EXPLOREMIN PTY. LTD.
GEOLOGICAL CONSULTANTS

6 PORTER STREET
LUDMILLA
DARWIN 0820
AUSTRALIA

A.C.N. 010 629 884

Phone/Fax: 61 (0)8 8941 3793

Report EPL-98/97

FOURTH ANNUAL AND FINAL REPORT
FOR EXPLORATION LICENCE 8442
- BLUE ANT -
FOR THE YEAR ENDED 7 MARCH, 1998

by

SIMON OMOTOSHO
BSc(Hons) MAusIMM

of

AUSERIAN EXPLORATION PTY LTD

for

HOMESTAKE GOLD OF AUSTRALIA LTD

OPEN FILE

1:250,000 - Pine Creek, SD52-8
1:100,000 - Tipperary, 5170

March, 1998
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1. INTRODUCTION

The Blue Ant EL 8442 is situated in the south central area of the Pine Creek Geosyncline. Gold mining first commenced in the Pine Creek Geosyncline in 1872 and since that time the area has produced gold, silver, lead, zinc, copper, tin, tungsten, uranium, and iron and minor amounts of cadmium, bismuth, arsenic, molybdenum and limestone.

EL 8442 was identified by Homestake Gold of Australia Limited (HGAL) to be prospective for economic gold mineralisation due to geophysical lineaments and anomalies, the auriferous nature of nearby Proterozoic lithologies and its proximity to the Cullen Batholith.

The target Proterozoic lithologies lie under Palaeozoic and Cainozoic cover rocks which are up to several hundred metres thick within the tenement. HGAL have been exploring for 'blind' gold deposits within these areas of buried Proterozoic lithologies.

This purpose of this report is to summarise all the work that has been carried out by HGAL during the four years of tenure of EL 8442.

2. SUMMARY

Exploration activities in EL 8442 have been conducted by HGAL over a period of four years. In Year one, work consisted of detailed library searches of the Northern Territory Department of Mines, the Water Resource Division of the Northern Territory Department of transport and Works and the Northern Territory Geological Survey. Geophysical images were also purchased and interpreted. In year two a gravity survey was conducted in the EL along with further processing of aeromagnetic data to pinpoint a drill target. Preparation and surveying of the drill site was then carried out. In the third year of tenure the magnetic target was drill tested by a diamond drill hole of 725 metres depth. The drill site was rehabilitated at the end of the field season. In the fourth and final year of tenure of EL 8442, the data was reviewed in the light of information collected from nearby EL’s. It was concluded from this review that no further work was warranted on the EL and it was surrendered.

3. LOCATION AND TENURE

The Blue Ant EL 8442 is located on the margin of the Cullen Mineral Field approximately 130 km SSE of Darwin in the Northern Territory (Figure 1). The Stuart Highway passes 18 km northeast of the tenement. An unsealed road off the Stuart Highway leads to Tipperary Homestead and passes through the northwestern corner of the tenement. The original EL was bounded by latitudes 13° 35’ - 13° 49’ south and longitudes 131° 7’ - 131° 15’ east.

Exploration Licence 8442 comprising 77 blocks was granted to HGAL on March 8, 1994, for a period of six years. In accordance with NTMME regulations half of the blocks were dropped in the third year of tenure resulting in 39 blocks being retained. In the fourth year of tenure a further 19 blocks were dropped resulting in 20 blocks being retained with a total area of 64 square kilometres (Figure 2). On the 9th of February, 1998, Homestake Gold of Australia surrendered all rights and interests in EL 8442 and the tenement was dropped in entirety.
4. GEOLOGICAL SETTING

This account of the geological setting of the Pine Creek Geosyncline is based largely on AGSO Bulletin 229 by Stuart-Smith et al. (1993).

4.1 Regional Overview

The Pine Creek Geosyncline forms the bedrock of approximately 40,000 km² in the Katherine-Darwin region of the Northern Territory. It contains early Proterozoic meta-sedimentary rocks resting on a gneissic and granitic Archaean basement.

4.2 Stratigraphic Development of the Pine Creek Geosyncline

In the early Proterozoic at about 2400 Ma, arkoses, quartzite’s and some iron formations of the Kakadu Group were deposited onto crystalline Archaean basement. After regional deformation and metamorphism to amphibolite facies the rocks were eroded.

Following erosion of these rocks, geosynclinal sedimentation took place in an intercratonic basin in the early Proterozoic probably between 2000 and 1870 Ma. This sedimentation was characterised by alternating continental and shallow marine conditions that gave way to deeper water conditions.

