TECHNICAL REPORT

No. 1164......

TITLE
EXPLORATION LICENCE NO. 1372 "TAWALLAH RANGE"
NORTHERN TERRITORY
FINAL REPORT

ISSUING DEPARTMENT
EXPLORATION

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DATE
NOVEMBER 1982
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1. INTRODUCTION

Exploration Licence No. 1372 in the McArthur River region of the Northern Territory was taken out in 1976, and expired in November 1982.

The targets were copper-lead-zinc in vein deposits and stratiform lead-zinc-silver deposits in sedimentary rocks of the mid-Proterozoic McArthur and Tawallah Groups.

The mineralisation found was not sufficient to justify further exploration, and the licence should be allowed to expire.

This final report on E.L. 1372 is intended as a summary of work done by Carpentaria Exploration Company Pty. Ltd. (CEC) in the above period and by BHP Minerals Limited (BHP), who were joint venture partners during 1981. Full annual technical reports covering the period to the end of 1981 have previously been submitted. The area was reappraised during 1982 but no further field work was done. Hence for detailed information, the reader is referred to the above reports, listed in the References.

2. TENURE

E.L. 1372 was applied for on August 16, 1976 and granted on November 30, 1976, for a one year term.

Subsequently the Licence was renewed each year and progressively reduced in area, as per the following table:
<table>
<thead>
<tr>
<th>Term</th>
<th>Area</th>
<th>Annual Committed Expenditure</th>
</tr>
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<tbody>
<tr>
<td>30.11.76 to 29.11.77</td>
<td>921.0 km²</td>
<td>$20 000</td>
</tr>
<tr>
<td>30.11.77 to 29.11.78</td>
<td>921.0 km²</td>
<td>$25 000</td>
</tr>
<tr>
<td>30.11.78 to 29.11.79</td>
<td>457.2 km²</td>
<td>$30 000</td>
</tr>
<tr>
<td>30.11.79 to 29.11.80</td>
<td>214.0 km²</td>
<td>$15 000</td>
</tr>
<tr>
<td>30.11.80 to 29.11.82</td>
<td>92.1 km²</td>
<td>$10 000</td>
</tr>
</tbody>
</table>

(final expiry)

The areas relinquished in different years are shown on Drawing No. 1/5091.

3. LOCATION AND ACCESS

Exploration Licence No. 1372 lies approximately 650 km south-east of Darwin, approximately 60 km west-north-west of Booroloola and 70 km north-west of the Mimets McArthur River camp.

Access from the Carpentaria Highway is via Ryans Bend and the unsealed graded roads to Nathan River Station and Rosie Creek Station, which pass through the centre of the original E.L. 1372.

The Apollo Prospect, where the most recent exploration work was carried out by BHP, is reached by a rough bulldozed track from the Nathan River Road.

During the wet season (December to March or April) the roads in the area become impassable.

4. PREVIOUS EXPLORATION

4.1. Old Workings

Old diggings and shafts occur at a number of areas, including Gordon's Copper Prospect and the Sly Creek Copper Prospect.
4.2. Modern Exploration

A chronological summary of recent exploration prior to the granting of E.L. 1372 is given below. For details the reader is directed to the reports listed in the References.

- 1960-61 BMR, Mt. Young 1: 250 000 sheet - geological mapping.

- 1961-62 CEC reconnaissance survey and one diamond drill hole at the Gordon's Copper Prospect (Marlow 1962).


- 1968 CEC regional stream sampling at a broad spacing, 1-2 samples per km² (Lord, 1969).

- 1972-73 CRA Pty. Ltd. geological mapping, geochemical sampling with detailed soil sampling at the Eastern Creek Lead Prospect. Three diamond drill holes were completed in the Eastern Creek Prospect (Johnson, 1974).

5. EXPLORATION BY CARPENTARIA EXPLORATION COMPANY PTY. LTD. AND BHP MINERALS LIMITED

5.1. Geology

The Exploration Licence area includes Carpentarian age Scrutton Volcanics and sediments of the Tawallah and McArthur Groups, with lesser exposures of the Adelaidean age Roper Group sediments. Cretaceous sediments and younger laterites also occur in the area.

Geological mapping was carried out, mostly in the western portion of the original E.L. In general the results of this work agreed with earlier BMR mapping of the region. Three 1: 25 000 scale geological
maps of the areas covered by the CEC mapping are given in the report by Logan (January 1980). This report also gives descriptions of the individual geological units within the Licence area.

