# Bureau of Mineral Resources, Geology & Geophysics



RECORD

Record 1988/52



## An Assessment of the Mineral Potential of the Helsham Inquiry Area and the Adjoining Areas Containing the 'Hole in the Doughnut' Area, Central Plateau Conservation Area and Walls of Jerusalem National Park

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N C Higgins, I S McNaught, Y Miezitis & M Solomon

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## SUMMARY


The mineral and energy resource potential of the areas covered by the Helsham Inquiry and adjacent specified areas (HIAA; Fig 1) has been assessed as to the likelihood of finding commercially exploitable resources using levels of high, moderate and low. The area lies east of the main mineral producing provinces of western Tasmania. There are no current operating mines in the HIAA and no economic mineral deposits are known. However, undiscovered economic mineral deposits may be present, and parts of the HIAA are currently being explored.

The total area has been subdivided into three for the purposes of presentation, viz. the northern section, the 'Hole in the Doughnut' and the southern section. The methods of assessment used are similar to those developed by the United States Geological Survey. They involve predictions based on our current understanding of the genesis of ore deposits occurring in similar terrains both in Tasmania and elsewhere, combined with information on the results of mining and exploration to date, and geological factors specific to the regions under investigation. The information includes that already published together with additional data obtained from the Tasmanian Geological Survey and the BMR. Lack of detailed geological information in substantial parts of the area and the short preparation time preclude more than a provisional assessment.

The conclusions of the survey are summarised on Figure 1 as zones having various levels of mineral potential. On the metallic side there are four zones of high resource potential for small mineral deposits; one for small tungsten/tin deposits and small base metal deposits near Lemonthyme from which there has been limited production, and three for small alluvial platinoid deposits near Adamsfield, once a major producer of osmium-iridium alloy. There are several larger zones of moderate, or low to moderate, potential for tin-tungsten or base metal deposits. There are large zones having moderate to high potential for dolomite, limestone and silica, and there are large zones having low to very low potential for coal and oil shale. The mineral potential for low unit value commodities such as limestone, dolomite and silica is enhanced in zones which are close to or more accessible from industrial centres.

The mineral potential for gold in the northwestern part of the Hole in the Doughnut area and potential for oil in the southeastern part of the Southern Forests is unknown and the zones involved have not been depicted on Figure 1.

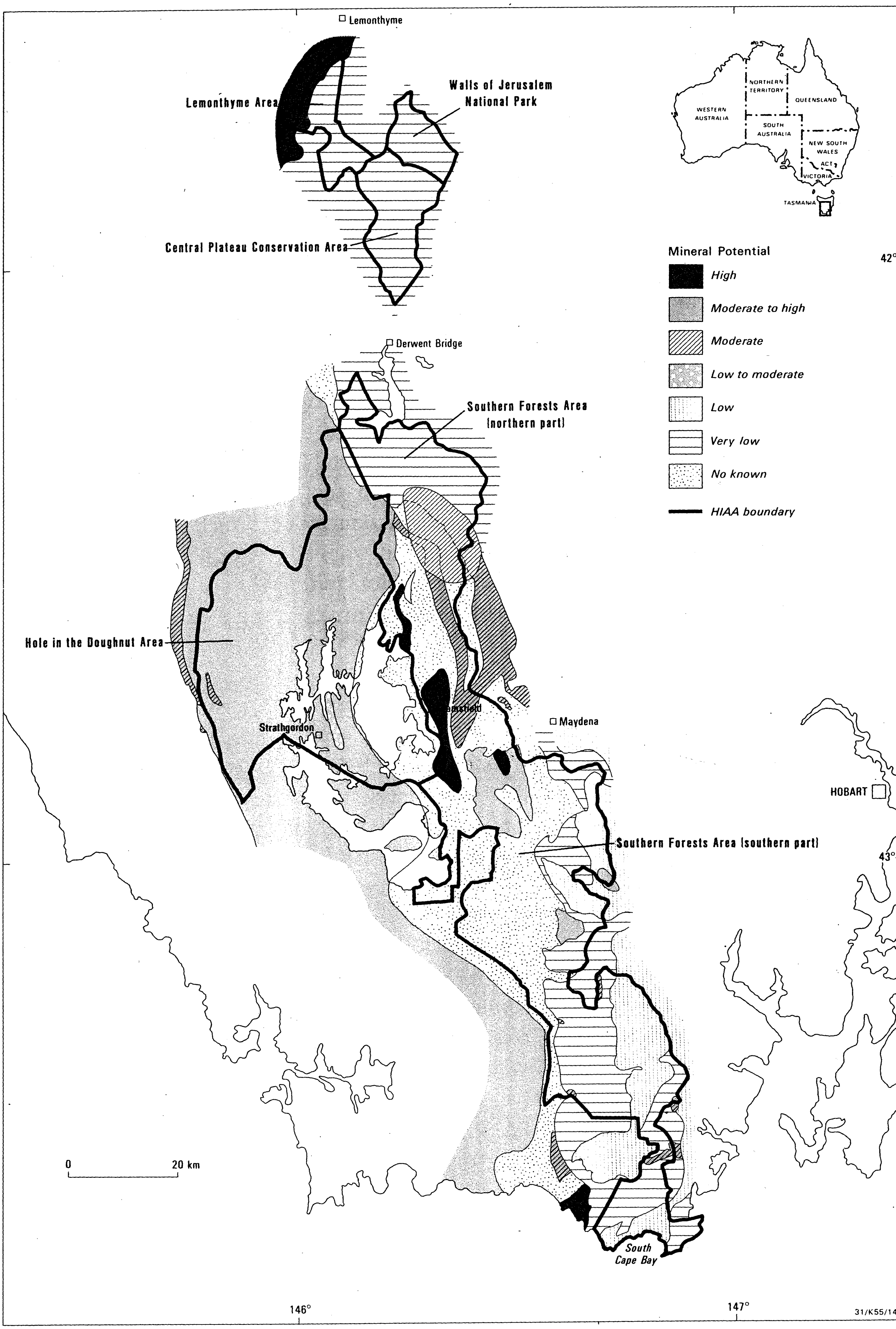


Fig 1 A preliminary delineation of zones of mineral potential in Helsham Inquiry and specified Adjacent Areas (HIAA)

## EXTENDED ABSTRACT


Because of time constraints and the lack of detailed geological information over substantial parts of the Helsham Inquiry and the specified adjacent areas (HIAA), this assessment can only be regarded as preliminary. A comprehensive assessment would take at least two person-years to complete. It should be emphasised that because of the dynamic nature of the mineral-resource potential assessments, even results of a comprehensive study cannot be regarded as final. The mineral resource potential of areas needs to be monitored and reassessed periodically in order to take account of new geologic concepts, advances in technology and changes in mineral markets. Such reassessments are greatly assisted by the results of continuing scientific investigation and exploration.

The most significant mineral producer within the HIAA was the Adamsfield district. Between 1925-1959 the district produced a little under 500 kg of platinoids (mainly osmium-iridium alloy). The only other mineral production of any significance has come from the small Oakleigh Creek wolfram mine which produced over 106 tonnes of contained $WO_3$ (tungstic oxide); this mine was closed down and the area rehabilitated in 1982. Currently there are no operating mines in the HIAA and no economic mineral deposits are known. Undiscovered economic mineral deposits, however, may be present, and parts of the HIAA are currently being explored.

The likelihood of discovering commercially exploitable resources is examined and this report presents a preliminary assessment of the mineral potential of the HIAA. The assessment is based upon the application of mineral deposit models to regional geological data obtained from the Tasmanian Geological Survey, open file mineral exploration reports and from data held by the BMR. For the purposes of this report an area is considered to have a mineral potential if existing geological data suggest that mineral exploration may discover an economic mineral deposit. The terms 'high', 'moderate' and 'low' potential are based on professional judgement and apply equally to energy based resources such as coal and oil shale.

The total area covered by the HIAA has been divided into three parts for the purposes of presentation. Potential for eleven different commodity assemblages have been recognised in and near the HIAA. The zones of occurrence of these assemblages is shown on Figures 3 to 5 as 'zones' one to eleven.

Starting from north to south, the three sub-areas of the HIAA together with their assessed potential for undiscovered mineral and energy resources are presented as follows.

**THE LEMONTHYME AREA, CENTRAL PLATEAU CONSERVATION AREA, AND WALLS OF JERUSALEM NATIONAL PARK (FIG 3)**

Mineral potential has been identified in this part of the HIAA for three different commodity assemblages. They are:

- Tungsten-tin, Base Metals (Zone 1)

  The Precambrian rocks in the northwestern part of the Lemonthyme area enclose part of a small mineral field which includes the old Oakleigh Creek wolfram mine. The area has a high potential for the discovery of small tungsten and tin vein deposits, and a high potential for the discovery of small base metal deposits.

- Coal, Oil Shale (Zone 2)

  The sediments of the Permian to Triassic sequence in the southeastern part of the Lemonthyme area are considered to have a low to very low potential for economic coal and oil shale deposits.

- Metallic and Energy Minerals in Dolerite (Zone 3)

  The dolerite of Jurassic age covers most of the Central Plateau Conservation Area, Walls of Jerusalem National Park and northeastern Lemonthyme area. It has a very low potential for metallic and energy mineral resources.

**THE HOLE IN THE DOUGHNUT (HOD) AREA AND NORTHERN PART OF SOUTHERN FORESTS AREA (FIG 4)**

The mineral potential for nine different commodity assemblages has been identified in this part of the HIAA. In addition, the presence of alluvial gold at Jane River, about 3 km outside the north western boundary of HOD indicates that there is an unknown potential for gold inside the north western part of the HOD. The various zones of mineral potential are:

- Copper-lead-zinc, Magnetite (Zone 4)

  Low to moderate potential for volcanic hosted copper-lead-zinc and magnetite deposits occurs in a zone around some hematitic iron formations near the Holley road in the HOD area.

- Limestone, Lead-zinc (Zone 5)

  Limestones of Ordovician age occur both in the HOD and in the northern part of the Southern Forests. These rocks have a moderate to high potential for commercial limestone deposits and a moderate potential for lead-zinc deposits.

- Platinoids (and associated gold and chromite) (Zone 6)

  This zone occurs as three discrete areas at Adamsfield which have a high potential for small eluvial and alluvial platinoid deposits (and associated gold and chromite). This zone occurs in the central part of the Southern Forests area and adjoins the boundary with the HOD. The old Adamsfield mining district is part of this zone of mineral potential.

- Dolomite (Zone 7)

  Dolomites and dolomitic rocks of Precambrian to Cambrian(?) age occur in the northwestern part of the HOD and in the Southern Forests area. These rocks have a moderate to high potential for commercial deposits of dolomite.

- Silica (Zone 8)

  The Precambrian quartzites occur over most of the HOD and have a moderate to high potential for silica deposits.

- Copper-lead-zinc (Zone 9)

  The rocks of this area have some similarities with the Mt Read Volcanics. The area has a low potential for copper-lead-zinc deposits.

- Tin (with marginal lead-zinc veins) (Zone 10)

  In this zone the Ordovician limestone may be underlain by Devonian granite and therefore it has a moderate potential for Renison and Mt Bischoff style tin deposits with marginal lead-zinc veins.

- Coal, Oil Shale (Zone 2)

  This style of mineral potential is present in the northern part of the Southern Forests. It has a very low potential for coal and oil shale deposits in Permian sediments within the Carboniferous-Triassic sequence.

- Metallic and Energy Minerals in Dolerite (Zone 3)

  Jurassic dolerite occurs in the northern part of the Southern Forests. The potential for metallic and energy resources within the dolerite is very low although such rocks are a source for road metal and construction materials. Jurassic dolerite, however, is very widespread in Tasmania.

**THE SOUTHERN PART OF THE SOUTHERN FORESTS (Fig 5)**

Mineral potential for six different commodity assemblages are present in this part of the HIAA. In addition to the six commodity assemblages within the HIAA, a zone of mineral potential for platinoid deposits also occurs just outside the southwestern boundary of the Southern Forests boundary. The various zones of mineral potential are:

- Dolomite (Zone 7)

  These dolomites are present in the southern part of the Southern Forests and they have a moderate to high potential for dolomite deposits.

- Limestone, Lead-zinc (Zone 5)

  Small areas of limestone extend into this part of the Southern Forests. These rocks have a moderate to high potential for limestone deposits and a moderate potential for lead-zinc deposits.

- Platinoids (and associated gold and chromite) (Zone 6, just outside the southwestern boundary of HIAA)

  Ultramafic rocks crop out just outside the south western boundary of Southern Forests west of South Cape Bay. The zone over these rocks has a high potential for small alluvial and eluvial deposits of platinoids and associated gold and chromite.

- Silica (Zone 8)

  The Glover's Bluff silica deposit occurs just outside the eastern boundary of the Southern Forests. An area of Precambrian rocks which contain this deposit extend into the Southern Forests. These rocks have a moderate to high potential for silica deposits. A large zone of moderate to high silica potential also occurs just outside the western boundary of Southern Forests.

- Coal, Oil Shale (Zone 2)

  Carboniferous-Permian-Triassic rocks crop out extensively over the southeastern part of the Southern Forests. These areas have a very low potential for coal and oil shale deposits.

- Coal (Zone 11)

  These rocks are host to the coal deposits in southeastern Tasmania and they crop out along the eastern margin of the Southern Forests. These areas have a low potential for economic coal resources.

- Metallic and Energy Minerals in Dolerite (Zone 3)

  Outcrops of Jurassic dolerite occur within the southern part of Southern Forests area. The potential for metallic and energy resources in the dolerite is very low although such rocks are a source of construction materials for roads and the building industry.

  In the southeastern part of the Southern Forests, there may be potential for oil sourced in the Gordon Limestone. Because of insufficient data, the level of this potential is unknown.

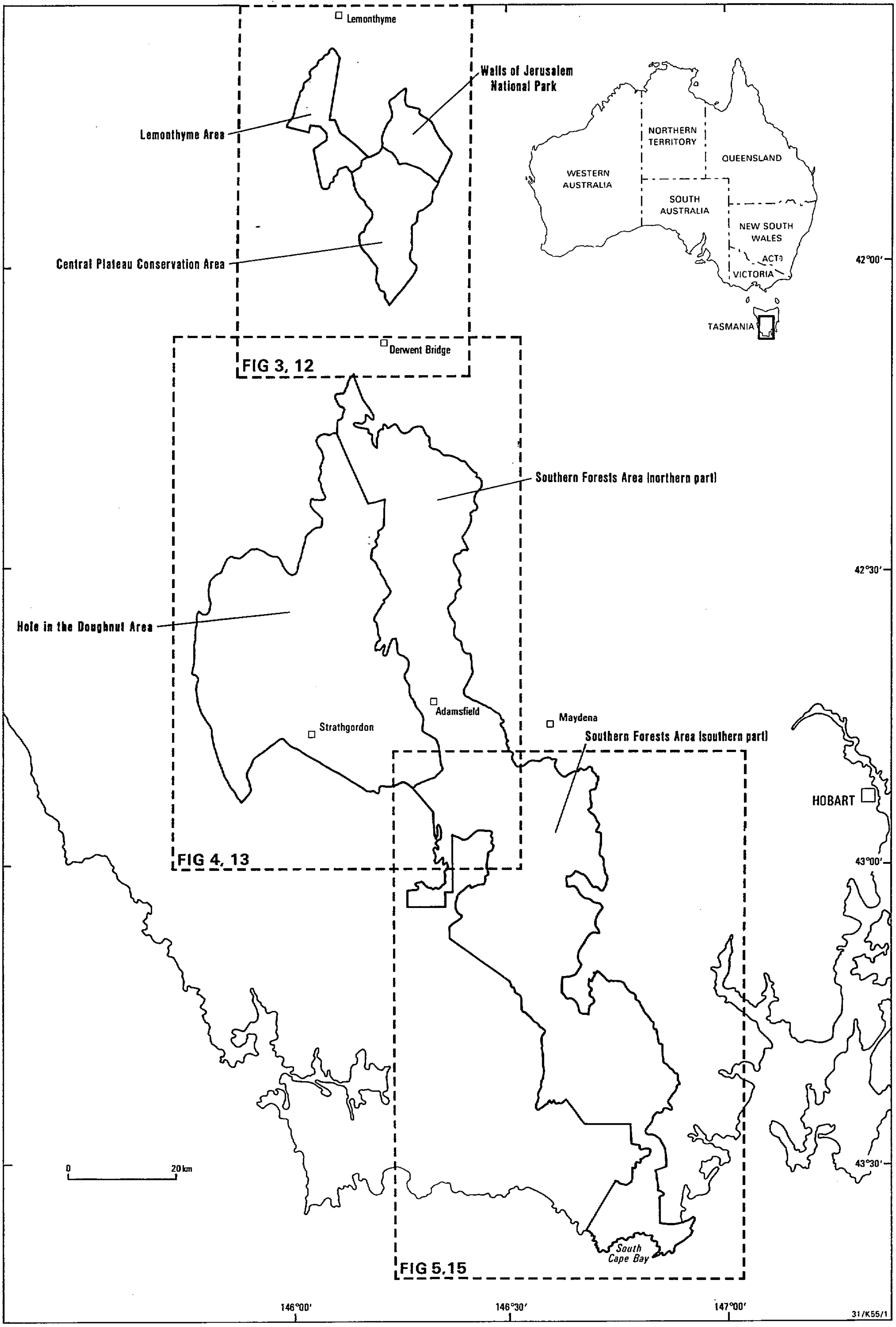


Fig 2 The Helsham Inquiry Area (includes the Lemonthyme and Southern Forests Area) and the adjoining areas containing the Hole In The Doughnut, Central Plateau Conservation Area and Walls Of Jerusalem National Park

