HOWLEY PROJECT AREA

ALLUVIAL EXPLORATION ACTIVITY IN EL 4847,

21st January 1987 to 20th January 1988

by

R. RUSSELL

for

METANA MINERALS N.L.

24th February 1988
CONTENTS

1 SUMMARY AND CONCLUSIONS .... 3
2 RECOMMENDATIONS .... 3
3 INTRODUCTION .... 4
4 EXPENDITURE .... 4
5 GEOLOGICAL EXPLORATION .... 4
  5.1 Mapping and Geomorphological Evaluation .... 4
  5.2 Ground Radar .... 9
  5.3 Costeanning .... 9
  5.4 Bulk Sampling .... 9
APPENDIX 1 Description of Georadar Method .... 12

FIGURES

Figure No. Page No.
1 Location Map 5
2 Radargram, Lower Dam Creek 10

TABLE

Table No. Page No.
1 Expenditure in EL 4847 between 21st January 1987 to 20th January 1988 6

ENCLOSURE

ENCLOSURE 1 Alluvial Exploration Map, EL 4847, Howley Project Area.
1 SUMMARY AND CONCLUSIONS

Exploration work on EL 4847 has been directed toward mapping the extent of the gold bearing gravels and determining their grade by pan and bulk sampling. Air photograph mapping has been carried out over the area as part of a broader regional study. Follow-up work in the field was then carried out in which the air photo maps were checked and measurements were taken of gravel thickness in river incisions, pits and costeans. Pan sampling was continued in the EL to fill-in gaps left by the earlier programme. A bulk sample of 2,420 M³ was taken from the gravels in the eastern part of the EL which returned a gold grade of 0.11 g/LCM. Some costeaning was done on Pandanus Creek and two ground radar traverses were made over the lower reaches of Dam Creek in the northeast of the EL.

The mineralized crest of the Howley Anticline lies to the east of the topographic watershed. The shed of auriferous gravels is therefore mainly eastward into the northeast part of EL 4847. Although some good grades were obtained in the southwestern part of the EL, volumes are likely to be low. In the northeastern part of EL 4847, two main channels carry auriferous gravels. They are the Pandanus Creek, where mining has already commenced (Nov. - Dec. '88) and Dam Creek to the north. Although gravel lenses, terraces and bars of reworked gold bearing material may occur beneath the silt on the flatter slopes downstream, the main resource is thought to be situated close to the Howley Ridge in the upper parts of the two major drainage systems. Economic gravels may total 255,000 Bank Cubic Metres (BCM's) in the two drainage systems.

2 RECOMMENDATIONS

Two lines of costean slots are required to test the gravels in the two gold bearing creeks in EL 4847 (Southwest). In the northeastern part of EL 4847, three further costeans are required in the upper parts of Dam Creek to fully test the gravels here. Several exploration slots could be cut at selected locations further downstream to test the extent of the gravel body and the degree of re-working. A bulk sampling test pit is required in the Dam Creek system and a suggested location is mapped on Enclosure 1. Follow-up slotting should be done on the basis of the ground radar results when they become available.
3 INTRODUCTION

The Howley Project Area is situated about 30 km southeast of Adelaide River on the Stuart Highway and consists of a group of EL's and MC's held by Northern Gold N.L. (Fig. 1). EL 4847 consists of two parts; a northeastern section (EL 4847 NE) and a southwestern section (EL 4847 SW). The two parts lie on either side of the Howley Anticline, a northwest trending fold structure which hosts primary gold mineralization in the crestal zone. Metana Minerals N.L. has negotiated a production agreement with Northern Gold for the alluvial gold mining rights in EL 4847 together with all the other leases in the Howley Project Area. This report deals with Metana's exploration work in EL 4847 for the period 21st January 1987 to 20th January 1988.