The Namoona Group is the oldest unit represented in the geosynclinal strata and consists of carbonaceous mudstones, limestones, greywacke and minor volcanics. The Mount Partridge Group unconformably overlies the Namoona Group and consists of sandstones, arkose, conglomerate, red and cream laminated siltstones and some massive haematitic ironstone lenses. The Mount Partridge Group is unconformably overlain by the South Alligator Group which is characterised by mudstone, carbonaceous mudstone, iron formation, greywacke, siltstone and tuff. This is then conformably overlain by and in places faulted against rocks of the Finniss River Group. This group represents flysch-type deposition in a deepening basin and consists mostly of greywacke and shale with some sandstone and minor volcanics.

The South Alligator and Finniss River Groups are economically important as they contain most of the gold deposits in the Pine Creek Geosyncline.

The Finniss River Group indicates the close of geosynclinal deposition. At about this time sills of the Zamu dolerite "series" were intruded into the geosynclinal sequence between 1880 and 1870 Ma. This dolerite intrusion was closely followed by, or was contemporaneous with, tight folding, faulting and associated low-grade regional metamorphism (The Nimbuwah Event).

Widespread granitic intrusion and associated contact metamorphism occurred between 1835 and 1820 Ma related to regional open east-west folding and fault movement along axial planes of earlier folds (The Shoobridge Event). At this time a number of plutons coalesced to form the Cullen Batholith. This plutonism is widely believed as having played a significant role in the metallogeny of the Pine Creek Geosyncline.

The extensional tectonics related to granitic intrusions led to the formation of fault bounded troughs that were later to be the sites for deposition of volcanoclastic sediments. The El Sherana and Edith River Groups were deposited and in places, lie unconformably against the Finniss River Groups. This concluded the development of the Pine Creek Geosyncline.

After a long stable period, uplift, erosion and ultimately deposition of the relatively flat-lying middle Proterozoic strata of the Katherine River and Tolmer Groups occurred. These consist of sandstones, siltstones and minor
TABLE 1  Summarised stratigraphy of the Pine Creek Geosyncline after Needham, 1981.

<table>
<thead>
<tr>
<th>Era</th>
<th>Stratigraphic Unit</th>
<th>Lithologies</th>
<th>Approximate Thickness (metres)</th>
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<td>Mesozoic</td>
<td>Bathurst Island Group</td>
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<td>Palaeozoic</td>
<td>Daly River Group</td>
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<tr>
<td></td>
<td>Tolmer Group</td>
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<td></td>
<td>Katherine River Group</td>
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<td>El Sherana/Edith River Groups</td>
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</tr>
<tr>
<td></td>
<td>Finniss River Group</td>
<td>Greywacke, sandstone, mudstone, minor volcanics</td>
<td>&gt;3000</td>
</tr>
<tr>
<td></td>
<td>South Alligator Group</td>
<td>Mudstone, carbonaceous mudstone, iron formation, greywacke, siltstone, tuff</td>
<td>1900</td>
</tr>
<tr>
<td></td>
<td>Mount Partridge Group</td>
<td>Sandstone, arkose, conglomerate, mudstone</td>
<td>2000</td>
</tr>
<tr>
<td></td>
<td>Namoona Group</td>
<td>Carbonaceous mudstone, limestone, minor volcanics</td>
<td>2000</td>
</tr>
<tr>
<td></td>
<td>Kakadu Group, Cahill Formation, Litchfield Complex, Fish Creek Schists, Youter Rum Jungle and Waterhouse Complex</td>
<td>Meta-arkose, quartzite, feldspar, quartz gneiss, mica quartz schist, graphic in places, para-amphibolite, crystalline dolomite-magnesite</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>Archaean</td>
<td>Rum Jungle Complex, Waterhouse Complex, Nanambi Complex, Woolner Granite, Litchfield Complex</td>
<td>Granite, foliated granite, unknown</td>
</tr>
</tbody>
</table>

volcanics. Following this the Palaeozoic sediments of the Daly River Group consisting of limestone, siltstone and sandstone were laid down.

The Mesozoic era resulted in the deposition of a thin veneer of epicontinental to terrestrial sediments, the remnants of which form scattered mesa and tablelands. Since the Mesozoic the area has essentially remained above sea level. Tertiary deposits of laterites, sand, colluvium and other transported terrestrial sediments have developed over the Mesozoic sequences and older strata.

Table 1 summarises the stratigraphy of the Pine Creek Geosyncline.