The BHP 1981 Annual Report contains a 1: 25 000 scale geological map of the reduced area of E.L. 1372, and a 1: 20 000 scale geological map of the Apollo Lead Prospect. The mapping was carried out by consultant geologist D.F. Ward.

Thirteen thin section descriptions of mineralised cherts are given in the report by Nenke (1979).

5.2. Geochemistry

An extensive helicopter-supported stream sediment sampling survey was carried out in 1977 and finished in 1978. This survey covered all of E.L. 1372 except the larger areas of sandstone outcrops (Roper and Tawallah Groups). Samples were collected at an average density of 4 to 5 samples per km², sieved to -80 mesh, and assayed for copper, lead and zinc by AAS. This work located the previously unknown Apollo Lead-Copper Prospect. The results are plotted on twelve 1: 25 000 scale maps in Nenke's (1979) report.

The following-up of other stream geochemical anomalies in 1979 failed to find any other significant mineralisation. Results of this work are given in Logan's (Jan. 1980) report.

BHP carried out additional stream sediment sampling (160 samples) in the reduced area of E.L. 1372 in 1981. The -80 mesh size was assayed for copper, lead and zinc but no new anomalies were found. Results are given in BHP's 1981 report.

Soil sampling on a grid pattern was carried out at the Gordon's Copper Prospect in 1977, and finished in 1979. A total of 427 -80 soil samples were taken. The results are given in Logan's (Jan. 1980) report.
5.3. Geophysics

Five trial INPUT EM lines were flown in 1978, three of them over the Apollo Prospect and two over the Eastern Creek Lead Prospect. This method detected the mineralisation at Eastern Creek but not at Apollo.

In 1980, a further 21 INPUT EM lines were flown over the Apollo Prospect and surrounding areas, and five at the Eastern Creek Lead Prospect. The INPUT anomalies at the Apollo area were associated with haematitic sediments of Cretaceous age and a haematitic fault zone. Anomalies at the Eastern Creek Lead Prospect were associated with haematitic sandstone of the Roper Group.

Induced Polarization surveys using 125 m dipole spacings were done on a 1500 m x 1200 m grid at Apollo and a 1000 m x 1500 m grid at Eastern Creek. Neither survey detected any significant anomalies. The INPUT EM and IP survey results are reported in Logan's (Jan. 1980) report.

During 1981 BHP did an Induced Polarization survey at the Apollo Lead Prospect. Some anomalous responses on line 6000N were found but later drilling along this line did not reveal any corresponding mineralisation. This IP work is fully recorded in BHP's 1981 report.

5.4. Drilling

The Apollo Prospect was tested with one diamond hole and 27 percussion holes. Four of the percussion holes were drilled to test a secondary anomaly 1.5 km south-east of the main Apollo Prospect.

Drilling at the Apollo Prospect failed to locate sub-surface mineralisation equivalent to that in surface outcrop. The only results greater than 1% lead were from Apollo 2 RDH, which from 0 m to 15.0 m averaged 2.15% lead and 5.65 g/t silver in weathered siltstone, dolomite and chert, and Apollo 28 RDH, which between 17.0 m and 18.0 m assayed 1.9% lead in brown clays, dolomite and chert.
All drill hole logs, locations and a tabulated summary of the results of the drilling programme are presented in Nenke's 1979 report.

In 1981, BHP carried out a shallow drilling programme (71 holes; total 1534 m) at the Apollo Lead Prospect. The holes were drilled along four east-west traverse lines, with the middle two following IP lines 5000N and 6000N.

No significant zones of mineralisation were intersected in this programme, and no extension of the mineralisation in CEC's hole 2 RDH was found.

Details of this work are given in BHP's 1981 report.

6. MINERALISATION

6.1. Introduction

Four separate mineralised areas and prospects were investigated during the currency of E.L. 1372. The nature of the mineralisation at each is summarised below.

6.2. Apollo Lead Prospect

The galena mineralisation occurs bedded in cherty (silicified dolomite) rocks regarded by BHP as being the basal part of the Amelia Dolomite (McArthur Group). Grades of over one percent lead were found in only a few holes, and the pattern drilling results plus the fact that the strata are flat lying suggest that the mineralisation is patchy and not extensive.

The associated copper, zinc, barium and silver values are generally low, although grades in the outcrops are relatively richer. A degree of lithological control is apparent but the work done has not clearly established the origin of the mineralisation. Petrological study suggests that the mineralisation either predates or is
contemporaneous with the silicification of the dolomite. Possibly the mineralisation and the silicification here are related to the unconformity between the McArthur and the Roper Groups.