4 EXPENDITURE

Expenditure in EL 4847 during the year 21/1/87 to 20/1/88 is summarized in Table 1. A total of $49,740 has been spent in the EL. Items 1 to 5 relate to direct geological exploration costs and total $10,930. The earthmoving and bulk sampling costs are shown in items 6 to 8 and total $23,860. Metana have incurred large overhead expenses in their overall exploration programme in the Howley Project Area. Items 9 to 12, relating to labour, vehicle costs, accommodation and travel are the allocation of costs under these headings to EL 4847 based on the size of the tenement and relative activity in the area. A total of $14,950 is spent under these categories.

5 GEOLOGICAL EXPLORATION

5.1 Mapping and Geomorphological Evaluation

Initial photo-mapping was based on 1:15,000 colour air photographs. Mapping was carried out on transparent acetate sheets using a mirror stereoscope. These individual sheets were then mosaiced together to form a 1:15,000 photo map. The photo map, showing geomorphological features was then carefully checked in the field and corrected where necessary. The corrected photo map was then enlarged to 1:5,000 to form the base for the construction of Enclosure 1 (contained in a pocket at the rear of this report) which contains all relevant information on the EL. Although the mosaicing was done with careful reference to EL bound-
Fig. 1 Location Map

<table>
<thead>
<tr>
<th>ITEM</th>
<th>EXPENDITURE ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Geologist</td>
<td>2 500</td>
</tr>
<tr>
<td>2. Mapping and Air Photos</td>
<td>800</td>
</tr>
<tr>
<td>3. Ground Radar</td>
<td>6 010</td>
</tr>
<tr>
<td>4. Pan Sampling</td>
<td>500</td>
</tr>
<tr>
<td>5. Report Preparation</td>
<td>1 120</td>
</tr>
<tr>
<td>6. Bulk Sampling</td>
<td>19 360</td>
</tr>
<tr>
<td>7. Costeining</td>
<td>200</td>
</tr>
<tr>
<td>8. Road Building (Haul Roads)</td>
<td>4 300</td>
</tr>
<tr>
<td>9. Labour</td>
<td>7 500</td>
</tr>
<tr>
<td>10. Vehicle Costs</td>
<td>5 100</td>
</tr>
<tr>
<td>11. Accommodation</td>
<td>1 600</td>
</tr>
<tr>
<td>12. Travel</td>
<td>750</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>49 740</strong></td>
</tr>
</tbody>
</table>
aries and location maps, Enclosure I represents essentially an uncon-
trolled photo-mosaic and scale distortions will occur accordingly.

Gold bearing gravels shed eastward and westward off the crest of the
Howley Anticline. Once clear of the steeper slopes of the Howley Ridge,
both the western and eastern drainages turn northwestward following the
synclinal structures on either side of the anticline. The western
orientated drainage in EL 4847 SW flows into the Bridge Creek System while
the eastern drainage in EL 4847 NE flows into the Howley System. Mineral-
ization occurs along the deformed axis zone of the anticline in competent
lithologies and the gold is associated with stratigraphically transgress-
ive quartz-pyrite veining and stockworks. The gold bearing alluvial
gravels shed eastward and westward from the primary ore zone depending on
the location of the topographic watershed which has been mapped with some
care. Generally, the shed of gold bearing gravels is to the east in this
area as the watershed is situated to the west of the anticlinal crest.
Thus, although some good gold shows are obtained in EL 4847 SW, most of
Metana's exploration effort is concentrated on the large spreads of high
grade gravels shedding eastward from the anticline in EL 4847 NE. Two
major creeks carry gold bearing gravels here; the Dam Creek in the north
and Pandanus Creek in the south. Pandanus Creek clearly flowed in an
east-west direction in the past, crossing two low watersheds. Palaeco-
gravels on these watershed positions have been worked by the early alluv-
ial miners and a series of MC's have been taken out to cover these highly
prospective gravels. Mining in this area commenced in November 1987 and
had covered the mapped area by December of that year. The palaecochannel
fans out as it approaches the Stuart Highway to the east and a thin sheet
(10 to 50cms thick) of gold bearing gravels cover a large area in the
eastern part of the EL. A bulk sample taken in the 'throat' of this fan
returned disappointing results (0.11 g/LCM). Good pan results were
obtained from Dam Creek in the north although the channel is as yet
incompletely explored. Ground radar was used in the lower reaches of the
creek system in an attempt to locate the gravel body. From the mapping
and field examination, the alluvial deposits are clearly poly-cyclic
with two main phases of deposition:

