

Annual Review

1998-99



Tasmania

MINERAL RESOURCES TASMANIA

A Division of the Department of Infrastructure,
Energy and Resources



MINERAL RESOURCES TASMANIA

A Division of the Department *of* Infrastructure,
Energy *and* Resources

Annual Review

1998/1999

Mineral Resources Tasmania PO Box 56 Rosny Park Tasmania 7018

Phone: (03) 6233 8333 ● Fax: (03) 6233 8338

Email: info@mrt.tas.gov.au ● Internet: www.mrt.tas.gov.au

CONTENTS

Mineral Resources Tasmania — Divisional overview	5
Financial performance	9
Performance indicators	10
Review of MRT activities branch activities, 1998/1999	12
Metallic Minerals and Geochemistry	12
Industrial Minerals, Environment and Tenement Management	15
Engineering Geology and Groundwater	22
GIS and Geophysics	24
Data Management	28
Publications	30
Library	30
Mineral Sector Overview	31
Value of the Tasmanian minerals industry	32
Mineral exploration expenditure	34
Review of Mineral Sector Operations	37
Metallic minerals	37
Non-metallic minerals	45
Fuel minerals	49
Mineral processing operations	51
Annual Report, Rehabilitation of Mining Lands Trust Fund	55

Mineral Resources Tasmania

Mineral Resources Tasmania serves the people of Tasmania by the provision of services to the mineral exploration, mining, quarrying and mineral processing industries, and the provision of geoscientific information to all levels of government and the private sector.

— Mission —

- ❑ To provide the necessary information and tenement infrastructure to foster responsible mineral resource development and land management for the benefit of the Tasmanian community.

— Objectives —

- ❑ To increase the investment in exploration for, and development of, minerals and petroleum in Tasmania and offshore waters;
- ❑ To provide geoscientific information essential for the development of the State's mineral resources and for responsible land management;
- ❑ To ensure a fair and sustainable return to the community when petroleum and mineral resources are developed;
- ❑ To give effect to government policy in relation to mineral and petroleum resources and improve Mineral Resources Tasmania's operational performance.

— Activities —

Activities within the Division include:

- ❑ Collection, integration, interpretation, publication and presentation of information on Tasmania's mineral wealth and geoscientific nature;
- ❑ Representation of wider community interests in land stability, underground water and waste disposal measures;
- ❑ Regulation of mineral and petroleum exploration in Tasmania, including off-shore waters administered by the State, and the promotion of vacant areas available for onshore and offshore exploration;
- ❑ Setting and monitoring of standards for both the performance of exploration activities and the technical reporting of exploration records and case histories;
- ❑ Environmental appraisal and monitoring and management of mining heritage and land-access issues; and
- ❑ The issue of legal titles to mining tenements, collation and recording of statistics relating to mining production, collection of fees and rentals, management of royalty regimes, and recording of mining tenements.

— Major Issues and Initiatives for 1999/2000 —

Mineral Resources Tasmania will overcome a shortage of storage space at its mineral core library by extending available space and developing an efficient core storage system.

Other major initiatives will include:

- ❑ Completion of development and implementation of Project TIGER (Tasmanian Information on Geoscientific and Exploration Resources) Phase 3, Stage 1 and start of planning for Phase 4;
- ❑ Completion of the first stage of the Tasmanian Regional Minerals Program;
- ❑ Continued expansion of digital data used by the minerals industry to assess the mineral potential of Tasmania;
- ❑ Continued promotion of Tasmania's mineral and petroleum potential; and
- ❑ Ongoing assessment of royalties to ensure compliance with the *Mineral Resources Development Act 1995*.

Mineral Resources Tasmania — Divisonal Overview, 1998/1999

Mineral Resources Tasmania experienced a positive and productive 1998/1999 financial year. Following the 1998 Tasmanian election, MRT was transferred from the former Department of State Development and Resources (TDR) to the new Department of Infrastructure, Energy and Resources (DIER) in September 1998.

Unlike previous changes, the transfer to the new Department was smooth, with MRT being re-allocated as a working Division with a stable budget and an increase of one (a field officer in the area of environmental and mining matters) in the establishment numbers. Because of the smooth transition, consolidation of projects started in previous years was undertaken and some new data acquisition projects were commenced.

Data collection

The capture of geological data continued, with eight 1:25 000 scale maps being completed during the year. Six of these maps cover parts of western Tasmania; one covers the Picton area in southern Tasmania, and the remaining map covers the Monarch area in northeast Tasmania. The 1:250 000 scale digital geology data was used to produce a new 1:500 000 scale map of Tasmanian geology.

Ten 1:25 000 scale geological maps were prepared for digital capture, a slight shortfall on the target of twelve. In contrast, 380 square kilometres of primary geoscientific data acquisition were completed, which represents a 90% excess over the performance criterion of 200 square kilometres. This reflects a greater concentration on the latter activity because of adequate resources, growth in experience of the project teams, and good access to the areas covered.

Digital data and/or specialised processing of geophysical data were supplied to 27 clients in the minerals industry. Reprocessing of old aeromagnetic datasets continued, with 32 datasets processed and indexed in digital form during the year. MRT has made current tenement information for mineral and oil exploration and for mining leases available on its website for download in several common GIS formats.

Mapping of landslide prone areas from Northdown to Smithton on the North West Coast was completed during the year. The resulting maps provide information essential to planners, developers, landowners and the general public prior to development decisions being made. Detailed studies of landslips occurring along the coastline and near the Channel Highway at Tarooma have commenced. MRT continues to collect data relating to groundwater levels at the Rosetta landslip and gives geotechnical advice to the Glenorchy City Council on this slip.

Collection and collation of information on groundwater resources continued. Detailed work was undertaken in the Sorell and Oatlands areas, with broad-scale data being collected from northern Tasmania. Input into siting waste disposal operations, for example council refuse disposal sites and waste-water irrigation from sewage plants, continues to be an important function. Considerable effort was applied to making the groundwater database more comprehensive.

Commonwealth-funded projects being undertaken within MRT include a study of groundwater conditions associated with soil salinity (Natural Heritage Trust) and an examination of groundwater resources in the drought prone area of the Northern Midlands and Fingal Valley (Rural Adjustment Scheme). A study of groundwater contamination from waste disposal facilities (Natural Heritage Trust) has been approved for funding.

A study of sand resources suitable for concrete manufacture and other uses was completed during the year. The study found that sand resources on current leases were greater than previously thought and considerable resources were also indicated in areas outside current leases. However the study did not consider

possible limits on extraction imposed by planning, social and environmental constraints. These issues will be addressed in future evaluations of the resources.

MRT received and assessed 165 reports detailing mineral exploration activities undertaken by companies exploring within Tasmania. A set of national standards for the lodgment of mineral exploration data in digital format is being developed in conjunction with similar agencies in other States. Adoption of these standards will ensure consistency when accessioning, integrating and redistributing modern mineral exploration data.

Promotions

MRT geologists presented three papers on the mineralisation and geology of Tasmania at the Australian Geological Convention in Townsville in early July 1998. Prior to this convention nine exploration companies were visited in Brisbane over two days. These visits were in addition to promotional visits already made to companies based in Melbourne, Sydney and Perth. MRT staff joined with staff from other Australian jurisdictions and the Commonwealth in a promotional booth at the Prospectors and Developers Association of Canada (PDAC) meeting in Toronto, Canada, in March 1999. During this visit ten mining or investment companies were visited in Toronto and Vancouver, both as part of an Australian delegation and as separate targeted visits by Tasmania.

Three offshore petroleum areas were released for bidding in 1999. These areas, on the western margin of the Bass Basin, were actively promoted at the American Association of Petroleum Geologists Conference in San Antonio (USA) and at the Australian Petroleum Production and Exploration Association Conference in Perth, Western Australia.

The Australian Society of Exploration Geophysicists International Conference, held in Hobart in November 1998, was attended by about 600 delegates. New maps and data promoting Tasmania's mineral potential were displayed in the exhibition area and a number of orders for this material were received from delegates. There was considerable interest in the nature and quality of the material presented by MRT.

Project TIGER

The development of Module 1 of Project TIGER Phase 3 was completed. This module has delivered an enhanced set of applications to manage geoscientific data held by MRT. The range and diversity of digital data sets has been expanded significantly to include data compiled from mineral exploration company reports and data collected by MRT geoscientists. Indexing of reports published by MRT (and its predecessor departments) has been completed and a spatial index of reports submitted by mineral exploration companies operating in Tasmania is now available.

Redevelopment of the tenement management system is in progress and will support the whole-of-government land information system strategy by providing textual and graphical mineral tenement data to the Land Information System Tasmania (The LIST).

Environmental monitoring and rehabilitation

MRT is responsible for ensuring that all exploration activity in Tasmania achieves the highest environmental standards and complies with the *Mineral Resources Development Act 1995* and the requirements of other legislation which protects such things as threatened species and cultural heritage. The recently released fourth edition of the *Mineral Exploration Code of Practice* outlines the current requirements, the approvals process, and the controls and monitoring procedures that MRT has in place.

MRT has a rigorous approvals process for on-ground exploration, which ensures that all land tenure requirements, and sensitive values such as flora, fauna, geological heritage and cultural heritage, are appraised by the State agencies responsible for the preservation of those values.

The Tasmanian Regional Forest Agreement (RFA) resulted in a need to formalise and record the approvals process and monitoring activities undertaken by Mineral Resources Tasmania in its administration of the environmental effects of on-ground exploration. An information system, which includes links to a database of exploration activity photographic images, is being developed. This will allow compliance auditing of the *Mineral Exploration Code of Practice* and, in the longer term, outcome-based auditing of the environmental effects of exploration in Tasmania.

The Rehabilitation of Mining Lands Trust was established under the *Mineral Resources Development Act 1995* to allow for the rehabilitation of abandoned mining sites for which no person or organisation has responsibility. Funds are provided from a negotiated increase in mining royalties. Strategy and work programs are approved by a steering committee comprising government and industry members. Following Ministerial approval programs are managed by MRT.

In 1998/1999 major works were carried out in former tin mining areas around Gladstone in the northeast, including the construction of a bypass canal diverting Ruby Creek from an area of contaminated tailings at the Endurance mine.

An initial study for the planned rehabilitation program in the Queen Hill area near Zeehan was completed. Work included detailed water analyses and field trials of treatment options.

Other work completed during the past year included the clean up of exploration camps in the South West Conservation Area south of Macquarie Harbour and the rehabilitation of quarries near Scottsdale and on King Island. Shaft covers were installed at the Great Republic mine at Gipps Creek and Crown Prince mine at New River.

Western Tasmanian Regional Minerals Program

Progress was made with the Western Tasmanian Regional Minerals Program (WTRMP) project, a tripartite program between the Tasmanian and Commonwealth Governments and the mining industry (through the Tasmanian Minerals Council). The purpose of this initiative is to improve investment potential and job opportunities in new and existing resource developments.

A committee, mainly consisting of mining industry representatives and with one representative from each of the Tasmanian and Commonwealth governments, manages the project. During 1998/1999 the committee engaged consultants AGC Woodward-Clyde Pty Ltd to undertake the WTRMP. The final reports, for public distribution, will be available in late 1999.

The main aim of the project is to propose a regional development plan for up to 15 years in order to identify the infrastructure needed to support an expanded industrial base in Tasmania. The plan is required to make existing mining and mineral-processing operations more cost effective by recommending solutions to common problems, such as infrastructure and energy limitations. It is also intended to look at ways to lower the development cost of new projects and determine what remote sensing and ground data is needed to facilitate exploration for minerals, oil and gas.

National Geoscience Mapping Accord

To enhance our understanding of the prospectivity of northern Tasmania, MRT has commenced a National Geoscience Mapping Accord project in conjunction with the Australian Geological Survey Organisation. An airborne survey collected magnetic and natural radiometric data over two areas in the first half of 1999. The

processed data will be available for integration with other datasets in November 1999.

Core library

As required by the *Mineral Resources Development Act 1995*, MRT, on behalf of the Government, maintains a library of drill core from exploration, mining and construction projects undertaken in Tasmania. This service is essential to document the geology and mineral deposits of Tasmania and to attract new mineral exploration projects. Because the facility is at capacity, a submission for funding for extensions was submitted for consideration in the 1999/2000 budget process.

The submission secured funds for the 1999/2000 and 2000/2001 financial years. Construction and fit out of a new module will take place in 1999/2000, with re-configuration of the existing facility to maximise storage efficiency to be done in the following year.