## KEY TO THE MINERAL RESOURCE POTENTIAL MAPS

(Figures 3, 4 and 5)

| Zone | |
|---|---|
| 1 | *High potential for small tin–tungsten veins and base metal deposits in Precambrian rocks* |
| 2 | *Very low potential for commercial coal and oil shale deposits (Carboniferous–Triassic rock sequence)* |
| 3 | *Dolerite having very low potential for metallic and energy resources* |
| 4 | *Low to moderate potential for volcanic-hosted copper–lead–zinc deposits and low to moderate potential for Savage River style iron ore (magnetite) (Holley Road)* |
| 5 | *Ordovician limestone having moderate potential for lead–zinc deposits and a moderate to high potential for commercial limestone deposits* |
| 6 | *High potential for small alluvial and eluvial platinoid deposits (and associated chromite and gold) derived from ultramafic complexes* |
| 7 | *Moderate to high potential for commercial deposits of dolomite (Precambrian–Cambrian)* |
| 8 | *Moderate to high potential for commercial deposits of silica (Precambrian and Ordovician)* |
| 9 | *Low potential for copper–lead–zinc deposits* |
| 10 | *Moderate potential for Renison-style tin deposits replacing carbonate* |
| 11 | *Dominantly Triassic sediments with low potential for economic coal resources* |
| | *No known potential* |

**Note:** *The mineral potential for low unit value commodities such as limestone, dolomite and silica is enhanced in zones which are close to or more accessible from industrial centres*

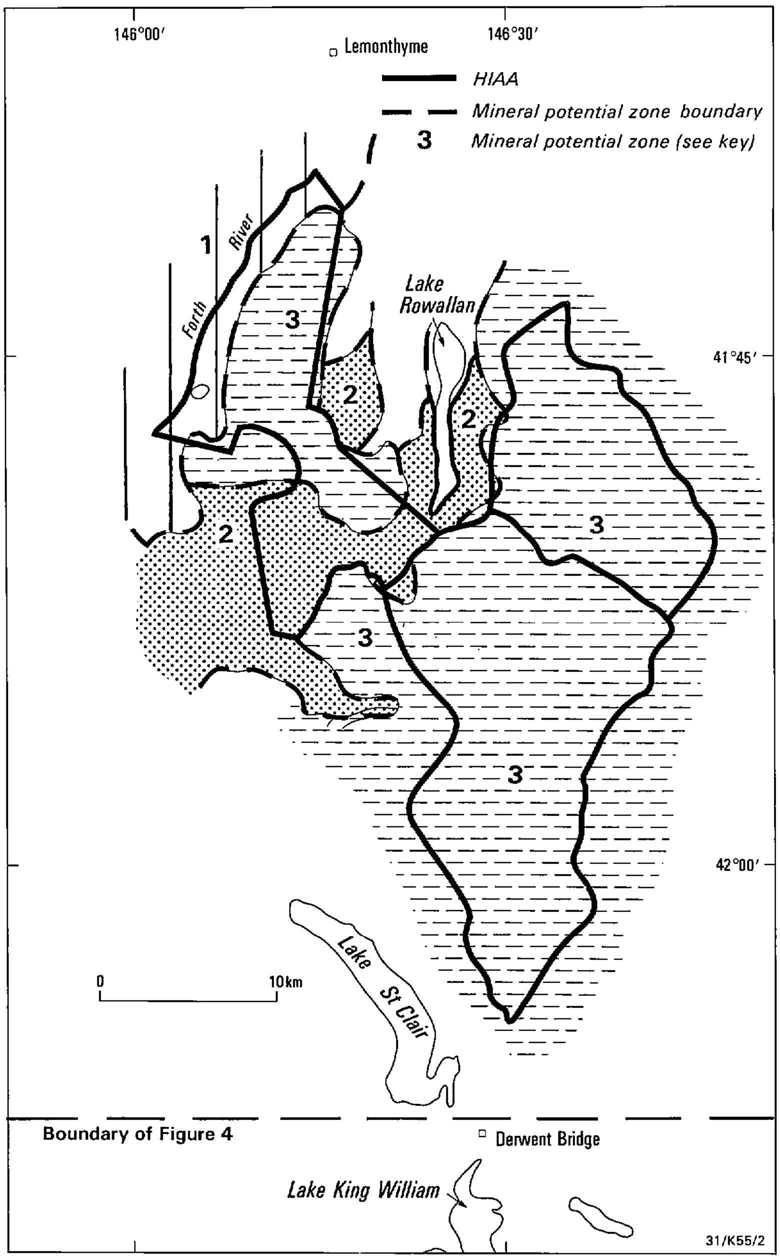


Fig 3 A preliminary delineation of zones of mineral potential in the Lemonthyme Area, Central Plateau Conservation Area and Walls Of Jerusalem National Park

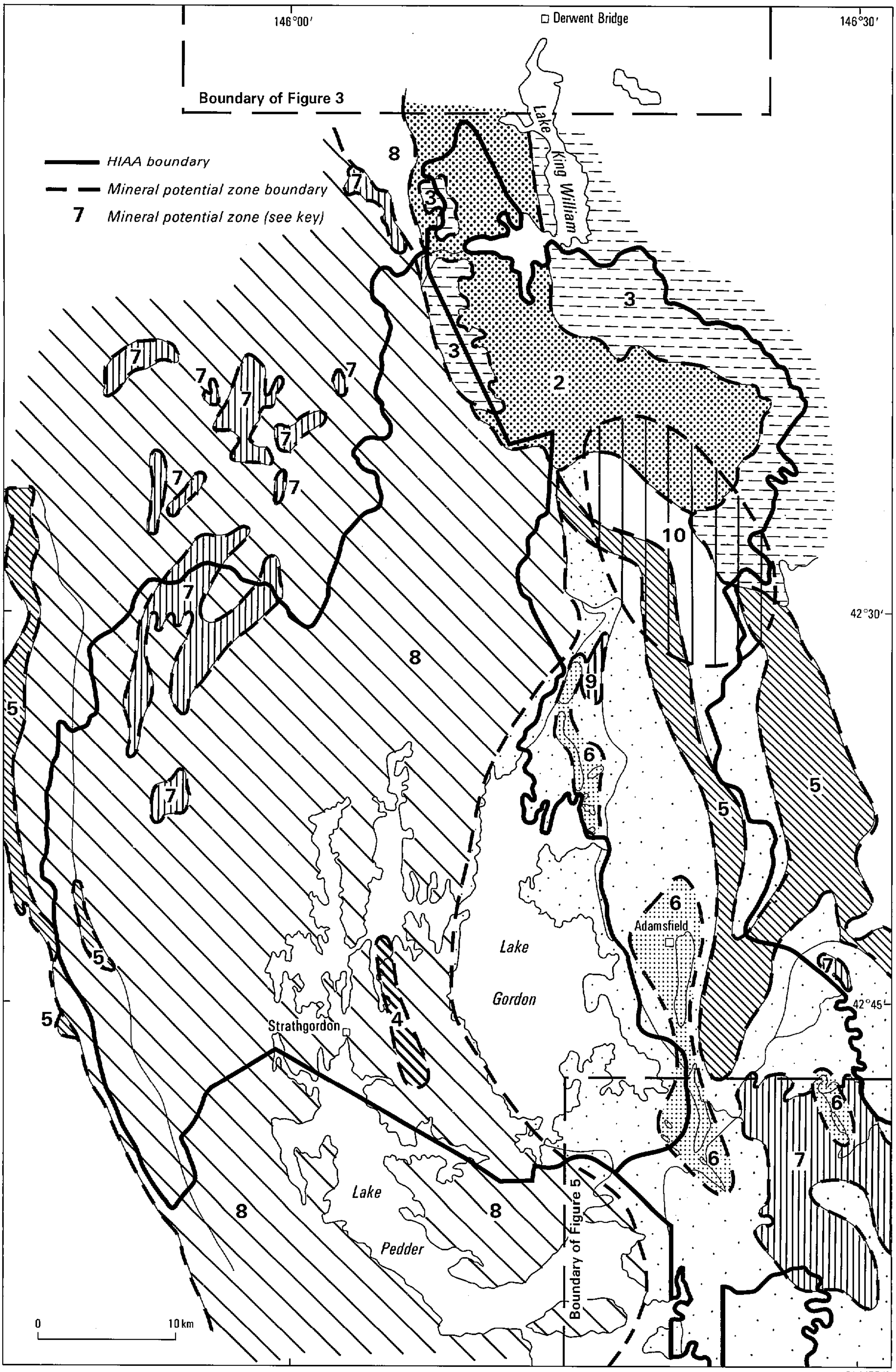


Fig 4 A preliminary delineation of zones of mineral potential in the Hole In The Doughnut and the northern part of Southern Forests

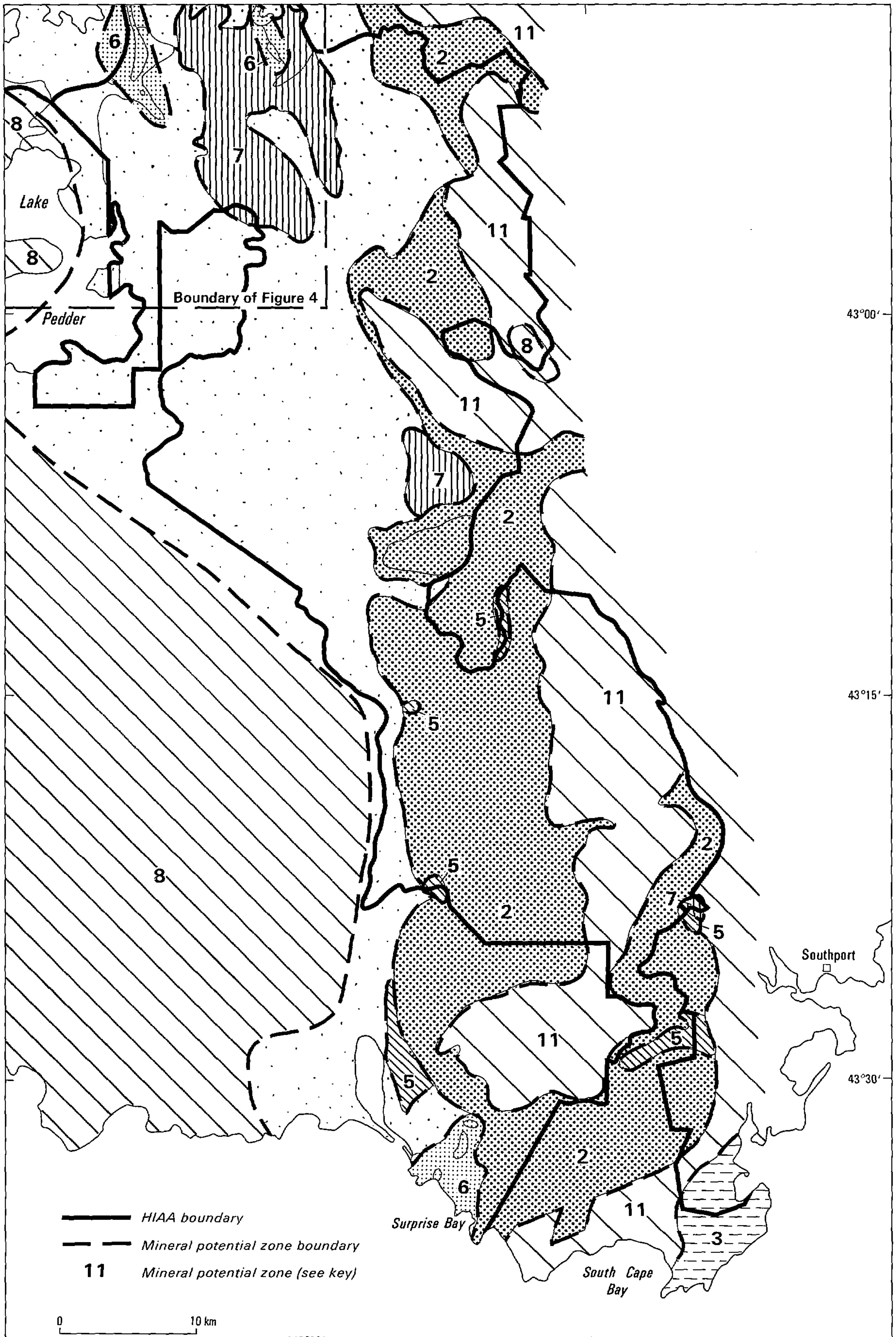

Fig 5 A preliminary delineation of zones of mineral potential in the southern part of Southern Forests

# INTRODUCTION

The Federal Minister for Resources has requested the Bureau of Mineral Resources (BMR) to examine the mineral potential within the Helsham Inquiry area and specified adjacent areas (HIAA, Figure 2). These areas have been nominated by the Prime Minister for protection by the Commonwealth.

This report has been prepared with the cooperation of the Tasmanian Mines Department and incorporates modifications suggested by them, and agreed to by BMR, at a joint discussion to consider a draft of this report.

The areas assessed in this report are:

Lemonthyme area, 87 $km^2$
Upper Mersey Valley, 59 $km^2$
Central Plateau Conservation Area, 222 $km^2$
Walls of Jerusalem National Park, 115 $km^2$
Southern Forest area, 2690 $km^2$
Hole in the Doughnut (HOD), approximately 1116 $km^2$ (excludes Lake Gordon area)

In this report the Lemonthyme and the Upper Mersey Valley areas are collectively referred to as the Lemonthyme area.

With the exception of the Walls of Jerusalem National Park, all areas comprising the HIAA have as their western boundary various National Parks listed on the World Heritage register. The Cradle Mountain - Lake St Clair National Park, the Franklin - Lower Gordon - Wild Rivers National Park and the Southwest National Park were inscribed on the World Heritage list in 1982.

The Lemonthyme Area and Southern Forests Areas were the subject of a Federal Government Commission under the Lemonthyme and Southern Forests (Commission of Inquiry) Act 1987 which was established in April 1987 and reported in May 1988 (the Helsham Report). The terms of reference for this inquiry focussed solely on forestry resources, particularly their exploitation and the impact of that exploitation, giving priority to identifying areas within the Lemonthyme area and Southern Forests area which could be excluded from forestry exploitation without causing detriment to the Tasmanian forestry industry. No submissions were sought or tabled on the mineral potential of the areas under consideration.

The HIAA lies almost completely within the South West Conservation Area, a large area of southwest Tasmania which has been successively increased in size up to 1978 at which stage it occupied 14 350 $km^2$, or 21% of the State. It has been the subject of several inquiries and reports, the most recent of which is the Cartland Report by the Southwest Advisory Committee reporting to the State Government (1978).

## SOURCES OF INFORMATION

In preparing this assessment, we acknowledge the cooperation of the Tasmanian Department of Mines and its officers who are continually contributing to the increasing knowledge of the geology and resources of Tasmania, not only by their own substantial programmes but by assessing and studying academic contributions and the results of company exploration in the State. The Department of Mines regulates industry exploration in the State. In conservation areas conditions for exploration are developed through an interdepartmental committee, implementing guidelines established in 1983. An officer of the Department of Mines chairs that committee.

There is complete geological map coverage of the HIAA at 1:250 000 scale by the Geological Survey of Tasmania, those of interest to this report being the sheets of Burnie (published 1973), Queenstown (1975), Port Davey (1977) and Hobart (1975). More detailed maps include the 1:63 360 scale maps of Middlesex (1958), Du Cane (1965) and St Clair (1963) in the north and the more recent maps at 1:50 000 scale of Huntley (1982) and Pedder (1985) in the south. Explanatory reports are available for the Middlesex, Du Cane and St Clair sheets and the Huntley report is at draft manuscript stage.

