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# Tasmanian magnesite resources: — a summary —

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## Introduction

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Very large deposits of magnesite are found in a belt of deformed Proterozoic rocks, known as the Arthur Metamorphic Complex, in northwestern Tasmania. The Arthur Metamorphic Complex is a linear, NE-trending zone, 8–15 km wide, extending from Granville Harbour on the west coast to Wynyard on the north coast. The geology of the area is shown in Figure 1, with tenements shown in Figure 2.

The magnesite occurs as a number of discontinuous, steeply-dipping lenses, up to 400 m thick, dispersed along this belt. Most of the magnesite occurrences belong to a part of the Arthur Metamorphic Complex known as the Bowry Formation, which also includes the iron ore (magnetite) deposit that is mined at Savage River by Australian Bulk Minerals. The magnesite deposits are thought to have resulted from metasomatism of dolomite, rather than deposition as a sediment, although this remains uncertain.

Six main magnesite lenses are known in this area, three in the south (Bowry Creek, Main Creek and Savage River), and three in the north (Lyons River, Keith–Arthur River and Central Creek). The magnesite lenses are all fundamentally similar in lithology and geological setting, and are likely to belong to the same stratigraphic unit that has been dismembered by faulting and deformation. A minor occurrence at Cann Creek, northwest of Central Creek, lies in a different setting in the western part of the Arthur Metamorphic Complex, and may belong to a different stratigraphic unit.

The magnesite is typically a massive, creamy-white, marble-like rock. It generally crops out very poorly, and its true extent has only become apparent through exploration drilling. Potential remains for further magnesite occurrences to be found elsewhere in the Arthur Metamorphic Complex, parts of which remain poorly known or which are covered by younger deposits. Land tenure of known deposits and most of the prospective ground allows for mining and exploration.

Within the last two years, Golden Triangle Resources NL and Tasmania Magnesite NL, the two most active explorers, have both foreshadowed the possibility of large-scale magnesium metal production from the deposits at Main Creek and Keith–Arthur River respectively.

## Southern area

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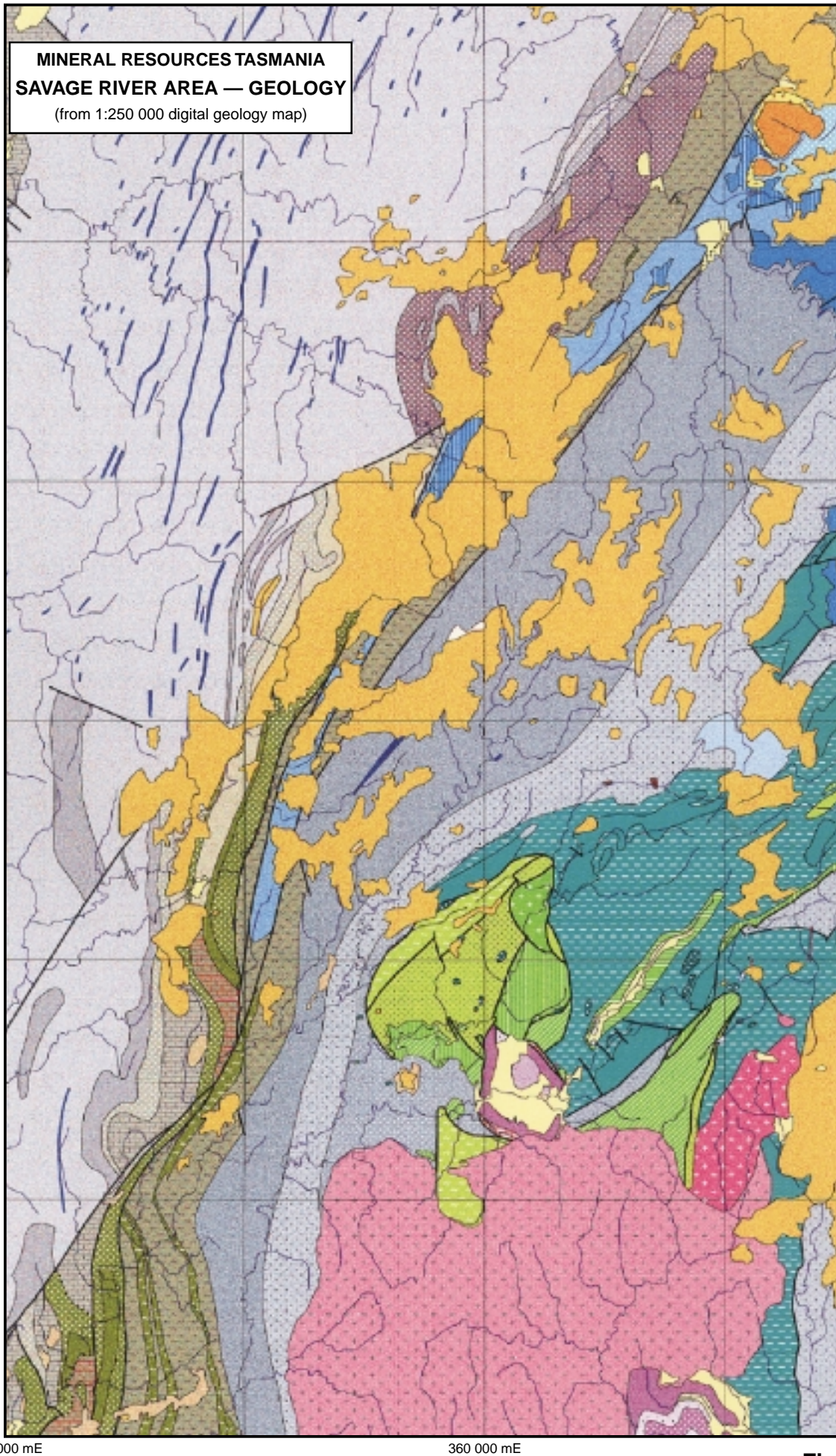
### *Main Creek and Bowry Creek*

