive textured sandstone (Figure 3). The boundaries of these basins are sharp.

The ironstone fragments (or boulders) in the western pit tend to occur in clusters. The ironstone fragments generally have a breccia texture comprised of ironstone and quartz fragments averaging 1cm in diameter, cemented by an ironstone matrix. Some ironstone fragments are not brecciated. They have massive or banded textures.

The geology of the Sundance deposits have many similar features to the Karst hosted mineral deposits described by Zuffardi (1976), Laznicka (1985) and Wolfenden (1965).

In these deposits, it is postulated that the solutions which form the karst also physically deposit detritus and chemically deposit the base metals, uranium, gold etc with iron and quartz. Continued solution after mineralisation can cause further collapse and brecciation of the mineralisation, and detrital accumulations (as occurs in the western pit).
Important exploration criteria are therefore carbonate suboutcrop, ironstone outcrop and evidence of karstic collapse. The latter may be evidenced by dolines or sandstone outcrops, which appear to be preferentially preserved in areas of collapse.

7.3 **Sampling and Reconnaissance**

A brief reconnaissance programme located a siliceous rock containing gossanous casts after pyrite up to one centimetre in diameter. Three rock chip samples were collected and analysed at Mt Bonnie. The gold content was less than 0.1 ppm in all three samples.

7.4 **Aerial Photography**

Quasco Northern Surveys Pty Ltd completed an aerial photography survey in May, 1987. The survey was flown at 12,500 AMGL and produced 1:25,000 colour photographs.

The survey will be used to aid geological interpretation and sample location.
REFERENCES


Geol. Surv. Borneo Region, Malaysia.

Appendix I

SUNDANCE
Tech.

amdel N.T.

MARJORIE STREET, BERRIMAH, NORTHERN TERRITORY 0788
18th May, 1987

Our Ref: D724/87

REPORT NUMBER: D724/87

CLIENT: MT. Bonnie Mine

CLIENT REFERENCE: Verbal Request

REPORT COMPRISING: Cover Page
Pages 1-2

DATE RECEIVED: 22nd April, 1987

Stuart Glenn
Manager
AMDEL-N.T.
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Total Fe as Fe2O3
APPENDIX II
The following are five brief reports on samples SD 57 - SD 61 inclusive.
SD 57 was taken from the most easterly pit at Sundance.
SD 58 and SD 59 from the most southerly costean at Sundance, dug during production.
SD 60 is a breccia in the Rum Jungle area outside of Sundance but which is completely devoid of gold but has anomalous Pb Zn.
SD 61 is the traffic stopping dolerite from the front of your office.

If you are interested in the polished or thin sections of any of these samples let me know.

Regards
Five rock samples were received for thin-section preparation and petrographic study; polished sections were also prepared.

**SD 57**

(T.S., P.S. 57383)

This is a goethite-chalcedony rock with some gossanous features, though not convincing as a true gossan derived from sulphides.

The rock consists largely of earthy, ultrafine goethite and chalcedony; the chalcedony occurs as fringes around shapeless goethite masses, and as infillings. A few goethite patches have cellular textures representing oxidised carbonate. There are occasional patches of finely cellular, compact goethite (i.e. the cell walls are compact, not earthy, goethite), where the cells are filled with quartz. These patches may represent an oxidised sulphide, possibly sphalerite, bornite and pyrite. In polished section, the earthy goethite has relict textures suggestive of derivation from a fine-grained acicular mineral.

Minute particles of gold are embedded mainly in earthy goethite, but also in quartz and compact goethite; the largest grain measured was 2x10 μ, but most are 1-2 μ across.

**SD 58**

(T.S., P.S. 57384)

This is a featureless, porous metaquartzite; the cavities are very probably due to weathering and leaching of less resistant minerals.

The rock consists virtually entirely of quartz, as strongly stressed, subparallel lenses of coarser quartz in a mass of interlocking microcrystalline quartz with typical metamorphic textures. The elongate cavities are shapeless, but tend to be thinly lined with limonite.

There are no relict sedimentary features, and the original material may have been vein-quartz, though the strongly developed metamorphic fabric may have obliterated pre-existing textures.

No opaque minerals were detected in the polished section.

**SD 59**

(T.S., P.S. 57385)

This is a dark, fine-grained quartzite and is believed to be a recrystallized carbonaceous chert; however, it is not (appreciably) metamorphosed.

The rock is composed almost entirely of microcrystalline quartz, with intergranular carbonaceous films; there are scattered small clusters of minute carbonate grains, thought to represent larger grains extensively replaced by quartz. A few relict rhombic outlines
reinforce this interpretation. Occasional veins of coarser quartz traverse the rock, and there are ptygmatic veinlets of carbonaceous matter.

Apart from a few isolated, very small pyrite grains, no opaque minerals were seen in the polished section.

(T.S. 57386)
This is a metaquartzite cut by thin breccia zones with goethite; the rock is pyritic, micaceous and carbonaceous.

The original rock was an orthoquartzite consisting of sand-sized, rounded quartz grains with very minor interstitial clay, carbonaceous material, occasional detrital heavy mineral grains, cemented by fine quartz. It was metamorphosed, but retained most of its sedimentary features. Small oxidised pyrite crystals are scattered through the rock and probably postdate the essentially dynamic metamorphism.

The vein-like breccia zones consist of angular quartzite fragments cemented by massive, colloform-banded goethite; there are occasional small clusters of pale tourmaline.

(T.S. 57387)
This is a hornblende hornfels or metadolerite, i.e. a thermally metamorphosed dolerite; that the rock is not merely urallitised is based on the good evidence of recrystallization, but with the retention of a doleritic fabric.

The rock now consists of radiating prismatic crystals, and bundles of needles, of hornblende, with interstitial patches of granular, untwinned oligoclase and minor fine quartz. There are small clusters of black oxide opaque crystals, representing recrystallized primary magnetite. A few small goethite grains occur, and may be oxidised pyrite.

The rock is quite fresh in all respects and should be suitable for use as an engineering material.

H.W. Fander, M. Sc.