Reviews of the geology and mineral resources of southwest Tasmania were prepared by Volframs (1978) and Waterman (1981), and more recent assessments have been made by Green (1985) and Large (1987). Solomon (1981) and Collins and Williams (1986) have published overall reviews of the geology and mineral deposits of Tasmania and more recent information is contained in chapters by Collins, Corbett and Solomon, and Large in the forthcoming book: The Geology and Mineral Resources of Tasmania (ed. C F Burrett). Regional gravity interpretations by Leaman & others (1980) and regional aeromagnetic compilations by BMR at 1:250 000 scale have been important sources of information. Other papers, theses and reports by the Geological Survey, exploration and mining companies and universities are cited through the report. Virtually all final reports of exploration tenements within the assessment area have been inspected except where the reports are unavailable because of non-lodgement or through confidentiality where the tenement is still current or the reports are less than five years old, or where the report is not strictly on exploration and confidentiality has been requested.

## THE DEFINITION AND CONCEPTS OF 'MINERAL POTENTIAL'

The methods used herein to assess mineral potential are essentially those of the United States Geological Survey as outlined in Marsh & others (1984), Taylor and Steven (1983) and Cargill and Green (1986).

An area is considered to have mineral potential (i.e. 'prospectiveness') if existing geological evidence suggests that mineral exploration may discover an economic mineral deposit. The terms high, moderate and low potential are qualitative assessments based on professional judgement. The terms apply equally to energy based resources such as coal and oil and the words 'mineral potential' are applied herein to all minerals, coal, oil and oil shale.

An area is considered to have a **high mineral potential** for a specified mineral commodity if there is strong geological, geophysical or geochemical evidence that mineral concentration has taken place and that there is a strong possibility of finding an economically workable mineral deposit. The area is likely to, but does not necessarily, contain occurrences and deposits of the type sought or a related type. The term very high potential is only likely to be used within provinces having known substantial resources such as parts of the Mt Read volcanic province.

An area is considered to have a **moderate mineral potential** if the available evidence indicates that there is a reasonable possibility of finding an economically workable mineral deposit. There may or may not be evidence of mineralization in the form of mineral occurrences or deposits.

An area is considered to have a **low mineral potential** if there is a low possibility of finding an economically workable mineral deposit. As Taylor and Steven (1983) have pointed out, the assignment of low potential requires positive knowledge and it is not used as catchall for areas where adequate data are lacking.

If potential is suspected but there is insufficient data to delineate the areas of high, moderate or low then the category **unknown** is used. Areas for which there is no known mineral potential are also indicated.

The most basic form of geological evidence for mineral potential of some areas is the presence of known mineral occurrences and deposits exposed at the surface, as in the Adamsfield mineral district; although the mineral potential of Adamsfield is also indicated by the presence of ultramafic rocks. Because most of the deposits in this field were found by rudimentary prospecting methods, it is probable that additional similar mineral deposits, not conspicuously exposed at the surface, will be found in the future by using more advanced exploration techniques. Such areas may also contain larger low-grade deposits which could be mined profitably using lower cost mining methods.

The assessment of the mineral potential of a region combines knowledge of its geology and mineral deposits and occurrences with current theories of mineral deposit genesis and the results of exploration (if any). Opinions on the mineral potential of a region thus change as geological knowledge improves and theories evolve to higher levels of sophistication. Advances in exploration techniques and changes in commodity prices also influence the mineral potential of an area. Consequently, with ongoing exploration, areas are repeatedly subjected to geological, geophysical and geochemical assessment by different exploration companies using evolving geological concepts and improved exploration techniques to determine where mineral deposition may have taken place and to delineate and quantify that mineralization with the aim of identifying an economic mineral deposit. Areas can be repeatedly explored for different types of mineral deposits for decades before an economic mineral deposit is discovered.

## CONFIDENCE LEVELS OF THIS ASSESSMENT

Most of the mineral deposit models and geological concepts used to assess the mineral potential of HIAA are those which are well established in western Tasmania. Time did not permit a detailed research of the geology of the HIAA to determine whether mineral deposits not now known to occur in western Tasmania may also be present. In addition, about two thirds of the HIAA has been mapped only on a reconnaissance scale (1:250 000) where the geology is not well known. It is stressed therefore that because of time constraints and lack of detailed geological information over parts of the HIAA, this assessment is only a preliminary one. A more reliable assessment involving the establishment of levels of certainty would require a comprehensive study involving more detailed assessment of the available information, laboratory research and fieldwork which would take at least two person-years to complete.

It is emphasised, however, that because of the dynamic nature of the mineral-resource potential assessments, even the results of a comprehensive study should not be regarded as final. The mineral resource potential of areas needs to be monitored and reassessed periodically by scientific investigation of the areas in order to take account of new geologic concepts, advances in technology and changes in mineral markets. Such assessments are also assisted by additional data resulting from continuing mineral exploration. It is important that the HIAA remains accessible for continuing detailed geological mapping and periodic assessments of mineral potential.

## GEOLOGICAL FRAMEWORK AND MAJOR TYPES OF MINERAL DEPOSIT IN WESTERN TASMANIA

Western Tasmania is one of the most richly mineralized terrains on Earth and mining has been almost continuous from the first discovery in 1871. However, as Large (1987) has pointed out, the prognosis for maintaining such a high level of output is not promising. The major metal mines are concentrated in three areas of northwest Tasmania (Figure 7), viz. near Savage River (magnetite), in the Zeehan-Renison-Mt Bischoff area, and in the Mt Read province, all lying well to the west of the HIAA. The major rock units in western Tasmania and their ages are given in Figure 6 and the main types of mineral and energy deposit in Table 1. The most important episodes of mineralization occurred in the Late Precambrian (about 720 million years ago), in the Cambrian (about 525 million years ago) and in the Late Devonian-Early Carboniferous (340 million years ago). The resulting ore deposits are clustered in the west and northwest of the island, mostly in discrete provinces as shown in Figure 7.

The oldest rocks of Tasmania, of late Precambrian age, crop out in the northwestern and central parts of the island. Those in the northwest (the Rocky Cape Block) are largely shales and quartzites with dolomites and mafic volcanics. The dolomites are relatively young and their age may be wholly or partly Cambrian. In the Arthur Lineament (Figure 7) there are found deposits of magnesite and lenses of pyrite-magnetite ore that are mined for magnetite at Savage River. The rocks of the central part of the island make up the Tyennan Block (Figure 7) and consist of a distinctive suite of multiply deformed quartzites, quartz schists, phyllites and amphibolites. The rocks cover most of the HOD area and though the quartzites have silica potential the suite is largely barren of metallic resources.

In Cambrian time several basins developed over the Precambrian basement (e.g. the Dundas and Adamsfield troughs; Figure 7) and became important areas of marine sedimentation and volcanism. Of particular significance was a belt of volcanoes running down the western margin of the Tyennan Block which gave rise to the presently observed Mt Read volcanic belt or province. These rocks host a number of large and high grade massive sulphide deposits containing zinc, lead, copper, silver and gold (the volcanic-hosted massive sulphide deposits), including Mt Lyell, Rosebery and Hellyer (Figure 7). These deposits mostly formed as lenses on the sea floor during pauses in volcanism as illustrated in Figure 8A. Prior to volcanism or while the volcanic belt was developing, deformation in the basin to the west (the Dundas trough) resulted in the emplacement of a number of mafic and ultramafic bodies which have yielded small quantities of nickel ore, asbestos and alluvial iridosmine and osmiridium (e.g. Cuni, Serpentine Hill and Heazlewood respectively). In similar basins elsewhere in Tasmania other ultramafic units were emplaced at about this time, e.g. at Adamsfield within the HIAA (Figure 7).

Cambrian sedimentation and volcanism ceased with minor deformation and uplift, after which most of Tasmania became submerged. A thick sequence of shale, sandstone and limestone then accumulated over the older rocks in the period from the Ordovician (about 500 million years ago) to the Middle Devonian (about 350 million years). The Ordovician limestones host small deposits of lead and zinc sulphides (e.g. near the Professor Range south of Zeehan and Bubs Hill east of Mt Lyell) that are similar to others in the world of much greater size and economic importance. The Professor Range ores are like the stratiform lead-zinc deposits of Eire (known as sediment-hosted massive sulphides) while the Bubs Hill deposits have closer similarities to lead-zinc deposits in the Mississippi Valley, USA (Mississippi Valley type deposits). Both types have potential to yield large tonnages of lead and zinc. Intensive exploration has not yet revealed any economic resources of these types in Tasmania.

Ordovician-Devonian sedimentation was disrupted by a major orogenic episode (the Tabberabberan Orogeny) in the Middle Devonian. Folding and faulting were followed by widespread intrusion of granitic plutons ranging in age from Late Devonian to Early Carboniferous. Many of these granites are the source rocks for the tin and/or tungsten deposits that occur over wide areas of western and eastern Tasmania and make up one of the worlds major tin-tungsten provinces. However most of the production has come from the Mt Bischoff-Zeehan-Renison region where granites are exposed or at shallow depths (Figures 7 and 9). The

Renison deposit is one of Earth's largest tin resources, mainly because of the unusual geology of western Tasmania. As at Mt Bischoff, once the world's richest tin mine, the ore solutions rising from the granite encountered a sedimentary carbonate horizon and the resulting fluid-rock interaction resulted in precipitation of virtually all the tin in the fluid system (Figure 8B). According to the gravity interpretations of Leaman & others (1980) another 'high' in the granites is associated with small tin deposits near Port Davey and possibly also north of Adamsfield (Figure 9).

All these tin-tungsten deposits are associated with highly fractionated, muscovite-bearing granites. Other types of tin-tungsten deposits also occurring in and near these granites are tin-silicate skarns, greisens and quartz-rich wolframite and cassiterite veins. Skarns containing tungsten minerals and no tin (like Kara near Burnie and King Island) are associated with less fractionated granites without muscovite.

Large Renison-type, replacement tin deposits have aureoles several kilometres in radius within which there are silver-lead-zinc veins (e.g. Zeehan, Dundas and Mt Bischoff). Such metal-rich haloes are not found associated with the vein, greisen and tin-silicate skarns.

The Tabberabberan Orogeny was followed by widespread marine and terrestrial deposition of Carboniferous to Triassic sediments containing coal measures and oil shales (Tasmanite oil shale). These subhorizontal rocks were intruded by the voluminous Jurassic dolerite sills and dykes that dominate the scenery in central and eastern Tasmania (Figure 7).

## EXPLORATION AND MINERAL TENEMENT COVERAGE

Past exploration tenement coverage for minerals, coal, oil and oil shale are presented in four time slices: 1962-1968, 1969-1972, 1973-1977 and 1978-1988 including current tenements (Figure 10). Current tenements for both exploration and mining are also presented separately (Figure 11).

Exploration tenements granted since 1962 comprise exploration licences (EL) special prospecting licences (SPL) and more recently, retention licences; all are measured usually in terms of square kilometres. Of smaller scale are the exploration tenement titles of miners right and prospecting licence, and the mining tenement, mining lease (ML) (which are granted for the categories: mineral, stone, coal and oil).

Apart from current exploration tenements (granted for the categories: minerals or coal, oil shale) in Figure 11, there are also three groups of current mining leases within the HIAA. Throughout both figures, only granted exploration tenements are shown.

Although all of the HIAA has been covered by exploration tenements at some time during the period 1962-1988, exploration effort and expenditure has not been applied uniformly within individual tenements. This is especially the case where exploration tenements have been granted over areas in excess of 1000 $km^2$. Thick vegetation, limited vehicular access and a short summer (dry) field season have made exploration both an expensive exercise with slow rates of progress and technically difficult because the mineral potential often has to be assessed from sparse and incomplete information.

Within the HIAA there has been a focus of exploration in the vicinity of the Oakleigh Creek (also known as Mt Pelion Wolframite) mine in the Lemonthyme area, near Adamsfield and the Boyes River ultramafic complexes (variously for osmiridium, gold, asbestos and chromite), and the Weld River area for silica. Exploration was also carried out on areas just outside the HIAA near the Mt Mueller-Humboldt prospects near Maydena for base metals and the Leprena-Catamaran area for coal. Broad regional interest has been expressed for coal exploration in both Permian and Triassic rocks and in Permian-Upper Carboniferous rocks for oil shale.

There was a moratorium on exploration within the South West Conservation Area from 1978-1983 during which time EL and ML applications were not processed until the end of the moratorium, with only areas external to the moratorium area available for granting. With the lifting of the moratorium came the release of guidelines for exploration within Conservation Areas and the establishment of an interdepartmental committee, chaired by an officer of the Department of Mines, to oversee exploration proposals in the area.

# MINERAL POTENTIAL OF THE LEMONTHYME AREA, CENTRAL PLATEAU CONSERVATION AREA AND WALLS OF JERUSALEM NATIONAL PARK

## GEOLOGY AND MINERALIZATION

The topography of the northern part of the area (Figure 12) is extremely rugged as a result of deep incision by the Forth and Mersey Rivers through the Jurassic dolerites of the Central Plateau. These river gorges expose Precambrian and overlying Permo-Triassic sediments intruded by Jurassic dolerite. The Walls of Jerusalem, the Central Plateau conservation area and much of the Lemonthyme area are underlain by the dolerite but along the western margin of the Lemonthyme above the Forth River Precambrian rocks are exposed and there is a considerable area of Permo-Triassic sediments in the catchment of the upper Mersey River.

### The Precambrian

On the western margin of the Lemonthyme area there are outcrops of highly deformed Precambrian sediments. These generally strike east of north and comprise quartzite, mica schist and quartz mica schist with minor dolerite dykes. Three phases of deformation are recognisable with the first two parallel to bedding and the third producing east-west open folds. The sediments reached a maximum of upper greenschist facies metamorphism during the deformational events. The metasediments are abundantly veined by quartz and locally sheared along planes trending north northwest. The latter serve as structural controls over the location of tin-tungsten and base metal deposits in the area. Much of this zone of Precambrian metasediments is probably underlain by Devonian granite, as indicated by the outcrops of granite in the Forth River (the Birthday and Lone Pine granites; Figure 12) and the gravity interpretations of Leaman & others (Figure 9). It appears that the area is close to the eastern margin of the highly productive tin zone containing Mt Bischoff and Renison. The granites exposed in the Forth River contain biotite and muscovite and traces of tourmaline, molybdenite and arsenopyrite; thus they appear to be like granites associated with tin-tungsten deposits rather than those associated solely with tungsten (as at King Island). Quartz veins, similar to those in the Precambrian, also cut the granites and contain tungsten, tin and copper minerals.

These and similar granites are probably the source of tungsten, copper and minor tin found in the several deposits of this area (see below and Figure 12). Deposits in Precambrian rocks in the adjacent Cradle Mt-Lake St Clair National Park include similar small quartz-wolframite-cassiterite veins and also base metal-bearing deposits that may be skarns (e.g. the Barn Bluff prospect) or mineralized shear zones (Big Blow).

**The Permo-Triassic**

The Permian sequence in this area consists of upper and lower fluvio-deltaic sequences consisting of conglomerates, pebbly mudstones, pebbly sandstones and minor limestone intercalated with two fresh water sequences containing coal measures. Similar formations to the north contain shallow marine sequences with oil shales (Tasmanites oil shale). Permian freshwater sediments are found to the west of the Lemonthyme area and these contain coal bearing sequences (Mt Pelion East). The reported occurrences of coal all lie outside the Lemonthyme area in the Cradle Mt-Lake St Clair National Park.

## MINERAL RESOURCES AND PRODUCTION

A small mineral field straddles the western boundary of the Lemonthyme area. Most of the mineral occurrences and deposits are hosted in Precambrian metasediments but two straddle the contacts of two small bodies of Devonian granite intruding the metasediments inside the Lemonthyme Area.

The occurrences and deposits (see Table 2) are of two types, viz.

- as quartz veins with varying amounts wolframite and cassiterite (tungsten and tin minerals respectively) in quartzites, quartzose micaceous schist and in one case in granite (e.g. localities 4, 5, Table 2); and as

- disseminations and veinlets of copper, lead and zinc sulphide minerals in altered quartzites and schist (locality 3, Table 2); some altered zones consist of chlorite, epidote and actinolite and may be skarns derived by metasomatism of dolomitic sediments or mafic volcanics (Ruxton, 1982).

Minor amounts of gold, silver and molybdenum are associated with both types.