Codes-SRC

The government, through MRT, continued funding support to the Centre for Ore Deposit Research, Special Research Centre at the University of Tasmania, with \$68,000 being provided in 1998/1999. The funding, which takes the form of Tasmanian Government Mining Scholarships, allows research to be undertaken on projects of significance that will increase the understanding the prospectivity of Tasmania.

Catherine Gifkins was funded by the scheme and successfully completed a PhD study on the geology of part of the Mount Read Volcanics near Rosebery.

\$20,000 per annum from the scheme will be dedicated to scholarships related to developing new exploration techniques using stable isotope geochemistry suitable for the Mount Read Volcanics. The project will also receive funds from industry and an application for funding from the Commonwealth Government has been submitted by CODES. The project will utilise existing expertise in this field at CODES, MRT and industry and MRT geoscientists will be playing an active role in the work.

On behalf of the government and management of DIER, I wish to personally thank all MRT staff for their dedication and work, at times under trying circumstances, which allowed the Government's Budget Outcomes to be reached through the timely production of Divisional Outputs of the highest level.

National Centre for Petroleum Geology and Geophysics

Mineral Resources Tasmania has contributed to a PhD project at the NCPGG (Adelaide) being undertaken by P. K. Das on the *Rift geometry, sedimentation history and hydrocarbon potential of the Bass Basin of Tasmania, Australia with particular reference to the Boobyalla Sub-basin*. The results of this project will assist MRT to encourage offshore petroleum exploration activities.

Dr AV Brown

Executive Director

Mineral Resources Tasmania

Financial Performance

Departmental restructures were undertaken in September 1998 following the election of a Labour Government in Tasmania. As a result of this restructure, MRT is no longer a division of TDR (now the Department of State Development) and has become a division of the Department of Infrastructure, Energy and Resources (DIER). The financial operations of the division are now published in the DIER Annual Report to Parliament.

The 1998/1999 appropriation to MRT was \$5.218 million, which was a two per cent increase over the 1997/1998 appropriation. The increase basically represented salary indexation and an increase in funds allocated to the Rehabilitation of Degraded Mining Lands program.

Outputs — Application of Funds, 1998/1999

	<i>\$'000</i>
1. Metallic Mineral Resource Investigation and Promotion Program	1,182
2. Industrial Mineral and Hydrocarbon Investigation and Promotion Program	768
3. Land Management, Environment and Rehabilitation Program	1,319
4. Tenement Management and Royalty Administration	856
5. Digital Geoscientific Data Capture, Maintenance and Output Administered Payments	418
Total	5,218

Descriptions of Outputs, 1998/1999

- Provision of geoscientific data and resource information on Tasmania's metallic mineral endowment. Promotion of mineral potential for the stimulation of mineral exploration.
- Provision of geoscientific data and resource information on Tasmania's industrial mineral and hydrocarbon endowment. Promotion of mineral potential for the stimulation of industrial mineral and hydrocarbon exploration.
- Provision of geoscientific information essential to the effective and sustainable management of land and mineral resources. Provision of advice to all levels of Government and the public on land management issues.
- Administration of mining legislation, including the issue of legal titles for mineral tenements. Collation and recording of statistics relating to mining production and exploration. The demand and monitoring of the collection of fees, rentals and royalties.
- Geoscientific database development, maintenance, output and marketing. Production of digital geoscientific maps and associated databases.

Administered payments included the \$350,000 funding for the Rehabilitation of Degraded Mining Lands program, as well as a \$68,000 grant for the Tasmanian Government Mining Scholarships at the University of Tasmania CODES-SRC unit.

Mineral royalties

Mineral royalty collections for 1998/1999 were \$9.1 million, an increase of \$900,000 over the 1997/1998 collections. An original estimate of \$10.0 million was made for royalty revenue in 1998/1999, which was based on increased mine production and the increased royalty rate applicable for the year. The original estimate was made at a time when commodity prices were more favourable, with the market conditions experienced during the year resulting in this target not being achieved. It is hoped that a strengthening of commodity prices during 1999/2000 will help improve the sales revenue and profitability of mining operations.

Both the ad valorem and profit components of the royalty regime increased effective from 1 July 1998 in line with the royalty rates agreed to by the mining industry in 1997. Royalty collections for 1999/2000 have been budgeted at \$10 million. Royalty revenue will be boosted in the 1999/2000 financial year with the commencement of production at the Beaconsfield gold mine, although this will be the final year of operation of the Hellyer zinc mine. Hellyer has contributed significantly to royalty revenue over the life of the mine.

Rents and Fees from Mineral Lands raised \$0.68 million in 1998/1999 which was a decrease from the previous year. Revenues were in line with previous years however increased expenditure on the administration of the off-shore leases resulted in an overall income reduction.

Departmental Fees and Charges

	<i>Target</i> 1998/1999	<i>Actual</i> 1998/1999	<i>Target</i> 1999/2000
Rents & Fees (\$,000)	770	678	770
Royalties (\$,000)	9,000	9,100	10,000
Sales of Maps and Publications (\$,000)	25	37	25

1998/1999 Performance Indicators

Growth in mineral exploration activity is essential for future development of the mineral sector and for the economic well being of Tasmania. Mining and mineral processing accounts for over 40 per cent of Tasmania's export capacity. Based on industry estimates, approximately \$26.3 million was paid to the Tasmanian and local governments in charges, fees and taxes during 1998/1999, including \$9.1 million in royalties.

Exploration activity is underpinned by updating and providing quality geoscientific data relating to Tasmania's mineral resources. The activities of MRT are directed at the capture, storage and promotion of such information, with the increased availability of this information being measured and correlated with exploration investment. Enhancement of geohazard information is also of high importance to stakeholders of MRT, as is the effective administration of MRT's regulatory framework.

Achievement against internal targets

<i>Measure</i>	<i>Target</i> 1998/1999	<i>Actual</i> 1998/1999	<i>Target</i> 1999/2000
Digital geoscientific coverage of Tasmania, 1:500 000 scale (Note 2)	1 map	1 map	0
Number of 1:25 000 scale maps (418 maps needed to cover State)	12 maps	9 maps (Note 3)	12
Digital geoscientific coverage of the State's geohazards	3 maps	3 maps	1
Digital geoscientific coverage of the State's groundwater resources	0	0	2
Collection of primary digital geoscientific data (km ²)	200	380	200

Notes:

- Digital Geoscientific information is the electronic data which forms the basis for the production of digital maps which are used for mineral exploration, land management and planning.
- 1:250 000 digital geology data has been 'generalised' electronically to produce this 1:500 000 scale map.
- Target not met due to: the introduction of a new plotter with its associated redevelopment of GIS shadesets for output products; the commencement of the groundwater resource mapping project; and the commencement of the exploration activity data project.

Achievement against external targets

<i>Area</i>	<i>Goal</i>	<i>1997/1998</i>	1998/1999	<i>% Increase</i>
Percentage of total Australian Exploration Expenditure	To increase and hold percentage above 2% (Note 1)	1.94%	1.42%	-27%
Exploration Expenditure (financial year)	To increase to a minimum of \$30 million per year	\$20.7 million	\$11.9 million	-43%
Exploration Expenditure (calendar year)	To increase to a minimum of \$30 million per year	\$29.6 million (1997)	\$12.6 million (1998)	-57%
Area held under Exploration Licence	To obtain an increase	9518 km ²	8955 km ² (Note 2)	-6%
Number of Exploration Licences granted	To obtain an increase	132	124 (Note 3)	-6%
Exploration drilling metres completed	To obtain an increase	86 420	43 859	-49%
Percentage of Strategic Prospectivity Zones (SPZ) area held under EL's	To obtain an increase	30.8% (Note 4)	22.6%	-27%

Notes

1. The 2% is based on twice the percentage of the area of Tasmania in respect to the whole of Australia.
2. These figures are for metallic and non-metallic minerals only. A further 30 356 km² was held for onshore oil exploration in 1998/1999 (11 938 km² in 1997/1998). The decrease in area is due to a number of companies having dropped large reconnaissance exploration areas and concentrating on small target areas.
3. The decrease in number of applications is due both to the same reason as in note 2 and an Australia-wide downturn in greenfield exploration. There is also a tendency for exploration to occur over existing mining leases.
4. The decrease in percentage is due to the reasons given in Notes 2 and 3.

Mineral Resources Tasmania **— Branch Activities, 1998/1999**

Mineral Resources Tasmania consists of six branches: Metallic Minerals and Geochemistry; Industrial Minerals, Environment and Tenement Management; Geographical Information Systems & Geophysics; Engineering Geology and Groundwater; Data Management; and Royalty, Finance and Administration.

Because of the integrated nature of the branches, outputs provided under the banner of the Tasmanian Geological Survey are contributed to by staff of most, if not all, branches.

Metallic Minerals and Geochemistry

During 1998/1999 the Metallic Minerals and Geochemistry Branch was involved in a number of projects and programs.

Regional Forest Agreement

Submissions were prepared for the Resource Development and Planning Commission Inquiry into areas to be reserved under the Tasmania–Commonwealth Regional Forest Agreement (RFA) and the Affected Agency Group. Together with industry submissions, the Agency submissions were successful in gaining more favourable land tenures and management regime for mineral exploration over large areas of western Tasmania.

Geoscientific data generation

Primary geological data acquisition for the Balfour, Temma, Picton and Port Sorell 1:25 000 scale map sheets was completed. Mapping of the Gog sheet, in the Mount Read Strategic Prospectivity Zone, commenced.

Compilation of new primary geoscientific data was completed for the Cethana, Picton and Dempster 1:25 000 scale map tiles in the form needed for digital capture.

Nine geological map sheets (Oxberry, Monarch, Gladstone, Ramsay, Moores, Innes, Lewis, Osmund and the Hibbs special compilation sheet 1) were prepared for digital capture.

Sampling was carried out in conjunction with the Australian Geological Survey Organisation as part of the TASMAPP99 collaborative project for further age dating of granites and sandstones.

A study of the nature of gold mineralisation in the Cygnet area and a report on diamonds in Tasmania were completed. A report on gold in the Weld River area was well advanced at year's end.

A regional study of the structural controls on gold mineralisation in northeast Tasmania was completed. Two papers were submitted for external publication on this work and a poster was presented at the Geological Society of Australia Specialist Group in Tectonics and Structural Geology meeting at Halls Gap, Victoria. The opportunity was taken at the meeting to compare the structural setting of the Victorian gold deposits with those of northeast Tasmania.

Papers on the mineral deposits of Tasmania, the Proterozoic geology of Tasmania and the formation of the Henty gold deposit were presented at the 14th Australian Geological Convention in Townsville.

A paper on Tasmania's type-mineral localities was presented at the 22nd annual meeting of the Australian Mineralogical Society in Melbourne.

Promotion of Tasmania's exploration potential

Two papers were presented and a display booth held at the highly successful Australian Journal of Mining *Tasmanian Mineral Exploration and Investment '99 Conference* held in Hobart in May.

Promotional booths were also held at the Australian Geological Convention in Townsville in July and the Australian Society of Exploration Geophysicists Conference in Hobart in November.

The Prospectors and Developers Association of Canada annual meeting was attended in March and a display promoting Tasmania was attended as part of an Australian display. During the visit ten mining and investment companies were visited in Toronto and Vancouver, some with the Australian delegation and others as a separate Tasmanian initiative.

Nine companies were visited in Brisbane in two days in July.

Articles and information on mineral prospectivity and exploration activities in Tasmania were prepared for various specialist mining journals.

Core library

Funding of \$422,000 was made available in the 1999/2000 Tasmanian State budget for the construction of an extension of the Mornington core library, with a further \$270,000 to be provided in the following financial year for the modernisation of the existing facility.

The work will involve conversion of the existing individual tray method of racking to a pallet system of storage. This change will provide a major improvement in storage efficiency. It will also maximise the capacity of the present site, by allowing the addition of further modules on an as-needed basis.

The work planned for 2000/2001 will involve upgrading of the core inspection facility to contemporary standards and an increase in rock sample archival capacity.

The funding for the project comes at a time when all existing space at the existing and nearby overflow facility will be used when committed core is stored. In addition the planned closure of the Hellyer mine in the second quarter of 2000 will result in a significant influx of core requiring storage.

Petrological laboratory

The lapidary and petrology laboratories provided a total of \$31,721 worth of analyses and services to both Government (\$16,200) and external clients (\$18,955). Most of the external work cannot be otherwise conducted within Tasmania.

The lapidary laboratories prepared 310 standard thin sections and 35 polished thin sections, making a total throughput of 345 samples.

The technical officer for petrological services processed 357 samples by X-Ray Diffraction, including 100 quantitative dust analyses. He also conducted 129 soil and sizing tests and 26 optical asbestos identifications, a total of 512 samples processed, valued at \$24,121. Much of his time was spent preparing samples for, and operating, the XRF for the geochemistry section.

