ANNUAL REPORT 1993-94

FOR THE PERIOD ENDING 24-3-94

LICENCE HOLDERS AND OPERATORS:

CHAMBIGNE RESOURCES PTY LTD

REPORT COMPiled BY:
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DOBOS & ASSOCIATES, BRISBANE

Submitted 17-6-1994
TABLE OF CONTENTS

SUMMARY page 2
INTRODUCTION page 2
LOCATION AND ACCESS page 3
REGIONAL AND LOCAL GEOLOGY OF EL8004 page 3
GARNET MINERALOGY page 4
TEST WORK page 5
EXPENDITURE 1993-1994 page 6
PROPOSED WORK 1994-1995 page 6
PROPOSED EXPENDITURE 1994-1995 page 7

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LOCATION PLAN OF EL8004 appendix A
1:100,000 GEOLOGICAL MAP
Artunga-Harts Range [special]
with outline of EL8004 appendix B

SAMPLING SITES AND TUG CREEK OVERLAID
ON LOCATION PLAN OF EL8004 appendix C
SUMMARY

EL8004 was granted to Chambigne Resources Pty Ltd on the 25th March, 1993. This report details the exploration carried out by Chambigne in the first 12 month period of the tenure of the EL. Chambigne is predominantly focused on exploration and development of alluvial and detrital garnet resources in this EL, and in other ELs close by.

The EL is centred on the central reach of Tug Creek, which mainly drains rocks of the Cadney Metamorphics [high-grade calc-silicates (some of which are garnetiferous) and marbles, and generally garnetiferous biotite and sillimanite gneisses] but also samples small areas of the Ongeva Metamorphics [calc-silicates, marbles, and intercalated high-grade pelitic rocks] as well as the Gough Dam Retrograde Schist zone, both of which contain garnetiferous units.

The garnets in Tug Creek are hence derived from three broad metamorphic rock types, namely, pelitic schists and gneisses, and mafic and basic granulites and amphibolites, all of which yield almandine-dominated garnet compositions, known to produce garnet with desirable (high) hardness, and calc-silicate rocks, which yield garnets spanning a much larger compositional range in the Ca-rich series grossular-andradite. The physical properties of these Ca-rich garnets from this area are not yet known, but they are expected to have somewhat lower hardness and specific gravity.

After three inspections of various parts of Tug Creek, seven samples were collected form prospective sites, and submitted for garnet grade analysis. All but one have garnet grades which are currently subeconomic, and additional exploration and garnet characterisation is projected for the next reporting period.

INTRODUCTION

EL8004 was granted to Chambigne Resources Pty Ltd on the 25th March, 1993, for a period of 3 years. Chambigne Resources is exploring this, and other ELs in the vicinity, chiefly for garnet (principally alluvial and detrital, but also for garnet-rich host rocks, from which the coarser garnet crystals attract a premium), as well as other styles of economic mineralisation which are in synergy with company objectives.

This report sets out the work carried out by Chambigne in the 1993-94 period, and the work proposed for the 1994-95 reporting period.
LOCATION AND ACCESS

EL8004 is approximately 220km northeast of Alice Springs, in the southeastern part of the Harts Range area, some 38km southeast of the Harts Range Police Station, on Ambalindum Station.

The EL comprises 13 blocks and encompasses 42km². The northwesternmost corner of the EL is at 134°39'E and 23°15'S while the southeasternmost corner is at 134°48'E and 23°20'S; the location plan is presented in Appendix A. The boundaries of the EL are superimposed on a 1:100,000 geological map comprising the central part of the Arltunga-Harts Range Geological Special [1984], presented in Appendix B.

Access to the EL is along the Stuart Highway to the Arltunga Tourist Road [The Gardens Road], via Ambalindum Station to Claraville Station. From here, take the Red Ochre Dam track to the north; some 8.5km along this track, turn east along the Muller Bore track; Tug Creek is reached some 0.8km after the turnoff. The headwaters of Tug Creek may also be reached via the Cattlewater Pass Road which runs from Blackfellows Bones Bore, just south of the Plenty Highway, to Claraville Station. Both access tracks are easily passable by 4WD in all but the heaviest of wet periods.