Two mineral occurrences and one small deposit lie inside the western boundary of the Lemonthyme area (localities 1, 4 and 5; Table 2). Minor amounts of wolframite occur in quartz veins in metasediments at the contact with a small granite body at Lone Pine. Tungsten and tin bearing quartz veins also occur in fissures in slightly greisenised granite at the Birthday prospect. The Oakleigh Creek mine (also known as the Mt Pelion Wolfram mine (McLeod et al, 1961; Kuys, 1981)) produced a small amount of tungsten at the turn of the century and was briefly in production again during 1945-1948 when it yielded 5 tonnes of contained $WO_3$ (McLeod, 1965). The deposit consists of a single quartz vein carrying wolframite, cassiterite, arsenopyrite and loellingite (Kuys, 1981). Elliston (1951) estimated the resources at this mine as about 5000 tonnes of ore with an average grade of 1.7% $WO_3$. A joint venture of companies (Serem (Australia) Pty Ltd) brought the mine into production in 1980 and during 1980 to 1982 about 101 tonnes of contained $WO_3$ were produced. Problems with the crushing plant, poor recovery rates and lack of economic resources forced the mine to close in 1982. By mid 1982, the plant and equipment was sold and the site was rehabilitated (Tasmanian Department of Mines, 1982). A recalculation of ore resources in 1980 estimated possible resources as 121 000 tonnes at 1.17% $WO_3$. It should be noted, however, that the latter mining would have depleted this resource.

Copper occurrences are prevalent further away from the two granite intrusions and to the west of the Lemonthyme area but none have yielded any production. The largest is the small low grade copper deposit at Barn Bluff (locality 3 Table 2). It is possible that this mineral field continues to the east of the two granite intrusions and is concealed to the east by the Jurassic dolerite in the Lemonthyme area.

The Permian sediments to the southwest of the Lemonthyme area contain thin seams of coal with a maximum recorded thickness of about half a metre (McLeod et al 1961). Seams have also been reported further south and to the east near the margin of the Jurassic dolerite (localities 16 and 17). The seams are best developed between Mt Pelion West and Mt Pelion East (localities 11 to 15, Fig 12) but there is no record of production. Because the known seams are so thin it is unlikely that they will be a resource of any significance in the future and a very low potential is indicated.

## EXPLORATION

Except for two regional aeromagnetic surveys (BHP in the late 1960s and BMR in the mid 1980s) the Lemonthyme, Walls of Jerusalem and Central Plateau areas have not been subjected to any recent geological exploration. Most of the exploration coverage, which has been nearly continuous, has occurred in the Forth Valley on the west side of the Lemonthyme area in the tungsten-tin field.

In the vicinity of the Lemonthyme area, Cochrane (1970, BHP EL 15/65) reported on exploration for a carbonate replacement tin deposit, focussing on aeromagnetic anomalies and their proximity to granite. The absence of any extensive dolomites in the area was established by ground follow-up, and the area lost appeal, despite the presence of significant geochemical tin values.

Shell in the 1980s (Ruxton 1982) explored EL 28/80 which included the northern parts of the Lemonthyme area and the Walls of Jerusalem, using two models of vein mineralization:

- Granite association with gold, silver, lead, zinc, arsenic mineral veins in and near Upper Ordovician granite (about 10 km to the north of Lemonthyme); and

- The Devonian granite association with tin, tungsten, molybdenum, bismuth ± copper, lead, zinc, arsenic minerals in quartz and greisen veins such as those occurring in the Lemonthyme area (e.g. Oakleigh Creek), and skarn mineralization within Precambrian dolomites or basic volcanics.

No significant deposits were located.

During the attempted resurrection of the Oakleigh Creek mine exploration occurred under EL 5/77, evaluating the potential for tungsten in the area. Gibson (1982) quoted results from the Big Blow prospect, immediately south of the Oakleigh Creek mine, with assays of grab samples grading up to 0.43% tin and over 1% zinc.

Base Resources Ltd's EL 48/82 tested the potential for diamondiferous pipes over the same area that Shell had explored for base metals, using 600 stream sediment samples obtained from Shell. Results of this work were negative (Charchalis 1987).

There are no current mineral exploration licences granted over the Lemonthyme, Walls of Jerusalem or the Central Plateau areas. Three current mining leases are located over the Oakleigh Creek mine area, covering a total area of approximately 72 ha (0.72 $km^2$) (Figure 11).

## MINERAL POTENTIAL

### Tungsten-tin, Base Metals (Zone 1)

Within this area the belt of Precambrian rocks on the western boundary of the Lemonthyme area holds the only promise for the discovery of economic metallic minerals (Figure 12). The presence of tin-tungsten-type granites, wolframite vein deposits and occurrences and known past production indicates that there is a high potential for discovery of additional tin and tungsten vein deposits of similar style and size. Zone 1 is confined to the western side of the Lemonthyme area because there are no known deposits on the eastern side and because this part is close to the eastern margin of the likely area of shallow granite (Figure 9). The area also has a high potential for small base metal deposits such as at Barn Bluff (locality 3).

### Coal, Oil Shale (Zone 2)

The Permian sediments of the Upper Mersey valley have a low to very low potential for economic coal deposits and oil shale.

### Metallic and Energy Minerals in Dolerite (Zone 3)

The dolerite has a very low to zero potential for metallic mineral and energy resources, though it has potential for industrial usage such as road metal and the building industry.

# MINERAL POTENTIAL OF THE HOD AND NORTHERN PART OF THE SOUTHERN FORESTS AREA

## GEOLOGY AND MINERALIZATION

The area (Figure 13) divides conveniently into two parts, viz. the HOD and the northern part of the Southern Forests.

## The HOD Area

Over 90% of the HOD is covered by Precambrian and Precambrian- Cambrian rocks which can be divided into a highly deformed and metamorphosed group and another group which lacks substantial deformation or metamorphism. The less deformed group is characterised by slates, siltstones and dolomites (correlated with the Oonah Formation of the Zeehan area) while the more deformed group includes quartzites, quartz-garnet-phengite schists and minor amphibolites. In the southern portion of the HOD topographic highs are commonly underlain by quartzite while intervening lowlands are underlain by phyllite or schist. In the Twelvetrees Range area (Holley Road, Green 1985) there is a close spatial association of amphibolite with thin units of hematitic iron formation. These could conceivably be related to the volcanic-hosted massive sulphide type of deposit though this is highly speculative (Green 1985). It is also possible that the amphibolite-hematite association is analagous to that in the Savage River area where amphibolites are associated with volcanogenic pyrite-magnetite deposits. The pronounced anomalies shown on the BMR 1:250 000 aeromagnetic maps may reflect both magnetite and amphibolite.

No other substantial mineral occurrences have been recorded from the Precambrian rocks in the HOD but just outside the area is the Jane River alluvial gold deposit, a small field of unknown source.

In the far western portion of the HOD (Figure 13) the Precambrian rocks abut a 2-5 km wide belt of Silurian to Lower Devonian quartzites, sandstones, siltstones and shales of the Eldon Group and these conformably overlie Ordovician limestone (Gordon Limestone) to the west. A small fault-bound sliver of Ordovician limestone lies to the east of the Eldon Group sediments. No mineral occurrences have been reported from these Ordovician to Lower Devonian sequences which are, however, very similar to those containing small lead-zinc deposits elsewhere in Tasmania (the sediment-hosted lead-zinc and Mississippi Valley type deposits). In the far northeast of the HOD there is a small area of Upper Carboniferous to Triassic sediments, belonging to the Parmeener Supergroup, which underlies much of the northern portion of the Southern Forests area.

## The Northern Part of the Southern Forests Area

The succession in this area is summarised in Figure 14. Immediately east of Lake Gordon, there are exposures of Cambrian to Ordovician rocks preserved in a large longitudinal downwarp known as the Adamsfield Trough. The Cambrian rocks comprise clastics with minor felsic and mafic volcanics and volcanogenic sediments, and tectonically emplaced ultramafic and mafic complexes. They lie unconformably on metamorphosed sandstones and shales of the more deformed Precambrian rocks to the west (Tyennan Block), and the relatively unmetamorphosed and less deformed Precambrian-Cambrian (?) quartzites, shales and dolomites to the south (Jubilee Block, Fig 14). Younger sediments occur to the east.

The ultramafic complexes consist of fault-juxtaposed blocks of partially serpentinised layered peridotite, dunite-harzburgite and pyroxenite-dunite (Varne and Brown 1978). Both the Adamsfield and Boyes River Ultramafic Complexes were tectonically emplaced up into the local sedimentary basin after deposition of the Middle Cambrian Trial Ridge Beds (see Zone 9, Figure 13) and before deposition of the Late Cambrian fossiliferous succession (Adamsfield Beds), which in the Adamsfield area unconformably overlies the ultramafic rock. This is similar to the time of emplacement of other serpentinized ultramafic complexes in the Dundas Trough in northwest Tasmania. These serpentinized Alpine type intrusions may be altered relics of ocean floor material and as with other examples elsewhere on Earth part of the platinium-group mineral assemblage (see below) may be derived from hydration and serpentinization of the original ultramafic rocks (Hoatson and Glaser 1988). These processes commonly result in formation of asbestos (e.g. the Serpentine Hill mine near Zeehan) but little fibre has been reported from the Adamsfield area.

The Adamsfield Beds of Late Cambrian to Early Ordovician age and the equivalent Reeds Conglomerate and Tim Shea Sandstone (Fig. 14) are terrestrial siliciclastic deposits derived from erosion of Precambrian and Lower to Middle Cambrian sediments, volcanics and ultramafic bodies to the west. These rocks and similar sediments in the Sawback Range, Ragged Range and Football Hill area north of Adamsfield contain platinoids, gold and chromite as detrital minerals (paleoplacers). The principal platinoid minerals are osmium-iridium-rhuthenium alloys with iridosmine the most common (Ford, 1981) but there is potential for other members of the group e.g. platinum. Erosion of these paleoplacers and primary ultramafics has also shed platinoids and minor gold into the Tertiary to Recent alluvial deposits of the Adamsfield Valley from which most of the early production was won (Figure 8C).

The Early Ordovician conglomerates and sandstones are overlain to the east by a sequence of Ordovician limestone and shales and sandstones of the Silurian-Lower Devonian Eldon Group. These pre-Middle Devonian rocks were gently folded into northnorthwest trending open synclines and anticlines during the Devonian Tabberraberran deformation. The northern end of this belt of rocks coincides with an area interpreted by Leaman & others (1980) as having granite at 1 km or less below surface (Figures 9 and 13). This, combined with the presence of carbonates, provides many of the features that make up the genetic model for Renison type tin deposits (Figure 8B). Though the geophysical interpretation is not definitive this area must be regarded as having potential for tin deposits until further exploration is carried out.

The Ordovician-Devonian rocks are bounded to the east and north (and overlain unconformably) by flat-lying Permian to Triassic sediments of the Parmeener Supergroup and capped by Jurassic dolerite. The Permian Woody Island Siltstone is a pyritic dark-grey to black siltstone and contains zones of oil shale and fossils which may be correlated with the Tasmanite oil shale in northern Tasmania. Low yields have been obtained from oil shales near Maydena (BHP 1981).

## MINERAL RESOURCES AND PRODUCTION

### The HOD Area

Reported mineralization within the HOD area is confined to four localities. These are:

- The Nicholl's Range copper occurrence (locality 23; Fig 13) where copper mineralization occurred in two separate zones, each about 3 m wide and up to 12 m long. Seven samples from the mineralized zone averaged 1.05% Cu (Hall & others 1969).

- Wing's Lookout silica deposit (locality 24) which occurs in Cambrian sediments on the eastern side of Lake Gordon (Green 1985).

- Adams River Falls gold occurrence (locality 25) - some sampling of a diversion channel above the Adams River Falls reportedly revealed some gold mineralization (Nye 1929). No production is recorded.

- Holley Road hematite iron formation (localities 26-29). Green (1985) considered that they may signify the presence of undiscovered massive sulphide deposits.

In the northwestern part of the HOD the Jane River alluvial gold prospect (locality 22) lies about 3 km outside the HOD boundary. At least 30 ozs of gold was reportedly obtained from this location.

**Northern Part of the Southern Forests Area**

The most important mineral producer in the HIAA is the Adamsfield mineral district. The area produced almost 500 kg of platinoid minerals (mainly iridosmine) from alluvial and eluvial deposits up to about 1959 and along with the Heazlewood River area in the northwest of the island provided half of Tasmania's (and Australia's) production (Elliston 1965; McLeod 1965; Hoatson and Glaser 1988). Small amounts of gold were also recovered.

The platinoids are associated with ultramafic rocks intruded along north trending faults during the Cambrian period. The platinoids were enriched by fractionation of the ultramafic rocks and probably further enriched during later shearing and serpentinization. Platinoids are reported to occur in chromite-rich streaks. It was enriched still further by residual accumulation and concentration by eluvial and alluvial action from early Ordovician times (about 450 million years ago) to the present day. In some deposits the platinoid elements tended to accrete and form 'nuggets' up to 30 gm in weight.

The deposits occurred as:

- Alluvial wash at Main Creek (locality 33, Fig 13), underlain by serpentinite which also contained detrital platinoids in narrow joint planes of serpentinite.

- Late Cambrian-Ordovician marine placer beds (Pollards(?) locality 30; Fig 13) consisting of ultramafic-rich conglomerate with platinoids and minor gold.

- Secondary eluvial or alluvial deposits of Tertiary and Recent age derived either from the primary platinoids or redistributed from the palaeoplacer deposits at Football Hill (locality 32) and West of Adam River (locality 31).

The major part of the platinoid production was obtained from the alluvial palaeoplacer deposits.

To the east of Adamsfield base metals are known to occur just outside the HIAA boundary at Mt Mueller (locality 35) and Humboldt (locality 34).

Quartz-carbonate veins exposed at Mt Mueller east of the Needles contain iron, copper and lead sulphides in fractures and disseminations in black slates presumed to be Precambrian. The Humboldt prospect nearby has high barium values but no signficant associated base metals.

## EXPLORATION

### The HOD Area

Exploration interest in the HOD area has not been great, principally because most of the rocks are Precambrian quartzites, phyllites and schists. The area lies within the South West Conservation Area which was subject to a moratorium on exploration during the period September 1978 - March 1983.

Although low grade copper occurrences were rediscovered in the Nicholls Ranges, west of Strathgordon township by Lyell-EZ Explorations (during the tenure of SPL 307 (Hudspeth and Hall, 1956)), that area received little follow-up. BHP on EL 13/65 reported that they had also investigated these occurrences (Hall & others 1969), however recommended no further work be done due to their small size and isolated location. Both these exploration tenements covered areas in excess of 1000 $km^2$ and were subject to regional aeromagnetics, and in BHP's case, airborne electromagnetics. Anomalies from the surveys were followed up by ground techniques.

The size of EL 13/65 was reduced in area and by 1972 was confined to within the HIAA on the eastern side of the HOD, principally covering the Adamsfield ultramafics and the sediments to the east. Flood (1972) concluded that regional exploration including ground follow-up of the airborne detected anomalies had not outlined any new major exploration targets, although an area near Mt Mueller, well east of the HOD was considered worth retaining. Details of work on the reduced EL 13/65 will be discussed in the section on the northern part of the Southern Forests Area.

Following relinquishment of these large exploration tenements in the early 1970s, the area was covered briefly by several ELs and SPLs, most of which did not submit completion reports to the Department of Mines.

From the early 1980s, some parts of the eastern part of the HOD were covered by ELs over targets principally within the northern part of the Southern Forests area; exploration on these ELs will be discussed in that part of this report.

St Joseph International Exploration Ltd have recently lodged applications for two ELs (ELAs 50/88 and 51/88 - not shown on Figure 11) for metallic minerals in the northwestern part of HOD.

**The Northern Part of the Southern Forests Area**

Exploration in this area has focussed mainly on the Adamsfield ultramafic belt and the Mt Mueller-Humboldt area (localities 34 and 35; Figure 13). Less interest has been shown in the coal and oil shale potential.

Lyell-EZ Explorations explored EL 1/59 covering the Adamsfield ultramafic belt and enclosing Cambrian sediments and minor volcanics without success (Kingsbury 1961).

BHP's EL 19/65 initially covered the whole of the Northern Part of the Southern Forests area (initial area 6000 square miles) and on reduction, this area was still largely covered to enable the follow-up of the more significant magnetic and electromagnetic anomalies from their initial airborne survey. The Humboldt copper prospect was investigated, however its vein style and narrowness rendered the prospect of little further interest (Hall & others 1969). In the Adamsfield area work focussed on the base metal potential of the ultramafics, and finally to test its asbestos potential which was reported as being low due to only minor occurrences of slip fibre (Flood 1972a).

Exploration interest was reserved over the northern part of the Southern Forests Area during the 1978-1983 moratorium covering the South West Conservation Area, EL applications remained pending within the moratorium area with only those parts of the EL outside the moratorium being granted exploration tenure.

BHP and Shell applied for areas each covering about half of the area (BHP to the south, Shell to the north). BHP on EL 8/79 was looking for carbonate replacement tin deposits in an area south of Maydena over which they conducted airborne magnetic and electromagnetic surveys (Dighem survey). Although the survey covered the Mt Mueller-Humboldt mine area, all anomalies of interest lay outside of the granted EL.