A total of 429 external samples were received for investigation, mostly by X-Ray diffraction. These samples include 104 for the Centre for Ore Deposit Research at the University of Tasmania (CODES SRC), 181 for occupational health clients, eleven construction materials, 117 soils and 120 samples for other paying customers. This external work came from a wide range of external sources, including the HEC, Department of Public Prosecution, and various other Government departments; various mining, mineral processing and mineral exploration companies; and the general public and miscellaneous businesses. CODES also periodically hired photomicrographic equipment. Our forensic studies required some court appearances to give expert witness.

Samples studied include geological materials (construction materials, mineral concentrates, ore samples, rocks, soils, sands, and clays) and anthropogenic materials (including concretes, asbestos sheeting, industrial materials, dusts, etc).

Laboratory maintenance included revision of radiation safety procedures, reprogramming of the XRD, and maintenance of XRD, microscope and lapidary

equipment. The laboratory participated in an international 'round-robin' XRD test program from quantitative analysis.

Industrial mineral enquiries and studies resulted in the preparation of unpublished reports on diamonds in Tasmania. An unpublished report into the mineral potential (platinoids, nickel, copper, gold and other commodities) of the ultramafic complexes of Tasmania is in preparation, as are reports on heavy minerals/beach sands, rare earths and beryllium.

Construction material studies continued, as a part of the Tasmanian alkali-aggregate reactivity research project (TAARRP) in conjunction with the HEC, DIER, Concrete Institute and various companies. Some of the work has been produced as consultant reports, and most of the costs are being covered by individual sponsors. The project is investigating the concretes and aggregates used in major structures (bridges, dams, etc.) in Tasmania, in regard to the form of deterioration known as alkali-aggregate reactivity.

Curatorial work has included the updating of rock collection and storage databases, preparation of displays and posters and supervision of the rock store. A temporary employee produced an inventory of the rock collections, and a computer database was generated for later integration with TIGER and TASROK. A stall was manned at a two-day gem and mineral exhibition.

The catalogue of minerals of Tasmania is being updated and is now substantially complete. The petrologist is preparing a field trip around Tasmania for an international museums conference in 2000. A talk was given on minerals at a local school. Numerous public and commercial enquiries were also handled.

The TASROK database of rock samples is being maintained and upgraded and an abandoned mines database was produced.

Geochemical laboratory

During 1998/1999 the laboratory was staffed by a senior chemist, and a technical officer. A geologist/geochemist and a technical officer provided part time assistance. A client of the Commonwealth Rehabilitation Service spent three months training as a laboratory assistant.

The laboratory supplies analyses necessary to maintain MRT databases. A total of 807 samples for 16,119 individual determinations were submitted for analysis during the year. This included 257 water samples, 323 rock samples and 227 minerals and products. A total of 26,043 separate chemical determinations were recorded, representing an increase of 2,664 determinations from the previous year.

The X-ray fluorescence spectrometer was upgraded in July 1998 at cost of \$80,000. This upgrade included new software and a sample changer, installation and a service. The upgrade represented a considerable saving on the cost of purchasing an equivalent replacement XRS machine. The replacement XRS has a life expectancy of at least eight years.

Further improvements made to the laboratory during the year included:

- Replacement of the compressor supplying air to the pneumatics of the XRS.
- An update of the SpectraAA20 to Windows/SP20 allowing PC control.

On-going activities

Mineral exploration report and exploration performance assessments were carried out as needed, as was preparation of promotional leaflets for Exploration Tender Areas.

Numerous meetings were held with industry and requests for information were answered promptly. Presentations were given to the Tasmanian Minerals Council Exploration Group meetings.

Industrial Minerals, Environment and Tenement Management

This branch is mainly responsible for the investigation and promotion of industrial minerals, including coal and hydrocarbons, the management of mineral tenements, land access issues and environmental control of exploration activity, and the protection of mining heritage.

Strategic Prospectivity Zones

Strategic Prospectivity Zones (SPZ) cover 25 200 km² or 37% of Tasmania. The areas in each SPZ occupied by mining tenements at the end of June 1999 are shown below.

SPZ	Metallic		Non-metallic	
	Area (km ²)	Occupied (%)	Area (km ²)	Occupied (%)
Adamsfield	0.0	0.0	0.0	0.0
Arthur	974.0	88.0	1.6	0.1
Balfour	1583.4	40.5	3.4	0.1
Beaconsfield	19.0	99.9	4.0	21.0
Cape Sorell	545.2	39.4	0.0	0.0
Mount Read	1548.2	21.6	0.0	0.0
North East	2008.6	20.7	110.9	1.1
Zeehan/Waratah	473.4	25.8	0.0	0.0



Petroleum exploration

Seven offshore permits are held for oil and gas exploration in Tasmanian waters. One retention licence (over the Yolla gas field) is held by a consortium headed by Boral Energy Resources Ltd. Efforts are continuing to find a market for the gas in either Tasmania or Victoria.

No exploration wells were drilled or seismic surveys undertaken during the year. Work suspended by joint authority approval during 1998/1999 is expected to be completed during the next financial year.

Permit T/31P was granted to Roma Petroleum Company Pty Ltd and Guinness Peat plc. This was one of two offshore areas in the Sorell Basin, off the west coast of Tasmania, that were released in 1998. Three offshore areas in the western margin of the Bass Basin were gazetted for release in May 1999 with bids closing on 14 October 1999.

Onshore, three exploration licences held by Great South Land Minerals Ltd (GSM) were surrendered and replaced by Special Exploration Licence 13/98. GSM have agreed to an extensive program of work, including expenditure of \$2 million per annum on seismic data collection and follow-up drilling.

Industrial minerals

In the past year two magnesite deposits south of Burnie have been the subject of further resource definition drilling and mine and infrastructure planning.

The Arthur River–Lyons River deposits are held by Crest Magnesium NL. A measured resource of 13 million tonnes of 43.9% magnesium oxide was identified in recent drilling. Mine and infrastructure planning have continued during the past year. A proposed rail route has been identified from the mine site and planning for the development of a gas pipeline from Victoria to Bell Bay is underway. Crest have applied for a Mining Lease and the preparation of the Development Plan and Environmental Management Plan is proceeding.

Golden Triangle Resources NL have tenements over the Main Creek magnesite deposits to the south of the Savage River mine. Recent drilling has established an indicated resource of 23.76 million tonnes at 44.03% magnesium oxide. This resource is sufficient for 50 years mining at the intended rate of 400 000 tonnes per year. The company has undertaken scoping studies and envisages an underground mine with a minimum of surface disturbance. Golden Triangle announced during the year that a magnesite to magnesium refinery would be built in the Latrobe Valley of Victoria.

Beach sands

The proposal to develop a heavy minerals mine at Naracoopa on King Island stalled when Australian Titanium Minerals went into liquidation. A legal dispute between two major shareholders has delayed the tendering of the project to a number of interested parties.

Coal

During the year there was a major re-arrangement of coal supplies for Tasmania's major industries. Operation ceased at Stanhope following closure of the Merrywood Coal Company Pty Ltd, with the result that the Cornwall Coal Company NL became the sole producer of coal in Tasmania. In contrast to this trend, the Kimbolton Coal Company Pty Ltd was formed to develop a coal resource at Langloh, near Hamilton in Tasmania's southeast. Trial shipments were made to paper producers. A permit application has been made to the Central Highlands Council following the drafting of an Environmental Management Plan, although approval has been delayed by a planning appeal.

Mining dams

With the repeal of the *Mines Inspection Act* 1968 dam approval has reverted to the Rivers and Water Supply Commission. Recommendations were made to the Commission to approve construction of a tailings dam at Beaconsfield, and for the raising of tailings dams at Henty, Pasmenco Rosebery, Renison Bell and Mount

Lyell at Princess Creek. Work on these dams was subsequently completed during the year.

Town planning

MRT has continued its activity with planning issues in respect to quarrying and extractive industries. Land use conflicts caused by residential encroachment close to existing operations continue to be a cause of concern. The Division of Environment and Planning has been developing a Model Planning Scheme framework that should result in uniform and sustainable planning decisions being made and greater certainty being provided for the community and industry.

Legal action over the Howrah Hills Local Area Plan in the City of Clarence has resolved outstanding issues over subdivisions near the Mornington quarry. Hobart Blue Metals Industries, the new operator on the site, has reduced the intensity of the operation considerably and planning applications have been made to redevelop the remaining areas of the property for a central waste transfer facility for the City of Clarence.

Representations were made to the Sorell Council to prevent a subdivision adjacent to a gravel pit near Copping. Objections were lodged with the Central Highlands Council against a proposed sub-division close to the proposed Kimbolton coal mine.

Environmental management

The environmental monitoring of exploration programs continued with diligence and attention to detail. Regular field visits were made to ensure exploration work was being conducted in an environmentally responsible manner and that rehabilitation of past sites was successful.

The fourth edition of the *Mineral Exploration Code of Practice* was completed during the year in preparation for gazetting as a code under the *Mineral Resources Development Act 1995*. The Code will then have legislative backing in common with similar Codes. The fourth edition includes reference to matters raised during the formulation of the Regional Forest Agreement. In particular new sections address issues such as biodiversity, geoconservation and the protection of wilderness values. Comments were sought from a wide cross section of industry, government and community organisation, with useful suggestions from this process being incorporated into the fourth edition.

The Regional Forest Agreement resulted in a need to formalise and record the approvals process and monitoring activities undertaken by Mineral Resources Tasmania in its administration of the environmental effects of on-ground exploration. Work is in progress to develop a system to record the exploration work approvals process to ensure compliance with the *Mineral Exploration Code of Practice*. It is intended that this new auditing system will be in use during 1999/2000.

Expert evidence on the environmental management of exploration was presented to the Resource Planning and Development Commission Inquiry into Regional Forest Agreement reserves.

Quarry Code of Practice

This Code, originally published in 1994, was redrafted following the reconvening of industry groups and regulators. Following public exhibition the code was adopted and published. The lead agency involved in updating the Code was the Department of Primary Industries, Water and Environment, with the Crushed Stone Association of Australia (Tasmania) Inc., the Tasmanian Minerals Council, Forestry Tasmania, the Local Government Association and MRT being the principal organisations involved in the draft.

King Island

The King Island Council is preparing management and rehabilitation plans in conjunction with MRT for their pits at Reekara and Pearshape where problems have been observed with acid drainage.

RiverWorks Remediation Program

John Miedecke and Partners Pty Ltd have been investigating a remediation strategy for the abandoned mine sites at Storys Creek and Rossarden. The major problems at these former mine sites are the diffuse emissions of acid and zinc into Storys and Aberfoyle Creeks, which drain into the South Esk River. Demonstration trials were completed during the year to evaluate the effectiveness of limestone additions to Storys Creek and its banks, in an attempt to generate sufficient alkalinity to neutralise acid generation and reduce diffuse zinc emissions.

The Commonwealth Government contributed funding for the consultant through the RiverWorks program, with the Department of Primary Industries, Water and Environment providing laboratory analyses and MRT providing project management. Two point sources of contamination have been identified as seepage from the precipitate dam on the banks of Storys Creek and an exploration adit nearby. Removal of the dam contents to a secure location and the sealing of the adit were projects identified to be carried out in 1999/2000. These works will be funded by the Rehabilitation of Mining Lands Trust Fund and RiverWorks.

Zeehan rehabilitation

Investigation continued into rehabilitation plans for abandoned mines in the Zeehan area. The Queen Hill area has been identified as the principal source of zinc emissions into the Little Henty River, with about half of the zinc in the river immediately downstream being emitted into Silver Lead Creek in the vicinity of Queen Hill. MRT's consultant, Earth Systems Pty Ltd, has conducted trials with a mill producing a limestone slurry for alkalinity additions to the creek. Significant increases of pH have been recorded over two kilometres of Silver Lead Creek and the Zeehan Rivulet. The Rehabilitation of Mining Lands Trust Fund paid for the work.

Mining heritage

MRT chairs the Mining Heritage Committee (MHC) with members from the mining industry, the Queen Victoria Museum and Art Gallery, Department of Primary Industries, Water and Environment, and Forestry Tasmania. The MHC advises MRT on mining heritage policy and on specific issues affecting Tasmania's rich mining heritage.

During the past year MRT commissioned archaeological reports on:

- the Godkin mine near Luina;
- alluvial mining along Middleton Creek near Corinna;
- hard rock and alluvial mining immediately west of Bridport;
- the Queen Hill area west of Zeehan;
- Kenworthy's shed at Mt Bischoff;
- the magazine buildings at Mt Lyell;
- the Commonwealth shed and compressor at Mt Bischoff; and
- the Hellyer mine.