i) An early alluvial phase in which a thick layer of coarse
poorly sorted material was deposited. Matrices are clay-rich
and the gravels are indurated and compact. Gold occurs through
the profile but the best results are obtained on the floor.
From the pan sampling results, grades appear to be poor. However, from mining results to the south, it is probable that the pan is giving unrealistically poor results because of the high clay content of the matrix. Grades may be as high as 0.6 g/LCM in this material. The old palaeochannel of Pandanus Creek is part of this 'early' phase of deposition.

ii) A later fluvial phase in which a thinner, better sorted layer of gravels was laid down. The materials are lighter and more rounded than the older gravels, matrices are sandy and the gravels are loosely compacted. Good gold grades are panned from the contact between the two gravel layers, but higher in the loose gravels, the gold grades drop off.

The gold bearing gravels are covered by a layer of grey silt which varies in the EL from a few centimetres to over a metre thick. From costeasing and mining along Pandanus Creek, it is probable that the best gravels in terms of grade and volume will be obtained in the upper reaches of the two main creek systems. From the costeans and exposure of the gravels in river beds, an estimated resource ('possible') of 142,500 BCM's of gravel grading over 0.3 g/LCM occurs in the Pandanus Creek system and a possible resource of 112,500 BCM's of gravel grading over 0.3 g/LCM in the Dam Creek system to the north. The older gravels have probably been fluvially re-worked and lenses and terraces of gold bearing material occur in the lower parts of the channels in EL 4847 NE but these are not included in the present calculations. It is not possible to locate them on the air photographs or by field examination.

The work in EL 4847 SW consists only of mapping, geomorphological evaluation and pan sampling. The main northward-orientated gravel body has very low gold concentrations. However, two smaller tributary creeks show good results and are worth follow up in the coming year. The two creeks are shedding southwestward off the Howley Ridge and although volumes are small, good grades may be anticipated. The main problem with this part of the EL is that the watershed lies west of the Anticlinal crest so most of the auriferous gravels are shedding northeastward. Slotting of the gravels in the two gold bearing creeks of EL 4847 SW is recommended.
5.2 Ground Radar

In August 1987, ground radar was carried out over parts of the Howley Project Area. It was hoped that rapid collection of subsurface data could be obtained from the system at low cost and with little disturbance to the environment. Two traverses were made across EL 4847 NE (Enclosure 1) in the lower reaches of Dam Creek. The intention was to locate gravel bodies, terraces and bars beneath the silt cover. Patchy, re-worked gravels from higher up in the system are thought to occur here and if large enough fragments of the gravels can be located, they may be economically mined. The technique proved relatively ineffective in this area, however, because of the hard, dry ground and the hardness and iron content of the gravels themselves. A radargram from the lower traverse is shown in Fig. 2. Some gravel patches and a few individual large boulders can be seen on the gram but the overall result is not considered to be usable. Only the preliminary results of the Radar work are available at present; a final report has not yet been received from the contractor. See Appendix 1 for a description of the system.

5.3 Costeanning

Costeanning was carried out in EL 4847 NE in 1986. The costeans were all pan tested but no profiles were constructed of the gravel body. Gravel thicknesses were measured but the results are not available. Three main costeans were cut and are located on Enclosure 1. Following two wet seasons, the cuts have now collapsed. Numerous slots were cut in the upper parts of Pandanus Creek in the past year on an exploratory basis. The gravels were pan tested but the results were not kept. Most of the costean slotting was carried out in the MC 1010 and in support of the mining in MC 1009. Further costeanning is required along Dam Creek to the north to trace the alluvial plume shedding from the Metro Howley mineralized zone. Three costeans are recommended at 1 - 1', 2 - 2' and 3 - 3'. No costean work has been carried out yet in EL 4847 SW. Exploratory lines of slots are required in the two gold bearing creeks at 4 - 4' and 5 - 5'.