4.3 Mineralisation (Omotosho and Stewart, 1996)

Mineralisation within the Pine Creek Geosyncline is associated with the interrelationships between granitoid intrusions and stratigraphic and structural controls.

4.3.1 Granitoid Intrusions

A total of twenty three plutons constitute the Cullen Batholith. Most of the plutons comprise highly fractionated (and in places metal-enriched) leucogranites. The plutons have resulted in varying degrees of contact metamorphism of the geosynclinal sediments, mostly to albite-epidote and hornblende hornfels facies.

Above the "roof" zone of various batholiths and at their margins, the interplay of basinal and hydrothermal fluids may have resulted in the structurally controlled emplacement of precious and base metal bearing quartz veins and
stockworks, in particular within the contact aureoles. The imposed geothermal gradient appears to have established a metal zonation pattern with over 90% of the tin, silver-lead and gold deposits occurring within the contact aureoles. The deposits largely coincide with a 500 and 1000 m distance from a granite. However, a small number of gold deposits occur outside the limit of the contact aureole.

Ewers and Scott (1977) concluded that the main role of the granitoid was as a "heat engine" for the mobilisation or remobilisation of ore solutions. The source of the metals or the transporting fluids is suspected to be either from the Cullen Batholith itself or from a combination of basinal and intrusive-derive fluids.

4.3.2 Stratigraphic Controls

Pyritic, carbonaceous and dolomitic strata from the Mount Partridge, South Alligator and Finniss River Groups have been preferentially mineralised. The greatest density of gold mines and highest average tonnage occur in the Mount Bonnie and Koolpin Formations of the South Alligator Group. This association of gold deposits is particularly marked in the Golden Dyke Dome area (Golden Dyke) and on the southern margin of the Burnside Granite (Cosmopolitan-Howley). The gold mineralisation is concentrated in either carbonaceous mudstone or pyritic chert-banded dolomitic siltstone horizons. This may reflect either a preferred replacement horizon for gold bearing fluids (Crohn 1968) or synsedimentary concentrations of gold related to exhalative activity during the deposition of the South Alligator Group. (Nicholson, 1980; Nicholson & Eupene, 1984, 1990; Cyprus Minerals Australia, 1989).

The stratigraphy-controlled gold deposits of the Cosmo-Howley and Golden Dyke areas have economic concentrations of gold that occur over a great vertical depth hosted by fine grained sediments.

4.3.3 Structural Controls

Structure has played an important role in the mineralisation of the Pine Creek Geosyncline. On a regional scale granitoids were emplaced along major structural breaks in the craton. On a more localised scale structures provided suitable deposition sites and focussed replacement-style mineralisation in calcareous strata.

Displacement measurements on the Pine Creek Shear system, indicate fault movement prior to, contemporaneous with, and after granitoid emplacement. This shear system was therefore a suitable site for mineralisation at a time of high fluid movement and temperature related to the granitoid intrusion.

The most common structural controls are steeply dipping faults and northwest trending shear zones, these parallel the S1 slaty cleavage which is axial planer to the main tight isoclinal F1 folds. The veins filling these fault zones range up to 2 m wide and 100 m long. Within the faults and shear zones, veins have a variety of forms and can occur as either discrete lenses or as a series of parallel or en echelon lodes.

There have been several periods of veining related to the deformation which accompanied granitic intrusion. Arnold (1986) recognised three main categories of veins. They are:

- Weakly mineralised bedding concordant veins, i.e. saddle reefs and sub-vertical S1 parallel "spur and hinge-zone veins" concentrated in the hinge zone of antilines;
- Mineralised stratabound "ladder and sheeted veins" developed late in the folding of the anticline limb; and
- Sphalerite and galena rich late stage veins and breccias in "post-tectonic" faults.
The main gold mineralisation is associated with the second period of veining when more massive quartz reefs are developed. There is a notable concentration of auriferous quartz veins with anticlines. This may be the result of focusing of fluid movement up-sequence from stratigraphic concentrations into anticlinal hinges. Auriferous quartz saddle reefs occur at the Enterprise and Woolwonga mines. The majority of gold is, however, from later stage, quartz-filled steeply dipping faults and shear zones that are concentrated on the hinge or adjacent limbs of the anticline. Nicholson and Eupene (1984) suggested that the presence of auriferous saddle reefs is a precondition for the later development of discordant auriferous reefs.
5. PREVIOUS EXPLORATION AND MINING

Previous exploration on and surrounding the present Blue Ant EL 8442 has been carried out over the years by a number of companies under tenure of a number of EL's (Figure 3).