Registry Section

The Registry Section maintains a number of registers and databases, and provides advice to officers within MRT, inquirers from other agencies, the mining industry, the legal profession and the general public on a wide range of matters associated with mining tenements and legislation.

The processing of applications for mining tenements and issue of tenement documentation continues to provide the majority of work for the section's officers.

Close liaison is maintained with officers of the Geological Survey, particularly in relation to maintenance of the TASXPLORE database, monitoring of exploration expenditure, circulation of company reports, and preparation and circulation of the *TasXplorer* news sheet.

Seventeen Exploration Tender Areas were offered to potential explorers by way of the *TasXplorer* news sheet, which is circulated widely within the Australian mining community.

Officers of the section have provided input into development of modules of the TIGER project, particularly the upgrading of TASXPLORE and design of the REGIS data base.

Mining Legislation

The *Mineral Resources Development Act* 1995 came into force on 1 July 1996.

Although industry feedback and support of the Act has been positive, an internal agency working committee has proposed a small number of amendments to the Act and Regulations which are believed to be appropriate after three years of operation of the Act.

Mineral Resources Tasmania is also undertaking a review of the Act in relation to National Competition Policy and imposes on business arising out of the legislation. A review panel, consisting of industry representatives and government, has met on several occasions to produce an issues paper which will form the basis of a Regulatory Impact Statement for public circulation.

The Registrar of Mines is a member of the ANZMEC Minerals Legislation subcommittee, which meets on a regular basis. The subcommittee has produced a number of papers including model mining legislation for the Australian States and interstate comparisons in a number of areas. The subcommittee's reports are produced as a planning tool for the various State mining agencies.

Mineral Resources Tasmania provides information through Service Tasmania outlets and forms approved under the Act are available via the agency's web page or direct from the agency on disc.

Mining Tribunal

Under the *Mineral Resources Development Act* 1995 a Mining Tribunal consisting of a magistrate has coverage of all Tasmania. Magistrate Michael Hill has acted as the Mining Tribunal since proclamation of the Act.

The Act places an obligation on the Director of Mines to attempt to resolve disputes before there is a formal hearing before the Tribunal. In effect this usually consists of an informal meeting between the parties arranged by the Registrar of Mines.

Experience to date suggests that the dispute resolution process required by the Act adequately covers most situations that would otherwise require formal determination.

To date there have been no matters that have proceeded to formal hearing before the Mining Tribunal although the Tribunal has formally ratified agreements reached during dispute resolution.

Tribunal matters dealt with by MRT or referred to the Mining Tribunal during the year were:

74087 *C & S Strong and J Morrison v Anglo Australian Resources Ltd* — ELA 2/98

Landowners within an exploration licence application area at Lilydale lodged objections to the application. Meetings have been held with the objectors and certain agreements reached. Follow up requests were forwarded to the explorer

who responded direct to objectors. Formal withdrawal of the objection has not been received to date.

74089 *Club Tarkine Inc v Cobra Resources NL — ELA 12/98*

Objection lodged by an association that carries out tourist related activities within the application area. Objection withdrawn after a meeting convened by Registrar of Mines.

74090 *Lloyd Foyster v Australian Titanium Minerals Ltd — 1673P/M & other tenements*

Matter lodged with Mining Tribunal in regard to applicant's claim that he had an interest in tenements owned by Australian Titanium Minerals Ltd at King Island. Not resolved to date.

74092 *Alfred Buchinger & others v P W Bardenhagen — ELA 22/98*

Objection lodged by persons owning land within the application area. Application amended by agreement to exclude private land and sensitive areas. Objections have been withdrawn.

74093 *William Thomas v Sirocco Resources NL — ELA 25/98*

Objection lodged by owner of land in vicinity of application area. Objection withdrawn on understanding that local residents would be briefed on exploration program.

Lease Applications, 1998/1999

Total number of all types of exploration rights held as at 30 June 1999:

<i>Mining Tenement</i>	<i>Number</i>	<i>Area</i>
Exploration Licences —		
All minerals	114	8 878 km ²
Non metallic	9	77 km ²
Oil (onshore)	1	30 356 km ²
Retention Licences —		
All minerals	13	232 km ²
Non metallic minerals	16	62 km ²
Prospectors Licences Issued	76	Not applicable
Permits to explore for Petroleum under <i>Petroleum (Submerged Lands) Act 1967</i>	6	469 Blocks
Retention Licence under <i>Petroleum (Submerged Lands) Act 1967</i>	1	9 Blocks

Leases applied for:

<i>Product</i>	<i>Number</i>	<i>Area (ha)</i>
All minerals and stone	1	25
Coal	3	860
Dolomite	2	101
Gold	1	2
Gravel	15	232
Magnesite	2	715
Magnetite	1	55
Ochre	1	15
Sand	2	22
Sand and gravel	1	17
Sand and stone	1	22
Sandstone	1	4
Specimens	1	5
Stone	10	70
Stone and gravel	2	49
Tin	2	139
Umber	1	6
Total	47	2339

Leases granted:	<i>Product</i>	<i>Number</i>	<i>Area (ha)</i>
	All minerals	1	50
	Coal	2	200
	Dolerite	1	40
	Dolomite	1	131
	Gold	2	556
	Gravel	15	141
	Magnesite	1	520
	Magnetite	1	55
	Ochre	1	15
	Sand	3	50
	Specimens	1	5
	Stone	6	88
	Stone and gravel	1	9
	Tin	1	75
	Umber	1	6
	Total	38	1941

Total number of leases in force at 30 June 1999	<i>Principal product</i>	<i>Number</i>	<i>Area (ha)</i>	<i>Sluiceways</i>
	All minerals	32	19 020	
	All minerals and stone	3	155	
	Clay	6	87	
	Coal	11	7 473	
	Copper	2	8	
	Dolerite	2	42	
	Dolomite	4	238	
	Easements	24	317	17
	Gold	21	1 387	
	Granite	4	50	
	Gravel	168	3 844	
	Gravel and clay	1	29	
	Iron	1	4 067	
	Kaolin	1	346	
	Lime sand	3	207	
	Limestone	11	1 266	
	Magnesite	2	715	
	Magnetite	1	55	
	Ochre	1	15	
	Peat	5	858	
	Quartzite	1	191	
	Sand	54	2 001	
	Sand and gravel	25	1 574	
	Sand and stone	8	176	
	Sandstone	7	54	
	Shale	4	39	
	Silica	6	454	
	Silica, sand and stone	1	50	
	Silica sand	2	31	
	Silver and lead	1	8	
	Slate	4	185	
	Specimens	3	13	
	Stone	252	6 062	
	Stone and gravel	13	494	
	Tin	14	1 172	
	Umber	1	6	
	Total	700	52 705	17

Engineering Geology and Groundwater

During 1998/1999 the section consisted of three permanent staff, a chief geologist, senior geologist and a geologist. A project geologist undertaking a Natural Heritage Trust (NHT) funded project on soil salinity was employed for the whole year. A second project geologist was appointed towards the end of the year to undertake a groundwater resource study in the Northern Midlands–Fingal Valley area, a region subject to drought conditions. This project is being funded by the Commonwealth under the Rural Adjustment Scheme and is a combined project with the Department of Primary Industries, Water and Environment which is examining soil and surface water issues.

A further NHT project was approved for funding during the year. This will examine the affect of waste disposal facilities on groundwater quality and develop guidelines for geologically related criteria for siting such facilities.

The consultant assessing sand resources in the Hobart area completed the project in the current year and a report was issued. The project geologist who began mapping the Hobart 1:25 000 scale map sheet in the 1997/1998 year completed the area and has since commenced work on the Richmond map sheet. These maps will be invaluable in assessing landslip risk and other problems related to engineering geology.

Major projects undertaken by the section included:

- completion of the study of land stability along the North West Coast;
- groundwater assessment of the Sorell quadrangle;
- collection of groundwater data from various regions around Tasmania;
- the NHT funded soil salinity project, and;
- he sand resource study for the Hobart region.

Enquiries from other agencies, local government and the public regarding groundwater and engineering geology continued to be received and dealt with in large numbers (estimated 1000-1500 for the year). Other activities included the monitoring of the Rosetta landslide, a study of stability problems at Tarooma, and monitoring groundwater regionally around the State and locally in areas where groundwater use is significant. Monitoring of landslides in northern Tasmania continued to be undertaken by a private surveyor.

Other sections within MRT provide important inputs into the work of the section.

Engineering geology

Land stability continues to be one of the more important aspects of the work of the section.

The final three 1:25 000 scale land stability maps covering the North West Coast were completed during the year. These sheets cover the area from Burnie to Smithton and complete the available coverage from Northdown (east of Devonport) to Smithton.

The maps show areas of recent landslip activity, areas of old landslips and steep areas which may be landslip prone. They provide broad scale information for planners, developers and property owners and are particularly useful for regional planning. Although they give an indication of stability conditions on a local scale, the maps do not remove the need for site-specific stability studies.

A study to examine stability conditions in the Tarooma area commenced. The highway has been affected by settlement over a long period and slumps have occurred along the shoreline, again over an extended period. Geological and geomorphological mapping has been undertaken and drillholes with inclinometer casing have been established at three locations. The aim of the study is to define the area subject to movement.

A contract surveyor has continued to survey active and recently active landslip areas in northern Tasmania where property and transport routes are threatened.

Although the Rosetta landslip appears to have largely stabilised over the last few years, monitoring of groundwater levels in bores in and around the slip continues and technical advice on the landslip is provided at regular meetings with the Glenorchy City Council.

Advice on landslide risk is a common request from the public and local government, and field inspections have been made in the Huon, Hobart, Lower Midlands, North West Coast and Tamar regions to service these requests. A large number of enquiries were also answered from office-based studies by telephone contact.

Groundwater

The study of groundwater resources in the Sorell quadrangle continued. Compilation of water quality, bore hole information and preparation of a groundwater map was completed for final preparation by the Data Management. Areas where there is considerable use of groundwater include Dodges Ferry–Carlton, where there is no reticulated water supply, and the Pawleena Road area near Sorell. Quality in both areas is not yet generally good enough for use as a drinking supply but a range of other uses are possible. A regional monitoring bore at Pawleena Road has shown a decline in water level with time. Monitoring at other locations within the valley has commenced to determine whether the decline is local or more widespread.

The NHT funded project dealing with soil salinity problems is primarily concerned with examining groundwater conditions in an affected area. Five areas have been selected for detailed study at this stage and piezometers have been established so that water levels and quality can be monitored. The selected areas are widespread, being located at Cambridge (university property), Tunbridge, Cressy, Cape Portland and Little Swanport. The possibility of including a small catchment at Hamilton is being considered. A further area at Richmond has been selected for study by an honours student from the University of Tasmania and MRT has been involved with this study in the form of piezometer installation and water analysis. This will be a valuable addition to the NHT funded project. Detailed geological mapping of each area is required; this information, combined with piezometer data, will allow the hydrogeological settings for these areas to be determined.

Collection and compilation of groundwater data for the Rural Adjustment Scheme-funded drought prone area project commenced during the latter part of the year. The aim of this project is to indicate areas which are prospective for small irrigation quantities of groundwater which will supplement surface water supplies in times of drought. Some 300 records of bores or attempts to obtain groundwater in and around the area are available. The project will include the drilling of some twelve to fifteen additional holes in areas where larger groundwater outputs are regarded as possible. These will be sited using a range of data including geological (lithological and structural), geophysical, geomorphological and Landsat imagery as well as information from previous drilling.

Collection and compilation of groundwater data, largely from contract drilling in northern Tasmania, continued. This information will be applied to the production of 1:250 000 scale groundwater maps which will provide broad information on groundwater prospectivity and quality. Some information on vulnerability to pollution will also be provided from this study.

Monitoring of some 30 bores around Tasmania continued, with water levels being measured and recorded by data loggers and samples from each site being collected twice yearly for analysis. Bores established in the Devonport–Port Sorell–Sassafrass region, an area of high groundwater use, has been monitored for some fifteen years. In general recharge continues to replace groundwater used during the summer period for cash crop production and pasture growth.

Groundwater quality protection is an important function of the section. The program of limiting disposal of sewage and other waste water to inland streams and to the sea has resulted in a rapid increase of proposals to use the waste water for land irrigation. The effects on groundwater quality needs to be considered for these proposals. Comments have been made on several proposed refuse disposal sites and their possible effects on groundwater quality at various locations around Tasmania. Consultants investigating possible pollution from a large number of sites (often petrol stations) have been supplied with groundwater data in the surrounding areas.