REGIONAL AND LOCAL GEOLOGY OF EL8004

The regional geology of the EL is adequately summarised in the map commentary accompanying the Arltunga-Harts Range N.T. 1:100,000 Geological Special map [Shaw, Stewart & Rickard, 1984, Australian Government Publishing Service].

The far northwestern headwaters of Tug Creek drain the Ongeva Granulite, the lowermost unit defined in the early Proterozoic Strangways Metamorphic Complex. This unit largely comprises hypersthene-bearing mafic and felsic granulites, subordinate garnet-hypersthene granulite and quartzofeldspathic gneiss, with small lenses and pods of calc-silicates, quartzofeldspathic sillimanite-, garnet- and cordierite-gneisses, amphibolites, migmatites and granitoids.

The far northern headwaters of Tug Creek, and the headwaters of Cadney Creek [which drains into Tug Creek] are fed off the rocks of the Gough Dam Retrograde Schist Zone, largely comprising felsic gneisses retrogressed to mica-rich schists. This retrogression post-dates the emplacement of the Harts Range Pegmatites, and is hence probably late Proterozoic.

The headwaters of an unnamed creek, (the easternmost creek draining into Tug Creek in the southeast part of the EL) drains rocks of both the (early Proterozoic) Bungitina
Metamorphics and the (mid Proterozoic?) Harts Range Group. The number of mineral assemblages entailed here is large, but since the volumetric input of this area into the body of Tug Creek is quite small, it suffices to say that these rocks span quartzofeldspathic gneisses through garnetiferous gneisses to mafic gneisses and granulites, and also include numerous calc-silicates and marbles.

For the most part, however, all the creeks and tributaries mentioned derive much of their sediment load from the rocks of the Cadney Metamorphics, which belong to the early Proterozoic Strangways Metamorphic Complex. This unit comprises chiefly high-grade calc-silicates and marbles, with subordinate sillimanite-biotite gneisses and biotite gneisses; they also contain minor lenses and intercalated horizons of felsic gneisses, paragranites, garnetiferous biotite gneisses, amphibolites and mafic granulites.

The lower reaches of these creeks flow through Cainozoic alluvium, sand and weathered rock, and these in turn were also derived from all the rock units mentioned previously.

**GARNET MINERALOGY**

The garnet grains in Tug Creek and its tributaries are derived from three main metamorphic compositional rock types: mafic and basic (basaltic) compositions [mafic granulites, gneisses and amphibolites], pelitic (aluminous or shale-like) compositions [feldspathic and biotite gneisses] and calc-silicates (derived from impure calcite-rich or calcite dominated protoliths).

Garnets from mafic and basic gneisses and granulites comprise a limited range of compositions dominated by almandine with subordinate pyrope and minor spessartine; grossular and andradite components are in trace amounts or absent. Garnets derived from pelitic compositions, (biotite and garnet gneisses) also have similar compositional ranges. On the other hand, garnets from calc-silicate rocks are dominated by the grossular and andradite end-members, with only minor to trace amounts of almandine and pyrope.

Detrital grains of garnet may thus be deep purplish red in the case of the almandine-pyrope garnets, and may vary from colourless (grossular), through pastel shades and reds, to almost black (andradite). Because of the colour range and overlap, it is not possible to determine on-site the garnet compositional ratios in the detrital grains in Tug Creek, since garnet grains here are all in the pale cream-pale pink-red range. The problem is further exacerbated by a thin "slimy" coating on many of the garnet grains.