The Main Creek and Bowry Creek deposits are held by Savage Resources Ltd under Mining Lease 2M/99. The area is classified as Multiple Use Forest, managed by Forestry Tasmania, with access for mineral exploration and mining. The deposits lie in a moderately rugged, forested area about six kilometres southwest of the township of Savage River. Access is by a 4WD track branching off the all-weather Corinna Road, two kilometres to the east of the deposits.

The magnesite at Main Creek occurs as a large stratiform lens, regionally conformable with the enclosing greenschist, and a similar body occurs two kilometres along strike to the south at Bowry Creek. Recent drilling suggests lateral continuity between the Main Creek and Bowry Creek occurrences, rather than separate lenses. The Savage River magnetite-pyrite and magnesite deposits lie four kilometres to the north along strike from the Main Creek deposit.

The magnesite is up to 400 m thick and dips steeply east. It is interlayered with dolomite and chloritic and talcose schist, and is underlain and overlain by pyritic schist. Dolomite, talc and quartz are the main mineralogical impurities in the magnesite, with 1–2% iron occurring in solid solution. Much of the magnesite at Main Creek and Bowry Creek is blanketed by several metres of umber and ochre pigments, which are residual deposits caused by prolonged deep weathering of the magnesite. Savage Resources holds two small mining leases over the pigment resources.

The Main Creek and Bowry Creek magnesite bodies were initially explored by Savage Resources and its