5.4 Bulk Sampling

A bulk sample was taken from the shallow gravels in the eastern part of EL 4847 NE. The purpose of the sample was to test gold grades on the
Pandanus Palaeochannel ahead of the mining being carried out in MC 1009. Geomorphologically, the pit is located in the 'throat' of a large fan on the palaeochannel where it reaches the very flat gradients of the Howley valley floor. The gravels are thin and relatively light with an immature ferricrete developed in the upper layers. Thickness ranges from about 10 cms to 50 cms in the flanks of the fan while along the axis, gravels are a little deeper but seldom exceed 1 metre. The bulk sample was taken from the gravel horizon after the silt overburden had been removed. A total of 2,420 M³ was taken from the pit and run through the alluvial processing plant. A disappointing return of 0.11 g/LCM was obtained.
Ground penetrating radar is a new non-destructive technique for rapidly profiling the subsurface and producing high resolution graphic records. Structures such as geologic bedding, jointing and faulting may be detected, as well as buried objects such as pipes, cables, underground cavities or archeological artefacts.

In principal, georadar operates as a reflective system (Fig 1), utilizing high frequency radio waves. A broad band pulse of very short duration (2 nano seconds) is transmitted downwards from a dipole transmitter. The mean frequency of this transmitted pulse is approximately 120 MHz for the low frequency antennae and 350 MHz for the mid frequency antennae. For high resolution work, 600 MHz antennae are used. Weak echoes of the radio signal are reflected back off geological features and are detected by the receiver unit placed on the ground surface adjacent to the transmitter.

In the normal surveying mode, called 'profiling', the transmitter and receiver are both placed on a wheeled trolley or a sled. This sled is pulled across the ground surface at a speed of approximately 5 metres per minute.

The reflected signals detected by the receiver are first amplified and then converted from high frequency to low frequency. The low frequency signals are then further amplified and filtered by a micro-processor built into the main unit of the georadar system.

Radio signals transmitted into the ground are attenuated exponentially with depth, resulting in a logarithmic decrease in the power of signals reflected from the deeper geologic layers. To off-set this attenuation problem, the micro-processor is programmed to increasingly amplify signals from the deeper layers. This feature is called 'time variable gain' (T.V.G.).

A function is also incorporated which enables numerous weak signals to be cumulatively added together to produce one stronger signal. This signal enhancement method is referred to as 'stacking', and it results in an improved signal to noise ratio.

The signal waveforms are displayed on a C.R.T. screen and the results of the survey may be printed out in the field on two printers simultaneously. A small monitoring printer is built into the main georadar unit and a larger (210 mm - A4 paper width) facsimile type printer using aluminiumized paper is incorporated in the graphic recorder. The survey data is also recorded on magnetic tape and additional copies may be printed at a later date.
For further processing, the data may enhanced using a colour processor unit from which colour radargrams of the subsurface may be printed using an ink jet plotter using 16 tone colour.

Each signal waveform consists of 1,024 words of 8-bit data. There are approximately 60 signal traces per centimetre on the radargrams printed by the graphic recorder, thus a typical profiling radargram is constructed from approximaely 1.5 million data bits.

Velocities and hence depths may be calculated using the wide angle reflection and refraction (WARR) method (Fig 2).

All the field units operate from a 12 volt D.C (car battery) power source and are readily portable.

***************

For further information contact:

R. Yelf.
Department of Resource Engineering,
University of New England,
Armidale,
N.S.W. 2351
Tel: 067-73-3150