The EL was relinquished after a long wait before the lifting of the moratorium in March 1983, when 7 $km^2$ of EL 8/79 was incorporated into EL 19/83 (the part of their initial application within the moratorium area). It was concluded that the detrital cassiterite (tin) reported in pan concentrates of stream sediment samples was derived from outcropping basal Permian tillites (BHP 1983).

Shell's application within the moratorium area also remained pending, with the remainder granted as EL 55/80. For the total initial application, Shell's targets were stratabound copper/lead/zinc in sediments or volcanics; tin/tungsten skarns in the Florentine Valley limestones, chromium/nickel/gold and platinoids (especially osmiridium) in ultramafic/mafic rocks and a possibility of kimberlitic intrusives in the Precambrian basement. However, within the granted area the targets were confined to stratiform copper in sandstones and conglomerate, Mississippi Valley type lead/zinc in limestones and tin/tungsten skarns in limestones. Stream sediment samples yielded low base metal values and geological mapping failed to indicate fault-related mineralization (Ruxton 1982a).

BHP continued their carbonate replacement tin exploration in EL 19/83, following-up their previous Dighem survey anomalies of 1980. Ground work identified a drill target and drilling intersected barren pyritic black shale overlying ultramafics. The EL was relinquished due to the difficult terrain and the environmental sensitivity of the area within the South West Conservation Area (BHP 1984).

Callina NL was granted EL 23/85 over the Boyes Basin, an area of ultramafics north west of Adamsfield, to explore for alluvial minerals. Results of pan concentrate sampling indicated the presence of osmiridium and abundant chromite near old workings however practical problems in sampling were recognised and no further work has been described (Kelligrew 1987).

Metals Explorations Ltd were granted EL 4/85 to evaluate the osmiridium potential of the Adamsfield area, in alluvial and hard rock environments. This work is ongoing and since the reports are less than five years old and the title is current, reports remain confidential with the Department of Mines.

Within the northern part of the Southern Forests Area two Exploration Licences, EL 4/85 and 14/88 and two small mining leases totalling 7 $km^2$ are current (Figure 11).

## MINERAL POTENTIAL

### The HOD Area

#### Gold (Unknown potential - No zone defined)

There is no known source for the gold in the Jane River alluvial gravels. If it is quartz veins in the basement of Precambrian rocks then a potential may well exist elsewhere in the Precambrian. The level of potential and the area involved is so uncertain that it is regarded as unknown.

**Copper-lead-zinc, Magnetite (Zone 4)**

The Holley Road occurrences of hematitic iron formation are, according to Green (1985), reminiscent of iron formations which overlie, or form lateral equivalents to volcanic-hosted copper-lead-zinc massive sulphide deposits of Tertiary age in Japan. No base metal occurrences have been found but on the basis of this analogy the area has a low to moderate potential for discovery of such deposits. The area is also considered to have a low to moderate potential for pyrite-magnetite deposits.

**Limestone, Lead-zinc (Zone 5)**

The small area of Ordovician limestone in the western portion of the HOD could on the basis of known association elsewhere in western Tasmania (Table 1) be prospective for lead-zinc mineralization. However, the lack of economic discoveries of these limestone-hosted deposits elsewhere in Tasmania downgrades the potential of these rocks to moderate. The limestones are relatively pure and have obvious high potential for industrial limestone. The potential is rated as moderate because of the area's remoteness.

**Dolomite (Zone 7)**

The dolomites in the western part of the area are obvious potential sources of dolomite as noted by Green (1985). This area has a moderate to high potential for commercial deposits of dolomite.

**Silica (Zone 8)**

The quartzites of the Precambrian rocks are clearly potential sources of high grade silica (Green 1985). A moderate to high potential for commercial deposits of silica is assigned to these rocks.

## The Northern Part of the Southern Forests Area

### Limestone, Lead-zinc (Zone 5) and Dolomite (Zone 7)

The limestones and older dolomites in this part of the Southern Forests area are moderate to high potential sources of industrial limestone and dolomite as noted for the HOD area. The Ordovician limestones also have moderate potential for discovery of lead-zinc deposits as noted for the HOD area above.

### Platinoids (and associated gold and chromite) (Zone 6)

The alluvial plains adjacent to outcrops of ultramafic rocks near Adamsfield and also to the north and south are highly prospective for detrital deposits of similar platinoids as are the paleoplacer deposits within the Late Cambrian-Lower Ordovician siliciclastic sequence and to a lesser extent the ultramafic source rocks. The platinoids may include platinum. As with other Phanerozoic ultramafic complexes elsewhere in the world, the platinoids tend to be associated with chromite and minor gold. All these prospects are currently being evaluated by Metals Exploration. The chances of finding large commercial grade platinoid and chromite deposits is considered to be small on the grounds that there are no large Phanerozoic deposits elsewhere on Earth in or related to such serpentinized ultramafic rocks and the fact that those in eastern Australia have been fairly well explored. However the potential for small commercial deposits in eluvial and alluvial situations is high (Hoatson and Glaser 1988).

The results of exploration indicate that the potential for commercial asbestos is low.

### Copper-lead-zinc (Zone 9)

At first sight the Middle Cambrian Trial Ridge Beds have an apparent potential to host volcanic-hosted massive sulphide deposits because they are of similar age to the Mt Read Volcanics to the west. However the sequences lack significant volcanics and no base metal mineral occurrences have been noted, indicating only a low potential for this style of deposit.

### Tin (with marginal lead-zinc veins) (Zone 10)

An area of Ordovician limestone to the west of the Florentine Valley (Gordon Range) has potential for discovery of carbonate replacement tin deposits like those at Renison and Mt Bischoff (Figure 8B) given the gravity modelling of Leaman & others (1980) which suggests that the granite in this area is within 1 km of the topographic surface. Silver-lead-zinc veins occur marginally to this style of deposit.
The lack of known mineral occurrences has led to the downgrading of the potential of this area to moderate.

### Silica - (Zone 8)

The quartzites of the Precambrian rocks are potential sources of high grade silica (Green 1985). A moderate to high potential for commercial deposits of silica is assigned to these rocks.

### Coal, Oil Shale (Zone 2)

On the basis of associations elsewhere in Tasmania the Permian sediments in the Carboniferous-Triassic sequence have a very low potential for coal and oil shale (Zone 2) and the Triassic sediments a low potential for coal. As described in the next section, the Woody Island Siltstone (of Permian age) in the Styx River Valley near Maydena has been explored for oil shales and low yields were intersected in drilling.

### Metallic and Energy Minerals in Dolerite (Zone 3)

The Jurassic dolerite in the northern part of the Southern Forests has a very low potential for metallic and energy mineral resources. It has potential for industrial usage such as road metal and the building industry although it should be noted that this rock type is very widespread in Tasmania.

# MINERAL POTENTIAL OF THE SOUTHERN PART OF THE SOUTHERN FORESTS AREA

## GEOLOGY AND MINERALIZATION

The northern portion of this area is underlain by the less metamorphosed and deformed Precambrian-Cambrian (?) rocks (quartzite, argillite and dolomite) with a large expanse of dolomite and dolomitic sediments exposed north of Mt Anne (Fig 15). Several small ultramafic bodies have been found in the Rocky Boat Harbour area west of the HIAA (Farmer, 1979). Sub-horizontal Upper Carboniferous, Permian and Triassic sediments (Parmeener Supergroup) unconformably overlie the Precambrian rocks to the east and south. The Parmeener super group sediments include shallow marine and freshwater deposits containing oil shales and coal measures. Ordovician shales and siltstone with minor limestone horizons occur in windows through this sequence (e.g. in the area north of South Cape Bay). The eastern margin of the area is capped by flat-lying Jurassic dolerite which occurs as remnants throughout the whole of the Southern Forests area and forms features such as Mt Anne and Precipitous Bluff.

Conga Oil has shown (Volkman, 1988) that the Gordon Limestone contains hydrocarbon biomarkers identical to those in oil seeps elsewhere, indicating that the limestone is a potential source rock for oil.

## MINERAL RESOURCES AND PRODUCTION

Dolomites of late Precambrian to early Cambrian(?) age crop out in the central and north eastern part of the area. To the south, small areas of Ordovician limestone are widespread (Figure 15).

Occurrences of Triassic coal seams are quite widespread just outside the southeastern boundary of the Southern Forests and it is possible that the Triassic sediments within the Southern Forests area also contain coal seams.

Near Rocky Boat Harbour immediately west of the Southern Forests area there are recorded occurrences of detrital osmiridium (Blake 1938; Ford 1981).

## EXPLORATION

Exploration in the area has been concentrated on the evaluation of coal/oil shale/petroleum potential over extensive areas, typically using large exploration licence areas or grouped exploration licences. Exploration for silica, limestone and dolomite deposits was usually conducted on smaller scale tenements and in several instances, exploration reports were not submitted to the Department of Mines for these tenements.

Coal exploration in the area culminated in the Marathon Petroleum Australia Ltd work on ELs 6/79, 40/83 covering the southeast part of the area over the Catamaran (locality 43) and Ida Bay (locality 40) areas, both old coal mining areas. Marathon (1984a) recognised limited inferred coal resources of low calorific value around the old Ida Bay coal mines (6 million tonnes, open cut potential) and the old Catamaran coal mine (11 million tonnes, shallow underground potential). Along with their proposed prospective coal area for possible thermal generation of electricity at Strathblane, these coal areas lie immediately east of the HIAA boundary.

BHP on EL 37/79 (BHP 1982) drilled Lower Permian shales to test their oil shale potential based on a model of equivalent rocks in northern Tasmania. The best yield for the two shallow drillholes was 7 litres/tonne oil shale (using Fischer analysis). This is poor in comparison to the Railton oil shale deposits for which Endeavour Resources Ltd reported seam average yields of up to 135 litres/tonne shale. This EL also extended into the area discussed under the northern part of the Southern Forests area.

Exploration for silica in Precambrian sandstone-mudstone sequences has been carried out in the Weld River-Glovers Bluff area.

Exploration for limestone and dolomite for agricultural purposes has occurred around the Lune River-Hastings Cave-Exit Cave area, where Benders Spreading Services (1964) Pty Ltd have current mining leases.

The presence of folded carbonate sequences and an indication of thermal maturation for oil generation has attracted Conga Oil Pty Ltd to apply for a series of exploration licences for oil over the area. Some of these ELs are still current.

Within the southern part of the Southern Forests area, there are three current ELs, variously for oil or coal, oil and one current minerals EL. There is one current mining lease near Hastings Cave with an area of 487 ha (4.9 $km^2$).

## MINERAL POTENTIAL

This part of the area under investigation is mostly less well known than the first two sections, making determination of resource potential more difficult. There do not appear to be any new styles of mineralization so that the zone potential numbers used in the first two parts are applicable.

### Dolomite (Zone 7)

The large area of Precambrian-Cambrian (?) dolomite and dolomitic rocks near Mt Anne has a moderate to high potential for dolomite.

### Limestone, Lead-zinc (Zone 5)

Small areas of Ordovician limestone occur further south with moderate potential for lead-zinc deposits and moderate to high potential for limestone.

### Silica (Zone 8)

A large area of moderate to high silica potential (Zone 8; Green 1985) just touches the western side of the Southern Forests boundary, and a much smaller area of silica potential occurs in the Weld River - Glovers Bluff area which is partly within the Southern Forests area.

### Coal, Oil shale (Zone 2)

The Permian sediments in this part of the Southern Forests have a very low potential for coal and oil shale.

### Coal (Zone 11)

The western rim of the Triassic sedimentary cover extends into this part of the Southern Forests area and these sediments locally contain coal seams, although exploration by Marathon

Petroleum Australia Ltd in the area just outside the southeastern boundary located only two small deposits of coal (locations 40 and 43, Table 2) with low calorific values. It is considered that there is a low potential of finding an economic deposit of coal in the Triassic sediments within this part of the Southern Forests area.

**Metallic and Energy Minerals in Dolerite (Zone 3)**

Outcrops of Jurassic dolerite occur within the southern part of the Southern Forests. As stated previously these rocks have a very low potential for metallic and energy mineral resources but do represent a source of road metal and materials for the building industry.

**Platinoids (and associated gold and chromite) (Zone 6)**

The small area outside the Southern Forests at Surprise Bay on the south coast and inside the South West National Park containing ultramafic bodies and alluvial platinoids is rated as for the other ultramafic complexes to the north.

The potential for oil sourced in the Gordon Limestone is unknown.

## CONCLUSIONS

1. It is emphasised here that this is a preliminary assessment. A comprehensive assessment would take at least two person-years to complete. Even a comprehensive assessment cannot be regarded as being final and continuing scientific investigation and regular reassessment are required to update mineral resource assessments. The results of this preliminary assessment indicate that although the past mineral production within the HIAA has been modest, undiscovered mineral deposits may be present. Mineral exploration is currently continuing.

2. The Lemonthyme - Central Plateau - Walls of Jerusalem part of the HIAA is mostly covered by Jurassic dolerite. The northeastern portion of the Lemonthyme area includes part of a small mineral field and it has a high potential for the discovery of small tungsten/tin deposits and small base metal deposits. The southeastern part of the Lemonthyme area has a very low potential for coal and oil shale.

3 The Hole-in-the-Doughnut (HOD) area has a moderate to high potential for deposits of limestone, silica and dolomite. Areas of limestone also have a moderate potential for the discovery of lead-zinc deposits. A small area east of Strathgordon has a low to moderate potential for copper-lead-zinc massive sulphide and also magnetite deposits. There is an unknown potential for gold in the northwestern part of the HOD.

4 The Southern Forests area contains the most significant mineral producer in the HIAA at Adamsfield. The ultramafic rocks in the Adamsfield district have a high potential for small eluvial and alluvial deposits of platinoids and associated gold and chromite. There are also areas of moderate to high potential for limestone, dolomite and silica deposits. Areas of limestone also have a moderate potential for lead-zinc deposits and in one part of the limestone outcrop there is a moderate potential for Renison-type tin deposits. A small area of low potential for copper-lead-zinc deposits occurs northeast of Lake Gordon. There are extensive areas of very low potential for coal and oil shale in Permian sediments, and Triassic sediments in the southeastern part of the Southern Forests area have a moderate to low potential for coal. There is an unknown potential for oil.

5 In summary, the HIAA is considered to have four zones of high mineral potential for small metal deposits; one for small tungsten-tin and base metal deposits near Lemonthyme, three for small alluvial platinoid deposits near Adamsfield; several larger zones of moderate, or low to moderate, potential for tin-tungsten, base metal and magnetite deposits; large zones having moderate to high potential for dolomite, limestone and silica; and large zones having low to very low potential for coal and oil shale. The mineral potential for low unit value commodities such as limestone, dolomite and silica is enhanced in zones which are close to or more accessible from industrial centres.

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## GLOSSARY OF SELECTED TECHNICAL TERMS

**Alluvium** - a relatively young deposit of gravel, sand, silt and mud formed by flowing water in river beds, flood plains, lakes or at the foot of mountain slopes.

**Alluvial mineral deposit (placer)** - deposit formed by concentration of detrital minerals (of possible commercial value), commonly gold, tin or platinoids, by action of running water as in a stream channel or alluvial fan.

**Anomaly** - an area which has features at variance to the surrounding area, thus an area of higher or lower geophysical/geochemical response compared with the surrounding region would be considered an anomaly.

**Dolerite** - a dark brown-green to black fine to medium grained crystalline rock. It can be used as road metal and in the building industry.

**Dolomite** - a double carbonate of calcium and magnesium ($CaCO_3$, $MgCO_3$) and theoretically contains more than 45.65% magnesium carbonate. It is used in iron and steel industry, in glass making and agricultural industries.

**Eluvial mineral deposit** - deposits resulting from decomposition of rock in place without much movement of the fragments. The material may have slumped or washed downslope a short distance but has not been transported by streams.

**Fault** - a surface or zone of rock fracture along which there has been displacement of the earth's crust, from a few centimetres to over several kilometres.

**Greisen** - a mica-rich altered granitic rock sometimes containing tin and other valuable minerals.

**Hardrock deposit** - a term used to indicate material which cannot be excavated without blasting as opposed to soft sand, clay and gravel.

**Hydrocarbon biomarkers** - hydrocarbons which can be traced back to their specific precursor molecule in a previously living organism e.g. algae.

**Iridosmine** - a tin-white or steel-grey rhombohedral mineral (Os, Ir). It is a native alloy containing 20-68% iridium and 32-80% osmium. It usually contains some rhodium, platinum, ruthenium, iron and copper.