**Figure 1**

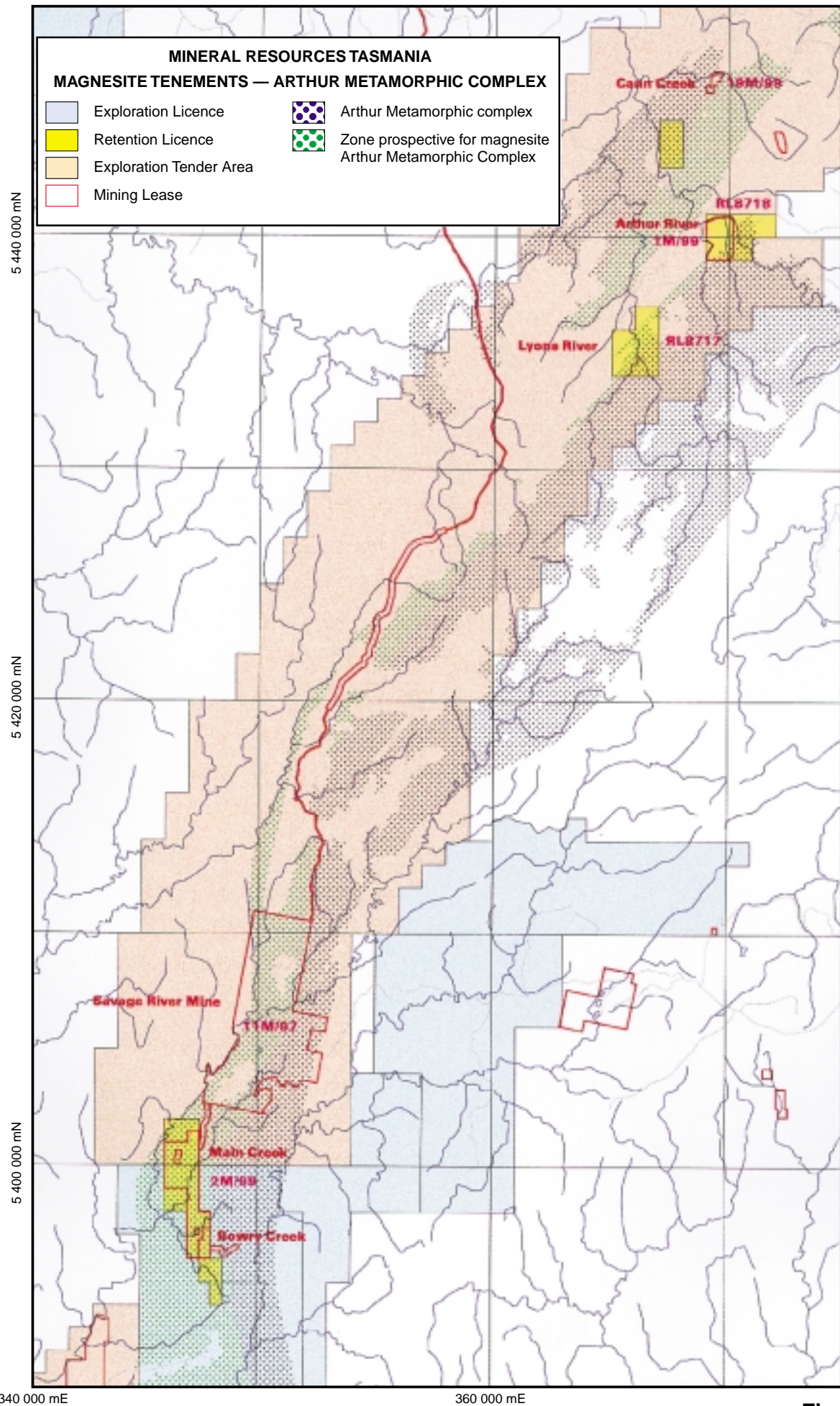


Figure 2

predecessor Industrial and Mining Investigations (IMI). Four diamond holes drilled between 1972 and 1983 showed that very large deposits were present. The magnesite and pigment deposits were transferred to retention licence in 1988 and mining lease in 1990.

In December 1997 Golden Triangle Resources NL entered into an option agreement with Savage Resources Limited to acquire the magnesite deposits. In 1998, a nine-hole, 3381 metre diamond drilling program by Golden Triangle defined an inferred mineral resource, in both the Bowry Creek and Main Creek deposits, of 47.4 million tonnes of 43.36% MgO and 2.66% SiO<sub>2</sub> (pure magnesite is 47.8 % MgO). The drilling suggested continuity of the magnesite between Bowry Creek and Main Creek, a zone previously thought to be faulted out. Five discrete lenses of high-grade magnesite were identified, two in the Bowry Creek area and three in the Main Creek area. There is no diminution of grade to depths of at least 240 metres. Nickel, one of the most deleterious elements for magnesium metal production, is well below specification maximum limits with 95% of samples at or below 3 ppm.

Golden Triangle withdrew from their option agreement with Savage Resources in September 1999. Bass Resources NL has subsequently expressed an interest in developing the Main Creek–Bowry Creek resource.

### ***Savage River mine area***

A large body of magnesite lies just east of the main magnetite orebody in the Savage River mine area. Available information suggests that this unit is of similar magnitude, but higher in talc and iron than the Main Creek–Bowry Creek magnesite deposits. The operator of the Savage River mine, Australian Bulk Minerals, has recently raised the possibility of extracting this resource, utilising existing infrastructure.

## **Northern area**

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### ***Lyons River–Arthur River***

Two large magnesite deposits occur at Lyons River and five kilometres along strike to the northwest between the Keith and Arthur Rivers. These deposits are in State Forest, some 55 km southwest of Burnie, and are accessed by an all-weather unsealed road. The Keith–Arthur River deposit is held by Tasmania Magnesite NL (Tasmag) [Crest Magnesium NL] under mining lease application 1M/99 and Retention License RL8718. A smaller nearby magnesite body occurs just north of the Arthur River at Central Creek, and is covered by RL8718. Retention license RL8717, also held by Tasmag, covers the Lyons River deposit. RL8717 lies within the Savage River Heritage Act Registered Entry area, which does not preclude mining.

