REPORT ON ALL
NEAR MINE SURFACE EXPLORATION
ADJACENT TO WOODCUTTERS MINE
NORTHERN TERRITORY

Project Name: WOODCUTTERS

Map Sheets: DARWIN SD 52-04 1:250,000

Commodities: COPPER, LEAD, ZINC, GOLD

Author: K. A. Williams

Date: 21 June, 1999

Volumes: VOLUME 1 OF 2

Accepted by: [Signature]

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2. Normandy Exploration, Adelaide

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Report No. 23988
21 June, 1999

The Secretary
Department of Mines and Energy
GPO Box 2901
Darwin NT 0801

Dear Sir,

re: Report On All Near Mine Surface Exploration Adjacent To Woodcutters Mine - Report No: 23988

Please find enclosed the Report On All Near Mine Surface Exploration Adjacent To Woodcutters Mine, Report No: 23988.

If there are any queries please do not hesitate to contact me at Woodcutters Mine, phone 8976 0088.

Yours faithfully,

[Signature]

K.A. Williams
Exploration Geologist

Encl.
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REPORT ON ALL
NEAR MINE SURFACE EXPLORATION
ADJACENT TO WOODCUTTERS MINE
NORTHERN TERRITORY

Author: K.A. Williams
Date: 21 June, 1999

**SUMMARY**

The area surrounding Woodcutters Mine has been extensively explored, testing deep targets adjacent to the mine and shallower targets further afield. Areas of exploration have been broadly subdivided into testing the old BMR lead anomalies at L1, L2, L3 and L6 along strike to the north of Woodcutters, the Huandot prospect to the south, the Seismic anticline to the west and Area 44 which is further west again. All of these prospects are within a 3km radius of Woodcutters Mine.

Exploration consisted of open file research, digitising surface geochemistry assays from other companies as well as Normandy Woodcutters, geological mapping, costeaming, geophysical surveys which included aeromag/radiometrics, surface gravity, a seismic line across the Woodcutters structure, IP and resistivity, followed up by RAB, RC and deep diamond drilling.

A number of geological models have been proposed for Woodcutters and these have influenced exploration priorities over the years.
1. CONCLUSIONS

Geochemistry is probably the most effective first pass exploration tool in the Woodcutters area. RAB / Auger drilling is often required because of poor outcrop.

Recent, intensive exploration has not identified a near mine open pitable resource.

A number of small surface targets identified, have not been fully tested.

Aeromagnetics is a useful tool in defining stratigraphy in areas of poor outcrop. Magnetic highs drilled intersected disseminated pyrrhotite.

Gravity highs drilled were unexplained.

2. INTRODUCTION

Over the years 328 deep diamond holes have been drilled searching for more base metal mineralisation, predominantly along the Woodcutters Structures. The Huandot and Flaming Fury/Highlander Projects were also explored for gold.

The focus of exploration since 1996 around Woodcutters has been the testing of deep structural targets which included L1 and L2 to the north. As reserves at Woodcutters became depleted the focus moved away from deep targets to shallower open pitable targets. Refer to Taylor 1999.

Many of the Mining Leases were also covered by 2 exploration licences. They were taken out to cover unpegged areas. These have already been reported on so there might be some duplication of reporting.

The purpose of this report is to compliment the above mentioned reports and to summarise the work conducted until 17.03.99 when Woodcutters Mine ceased production. No exploration has been carried out since that date.

3. LOCATION AND ACCESS

Woodcutters Mine is located adjacent to the Great Northern Highway and approximately 80 km south of Darwin (see Figure 1).
4. **TENURE**

Woodcutters Mine is surrounded by Mining Leases which extend as far west as Area 44. To the north of the mine site the BMR lead ("L") anomalies are covered by Mineral Claims. For grant and expiry dates see Table 1. Two exploration licences, EL4423 and EL8604, filled in "gaps" not covered by the MLN's.

Exploration Licence 8604 was granted to Nicron Resources Limited on 25 July 1995 for a period of six years. The licence was comprised of 2 blocks and the compulsory 50% reduction after 2 years was waived for 12 months. The southern block of the licence was relinquished on 24 July 1998.

Exploration Licence 4423 was granted to Nicron Resources Limited on 31st January 1990 for a period of six years and comprised 4 blocks. The 50% compulsory reduction was deferred until 1993 when the 2 eastern blocks were relinquished. The tenement was reduced by a further 50% in 1994, leaving 1 remaining block. A two year extension of the Exploration Licence was granted until 30 January 1998. The Licence was finally surrendered on 19 March 1999.