**Limestone** - a sedimentary rock of chemical or organic origin composed largely of calcium carbonate ($CaCO_3$). When limestone is heated, the carbon dioxide is expelled and the carbonate is converted to calcium oxide CaO ('lime'). Limestone and lime are used in metallurgical processes; in manufacture of cement, glass, paper; in industrial chemical; in building industry and agriculture.

**Lode deposit** - mineral or minerals (of possible commercial value) in consolidated rock, as opposed to placer deposits.

**Maturation** - process whereby organic matter in rocks is converted to petroleum due to heating through burial. The rocks containing this organic matter are termed the source rocks.

**Mineral deposit** - naturally occurring material containing a mineable accumulation of one or more minerals of possible commercial value. If any of these minerals can be extracted at a profit, the deposit is considered to be economic.

| | |
|---|---|
| **Mineral field** | - an area or a region where many workable mineral deposits are found. If one type of mineral is dominant in a field, it can be used as a prefix e.g. tinfield, goldfield. |
| **Mineral occurrence** | - the presence of minerals of possible commercial value at a locality. A mineral occurrence may comprise only traces or a small volume of a valuable mineral which may never be economic to mine; or its full size may not be known in which case it is sometimes called a 'prospect'. Even a small mineral occurrence is significant as it indicates that deposition of valuable minerals has occurred and therefore undiscovered economic mineral deposits may be present in the area. |
| **Mineral potential** | - an area is considered to have mineral potential if geological evidence suggests that mineral exploration may discover an economic mineral deposit. |
| **Osmiridium** | - A white to grey cubic mineral (Ir, Os). It is a native alloy containing 25-40% osmium and 50-60% iridium, and is often found with platinum. Although the term 'osmiridium' has been widely used in Tasmania, osmiridium is usually subordinate to iridosmine in Tasmanian deposits. |
| **Palaeoplacer** | - an ancient alluvial detrital mineral deposit which has been covered by later sediments. In this report the palaeoplacers are of Late Cambrian to Early Ordovician age (430-500 million years old). |
| **Platinoids** | - refers to the group of six precious metallic elements platinum (Pt), palladium (Pd), osmium (Os), iridium (Ir), ruthenium (Ru) and rhodium (Rh). |

| | |
|---|---|
| **Silica** | - is white or colourless, hard crystalline silicon dioxide ($SiO_2$). In the HIAA it occurs as sandstone or quartzite which are rocks comprised of grains of quartz (silica). It is used in manufacture of glass and special refractories, in metallurgy as a flux and as raw material for the manufacture of silicon, ferrosilicon, and other silicon alloys. |
| **Skarn** | - a body of lime-bearing silicate minerals formed from the reaction of carbonate bearing rocks and fluids rich in silica, aluminium, iron, magnesium and sometimes base and precious metals, eminating from an igneous intrusion. |
| **Ultramafic rocks** | - dark coloured igneous rocks containing less than 45% silica. Platinoid elements are often associated with these rocks. |

Table 1 Association of resource and host rock, Western Tasmania

| Resource | Classification | Host Unit | Lithologies |
|---|---|---|---|
| Cu-Au<br>Pb-Zn-Ag | Volcanic-hosted massive sulphide | Mt Read Volcs. (Cambrian) | rhyolite, dacite, subvolcanic plutons |
| Sn,W | Replacement/ vein/skarn | Success Creek Gp to Gordon Lmst. (PreC to Ord) | dolomite, limestone, Devonian granite |
| Pb-Zn-Ag | Mississippi Valley/Irish type | Gordon Lmst. (Ord.) | dolomite, limestone, Devonian granite |
| Au | Alluvial | Quat. to Recent gravels | limestone |
| Platinoid<br>Asbestos<br>Cr | Veinlets | Adamsfield and Heazelwood u/m complexes(Camb) | ultramafics |
| | Alluvial/ eluvial | Recent to Late. Cambrian gravels | |
| Fe | volcanic-hosted massive ore | Arthur Lineament | mafic volcanics |
| Magnesite<br>Silica | | Arthur Lineament | dolomite<br>quartzites |
| Oil Shales | | Lower Permian | siltstone |
| Coal | | Carb to Triassic | |

## TABLE 2

## MINERAL OCCURRENCES AND DEPOSITS WITHIN AND IN THE VICINITY OF HIAA

| NAME OF MINERAL LOCALITY (inside or outside HIAA) | COMMODITIES | DESCRIPTION OF MINERALIZATION | REFERENCE & REMARKS |
|---|---|---|---|
| | | **LEMONTHYME-JERUSALEM-CENTRAL PLATEAU AREA** | |
| 1 Lone Pine (inside) | W | minor amounts of wolframite and cassiterite in quartz veins adjacent to granite. | Gibson (1982) |
| 2 Hartnett (outside) | W, Sn | mineralized quartz veins in quartzitic schist | Reid (1919) |
| 3 Barn Bluff (outside) | Cu (Sn, Ag, Au) | impregnations and veins in altered quartzites and schist. Thin dolomite bands and actinolite lodes also present | Reid (1919)<br>Cochrane (1970)<br>Low grade mineral deposit; extensively explored early this century; no production. |
| 4 Birthday (inside) | W (Mo, Sn, Cu) | mineralised quartz veins, in Devonian granite, with varying amounts of tungsten and traces of other metals | Reid (1919)<br>Chochrane (1970) |
| 5 Oakleigh Creek (inside) | W (Sn) | tungsten bearing quartz veins in quartzite and mica schist | Reid (1919), McLeod et al (1961), Kuys (1981), McLeod (1965). Some production from this deposit early this century and again between 1944-48 (5 tonnes) of tungsten. Another 101 tonnes $WO_3$ were produced during 1980-82. |
| 6 Big Blow (outside) | Zn, Pb | sulphide lode in metasediments | Reid (1919)<br>McLeod & others (1961) |

| NAME OF MINERAL LOCALITY (inside or outside HIAA) | COMMODITIES | DESCRIPTION OF MINERALIZATION | REFERENCE & REMARKS |
|---|---|---|---|
| 7 Windermere (outside) | Cu | sulphides in chloritic and actinolitic rocks in quartzose and micaceous schist | Reid (1919) |
| 8 Cradle Mountain (outside) | Cu (Au, Ag) | as above | Reid (1919) |
| 9 Brook (outside) | W | Sulphide mineralization in fissure vein containing veinlets of quartz with wolfram | Reid (1919) |
| 10 Mt Pelion (outside) | Cu (Pb, Zn, Ag, Au) | sulphide lodes in quartzose and argillaceous schist | Reid (1919) |
| 11-19 nine occurrences of coal (all outside) | | coal seams in siltstone units of Permian age | McLeod & others (1961) |
| 46 McCoys (outside) | W | wolframite bearing quartz veins | Ruxton (1982) |
| | | **HOLE-IN-THE-DOUGHNUT AREA** | |
| 20 & 21 Mt Arrowsmith area (outside) | Cu | sulphides in quartz veins in Precambrian metasediments | Green (1985)<br>Gulline (1965) |
| 22 Jane River (outside) | Au | alluvial gold deposit | BHP report (1969)<br>Reported production of 29 oz Au |
| 23 Nicholl's Range (inside) | Cu | Copper mineralization as small blebs and veinlets of chalcopyrite and pyrite along schistosity planes of mica and chloritic schist | BHP report (1969) |

| NAME OF MINERAL LOCALITY (inside or outside HIAA) | COMMODITIES | DESCRIPTION OR MINERALIZATION | REFERENCE & REMARKS |
|---|---|---|---|
| 24 Wing's Lookout (inside) | Si | | |
| 25 Adam's River Falls (inside?) | Au | alluvial gold | Brown & others (1988) |
| 26-29 Holley Road Area (outside) | Fe | hematitic banded iron formation | Green (1985) |
| | | **SOUTHERN FOREST AREA** (Northern Part) | |
| 30 Pollards? (inside) | Os, Ir, Cr (Au) | Platinoids chromium and minor gold as a 'Palaeozoic placer' in Ordovician ultramafic-rich conglomerate surrounding the Adamsfield ultramafic complex | Brown & others (1988) production not known |
| 31 West of Adam River (inside) | Os, Ir (Au) | Platinoids and minor gold from small alluvial deposits possibly derived from Palaeozoic placers | Brown & others (1988) a past producer |
| 32 Football Hill (inside) | Os, Ir | Platinoids in alluvial deposits | Brown & others (1988) a past producer |
| 33 Main Creek (inside) | Os, Ir (Au) | Platinoids in eluvial deposits overlying ultramafic rocks and as detrital minerals in joint planes | Brown & others (1988) a past producer. Total production of platinoids from Adamsfield district during 1925 to 1959 (localities 30 to 33) is estimated at just less than 500 kg |
| 34 Humboldt Mine (outside) | Cu, Au (Pb, Zn) | Narrow zones of base metal and gold mineralization occurs in quartz and siderite veins in Late Precambrian black slate | Brown & others (1988) Hall et al (1969) |

| NAME OF MINERAL LOCALITY (inside or outside HIAA) | COMMODITIES | DESCRIPTION OR MINERALIZATION | REFERENCE & REMARKS |
|---|---|---|---|
| 35 Mt Mueller Mine (outside) | Cu | Copper mineralization in a narrow zone of about 1 m wide in silicified black slate | Brown & others (1988) |
| 47 Cashions Creek (outside) | Sn, W | anomalous amounts of tin and tungsten in sample, may be from a primary source or from granite boulders in basal Permian | Brown & others (1988) |
| | | **SOUTHERN FORESTS AREA (Southern Part)** | |
| 36 Glover's Bluff (outside) | Si | deposit in unmetamorphosed Precambrian sandstone | Green (1985) |
| 37 Strathblane (outside) | coal | coal in the uppermost Triassic sequence | Farmer (1979)<br>Marathon (1984) |
| 38 | coal | coal in the Triassic sequence | |
| 39 Hog's Back (outside) | Si | | |
| 40 An inferred coal resource near the old Ida Bay coal mine (outside) | coal | coal in the uppermost part of the Triassic sequence | Marathon (1984)<br>Exploration of the area during 1979-1983. Total potential in-situ resource is 6 million tonnes of open cut coal. |
| 41 Lune River (outside) | limestone | | |
| 42 Moss Glen (outside) | coal | coal in the Triassic sequence | |

| NAME OF MINERAL LOCALITY (inside or outside HIAA) | COMMODITIES | DESCRIPTION OR MINERALIZATION | REFERENCE & REMARKS |
|---|---|---|---|
| 43 Catamaran coal mine (outside) | coal | coal in the uppermost Triassic sequence | Marathon (1984) Potential in-situ resource of 11 million tonnes of shallow underground coal. Resource occurs near the old Catamaran coal mine. Past producer. |
| 44 Precipituous Bluff | limestone | | |
| 45 Rocky Boat Harbour | Au, Os, Ir | detrital platinoids deposits derived from ultramafic rocks | Blake (1983), Farmer (1979) minor production. |