Like the southern deposits, these occurrences are lenses up to 400 m thick that dip steeply southeast. The enclosing rocks are less metamorphosed in this area. The magnesite lenses are underlain by pyritic siltstone and amphibolite. Minor intervals of sandy dolomite, slate and sandstone occur within the magnesite. The magnesite is faulted against quartz-mica schist to the east. Like the southern occurrences, silica is the dominant impurity, with 1–2% iron present in solid solution in the magnesite. The Lyons River deposit lies in an area of moderate relief (100 m), while the Keith–Arthur River deposit underlies low-lying alluvial terraces. The Central Creek occurrence is overlain and partly surrounded by flat-lying Permo-Carboniferous sedimentary rocks that conceal possible further northward extent. The Central Creek magnesite has karst developments of conservation significance.

These magnesite resources have been explored for many years, beginning in 1970 by Mineral Holdings Australia Pty Ltd (MHA). CRA Exploration (now Rio Tinto) joint ventured into the ground in 1982. Seven diamond holes drilled in the Keith–Arthur River deposit in 1983/84 defined an estimated resource of 30 million tonnes of plus 40% MgO with 1.57% Fe<sub>2</sub>O<sub>3</sub>, 2.17% CaO and 6.35% SiO<sub>2</sub>. The deposit extends to at least 300 m depth.

Eleven holes in the Lyons River deposit defined an estimated 30 million tonnes of plus 40% MgO with 1.10 % Fe<sub>2</sub>O<sub>3</sub>, 2.55% CaO and 5.53% SiO<sub>2</sub>. This body grades to dolomite in the south and pinches out to the north under basalt cover.

CRA carried out metallurgical testing and feasibility and marketing studies to assess the deposits as a source of dead burned magnesia, caustic calcined magnesia and direct shipping ore. The deposits were transferred to retention licenses in 1988, and CRA withdrew from the joint venture in 1997. MHA then sold the retention licenses (RL8718 and RL8717) covering these deposits to Tasmania Magnesite NL. Diamond drilling on the Keith–Arthur River deposit by Tasmag in 1997 defined an indicated resource of 29 million tonnes at 42.8% MgO and 5.3% SiO<sub>2</sub>. Tasmag estimates that total resources of high grade (+40% MgO) magnesite in both the Keith/Arthur and Lyons deposits to be about 180 million tonnes. The raw magnesite can be readily upgraded to 45% MgO through rejection of silica by single stage beneficiation.

### ***Cann Creek***

Some seven kilometres north of the Keith/Arthur River magnesite deposit lies a smaller magnesite body at Cann Creek, which has been investigated by MHA and CRA. This deposit lies in the eastern part of the Arthur Metamorphic Complex and is associated with chloritic schist, phyllite and quartzite. These rocks may be Neoproterozoic in age and younger than the Bowry Formation which hosts the deposits described above.

Two diamond drillholes and costeans in 1983/84 showed high-grade magnesite, extremely low in iron (44.2% MgO, 3.6% CaO, 1% SiO<sub>2</sub> and 0.06% Fe<sub>2</sub>O<sub>3</sub>). The deposit is relatively small in size, 285 000 tonnes being an optimistic estimate. Drilling showed that the deposit grades to dolomite to the south. To the north, the magnesite is concealed by basalt cover. The area is held by MHA under mining lease application 19M/99.

### **Other occurrences and exploration potential**

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The Arthur Metamorphic Complex as a whole is regarded as highly prospective for further large, high-grade magnesite deposits similar to those already known. Most of the Arthur Metamorphic Complex

will become available to explorers as Exploration Tender Areas (ETA). In December 1999. Magnesite outcrop is known on a tributary of the Little Donaldson River near the Savage River pipeline road (ETA 514) within the Arthur Metamorphic Complex about halfway between the two main groups of magnesite deposits described above. Most of the central Arthur Metamorphic Complex remains poorly known, and large parts are concealed by younger cover.

Thick Neoproterozoic dolomite successions are present in several parts of Tasmania, and have some potential for magnesite deposits. Some of the dolomite is similar in age to the sedimentary magnesite of South Australia.

[30 November 1999]