5. **PREVIOUS EXPLORATION**

A brief chronology of exploration in the Woodcutters area is presented in Table 2.

<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early 1950's</td>
<td>Territory Enterprises excavated shallow costeans at Area 44 after surface radiometric prospecting.</td>
</tr>
<tr>
<td>1957</td>
<td>BMR airborne radiometric survey found two anomalies on the Woodcutters structure.</td>
</tr>
<tr>
<td>1962</td>
<td>BMR surface radiometrics and EM over Area 44.</td>
</tr>
<tr>
<td>1964-1968</td>
<td>Intensive geochemical sampling, mapping and geophysics outlined distinct base metal anomalies at Area 44 and L1-L6. These were drilled, but only L5 produced ore-grade intersection.</td>
</tr>
<tr>
<td>1969-1971</td>
<td>Detailed drilling and other geochemical and geophysical exploration at L5 by Geopeko defined over 0.7 million tonnes of ore reserve.</td>
</tr>
<tr>
<td>1974-1977</td>
<td>Further geochemical and geophysical surveys by Geopeko at Area 44 and Huandot defined earlier anomalies.</td>
</tr>
<tr>
<td>1977-1083</td>
<td>Magnum Exploration and then CSR outlined anomalous Pb mineralisation at Flaming Fury.</td>
</tr>
<tr>
<td>1980-1982</td>
<td>L5 open cut resource was defined and RC drilling north of L5 and to the north of Area 44 confirmed the extent of the anomalies but did not intersect ore-grades.</td>
</tr>
<tr>
<td>1987, 1989</td>
<td>Woodcutters Mine intersected minor Pb-Au mineralisation at Flaming Fury in diamond drill holes, then found significant low grade Pb-Au in costeans.</td>
</tr>
</tbody>
</table>
### Woodcutters Tenements

<table>
<thead>
<tr>
<th>Tenement No</th>
<th>Prospect</th>
<th>Grant Date</th>
<th>Expiry Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL4423</td>
<td>Area 44</td>
<td>31/01/90</td>
<td>30/01/98</td>
</tr>
<tr>
<td>EL6604</td>
<td>Woodcutters</td>
<td>25/07/95</td>
<td>24/07/01</td>
</tr>
<tr>
<td>MCN3258-3260</td>
<td>L1</td>
<td>21/02/91</td>
<td>6/08/00</td>
</tr>
<tr>
<td>MCN3931</td>
<td>L1</td>
<td>9/08/91</td>
<td>8/08/06</td>
</tr>
<tr>
<td>MCN3937</td>
<td>L1</td>
<td>9/08/91</td>
<td>8/08/06</td>
</tr>
<tr>
<td>MCN3249-3257</td>
<td>L2</td>
<td>21/02/91</td>
<td>6/08/00</td>
</tr>
<tr>
<td>MCN3928-3930</td>
<td>L3</td>
<td>9/08/91</td>
<td>8/08/06</td>
</tr>
<tr>
<td>MCN3938-3943</td>
<td>L3</td>
<td>9/08/91</td>
<td>8/08/06</td>
</tr>
<tr>
<td>MCN3951-3952</td>
<td>L3</td>
<td>9/08/91</td>
<td>8/08/06</td>
</tr>
<tr>
<td>MCN3269-3270</td>
<td>L5 (Woodcutters)</td>
<td>7/08/90</td>
<td>6/09/00</td>
</tr>
<tr>
<td>MLN1095-1097</td>
<td>L5 (Woodcutters)</td>
<td>4/11/91</td>
<td>14/05/09</td>
</tr>
<tr>
<td>MLN1104</td>
<td>L5 (Woodcutters)</td>
<td>4/11/91</td>
<td>14/05/09</td>
</tr>
<tr>
<td>MLN314-316</td>
<td>L5 (Woodcutters)</td>
<td>4/12/74</td>
<td>14/05/09</td>
</tr>
<tr>
<td>MLN323</td>
<td>L5 (Woodcutters)</td>
<td>23/02/76</td>
<td>14/05/09</td>
</tr>
<tr>
<td>MLN344-345</td>
<td>L5 (Woodcutters)</td>
<td>15/07/76</td>
<td>31/12/21</td>
</tr>
<tr>
<td>MLN977</td>
<td>L5 (Woodcutters)</td>
<td>29/01/86</td>
<td>14/05/09</td>
</tr>
<tr>
<td>MLN11</td>
<td>L5 (Huandot)</td>
<td>15/05/84</td>
<td>31/12/09</td>
</tr>
<tr>
<td>MLN1106-1107</td>
<td>L5 (Huandot)</td>
<td>5/10/92</td>
<td>13/05/09</td>
</tr>
<tr>
<td>MLN12</td>
<td>L5 (Huandot)</td>
<td>15/05/84</td>
<td>14/05/09</td>
</tr>
<tr>
<td>MLN324-325</td>
<td>L5 (Huandot)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCN3261-3268</td>
<td>L6 (Woodcutters)</td>
<td>21/02/91</td>
<td>6/08/00</td>
</tr>
<tr>
<td>MCN3932</td>
<td>L6 (Woodcutters)</td>
<td>9/08/91</td>
<td>8/08/06</td>
</tr>
<tr>
<td>MCN4158-4161</td>
<td>Area 44</td>
<td>30/09/91</td>
<td>28/09/06</td>
</tr>
<tr>
<td>MLN355-358</td>
<td>Area 44</td>
<td>3/05/77</td>
<td>31/12/97</td>
</tr>
<tr>
<td>MLN377-379</td>
<td>Area 44</td>
<td>3/05/77</td>
<td>31/12/97</td>
</tr>
<tr>
<td>MLN398-404</td>
<td>Area 44</td>
<td>31/10/77</td>
<td>31/12/98</td>
</tr>
<tr>
<td>MLN427-434</td>
<td>Area 44</td>
<td>8/08/78</td>
<td>31/12/98</td>
</tr>
<tr>
<td>MCN4197-4202</td>
<td>L6 (Manton Dam)</td>
<td>28/05/92</td>
<td>6/03/01</td>
</tr>
</tbody>
</table>