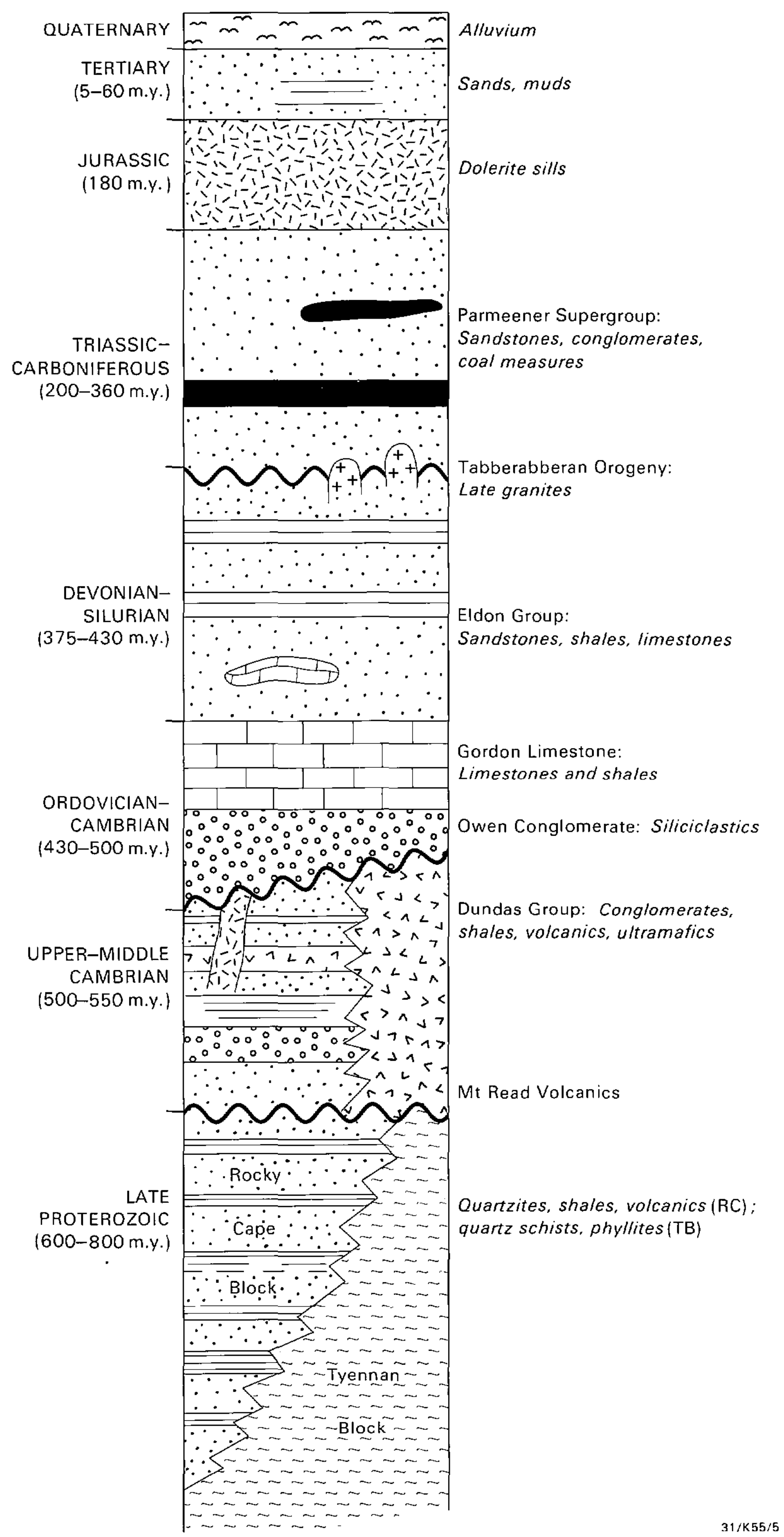


Fig 6 A generalised stratigraphic column for western Tasmania

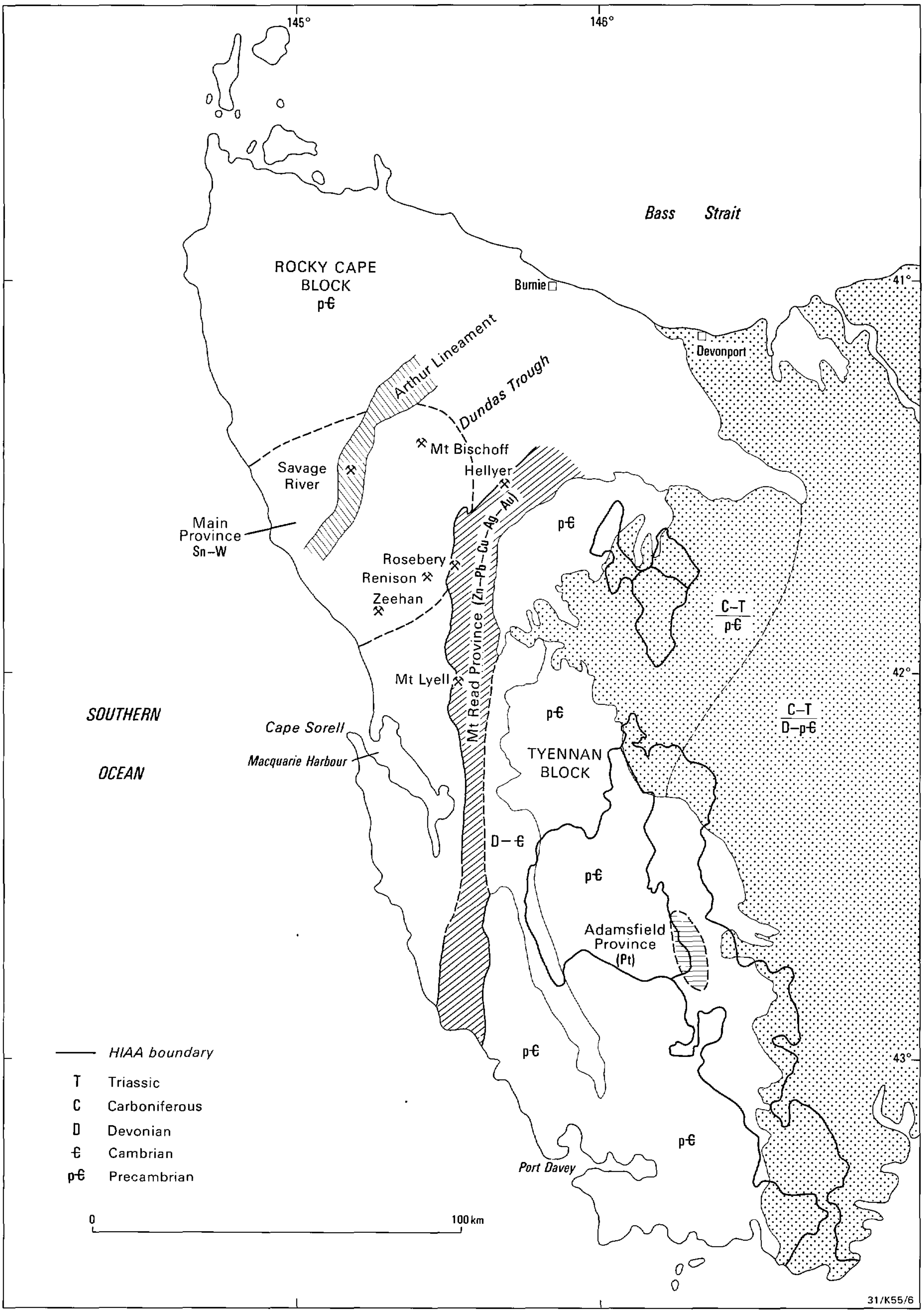


Fig 7 A geological sketch map of central and western Tasmania

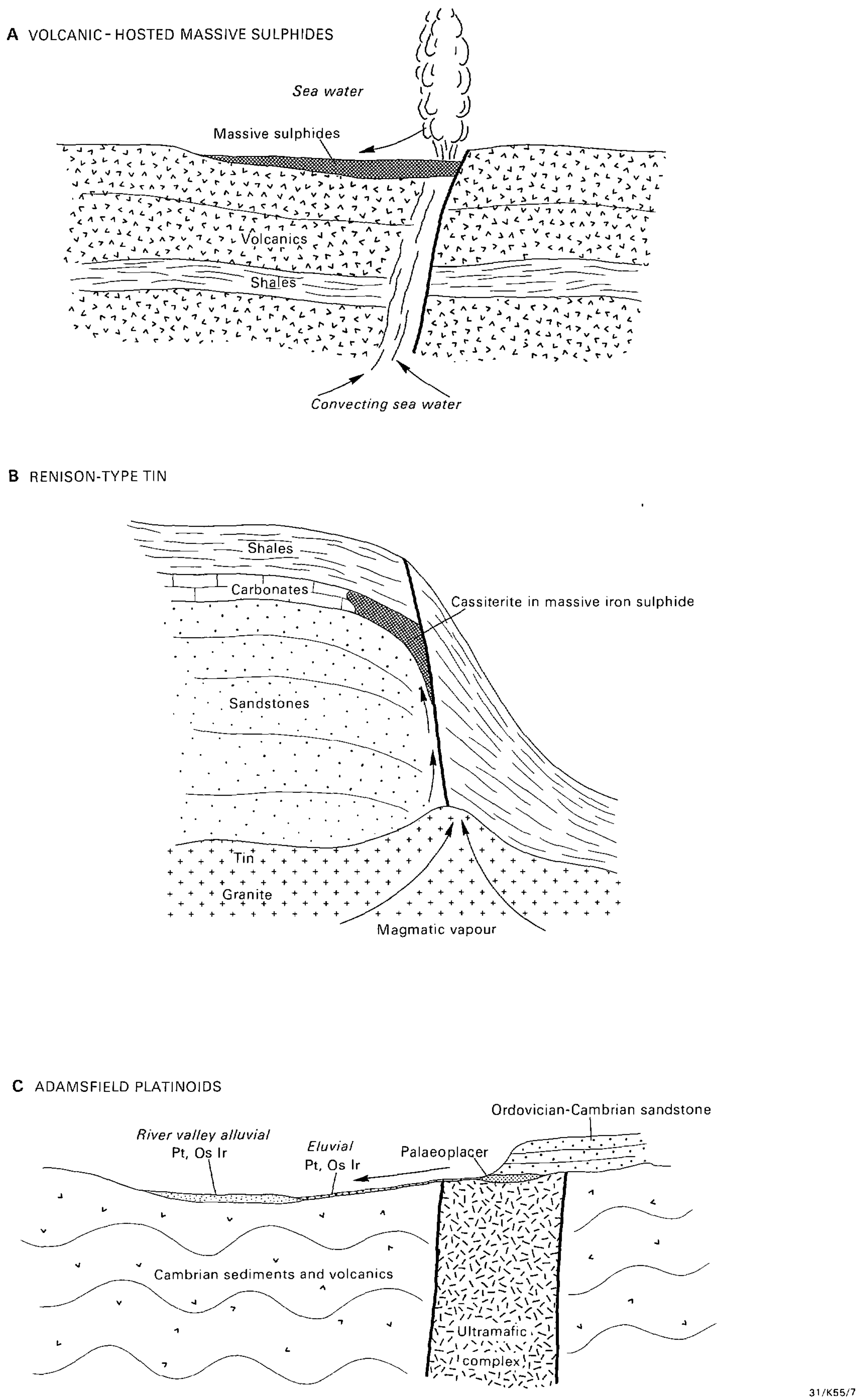


Fig 8 Schematic diagrams illustrating the formation of three types of mineral deposit in western Tasmania

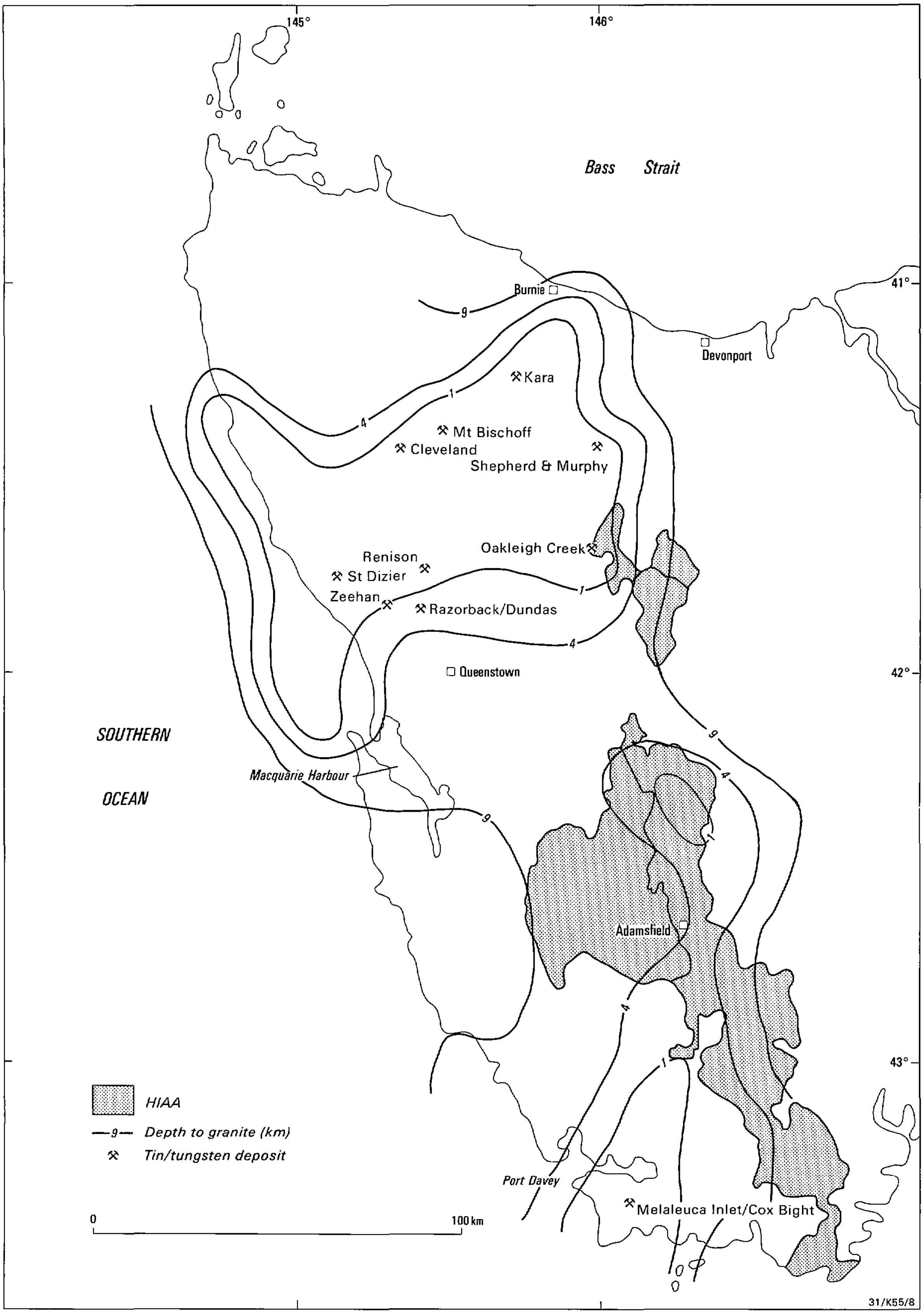


Fig 9 An interpretation of gravity data by Leaman & others (1980) showing approximate depths to granite surface

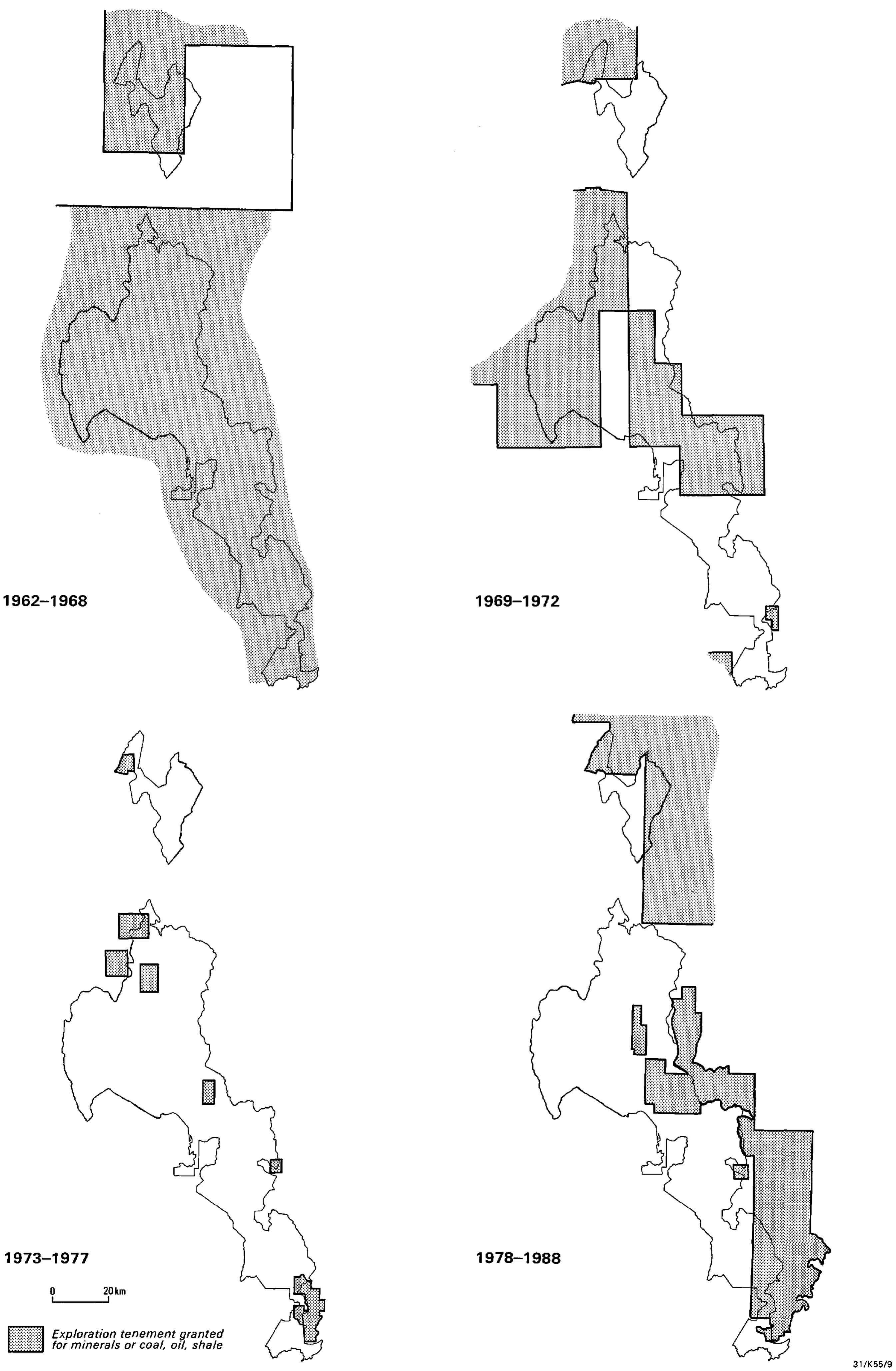


Fig 10 HIAA exploration tenement coverage: time slices 1962 to current

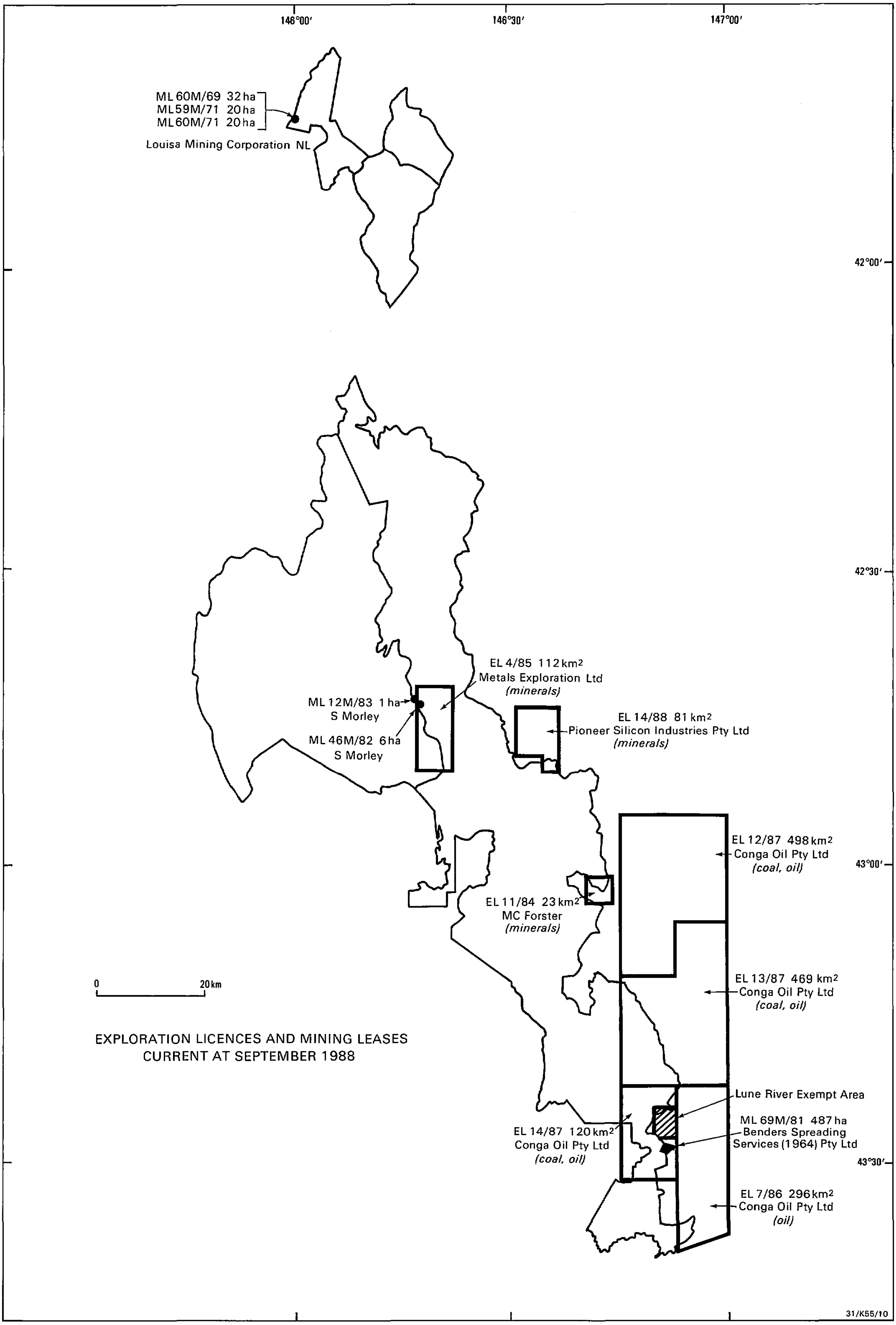


Fig 11 HIAA current exploration and mining tenement coverage

## LEGEND FOR FIGURES 12, 13 & 15

*Jurassic dolerite*

*Triassic sediments*

*Triassic — Upper Carboniferous sediments*

*Permian — Upper Carboniferous sediments*

*Lower Devonian — Ordovician sediments*

Gordon Limestone

*Cambrian sediments*

*?Early Cambrian — ? Late Precambrian dolomite and dolomitic sediments*

*Precambrian sediments*

*Devonian granite*

*Cambrian ultramafics*

*Boundary of Lemonthyme, Walls of Jerusalem, Central Plateau, Southern Forest and Hole in the Doughnut areas*