A large number of telephone enquiries regarding groundwater prospects and protection were received from the public, local government and other agencies.

Hobart area sand resource study

This project was completed during the year. This study was initiated as a result of concern that resources on some of the sand mining leases would be worked out in a few years (in the range of 4–8 years) and that new areas needed to be defined for sand extraction in the future. Cement production is the biggest user of sand in the region.

The study involved drilling, test pitting and surface mapping to assess sand resources at a number of locations, including current leases. The study found that the indicated resources of sand on some current leases was larger than previously suggested. It also identified significant resources at a number of locations not under lease, including Carlton, Buckland, Brown Mountain near Campania, Pitt Water and Huonville (gravel around the Huon River).

All of these indicated resources are subject to quality testing for particular uses but preliminary information suggests that these resources are often similar to material currently being used. Sieve analyses were conducted on several hundred samples and examples of most of the materials excavated at the various sites are available for inspection at the MRT core store.

General

Over one thousand phone enquiries, dealing mainly with groundwater, groundwater protection and engineering geology (mainly land stability), were received during the year.

Mineral water continues to be a subject of enquiry and possible sources have been suggested.

Staff members have attended meetings and conferences dealing with land stability, groundwater protection and other groundwater issues during the year. Most have been within Tasmania but interstate meetings included the AWWA conference in Adelaide, Landslide Management Course at Mt Macedon and the National Groundwater Committee meeting in Sydney.

Publications prepared during the year included the *Sand Resources of the Hobart Region* and the Landslip Study Maps for the North West Coast.

GIS and Geophysics

This section is responsible for implementing Project TIGER, providing geophysical services and advice to MRT and our clients, providing computer support for MRT and ensuring that MRT's critical systems are not affected by the transition to Year 2000.

The staffing of the GIS and Geophysics section was stable throughout the year following the appointment of a Computer Systems Officer Level 1 in July. There were three permanent staff in the GIS group, predominantly involved with the implementation of project TIGER Phase 3, two Computer Systems Officers, two temporary staff capturing historical data for metadata indexes and the section manager, who is also responsible for geophysical activities.

The main projects of the GIS and Geophysics section during the year were:

- ❑ developing and implementing Project TIGER (Tasmanian Information on Geoscience and Exploration Resources) Phase 3;
- ❑ completing of back capture of metadata for MRT reports and publications (DOMINFO);
- ❑ completing of back capture of the spatial index for TASXPLORE reports;
- ❑ developing and implementing a Year 2000 plan for MRT;
- ❑ installing a new PC file server and mail system;
- ❑ participating in the development of a common format for the digital lodgement of exploration data and reports throughout Australia;
- ❑ precise levelling and indexing aeromagnetic data sets.

Data capture

Entry of open file stream-sediment geochemistry into databases continued from 1998. Data were mainly from the northwestern region of Tasmania covering the Mawbanna, Holder, Tayatea, Milabena, Folly, Dempster and Picton 1:25 000 scale sheets.

To date a total of 36,623 stream-sediment samples have been recorded, representing a total of 253,500 analyses.

The entire TASED dataset was checked for data consistency with respect to analytical data and corresponding detection limits.

Over 4300 company reports have been entered into the TASXPLORE spatial index of exploration activity, representing all open, closed and restricted file company reports held by MRT. This concludes the back-capture of TASXPLORE data. New incoming company reports are spatially indexed and appended to the dataset as they are received.

Over 4600 technical reports have been indexed in the DOMINFO dataset. This includes all unpublished technical reports held by MRT. Back capture of DOMINFO data has been completed and the index is being maintained as new reports are produced.

Project TIGER

The development of Project TIGER Phase 3 continued during 1998/1999. Redevelopment of the TASXPLORE, PETXPLORE and DOMINFO document indexes has been completed and MRT staff now have an easy to use graphical interface for updating and searching information on exploration and mining company reports, offshore petroleum exploration reports and MRT technical reports. Document index queries can be requested and the results quickly forwarded by post or fax from the TIGER reporting system.

Redevelopment of the tenement management system (REGIS) is in progress and due for completion by October 1999. REGIS will include many new features for monitoring bonds, exploration licence transfers and incorporation of the spatial representation of tenements.

The advanced technology used for the TIGER data management system is initiating revision and improvement of many work practices. Easy access to data using well designed applications is reducing the complexity of data entry and increasing data quality.

IT summary

The transfer of MRT from Tasmania Development and Resources to the Department of Infrastructure, Energy and Resources raised a number of problems relating to the ownership of hardware and software. These problems have been resolved but required MRT to increase the number of licences it held for a variety of desktop and network software. The opportunity was taken at this time to assess the software and hardware used by MRT and to make changes to new products where

the needs of the division were not being adequately met by existing resources. An intranet server was configured to replace the facility previously hosted under Lotus NOTES.

The standard desktop configuration for MRT staff is now a Year 2000 compliant PC running Windows NT and Microsoft Office 97. The corporate mail system has been changed from Lotus NOTES to Microsoft Exchange. Specialised applications are then installed on individual desktop systems to accommodate the requirements of each user. The PC network server hardware and software were upgraded early in 1998/1999 and a number of specialist applications to make system and user maintenance easier and more reliable have been installed. A CD writer was purchased to allow reliable writing of compact discs in all formats (including Unix compatible) required to meet the needs of MRT's clients.

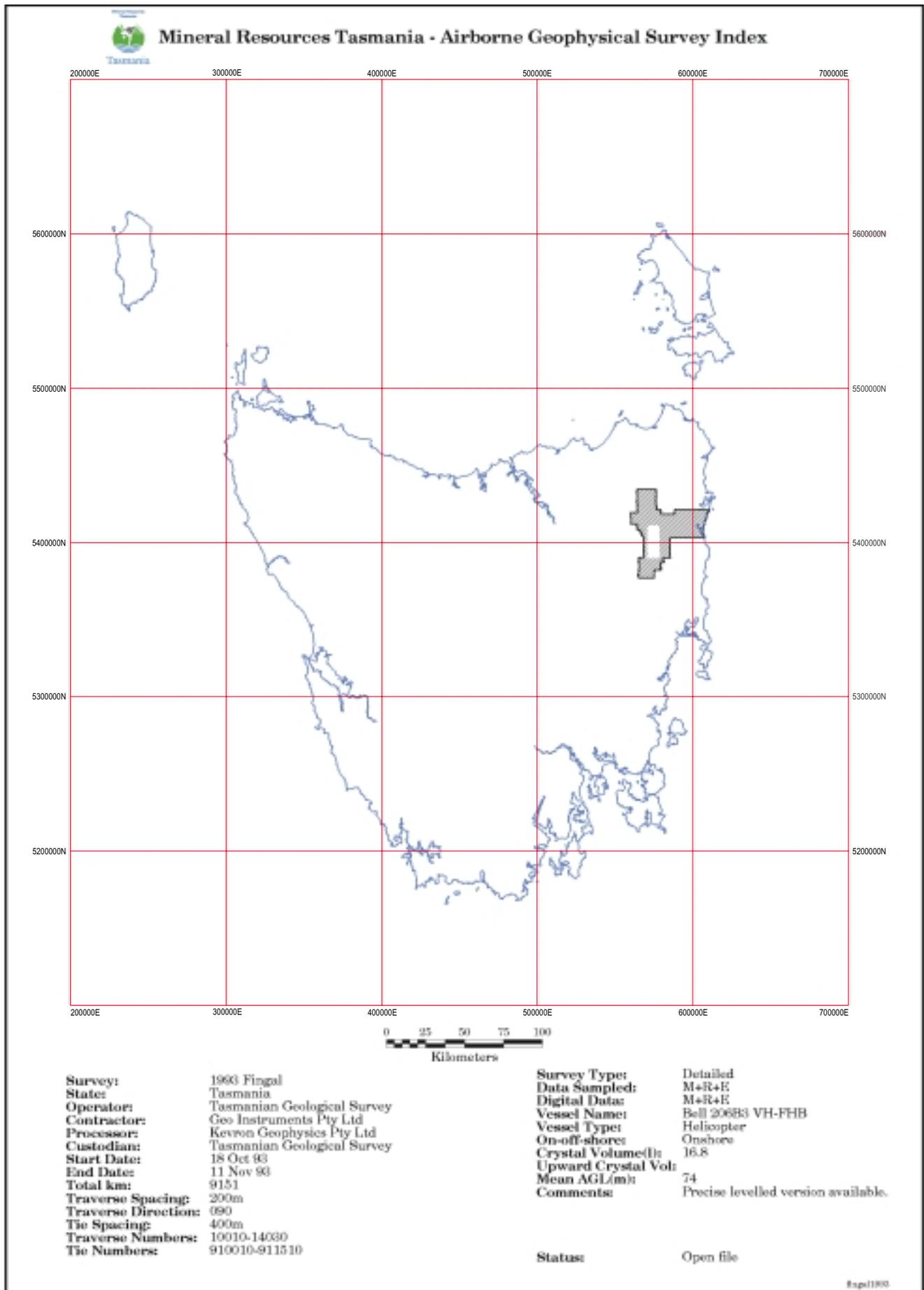
As a consequence of the requirements of Project TIGER, one of the Unix workstations has been dedicated to running the Oracle database system that will be used for storing spatial, textual and image data for use by both PC and Unix-based applications. There has been an increase in high-speed disk storage on the Oracle server and a number of ArcView licences have been transferred from Unix to a PC-based environment.

Year 2000

MRT responded to the potential impact of changes associated with Year 2000 on information technology early in the 1998 calendar year. Equipment purchases since that time have included checking for Year 2000 (Y2K) compliance and, where possible, selection of equipment that allows firmware upgrades if Y2K 'bugs' are discovered. MRT is a member of the DIER Y2K Project Team and also reports on the status of two key divisional activities as part of the government's program of public disclosure of Y2K readiness. A divisional risk minimisation plan, identifying infrastructure, information technology, and activity-related risks as well as Y2K related risks, has been accepted by the Executive Director, Mineral Resources Tasmania. Implementation of measures proposed in this plan commenced in May 1999.

All critical MRT corporate applications were examined for possible adverse Y2K impacts, changes were made where necessary and then total system testing was carried out. All applications tested passed the tests successfully. Data held by MRT ranges in age from the 1800s to the present time, so many existing applications were written to accommodate four digit years and the data and application are already Y2K compliant. MRT infrastructure has either been checked against manufacturer's compliance statements where these are available or tested for adverse Y2K impact. The only items that are not Y2K compliant are three telephones. The MRT supply chain has also been examined and critical dependencies identified to allow contingency plans to be prepared.

There are a number of applications developed by individuals within MRT that hold MRT corporate data. Testing of data sets for the most common applications (Microsoft Access and Excel) commenced in May with testing of all the data sets of this type held on the divisional PC server. Individual desktop PCs are also being examined to test the data and applications held on them and to ensure that the operating system and standard corporate applications are at the latest patch level and Y2K compliant. As part of the implementation of project TIGER Phase 3 a number of databases that are currently not Y2K compliant will be transferred to Y2K compliant applications.



Geophysics

Indexing of airborne geophysical data sets, and precise levelling where required, has continued throughout the year. A total of 83 data sets have now been completed and index sheets (see example) prepared. Where levelling has been carried out data sets are supplied to clients in both original and levelled form.

As part of the National Geoscience Mapping Accord, the Australian Geological Survey Organisation flew two areas in Central Tasmania early in 1999. The first area was from the north coast to near Perth and the other was from near Melton Mowbray to near Ross. Aeromagnetic, radiometric and digital terrain data were acquired along east-west lines spaced 200 metres apart and the processed data are scheduled for release in August 1999.

During the year the Government Geologists Information Policy Advisory Committee, of which MRT is a member, developed guidelines for the digital lodgement of mineral exploration reports and data with the relevant authorities throughout Australia. A variety of standard formats are available for many data types and a set of templates, which can be created using a customised application, have been developed for drill collar, drilling, geochemistry and related data types.

Data Management

The role of Data Management includes:

- the recording of mining tenements on the Division's maps and plans;
- the management of the Division's Geographical Information System and Computer Aided Drafting system; and
- the provision of support drafting services.

The Tasmanian Regional Forest Agreement (RFA) resulted in a need to formalise and record the approvals process and monitoring activities undertaken by MRT in its administration of on-ground exploration. The section is using MRT's GIS to develop this information system, which includes links to a database of photographic images recording exploration activity.

The introduction of a new high resolution (600 dpi) plotter resulted in the redevelopment of GIS shadesets and output programs for output products.