\[g:\text{mine closure\tenements\current tenements.xls}\]
Prior to the discovery of Woodcutters, exploration interest was centred on Rum Jungle, 12 km to the west. Mineralisation at Rum Jungle first became known during the construction of the overland telegraph line in the 1870’s and later the North Australian Railway which passed through what is now Batchelor. Copper minerals were seen and identified and a green mineral, probably torbernite, was reported. It was not until 1949 that uranium mineralisation was identified at Rum Jungle and intensive exploration then located three uranium orebodies, two copper orebodies and one large sub-economic lead-cobalt deposit (Walpole et al, 1968).

In conjunction with this local exploration, regional work by the Bureau of Mineral Resources (BMR) and Territory Enterprises Pty Ltd (the operator of the Rum Jungle mines) identified many areas of uranium and base metal anomalism. A regional “C” horizon geochemical sampling programme by the BMR in 1964 outlined a linear anomaly over what is known to be the Woodcutters structure and significant anomalies in Area 44.

Initial drilling of the major geochemical anomalies in the Woodcutters area in 1966-67 produced ore grade intersections of lead-zinc-silver mineralisation only at L5, where efforts were then concentrated. In 1968, L5 was put up for tender by the Commonwealth and a consortium of Electrolytic Zinc Company of Australia (EZ) and Peko Wallsend was successful. Intensive drilling and detailed geochemical sampling were successful in outlining a resource, but exploration ceased in 1971 when a feasibility study by the Joint Venture showed that further development work was not justified due to the size of the deposit.

Between 1972 and 1979 the Joint Venture acquired ground covering Area 44 and the Woodcutters structure to the north (towards Manton Dam) and south (Huandot). Intermittent surface exploration was carried out with no positive results. Between 1977 and 1983 work by Magnum Exploration and then CSR identified the Flaming Fury anomaly, east of L5. Further development of the L5 deposit occurred from 1980 when shallow drilling, designed to test for precious metal rich bodies in oxidised zones, delineated the pod which formed the open cut resource. In 1983, Nicron Resources purchased the tenements and through the formation of the Woodcutters Joint Venture, proceeded to develop L5 on the basis of an ore reserve of 1,073,000 tonnes at 7.9% Pb, 17.9% Zn and 170 g/t Ag. The open cut pre-strip commenced in December 1984 followed by mill and site infrastructure construction and upgrading of concentrate storage and handling facilities at Darwin Port. The first ore was milled in August 1985.