In the late 1970's the Sutton Group of Companies (Sutton) held ELs 1355, 1484 and 1724 that occupied 39, 22 and 1 block/s respectively of the 77 blocks that comprise EL 8442. Sutton commissioned several appraisals of the mineral potential of Tipperary Station, an aeromagnetic and radiometric survey and a photogeology study. Compilation maps showing BMR background geophysical data at 1:250,000 scale were utilised. Sutton established that no previous mining had taken place on their tenements. The only known mineralisation located in the area was ironstone near Mount Pleasant (1 Mt of "low grade") in the north western corner of EL 8442; a number of small manganese prospect in the Green Ant creek area; and four occurrences of barite-flourite-Pb-Zn in the vicinity of a dome-like structure 15 km SSW of EL 8442. A linear magnetic high was also noted in the SE corner of EL 8442.

In the late 1970's to early 1980's, Northern Cement Pty Ltd held a number of exploration licences in the area to locate limestone resources suitable for quicklime production. EL 1426 encompassed 12 blocks in the north eastern part of the current EL 8442. Limestones of the middle Cambrian Jinduckin Formation and Tindall Limestone were examined and sampled. Deposits of sufficient size and purity were not located. Northern Cement went into joint venture agreement with C. D. Ronan on EL 1747 that encompassed 4 of the eastern blocks of EL 8442. Ronan carried out exploration for Au, Sn, Ta and base metals by panning and rock sampling. A 100 m by 5 cm wide baryte vein probably within EL 8442 was reported. Most work carried out was approximately 3 km east of EL 8442. Some rock samples from this area returned results of up to 2 ppm Au, 5000 ppm Zn and >10,000 ppm Pb. Soil sampling revealed slightly anomalous Cu and Pb values. Northern Cement carried out a geophysical resistivity survey and eleven percussion holes were drilled in an area just outside of EL 8442. As a result of this work mineral leases were pegged.

Australian Coal and Gold Holdings Ltd held EL 4499 in the mid to late 1980's. This EL encompassed 4 blocks in the north eastern part of EL 8442. The exploration targets were Au, Sn and diamonds. A 80$ reconnaissance stream sediment sampling programme was undertaken. Only one sample was located within the current EL 8442. This returned an anomalous value of 0.012 ppm Au. However the catchment area for this sample extended beyond the boundary of EL 8442. Geoterraex undertook an airborne magnetic and radiometric survey for Australian Coal and Gold in 1986. The survey identified one magnetic anomaly within EL 8442. A follow up ground magnetic survey attributed the anomaly to a magnetic sedimentary lens within sandstone. Limited geological mapping was also undertaken on the NE corner of EL 8442 at 1:25,000 scale. Lithologies mapped belonged to the Burrell Creek Formation.

The most recent work was completed by Newmont Australia Ltd in the late 1980's under EL 5767 which encompassed 33 blocks of the southern part of EL 8442. Airborne magnetic and radiometric data was acquired from the Northern Territory Geological Survey. A soil and drainage BLEG sampling programme was undertaken. The best result being up to 2.36 ppb Au in soils from the central part of EL 8442.
6. WORK COMPLETED - EL8442

6.1 First Year

Work completed in the first year of tenure of EL8442 consisted of familiarisation with the area in regard to the depth of the target Proterozoic lithologies in the area. This involved a literature search of the Water Resource Division of the Northern Territory Department of Transport and Works. Water bore information was gathered to try and pinpoint the thickness of Palaeozoic and Cainozoic cover in the area. A map of water bores in the area is presented as Figure 4. Logs from holes drilled by the Northern Territory Geological Survey in the late 1970's to investigate the nature of the base of the Daly Basin were also investigated. An open file search of the Mines Department for previous exploration or mining activity in the area was also undertaken.

As the nature of the exploration in EL8442 was essentially reliant on geophysics, Multiclient geophysical data of the area consisting of magnetic and gravity images at 1:500,000 scale were purchased by HGAL. The magnetic and gravity images are presented as Figures 5 and 6 respectively. In addition to this a 1:100,000 image of total magnetic intensity reduced to pole was also purchased and this is presented as Figure 7.

The geophysical images were interpreted in conjunction with Satellite TM Imagery, topographical maps, 1:25,000 aerial photos and detailed geology maps at 1:100,000 scale. This work resulted in a 1:500,000 scale map of the structural and geophysical signature of the area in and around EL8442 and a part of this map is presented as Figure 8.