During 1998/1999 the capture of geological data continued, resulting in:

- The completion of seven 1:25 000 scale digital geological maps in western Tasmania (Mawbanna, Milabena, Folly, Tayatea, Holder, Dempster and Cethana);
- The completion of one 1:25 000 scale digital geological map in southern Tasmania (Picton);
- The completion of one 1:25 000 scale digital geological map in northeast Tasmania (Monarch).

The 1:250 000 digital geology was generalised and used to produce a new 1:500 000 scale map of the geology of Tasmania. The 'generalisation' process uses ArcInfo commands to erase, amalgamate and simplify the 1:250 000 scale data for output at the smaller scale.

Three 1:25 000 scale maps for the Engineering Geology Land Stability Hazard Mapping Project were completed in northwest Tasmania (Wynyard/Calder, Rocky Cape/Mawbanna and Stanley/Smithton).

Work commenced on capturing data for the Sorell groundwater resource mapping project.

Twenty-four sets of geological or tenement data were produced for clients. During the year tenement data was made available as free download from the MRT web site. This data is updated on a weekly basis.

CAD continues to be used as a support tool for many projects, with 72 maps and plans and 223 tenement diagrams being produced throughout the year.

Output maps of digital geological data were produced on demand using the Agency's inkjet plotters.

Publications

The Publications Section is responsible for the production of geological reports, promotional books, newsletters and material for displays, Exploration Tender Area flyers, maintenance of the MRT Internet site, and other reports and leaflets as required. Major publications produced during the year included:

- The Mineral Resources Tasmania *Annual Review*;
- Fourth Edition of the *Mineral Exploration Code of Practice*;
- *Mineral Exploration Opportunities in Tasmania — A summary of opportunities for mineral exploration and mineral resource development in Tasmania*;
- Two issues of the *ProspecTas* newsletter were issued during the year.

Reports issued in the *Tasmanian Geological Survey Record* series included:

- 1993/28 — *Geological setting and petrochemistry of Eocambrian–Cambrian volcano-sedimentary rock sequences from southeast King Island*, by H. M. Waldron and A. V. Brown;
- 1998/06 — *Rock and gravel resources of King Island — A supplementary report*, by C. R. Calver;
- 1998/07 — *Strategy — The rehabilitation of abandoned mining lands*, by C. A. Bacon;
- 1998/08 — *Vision for Mineral Sector growth — TASGEOL 2005*, by A. V. Brown (report revised as 1999/02);
- 1998/09 — *Diamonds in Tasmania*, by R. S. Bottrill;
- 1999/03 — *A study of the sand resources of southern Tasmania*, by D. McP. Duncan;
- 1999/04 — *Tenement and Cultural Heritage Management at Mineral Resources Tasmania (Revision 1)*, by J. Pemberton and C. A. Bacon.

Library

The library continues to be staffed by a full-time librarian, with assistance being provided two days per week. The Workplace Standards Tasmania collection, although housed in the Rosny Park library, is maintained separately by a part-time temporary librarian. It is expected that this position will be made permanent part-time in the near future.

Work has continued on maintenance and improved access to the collection, particularly the departmental publications, many of which were previously uncatalogued. Two temporary staff have completed indexing all the MRT publications onto the Dominfo database. This has resulted in dramatically improved access to this collection and allows for easy printing of the relevant references.

Technical services

Cataloguing of books and journals onto Inmagic DB/Textworks 3.0 continued during the year. New additions lists were generated and circulated to MRT staff by e-mail.

Collection

The library contains many rare and important books and compilations of historic reports related to the mining industry. Some of these volumes have deteriorated over time and steps have been taken to conserve them in their original state where possible. This conservation has been done by a professional book binder.

Unfortunately, with a general increase in the new subscription prices for journals and a weakening of the Australian dollar against the U.S. dollar, ten journal subscriptions (costing approximately \$6,000) were cancelled.

Despite financial restrictions 23 books were purchased during the year.

Mineral Sector Overview

There were further major changes in Tasmania's metalliferous mining and processing industry during 1998/1999, with most developments signalling the robustness and future success of the industry.

Western Metals Resources Limited mounted a successful takeover of Aberfoyle Limited and now operates the Hellyer base metal mine. The mine is due for shutdown in 2000, but the operators are investigating reprocessing the Hellyer and Que River mines tailings, which comprise 11 million tonnes grading 3% zinc and 2.7 grams per tonne gold.

The Mt Lyell Mining Company Limited, the parent company of Copper Mines of Tasmania (CMT), was put into administration late in 1998. Subsequently CMT was purchased by an associate company of Sterlite, an Indian telecommunications cable maker. The Mt Lyell operation now supplies copper concentrate exclusively to Sterlite's smelter.

The Renison tin mine was sold to Murchison United NL on 28 August 1998. The new operators have since reduced costs further with major operational changes and restructuring of the workforce to secure the future of the operation through periods of low world tin prices.

As part of the sale of their manganese operations, BHP sold the TEMCO plant at Bell Bay to the United Kingdom-based company Billiton Plc.

According to Australian Bureau of Statistics (ABS) data, mineral exploration expenditure fell 43% from \$20.7 million in 1997/1998 to \$11.9 million in 1998/1999, with Tasmania's share of national expenditure falling 27% from 1.94% to 1.42%. Falling commodity prices are considered the main cause of the decrease and the declining levels of expenditure experienced in Tasmania were felt throughout the nation, but Tasmania suffered disproportionately.

There is a major discrepancy between the ABS data and Mineral Resources Tasmania figures, with MRT recording a total expenditure on mineral tenements of \$15.5 million, down just 13% from 1997/1998. The reason for the disagreement between the data sets is obscure, but MRT is in contact with the ABS on the matter. Of the MRT data, expenditure on exploration licences in 1998/1999 was \$5.36 million (down 32% from the preceding year) and expenditure on mining leases was \$5.9 million (down 31%). Expenditure on retention licences differed, with an increase of 193% to \$4.28 million, largely reflecting higher levels of expenditure on magnesite exploration.

Despite the decrease in expenditure, several projects reported positive results, with the gold exploration sector being particularly buoyant. Goldfields Exploration Pty Ltd reported new inferred resources at the Zone 15 area and the Mount Julia prospect, south of the main Zone 96 deposit of the Henty gold mine. These resources comprised 233 700 tonnes at 9.2 grams per tonne (g/t) gold and 731 000 tonnes at 7.6 g/t Au respectively. Other significant drill intersections of high-grade gold mineralisation on the Henty mine lease have also been reported by the company. Jervois Mining NL has found promising mineralisation in a program of twelve short diamond drill holes at Narrawa Creek, south of Sheffield, with a best intersection of 24.4 metres at 4.48 g/t Au. Defiance Mining NL, operating in a joint venture with Barmenco Pty Ltd at Mathinna, discovered two new gold reefs in two campaigns of reverse circulation drilling at the former New Golden Gate mine, with ore grade intercepts. Contrary to the general trend in the industry, Defiance was able to raise \$1.22 million through a share and subscription issue for further exploration at Mathinna. There were also positive results from nickel exploration by Allegiance Mining NL at the Avebury prospect west of Zeehan, including intersections of a 50.4 metre wide zone of significant (0.83%) nickel in one hole, with two main zones of 9.7 m at 1.39% Ni and 3.0 m @ 2.29% Ni.

Value of the Tasmanian Mineral Industry

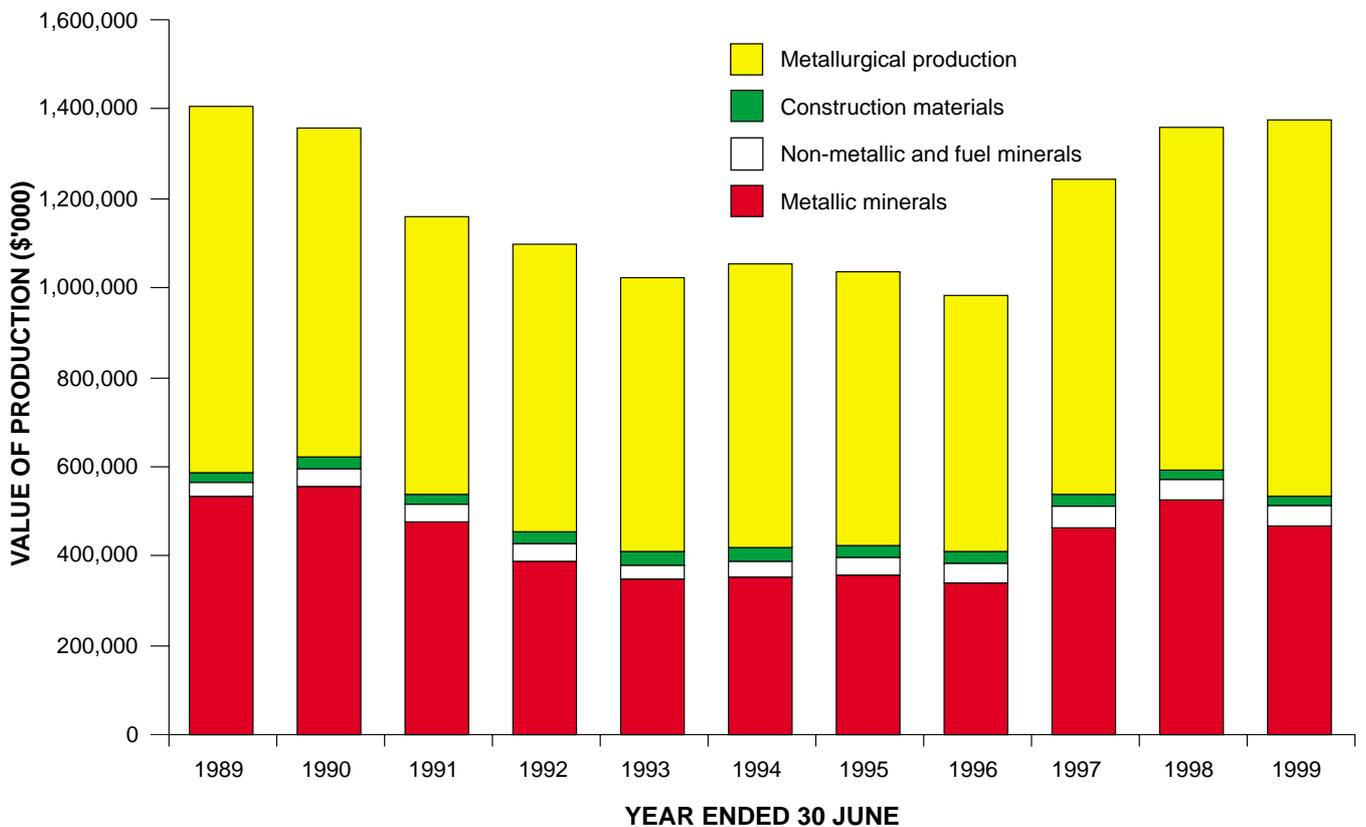
Year ended Commodity	Unit	30 June 1999 Total Quantity	30 June 1998 ¹ Total Quantity	
Metallic minerals				
Cadmium	(tonne)	0	0	
Cobalt oxide	(tonne)	0	0	
Copper (assayed)	(tonne)	19 833	27 698	
Gold (assayed)	(kilogram)	3 635	3 256	
Iron ore pellets	(tonne)	1 816 150	820 841	
Iron (in magnetite)	(tonne)	62 071	55 038	
Lead (assayed)	(tonne)	65 153	57 041	
Molybdenum	(tonne)	0	0	
Pyrite	(tonne)	0	0	
Silicon (metallic or as alloy)	(tonne)	0	0	
Silver (assayed)	(kilogram)	141 836	138 764	
Tin	(tonne)	7 807	9 868	
Tungsten as tungstic oxide	(tonne)	5	5	
Zinc (assayed)	(tonne)	190 676	183 198	
<i>Value of Metallic Minerals</i>		466 987 499	\$524 476 689	
Non-metallic and fuel minerals				
Clay –	Cement	(tonne)	42 897	44 735
	Brick	(tonne)	22 571	26 155
	Other	(tonne)	0	95 579
	Kaolin	(tonne)	9 507	6 742
Dolomite	(tonne)	6 021	6 183	
Limestone –	Agricultural	(tonne)	110 324	108 007
	Cement	(tonne)	1 617 962	1 149 310
	Chemical and metallurgical	(tonne)	47 454	34 886
	Other	(tonne)	67 675	66 230
Silica (glass and other)	(tonne)	118 966	127 044	
Sulphuric acid	(mono tonne)	386 302	270 660	
Coal (run of mine)	(tonne)	563 117	566 720	
Coal (washed)	(tonne)	385 437	380 300	
Peat	(m ³)	510	5 868	
<i>Value of non-metallic and fuel minerals</i>		\$43 628 106	\$45 818 650	
Construction materials				
Building stone –	Freestone	(tonne)	1 159	957
	Granite	(tonne)	0	0
	Other	(tonne)	12 890	1 450
	Sandstone	(tonne)	285	136
Crushed and broken stone –	Basalt	(tonne)	785 390	805 964
	Dolerite	(tonne)	720 764	872 809
	Limestone	(tonne)	21 015	20 606
	Sandstone	(tonne)	10 036	102
	Other	(tonne)	160 796	144 184
	Gravel	(tonne)	60 535	73 510
Sand	(tonne)	384 959	346 369	
Other road materials	(tonne)	1 587 744	1 426 971	
<i>Value of construction materials</i>		\$24 357 789	\$22 280 239	
Total value with Australian metal prices		\$534 973 394	\$592 575 578	
Value added production from Tasmanian and other ores				
Aluminium)			
Cadmium)			
Cement)			
Ferromanganese)	\$841 101 480	\$764 026 640	
Silicomanganese)			
Sinter)			
Superphosphate)			
Zinc)			
Total value of mining and metallurgical production		\$1 376 074 874	\$1 356 602 218	
Reported average number of employees ²		3861	3935	