6. GEOLOGY AND MINERALISATION

A brief description of the regional and local geology is presented in this report. For a detailed description of the local geology as well as a summary of the various models proposed for Woodcutters, refer to Taylor 1999.

The Woodcutters mineral field lies to the east of the Rum Jungle Complex. The rocks of the Rum Jungle Complex are Archaean in age and act as
basement to Lower Proterozoic sedimentary rocks of the Pine Creek Geosyncline. The Lower Proterozoic sediments are unconformably overlain by minor pockets of Middle Proterozoic sandstone and karstic deposits. Tertiary alluvial deposits and laterite cover low lying areas.

The following are descriptions of the stratigraphic units in order of decreasing age:

**Rum Jungle Complex**
Lithologies consist of granite, gneiss, schist and iron formation.

**Beestons Formation (Batchelor Group)**
This unit consists of conglomerate, arkose and sandstone and is 100 to 200 metres thick.

**Celia Dolomite (Batchelor Group)**
Massive crystalline dolomite and magnesite are the main lithologies, with minor interbeds of chert and mudstone. The unit is 100 to 400 metres thick.

**Crater Formation and Coomalie Dolomite (Batchelor Group)**
These formations are very similar in lithology and thickness to the Beestons Formation and Celia Dolomite respectively.

**Whites Formation (Namaona Group)**
This unit has a thickness of at least 500m and predominantly comprises carbonaceous dolomitic slate with minor interbeds of impure carbonate (dololutite) and rare thin tuffs. Dololutite units and thin tuff marker beds can be correlated over distances of 2-3km to the north and west of Woodcutters Mine.

**Wildman Siltstone (Mount Partridge Group)**
Carbonaceous meta-pelite is the predominant lithology with lesser interbedded quartzite. some intervals of carbonaceous slate contain 20-30% pyrite and lesser pyrrhotite. An amphibolite unit 50-100 metres thick occurs at the base of the Wildman Siltstone or at the top of the Whites Formation. The BMR have mapped this unit to the south of Woodcutters and subsequent diamond drilling indicates it is probably an intrusive sill.

**The Acacia Gap Quartzite member**
The Acacia Gap Quartzite Member occurs about 200 metres above the base of the Wildman Siltstone. It is 50-200 metres thick and comprises several 3-20 metre thick beds of quartzite. Outside the Woodcutters Area the Wildman Siltstone is overlain by the South Alligator and Finniss River Groups.

Sink holes and karstic surfaces have formed over the carbonate sequences, probably during Middle Proterozoic time. Depressions were filled with clay, gossan-sulphide-quartz breccia and sandstone. The sandstone probably correlates with the Depot Creek Sandstone of the Tolmer Group.

Two main types of base metal mineralisation are recognised within the Woodcutters area:

- Vein-replacement base metal mineralisation (L5)
Stratiform base metal mineralisation (Rum Jungle type)

The L5 vein replacement mineralisation consists of numerous irregular lenses of sulphides which generally fill the steeply dipping north-south axial plane faults within the Woodcutters structure. Thicker sections of the lenses and sometimes the actual presence of mineralisation are controlled by the intersection of these faults with dololutite rich intervals and cross faults. The mineralisation thickness may change rapidly, both in the vertical plane and along strike. The orebodies show replacement textures as well as vein-like features. A number of chemical/mineralogical types of ore can be distinguished, but the most common sulphide minerals in the lenses are pyrite, arsenopyrite, sphalerite, galena and lead-antimony sulphosalts.

Diamond drilling has intersected stratiform chalcopyrite, sphalerite and galena mineralisation associated with manganese rich stratigraphic intervals in the Lower Whites Formation close to the basal contact into Coomalie Dolomite at Area 44. Highly anomalous Pb, Zn, Cu, Ni and Co levels have also been recorded from shallow drilling and surface sampling in the same area as the deeper stratiform mineralisation intersections.

7. WORK CARRIED OUT DURING THE REPORTING PERIOD

Work carried out during the reporting period is not outlined in detail in this report. Rather, the reader is directed as to where the data is available. All relevant maps and plans have been scanned and are available at the NTDME. The data is also available digitally for the generation of geochemical surveys, drill hole sections and geophysical surveys. Figure 3 is included as a cross reference for the local grid, AMG's and latitude/longitude coordinates.