*Boundary of zones of mineral potential*

*Geological boundary*

Mineral occurrences and deposits

| | Hardrock | Alluvial |
|---|---|---|
| *Mineral occurrences and deposits* | × | × |
| *Mineral deposit with past production* | × | × |
| *Quarry* | × | |

| Element | |
|---|---|
| *Copper* | Cu |
| *Lead* | Pb |
| *Zinc* | Zn |
| *Tungsten* | W |
| *Tin* | Sn |
| *Osmium* | Os |
| *Irridium* | Ir |
| *Chromium* | Cr |
| *Gold* | Au |
| *Silver* | Ag |
| *Banded Iron formation* | Fe |
| *Silica* | Si |
| *Limestone* | Ls |
| *Coal* | C |

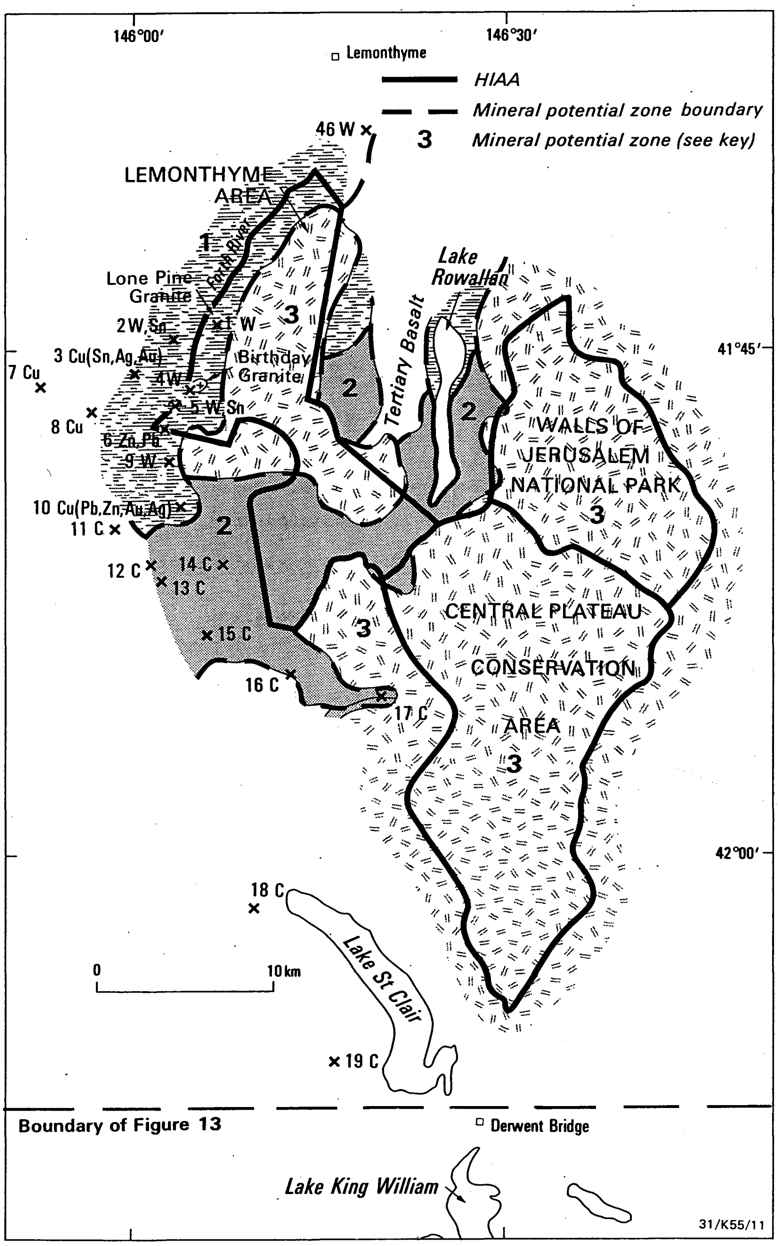


Fig 12 Lemonthyme Area, Central Plateau Conservation Area and Walls Of Jerusalem National Park mineral occurrences, deposits and generalised geology

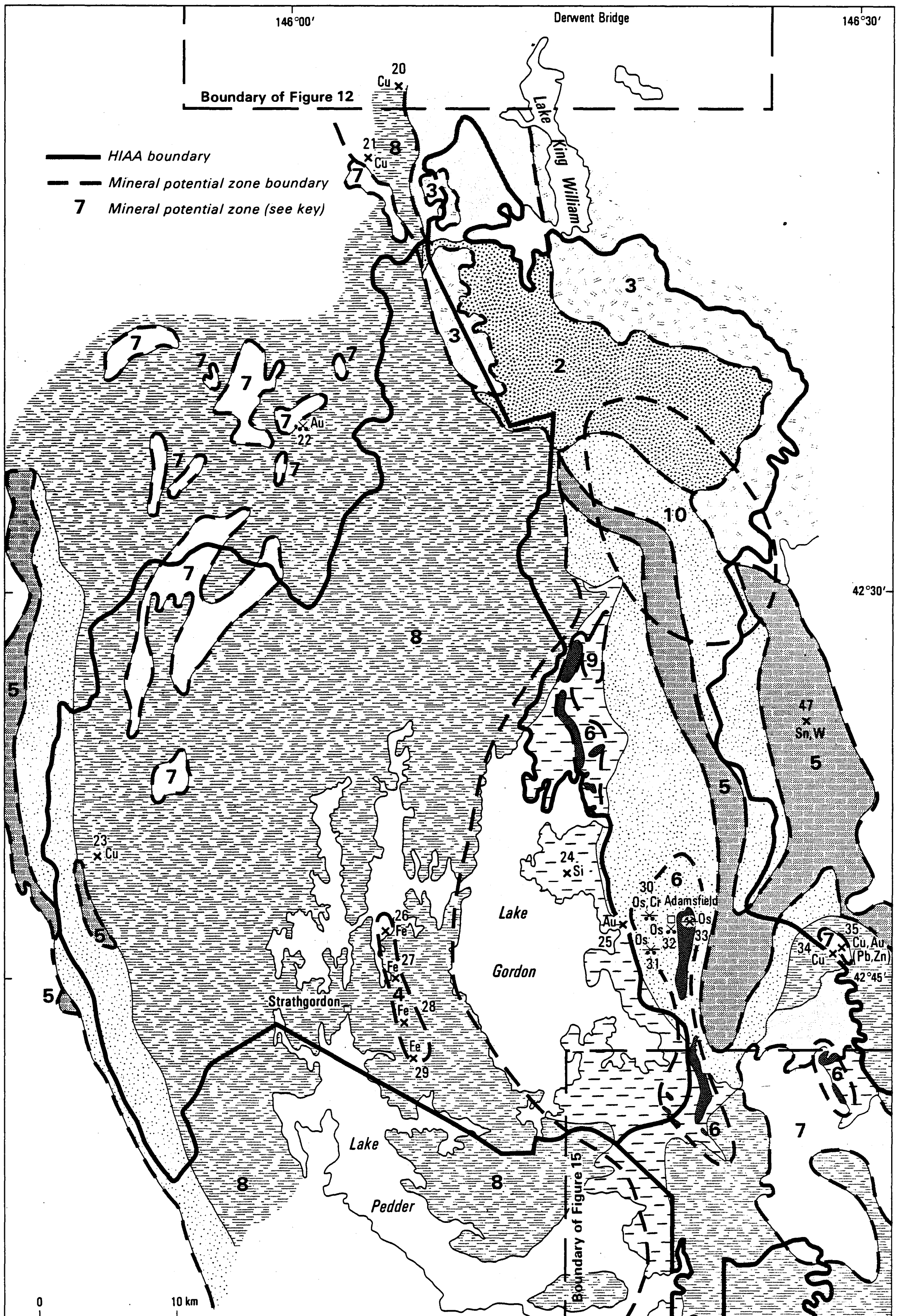


Fig 13 Hole In The Doughnut and northern part of Southern Forests mineral occurrences, deposits and generalised geology

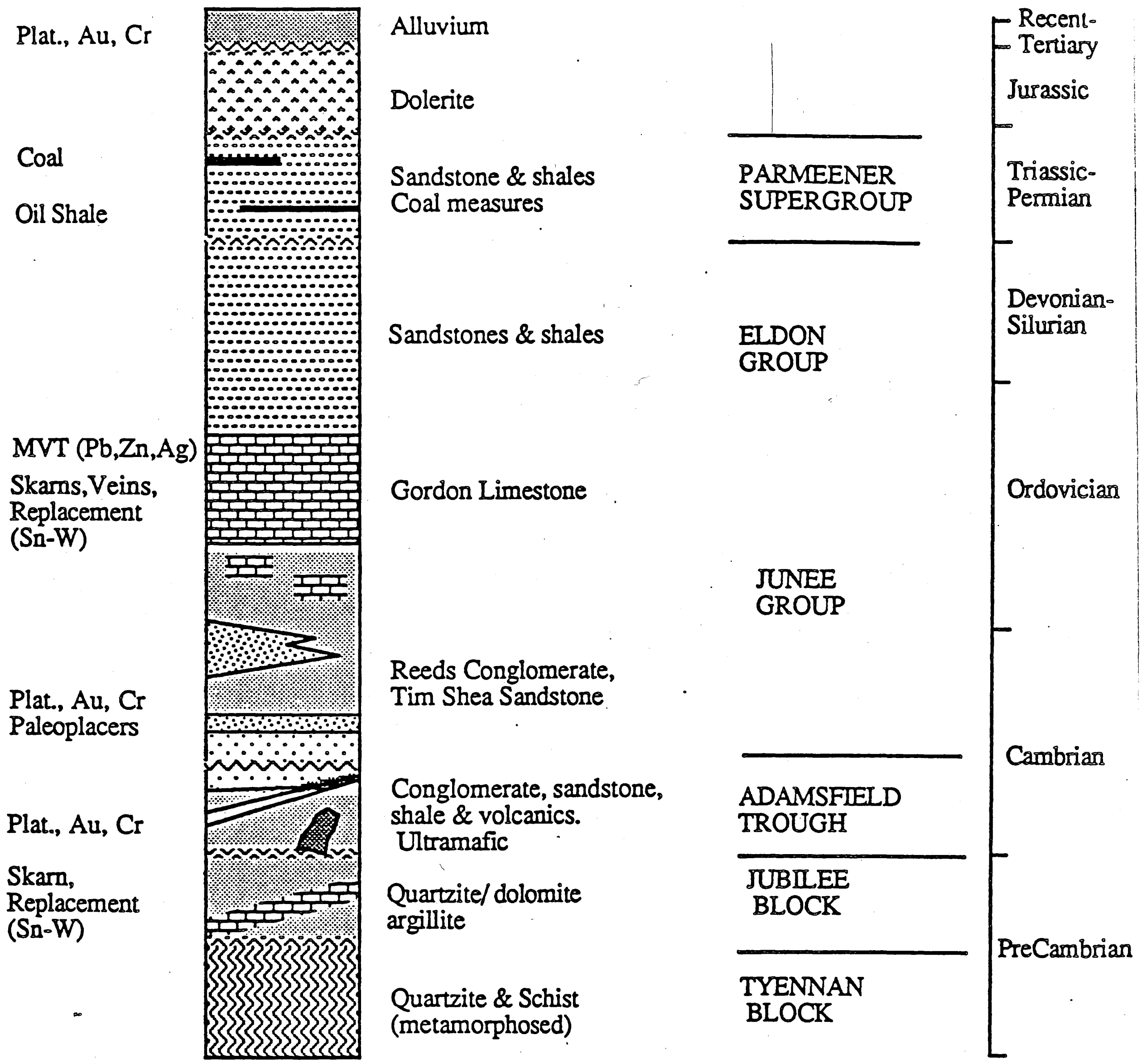


Fig 14 Geological succession in the Adamsfield area
(after Corbett and Banks 1975)

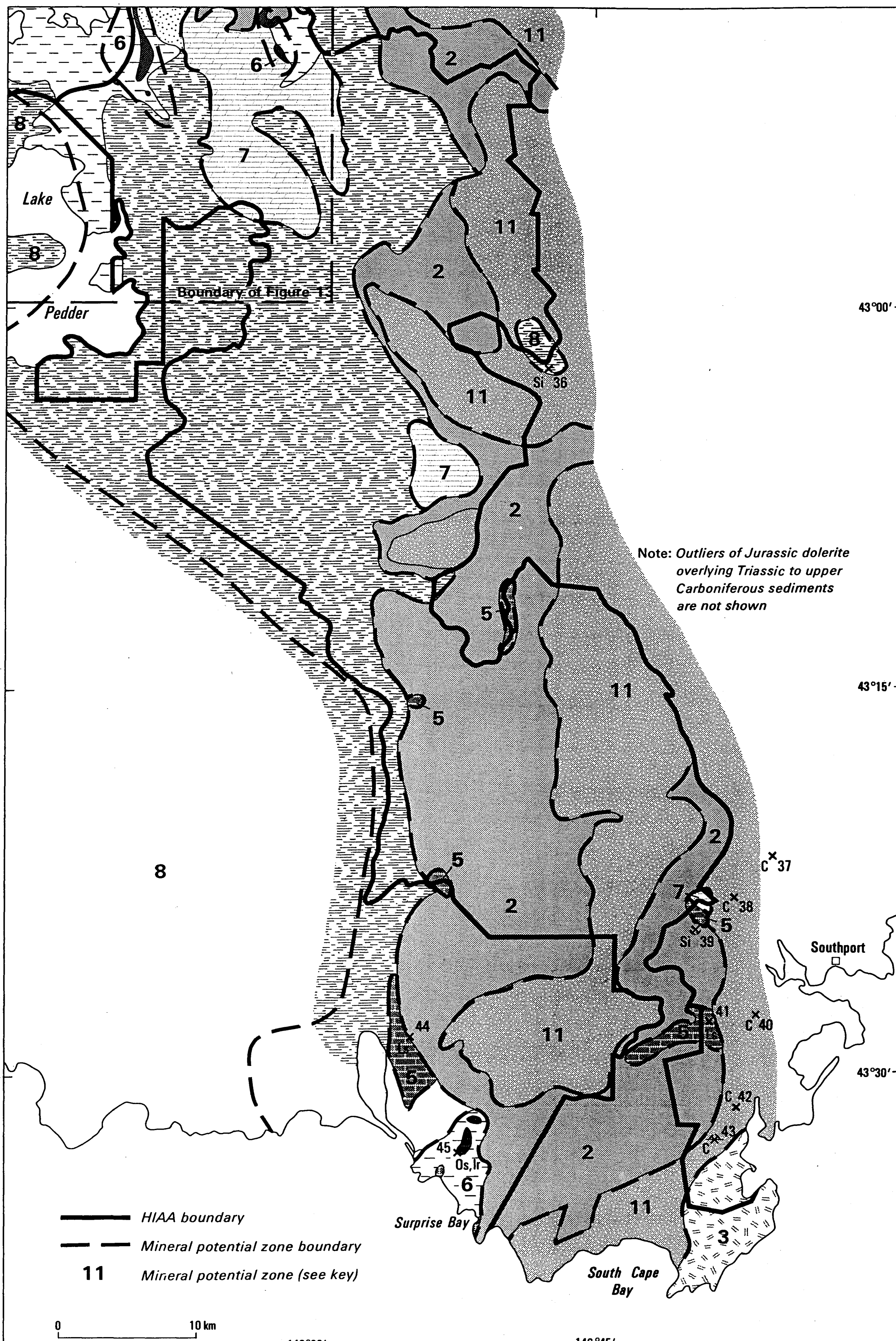


Fig 15 Southern part of Southern Forests mineral occurrences, deposits and generalised geology