1. Figures may vary from the 1997/1998 Annual Review because of inclusion of late or amended returns.

2. Not all operators report full details

Value of Production, 1997/1998 and 1998/1999

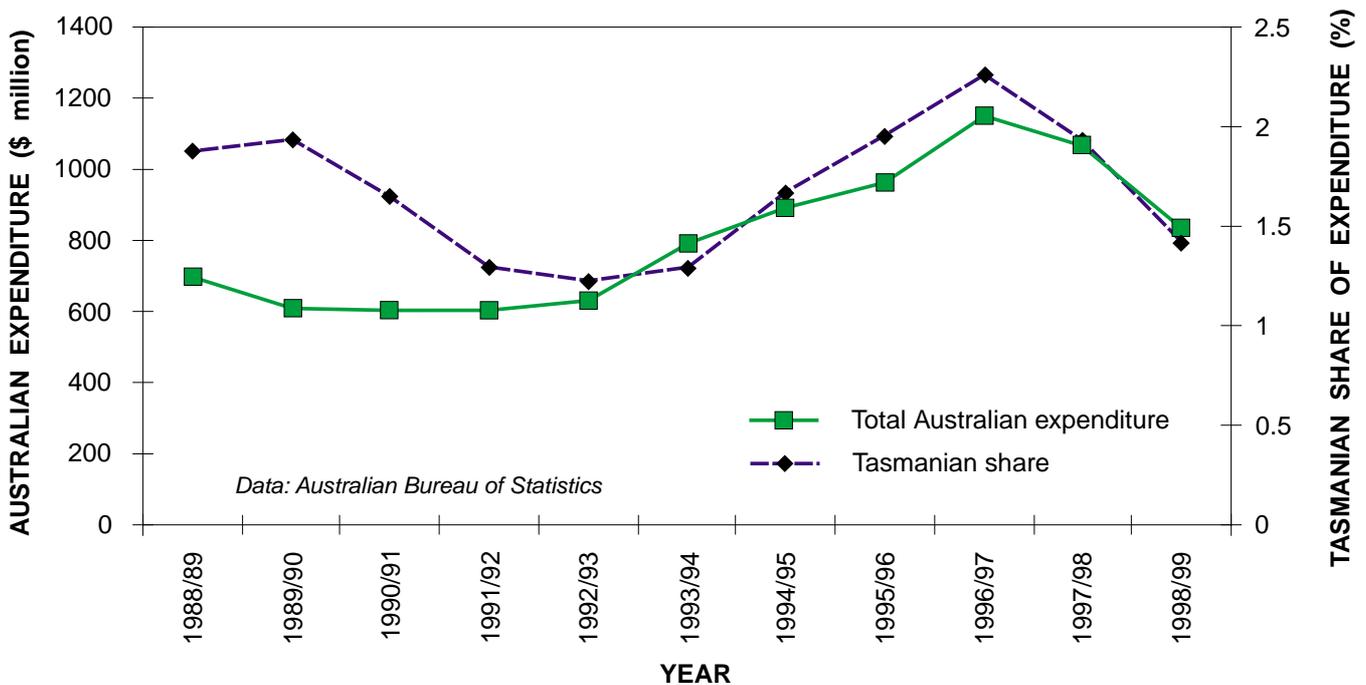
	1997/1998		1998/1999		% Change
	Tonnes	A\$'000	Tonnes	A\$'000	
Gold	3.26	–	3.64	–	+11.7
Silver	139	–	142	–	+2.2
Zinc	183 198	–	190 676	–	+4.1
Copper	27 698	–	19 833	–	-28.4
Lead	57 041	–	65 153	–	+14.2
Tin	9 868	–	7 807	–	-20.9
Tungsten	5	–	5	–	0
Iron ore pellets	820 841	–	1 816 150	–	+121.3
Total metallic minerals	–	524,476	–	466,987	-11.0
Non-metallic and fuel minerals	–	45,818	–	43,628	-4.8
Construction materials	–	22,280	–	24,358	+9.3
Value added production from Tasmanian and foreign ores	–	764,026	–	841,101	+10.1
Value of mining and mineral processing production	–	1,356,602	–	1,376,075	+1.4



Mineral exploration expenditure

Year	Australian Expenditure (\$ Million)	Tasmanian Expenditure (\$ Million)	Tasmania as % of Australian Expenditure
1987/88	802.2	10.4	1.30
1988/89	697.6	13.1	1.88
1989/90	607.5	11.8	1.94
1990/91	601.5	9.9	1.65
1991/92	603.7	7.8	1.29
1992/93	631.7	7.8	1.23
1993/94	792.6	10.2	1.29
1994/95	893.4	14.9	1.67
1995/96	960.2	18.8	1.96
1996/97	1148.6	26.0	2.26
1997/98	1066.8	20.7	1.94
1998/99	837.8	11.9	1.42

Source: Australian Bureau of Statistics — Actual and Expected Private Mineral Exploration, Australia.

**Value of the Mining Industry**

As well as the direct contribution to the Tasmanian economy through infrastructure development and employment, the mining and mineral processing industries also contribute to the State through royalty, taxes and charges paid to the Tasmanian and local governments.

According to figures obtained by Tasmanian Minerals Council surveys, the total value of sales or shipments for 1998/99 was \$1461 million, a 6% increase over the previous year. Total equivalent full time employment on mine sites was 3502 with a gross annual payroll of \$150 million. Government taxes and charges, including royalties, amounted to \$26.3 million, with electricity and port charges adding a further \$115 million. The minerals industry spent a total of \$636 million on goods and services (excluding electricity), of which \$348 million was spent within Tasmania.

Royalty regime

MRT collects royalties and rents and fees from mineral lands, which are forwarded directly to consolidated revenue. In 1998/1999, royalty revenue amounted to \$9.1 million compared to \$8.2 million in 1997/1998. Royalty collections are budgeted at \$10 million for 1999/2000.

In Tasmania a sales and profit-based royalty applies to metallic and coal mines, whilst a production-based royalty is payable on non-metallic materials. The two-tiered metallic and coal royalty consists of an ad valorem percentage payable on net sales, and a formula based percentage of profits.

Following negotiations with the mining industry, new royalty rates were approved by in August 1997, with the new regime taking effect from 1 July 1997. Non-metallic rates increased from \$1.00 per tonne to \$1.20 per tonne, while metallic minerals and coal royalties are being increased incrementally over a number of years.

In 1998/1999 the ad valorem component of royalty was payable at 1.5% of net sales. The exponential factor used to calculate the profit component moved to 0.35% from 0.3%. There are two further increments in rates to occur, with the ad valorem rate to move to 1.6% of net sales in 1999/2000 and the exponential rate to become 0.4% in 2000/2001 and beyond. There is a maximum amount of royalty payable at 5% of net sales.

Mining companies that expand into downstream processing to produce a metal receive an automatic 20% rebate on royalties payable. Companies that produce gold doré receive a 10% rebate on royalties. The Minister has the discretion to increase the gold doré rebate to 20%, depending on criteria such as the level of investment undertaken.

Metal Prices and Future Trends

After substantial falls in 1998, the Australian Bureau of Agricultural and Resource Economics reported that prices for most metals firmed during the first months of 1999, although average prices received by Australian minerals and energy exporters were estimated to have fallen by 5% during 1998/99. The growth in supply of most commodities continued to exceed demand, putting downward pressure on prices.

There are increasing signs from a number of Asian countries that economic growth is rebounding with a resultant increase in demand for metals. Continuing growth in demand in both Europe and North America should also result in improving prices for most commodities in the 1999/2000 financial year. However returns to Australian producers may be affected by the value of the Australian dollar, with any increase in the value eroding increases in metal prices

Expenditure on mineral exploration in Australia fell by 22% in 1998/99, with metallic mineral exploration falling by 27%. It is expected that exploration expenditure will decline further in 1999/2000 in response to high global stock levels, companies rationalising their exploration activities and a fall in the relative attractiveness of Australia for mineral exploration.

Commodity prices

Copper

The fall of copper prices since mid-1997 continued through to March 1999, before some rises occurred towards the end of the financial year. These increases may reflect a perception that the economies of Asian countries may be improving which may lead to an increase in copper consumption. In the short term production continues to exceed consumption, and the resulting high levels of stock should result in copper prices remaining low.

Tin

The improvement in tin prices continued until August 1998 from when it declined to low in January 1999. The price then improved to a new high in May before easing in June.

Aluminium

Aluminium prices continued to decline throughout 1998 although some improvement was evident towards the end of the financial year. World production continues to exceed demand, and increasing stocks will continue to exert downward pressure on prices.

Zinc

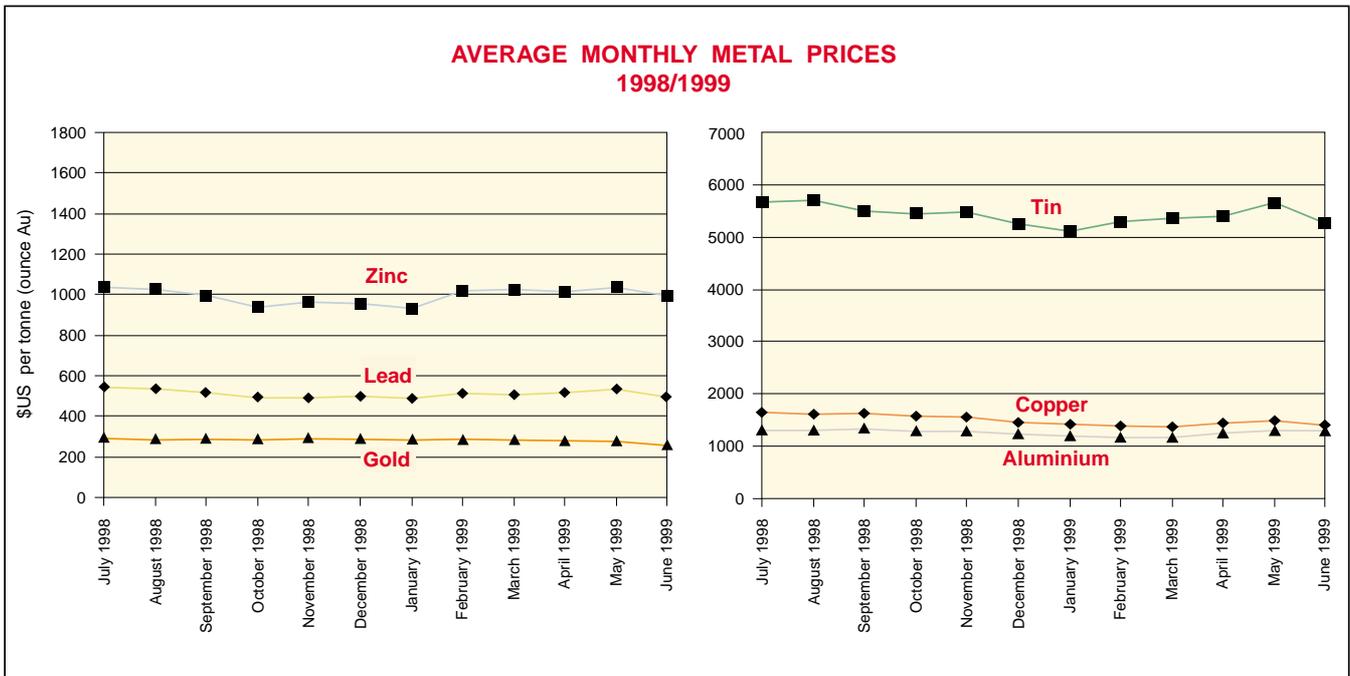
Zinc prices declined in the first half of the financial year, reaching a low point in January 1999. The price recovered in February but remained relatively subdued, despite consumption exceeding supply and a consequent decline in stocks. This resulted in prices moving higher in the first part of the 1999/2000 financial year, with further rises forecast through 1999 and 2000.