All work outlined above and all relevant results and discussions of that work are included in the Annual Report for period ending March 8, 1995 (Omotosho, 1995).

6.2 Second Year

To further resolve the geophysical information already obtained, a gravity survey was conducted in EL8442 along lines cleared by a grader. The E-W lines, were 9 kilometres apart and 14 and 16 kilometres in length. The data collected was combined with AGSO and NTGS data to construct a residual Bouger gravity map. This is presented as Figure 9.

Further processing of aeromagnetic data acquired in the previous year was carried out to produce a contour plan presented as Figure 10. This provided enough resolution to allow for the siting of a drill hole to test the magnetic ridge pinpointed.

An access track was cleared to the proposed drill site of FEND 9. A pad and diamond drill sump were prepared by a front end loader and backhoe. The proposed drill site of FEND 9 was surveyed by Ausurv Pty Ltd using differential GPS survey.

At the end of the field season in December 1995 the sump was refilled without the hole being drilled due to the on-set of the monsoon season. HGAL had been committed to drilling on nearby El's during the 1995 field season.

Regional reconnaissance was also conducted for Proterozoic Basement in areas covered by black soil.

All work outlined above and all relevant results and discussions of that work are included in the Annual Report for the year ended 7 March, 1996 (Omotosho, Stewart 1996).
6.3 Third Year

In May 1996 the access track first cleared in 1995 was reclaimed by front end loader and the drill pad and sump were reopened in preparation for drilling. The location of the drill site is shown in Figure 11.

In June and July 1996 two NQ diamond holes totaling 869 metres were drilled on the prospect. Drilling was carried out to test a magnetic ridge that had been highlighted in the previous exploration year. The first hole, FEND 9 was drilled to 144 metres and terminated due to a radical deviation in direction which made it impossible to intersect the magnetic target at depth. The second hole FEND 9A was drilled 2.6 metres to the south of the aborted hole and attained a target depth of 725 metres. Drilling was carried out by Gaden Drilling using a Warman UDR 1000. The holes were collared at -70° towards 267.5° magnetic.

The RC pre-collar in FEND 9 was drilled to 84 metres. Sample was passed through a cyclone and logged and collected in 1 metre intervals and placed un-bagged next to the rig. Assay samples were composited into 2 metre intervals by grab sampling from the heaps. The samples were assayed by Assaycorp in Pine Creek for gold by fire assay FA50 and for arsenic by AAS/MA-3. The RC pre-collar for FEND 9A was drilled to 84 metres but was not logged or sampled.

Core from both holes was logged for core recovery, geology and magnetic susceptibility. Prospective sections were cut in half and assayed in 1 metre intervals by Assaycorp in Pine Creek for gold and arsenic by the method as described above. An interval in FEND 9A from 582 to 594 metres was subjected to multi-element analysis by ICP-MS/MA-3 and ICP-OES/MA-3 by Assaycorp.

At the end of the field season the drill sump was back-filled and hole collars buried and capped in accordance with standard NTMME requirements.

All work outlined above and all relevant results and discussions of that work are included in the Annual Report for the year ended 7 March, 1997 (Omotosho, Stewart 1997).

6.4 Fourth Year

The work carried out in the fourth and final year of tenure consisted of the review of data collected in EL8442 in the light of information gathered in nearby EL’s. From this review it became clear that no further work could be warranted on the EL and the Exploration Licence was surrendered.

SIMON OMOTOSHO
BSc(Hons) MAusIMM
7. EXPENDITURE STATEMENT - YEAR 4

Total expenditure by Homestake Gold of Australia Limited on the Blue Ant project (EL 8442) for the twelve months to March 7, 1998 was $1,495.

A breakdown of this total by expenditure type is set out below:

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<tr>
<td>CONSULTING &amp; TECHNICAL SERVICES</td>
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<td>TRAVEL, ACCOMMODATION AND MEALS</td>
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<td>OVERHEADS</td>
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<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>1,495</strong></td>
</tr>
</tbody>
</table>

This failed to meet the Expenditure Covenant of $10,000. An application for Variation of Covenant has been lodged.
8. BIBLIOGRAPHY


CYPRUS MINERALS AUSTRALIA COMPANY, 1988 - The Moline Dam and North Hercules gold deposits, Moline Northern Territory. In: JONES, D.G. (Editor) - NORTHERN TERRITORY GOLD DEPOSITS. BICENTENNIAL GOLD 88. EXCURSION GUIDEBOOK. University of Western Australia, Department of Geology, Perth, 4-10.


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