Since the physical properties of garnet vary with composition, it becomes necessary to determine individual garnet compositions and measure their respective Knoop hardnesses; this can best be achieved by electron microprobe analysis of individual grains, followed by microhardness determination on the same grains. This remains to be done for the Tug Creek garnet grains.
TEST WORK

Several inspections of Tug Creek, some of its tributaries and the flood plain were carried out by R Jolly and Ms. Joann Russell in 1993. Following this, Mr. Kelvin Fiedler of Mineral Process Consultants Pty Ltd was retained to inspect Tug Creek and collect samples for garnet grade analysis. Costeans or holes were dug across the creek or the alluvial flat, the loose sand was compositon to be representative of the cross-section and seven subsamples of about 5kg each were collected from the following localities, with coordinates determined by GPS [plotted on Appendix C]

#1a 23°19'43.2"S, 134°47'05.9"E 0-0.6m fine to coarse, with some pebbles
creekbed 70m wide

#1b position adjacent to above 0-0.6m coarse sand, damp below 0.2m
collected to compare grade variability over short distance

#2 23°18'36.9"S, 134°46'34.7"E (alluvial plain red) 0-0.45m sand, coarse pebbles at bottom
creekbed 30m wide

#3 23°19'07'0"S, 134°46'20.4"E 0-0.6m, material similar to #1
creekbed

#4 23°18'42.8"S, 134°46'03.6"E 0-0.6m fine to medium sand
dry on top but more damp with depth

#5 23°18'32.2"S, 134°45'21.8"E 0-0.6m medium coarse sand grading to
pebbles at bottom; washout gullies and thick scrub; creekbed 40m wide

#6 23°17'37.6"S, 134°44'47.5"E 0-0.6m, very low garnet grade; sand derived
directly from outcrops; Red Ochre Dam Crossing

The seven samples were shipped to Readings of Lismore Pty Ltd for processing. The garnet grades were as follows, in weight %:

<table>
<thead>
<tr>
<th></th>
<th>Garnet (%)</th>
<th>Quartz (%)</th>
<th>Opales (%)</th>
<th>Oversize (%)</th>
<th>Others (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1a</td>
<td>3.33</td>
<td>60.00</td>
<td>11.10</td>
<td>17.8</td>
<td>7.77</td>
</tr>
<tr>
<td>#1b</td>
<td>14.59</td>
<td>42.54</td>
<td>14.59</td>
<td>20.98</td>
<td>7.30</td>
</tr>
<tr>
<td>#2</td>
<td>7.91</td>
<td>57.37</td>
<td>15.82</td>
<td>3.09</td>
<td>15.81</td>
</tr>
<tr>
<td>#3</td>
<td>3.28</td>
<td>61.36</td>
<td>8.75</td>
<td>16.77</td>
<td>9.84</td>
</tr>
<tr>
<td>#4</td>
<td>24.45</td>
<td>74.31</td>
<td>7.33</td>
<td>1.25</td>
<td>12.22</td>
</tr>
<tr>
<td>#5</td>
<td>2.83</td>
<td>51.89</td>
<td>11.31</td>
<td>19.84</td>
<td>14.13</td>
</tr>
<tr>
<td>#6</td>
<td>0.83</td>
<td>41.57</td>
<td>3.32</td>
<td>50.12</td>
<td>4.16</td>
</tr>
</tbody>
</table>

Annual Report EL8004 93-94 Chambigne Resources Pty Ltd
All but one of the previous samples are clearly subeconmic. Readings consider these as indicative analyses, but rather than making a composite of these, washing, sizing and recounting the composite, it will be more productive to conduct further detailed testing in the vicinity of sample 1a and 1b, with geological assistance, and then analyse these.

EXPENDITURE 1993 - 1994

Total expenditure for work carried out on EL8004 by Chambigne Resources Pty Ltd in the 12 month period to 24/3/94 was as presented below. Many of these items were apportioned between this and other ELs in the area, also held by Chambigne.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel</td>
<td>$1,962</td>
</tr>
<tr>
<td>Accommodation</td>
<td>$247</td>
</tr>
<tr>
<td>Vehicle &amp; Fuel Costs</td>
<td>$1,540</td>
</tr>
<tr>
<td>Consumables and supplies</td>
<td>$240</td>
</tr>
<tr>
<td>Field assistance</td>
<td>$600</td>
</tr>
<tr>
<td>Backhoe hire</td>
<td>$500</td>
</tr>
<tr>
<td>Wages</td>
<td>$2,400</td>
</tr>
<tr>
<td>Analytical &amp; Laboratory Costs</td>
<td>$1,790</td>
</tr>
</tbody>
</table>

TOTAL EXPENDITURE $9,279

PROPOSED WORK 1994 - 1995

There are two thrusts to exploration in this EL for the 94-95 period. Firstly, it will be necessary to undertake detailed sampling around the area from which the highest garnet grades were recovered, and to re-examine other areas of the lower Tug creek. Additionally, some of the feeder creeks will be examined and/or sampled if on-site indications warrant. This will be accomplished with geological assistance.