7.1 Surface Geochemistry

Data from numerous Open File Company Reports, as well as data generated by Normandy Woodcutters/Nicron Resources was digitised to form the ALLWOOD Access database at Woodcutters. This database identifies the various sampling methods eg. soils, stream sediments, auger, rock etc. It also identifies which company collected the samples. Assaying methods were not been recorded at the time of data entry, however company report numbers and or projects names are included in the database so assaying methods can be tracked down.

The ALLWOOD database has been divided into 3 Access tables, namely Woodcutters, Moline and Evelyn. It should be noted that only the Woodcutters table has been validated and is still not perfect. For sample locations see Enclosure 2.

7.2 Geological Mapping and Costeanning

Much of the report area was mapped in detail. Both scanned and hardcopies of the summary geology maps produced are available from the NTDME.
Costeanning was carried out extensively at Area 44, and to the north and south of Woodcutters Mine. The costeans were mapped along with the geology and are also plotted on the summary geology maps available from the NTDME.

Refer to plan numbers:  WCEX0646 to WCEX0655
                        WCEX0676 to WCEX0705

7.3 Geophysical Surveys

Numerous geophysical surveys were undertaken in the Woodcutters area. They included Aeromagnetic/radiometric Surveys, Ground Gravity Surveys, Ground IP and Resistivity Surveys. The seismic line is located on grid line 5600N (see Figure 3). Digital data for the Seismic Line survey is not available. Refer to plan WCEX0795.

See Enclosure 1 for outlines of where the surveys were conducted. All of this data is available digitally from the NTDME and includes surveys of regional exploration conducted further afield from Woodcutters Mine as well.

7.4 RAB Drilling

Early soil and auger geochemical surveys outlined areas of anomalism. RAB was generally not used as a near mine exploration tool, however as part of the sterilisation process at Woodcutters an extensive RAB programme was implemented in 1998 to the west of the mine. A total of 303 holes were drilled (RABAF001 to RABAF303). Details of the Survey and results are available in Taylor 1998. (see Enclosures of plans 1 to 8)

7.5 RC Drilling

All the RC drilling, prior to 1998, has been previously reported on. For details of the 1998 drilling at Area 44, L6 and just north of the mine site (RCAF001 to RCAF023, RCWC001 to RCWC019 and RCL601) see Taylor 1998. The 1998 data is available digitally. (see Enclosures of plans 1 to 8)

7.6 Surface Diamond Drilling

This database includes 328 diamond holes, some of which are old Geopeko and BMR holes. A number of the later, deeper holes (to 1300m) did not intersect mineralisation but are useful for structural interpretation. All the surface diamond drilling data is available digitally from the NTDME.

Generally core sample assays were done on site and a scanned copy of the Woodcutters assaying procedure is available. For drill hole locations see Enclosures of plans 1 to 8.
Woodcutters Local and AMG Grids

Scale 1:25000
7.7 Previous Reports Submitted

Work reported on to date includes areas covered by EL4423 and EL8604. Most of the Mining Leases at Area 44 were renewed in 1997 and a comprehensive report was prepared for that renewal application. That report, in conjunction with the Summary Exploration Report for 1998 covers all of the work done at Area 44.


**EL 8604**


**EL 4423**


8. **ENVIRONMENTAL/REHABILITATION REPORT**

All rehabilitation has been completed in accordance with Sections 24(e) and 166(1)(a) of the Mining Act. This included back filling of all sumps and costeans and capping all drill holes.

The areas being reported on fall within the environmental rehabilitation plan for the entire Woodcutters Mine site.
9. REFERENCES


NORMANDY WOODCUTTERS LIMITED

WOODCUTTERS MINE


BIBLIOGRAPHIC DATA SHEET

REPORT NUMBER: 23988

REPORT TITLE: Report On All Near Mine Surface Exploration Adjacent To Woodcutters Mine, Northern Territory

PROSPECT NAME: Woodcutters
Area 44
Seismic Anticline
Huan dot
L1, L2, L3, L6

TENEMENT NUMBERS: Refer to Table 1

OWNER/JV PARTNERS: Normandy Woodcutters Limited - 100%

COMMODITIES: Gold, Zinc, Lead

TECTONIC UNITS: Pine Creek Geosyncline.

STRATIGRAPHIC UNITS: Whites Formation

1:250,000 MAP SHEET: Darwin SD 52-04

1:100,000 MAP SHEET: Noonamah 5172

KEYWORDS: Exploration Review
Diamond Drilling
RAB Drilling
RC Drilling