6.3. Eastern Creek Lead Prospect

The mineralisation is thought to be stratabound within the Balbirini Dolomite (top of McArthur Group) and may be related to the unconformity between the McArthur Group and the overlying Roper Group.

Galena and barite are present in a sequence of oolitic chert, banded chert, ferroan dolomite and minor siltstone.

6.4. Gordon's Copper Prospect

Copper sulphides and carbonates with pyrite and rare galena occur in and adjacent to an east-west fault cutting the Amelia Dolomite. The dolomite is silicified, and the mineralisation and the silicification are possibly related to the unconformity between the McArthur and Roper Groups, with concentration of base metals occurring in the fault zone.

6.5. Sly Creek Copper Prospect

Geologically this occurrence is similar to Gordon's Copper Prospect, and a similar origin is suggested.

6.6. Other Mineralisation

It was noted from following-up stream sediment geochemical anomalies that scattered galena, chalcopyrite and minor sphalerite mineralisation were sometimes present in the Tooganinie Formation and Amelia Dolomite, and that scattered chalcopyrite-pyrite mineralisation occurred in the Wollogorang Formation.
7. DISCUSSION

For a full discussion of the exploration work and the mineralisation found, the reader should refer to the annual technical reports by CEC and BHP.

Logan's January 1980 report concluded that four styles of mineralisation were present. BHP's later work on the Apollo Prospect has not changed these interpretations.

Briefly, the mineralised or anomalous situations occur as follows:

(i) At the McArthur Group-Roper Group unconformity, where a silicified sedimentary breccia (the Billengairah Formation—probably a pre-Roper Group regolith) often contains anomalous lead values.

(ii) Stratiform fracture filling base metal mineralisation in a stromatolite bed (the Great Scott Horizon) in the Tooganinie Dolomite.

(iii) Regional geochemical copper anomalies associated with the Scrutton Volcanics and with the Wollogorang Formation.

(iv) Shear or fault concentrated (mainly) copper mineralisation in the Amelia Dolomite, and probably also related to the Roper-McArthur unconformity.

It is observed that the mineralisation in many instances occurs at or near the surface and does not continue at depth. This may be due to original concentrations at the unconformity being remobilised and perhaps enriched during subsequent weathering and erosional cycles, as described in Nenke's 1979 report (end of Section 5).

The styles of mineralisation described above are not considered likely to produce bodies of economic size and grade, although such a possibility cannot be altogether ruled out. Even if such a body did exist in E.L. 1372, it would most likely have been detected by the geological,
geochemical and geophysical exploration programmes which have been
carried out. For these reasons it is recommended that no further
work be carried out in this E.L.
REFERENCES


Rawlins, R.J. et al (1972)
Report on Exploration within Prospecting Authority No. 3319
"Carpentaria", Northern Territory - Year Ended December 31, 1971
CEC Technical Report No. 230

Logan, R.G. (1980b)
Exploration Licence No. 1372 "Tawallah Range" Annual Report 1980
CEC Technical Report No. 877

BHP Minerals Limited (1982)
Exploration Licence 1372, Annual Report for 1981
LOCATION MAP

CARPENTARIA EXPLORATION COMPANY PTY. LTD.
E.L. 1372 "TAWALLAH RANGE" N.T.

AND E.L. AREA REDUCTIONS

REVISION SCALE: 1:250,000

EASTERN CREEK LEAD PROSPECT

 apollo LEAD PROSPECT

GORDON'S COPPER PROSPECT

SCALE: 1:250,000
0 5 10 15 20 KILOMETERS

NOV. 1978
NOV. 1979
NOV. 1980
NOV. 1982 (EXPIRED)

15°45'S
135°30'E
15°49'S
15°50'S
15°55'S
15°54'S
15°56'S
16°00'S

MAP AREA
LOCALITY PLAN

DATE: NOV. 1982
CHECKED: PGS
DRAWN: P03

MINING FIELD OR DISTRICT: McARTHUR RIVER
ROLL NO.: 1/505

GEO GAS E.L. 1372 TAWALLAH RANGE II N.T.
DRAFT: PGS
LOCATION MAP
MICROFILMED:
ROLL No.:
MINING FIELD OR DISTRICT: McARTHUR RIVER

REVISION
SCALE:
1:250,000

Date of Partial Relinquishment.

TRACK TO
Booroloola
AND
McARTHUR RIVER

"ROSE CREEK (RUINS)"

135°25'E
135°30'E
135°45'E
125°30'E
THE C.

NOV. 1980