Secondly, a suite of creek sample garnet concentrates will be analysed for both individual grain compositions and Knoop microhardness; source rock garnet from both the pelitic/mafic suite rocks and the calc-silicate suite rocks will be analysed in the same way. This should set up correlation factors for source rock-garnet composition-hardness variables, and together with refined grade values for prospective portions of the Tug Creek system, enable a go-no go decision to be made by the end of the next reporting period.
PROPOSED EXPENDITURE 1994 - 1995

The total proposed expenditure for work to be carried out by Chambigne Resources Pty Ltd on EL8004 to 24/3/95 is projected as follows:

- In fill costeaining: $1,500
- Stream sampling: $2,000
- Geological/mineralogical consultant: $1,000
- Sample analytical costs: $2,000

**TOTAL EXPENDITURE**: $6,500

________________________________________________________________________

Appendices A through C to follow
EL8004

13 BLOCKS
42 km²

134°39'

134°48'

23°15'

23°20'

Scale: 1:100,000

Appendix A
ARUNTA BLOCK

METAMORPHIC AND IGNEOUS ROCK TYPES

- **Amphibolite**
- **Anthophyllite, cummingtonite or gedrite-bearing rock, rarely containing sapphire**
- **Aplite, aplagranite**
- **Garnet amphibolite**
- **Biotite gneiss CI>10**
- **Basic metavolcanics**
- **Calcite**
- **Calc-silicate rock**
- **Deformed rock eg mylonite, cataclastic, highly foliated rock**
- **Dolomitic, metabasite, micromagrite**
- **Diorite**
- **Epidote**
- **Quartzofeldspathic gneiss, CI<10**
- **Felsic granulite, CI<50**
- **Granite, adamellite, includes retrogressively metamorphosed equivalents**
- **Gabbro or norite**
- **Granodiorite: includes retrogressively metamorphosed granodiorite**
- **Granitic gneiss**
- **Granitoid**
- **Hornblende gneiss**
- **Hornblende or clinopyroxene-bearing plagioclase-rich quartz gneiss**
- **Cordierite gneiss**
- **Cordierite-bearing felsic granulite**
- **Quartz-rich metasediment**
- **Plagioclase-quartz rock**
- **Marble**
- **Migmatite, migmatitic gneiss**
- **Mafic granulite CI>50**
- **Porphyroblastic feldspar gneiss**
- **Thinly layered amphibolite, quartz amphibolite**
- **Pegmatite, undivided**
- **Vein quartz**
- **Quartz-magnetite rock, hematite-quartz rock**
- **Quartzite**
- **Retrogressively metamorphosed rock, generally greenschist facies**
- **Muscovite-biotite schist or gneiss**
- **Biotite schist**
- **Chlorite schist, tremolite-actinolite schist**
- **Quartzofeldspathic schist**
- **Muscovite schist, sericite schist**
- **Garnet-muscovite-biotite schist or gneiss**
- **Tonalite, includes retrogressively metamorphosed tonalite**
- **Trondhjemite (rare)**
- **Meta-ultramafic rock, serpentinite**
- **Garnet-biotite-plagioclase-quartz gneiss**
- **Garnet-bearing quartzofeldspathic gneiss**
- **Andalusite gneiss or schist**
- **Silimanite-bearing biotite gneiss, garnet-sillimanite gneiss**

* = Dyke rocks
CI = Colour Index

\[\text{Unconformity}\]
LOCATION OF SAMPLING SITES
TUG CREEK

EL8004

Scale: 1:100,000

Appendix C
TEST WORK

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Annual Report EL8004 93-94 Chambigne Resources Pty Ltd page 5