Lead

The average lead price fluctuated throughout the year with the price expected to decline throughout 1999 as concentrate and metal supply increase faster than consumption. Strengthening Asian demand for the metal should result in prices rising in 2000.

Gold

Gold prices stabilised for the first six months of the 1998/1999 financial year but strengthening of the Australian dollar against the US dollar caused a further decline in the price in the first six months of 1999. There was some upward movement in prices in the first months of the 1999/2000 financial year. Any further strengthening of the value of the Australian dollar relative to the US dollar may cause gold prices to decline further.



Review of Mineral Sector Operations — Metallic Minerals

BASE METALS

Western Metals Resources Limited — Hellyer Operations

Western Metals Resources Limited mounted a successful takeover of Aberfoyle Limited and now operate the Hellyer base metal mine. The mine is due for shutdown in 2000, but the operators are investigating reprocessing the Hellyer and Que River mines tailings, which comprise 11 million tonnes grading 3% zinc and 2.7 grams per tonne gold.

Mining

A total of 1.5 million tonnes of ore at an average grade of 10.5% Zn, 5.1% Pb, 0.3% Cu, 114 g/t Ag and 2 g/t Au was mined from underground at Hellyer. Waste rock mined totalled 36 000 tonnes.

Nearly all of the ore was recovered from remnants.

Milling

The mill processed a record 1.492 million tonnes of ore, at a headgrade of 9.4% Zn.

Concentrate production was 245 857 tonnes of zinc concentrate at 50.53% Zn, 73 790 tonnes of lead concentrate at 56.66% Pb, 12 639 tonnes of bulk concentrate at 32.04% Zn, 15.54% Pb, and 8999 tonnes of copper-silver concentrate at 13.01% Cu, 4417 g/t Ag.

Concentrate railed to Burnie totalled 360 629 tonnes.

Developments

No major projects were undertaken during the year, except for some pilot plant work for testing the retreatment of the Hellyer tailings.

Ore reserves

At 30 June 1999, the remaining reserves stood at 1.4 million tonnes @ 9.6% Zn, 0.3% Cu, 5.3% Pb, 120 g/t Ag, 2.0 g/t Au.

Exploration

Nine drill holes tested for remnants and voids and eight drill holes targeted new mineralisation.

Employment

The total workforce was 234, including 90 contractors.

Pasminco Mining Rosebery

Mining

Ore production at the Rosebery mine totalled 522 541 tonnes from underground lower levels, 64 289 tonnes from the upper levels, and 19 406 tonnes from the Southern open cut. Most of the ore was extracted from T, J, B and K Lenses. Operations in the open cut ceased in January.

Development activity included 4761 metres geared towards production and 467 metres for the Deep Exploration Project. Operating waste totalled 61 300 tonnes, with the Deep Exploration Project contributing another 32 400 tonnes.

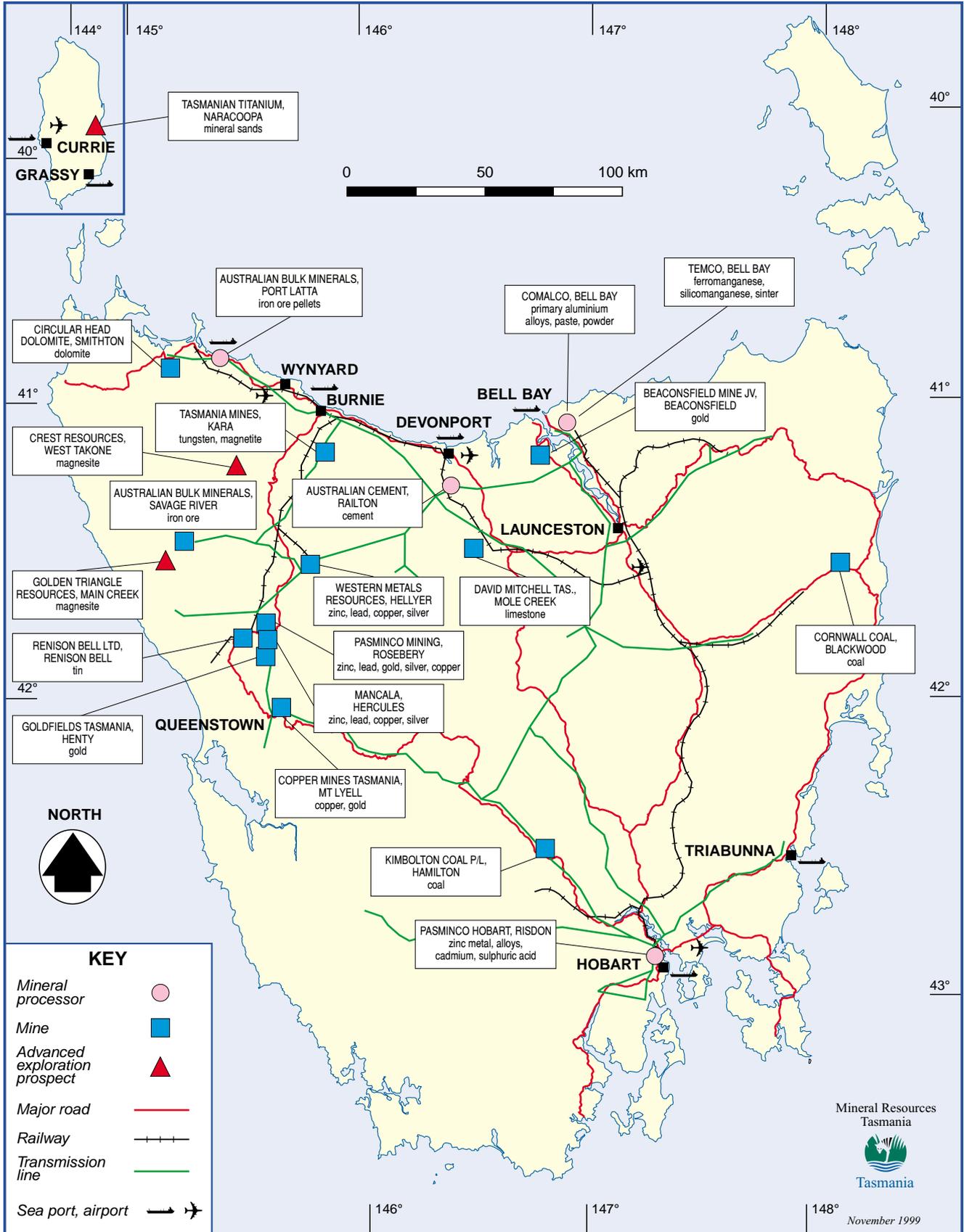
Milling

Tonnage treated, including the Rosebery and Hercules ores, increased by 8.7% to a total of 706 054 tonnes. The ore assayed 11.92% Zn, 3.37% Pb, 0.39% Cu, 105 g/t Ag and 1.47 g/t Au. Gold doré production increased by 47% compared to the previous year, attaining the pre-1997/1998 level. Improvements in process control techniques in the lead flotation circuit metallurgy resulted in a 42% increase in lead concentrate output being achieved with only a 21% increase in head grade.

Tasmania

Major Mining and Mineral Processing Operations

(as at 30 June 1999)



Improvements in lead recovery also resulted in a 53% increase in silver recovery. The reduced lead in the circuit resulted in a cleaner zinc concentrate, as demonstrated by the increase in assay to 55%, while also achieving a modest increase in recovery of 1.5%.

The mill produced and shipped 136 487 tonnes of zinc concentrate (55.08% Zn), 28 056 tonnes of lead concentrate (65.38% Pb, 1410 g/t Ag), 5925 tonnes of copper concentrate (22.73% Cu, 9.19% Pb, 3,291 g/t Ag, 69.6 g/t Au) and 167 kg doré (67% Au, 31% Ag).

Developments

Nearly \$26 million was spent on capital developments, including the Deep Exploration Project, northern upcast shaft, primary crushing unit, and a number of upgrades and replacements of underground equipment.

Ore reserves

The cut-off grades for ore definition were raised by over 30% to better reflect the true cost of production, with a subsequent decrease in the mine's resources. The annual reporting date also changed from 30 June to 31 March.

The mine reserve decreased by 0.327 million tonnes (10%) and the resource decreased by 0.656 million tonnes compared with June 1998. All metal grades are up on the previous year, due to increased cut-off grade and the increasing significance of K Lens.

		<i>tonnes</i> <i>(000's)</i>	<i>Pb</i> <i>(%)</i>	<i>Zn</i> <i>(%)</i>	<i>Cu</i> <i>(%)</i>	<i>Ag</i> <i>(g/t)</i>	<i>Au</i> <i>(g/t)</i>
Rosebery	Proved reserve	1 989	3.8	10.2	0.48	119	2.1
	Probable reserve	1 084	4.2	11.4	0.38	132	3.1
Rosebery	Measured resource	2 319	4.4	11.1	0.54	127	2.3
	Indicated resource	1 226	4.5	12.4	0.42	144	3.3
	Inferred resource	7 470	5.5	15.1	0.31	172	2.2
South Hercules	Indicated resource	520	2.0	3.7	0.11	167	3.0
	Inferred resource	40	1.2	3.2	0.10	22	3.3
Browns Tunnel	Inferred resource	104	1.9	6.8	0.6	45	0.9
Southern Trenches	Inferred resource	10	17.3	21.9	2.0	93	11.0

Exploration

Deep exploration continued, with 9795 metres of underground exploration drilling and 13 544 metres from the surface.

Geological mapping, soil geochemistry and geophysical surveys were conducted north of the mine area.

Environmental initiatives

The capacity of the Bobadil dam is being increased with the commencement of a civil construction program. Rehabilitation was completed on a former rock dump.

Employment

At the end of June, the mine had 79 staff employees and 186 award employees.

Hercules Resources Pty Ltd **— Hercules mine**

Ore delivered from the Hercules mine at Williamsford to Pasmenco's Rosebery mill totalled 100 510 tonnes at 9.3% Zn, 1.8% Pb, 0.5% Cu, 30 g/t Ag and 0.9 g/t Au.

Developments

Over 500 metres of hand-held development was achieved.

Ore reserves

The remaining proven and probable reserve as at 30 June was 31 100 tonnes @ 10.5% Zn, 2.3% Pb, 0.20% Cu, 29 g/t Ag and 0.7 g/t Au.

Exploration

Surface and underground exploration included 707 metres of drilling.

Employment

There were twenty employees at 30 June 1999.

COPPER**Copper Mines of Tasmania Pty Ltd — Mt Lyell mine**

Copper Mines of Tasmania Pty Ltd's (CMT) parent company, Mt Lyell Mining Company Limited, was put into administration late in 1998. Subsequently CMT was purchased by an associate company of Sterlite, an Indian telecommunications cable maker. The Mt Lyell operation now supplies copper concentrate exclusively to Sterlite's Tuticorin smelter in southern India.

Mining

At the Mt Lyell mine, a total of 2.03 million tonnes of ore at an average grade of 1.35% Cu was mined from underground. Development in waste totalled 86.3 metres.

Milling

Ore treated totalled 2.1 million tonnes. Production of copper metal in concentrate increased by 10% to 26 505 tonnes and gold production increased by 19% to 16,660 ounces. Concentrate shipments totalled 107 430 tonnes.

Development

Over \$5.5 million was spent on development. This included completion of a feasibility study into block caving the lower extension of the Prince Lyell ore body at depth, installing a new rising shaft for pumping and commencing the installation of a new single-stage pump system to replace the current two-stage system. The Princess Creek tailings dam was raised and the concentrator upgraded.

Ore reserves

Reserves and resources at 30 June 1999 totalled:

Proved reserve:	4.79 Mt @ 1.32% Cu, 0.35 g/t Au
Probable reserve:	17.43 Mt @ 1.24% Cu, 0.34 g/t Au
<i>Total proved and probable reserves:</i>	<i>22.22 Mt @ 1.26% Cu, 0.34 g/t Au</i>
Measured resource:	6.41 Mt @ 1.34% Cu, 0.36 g/t Au
Indicated resource:	148.38 Mt @ 0.83% Cu, 0.26 g/t Au
Inferred resource:	37.44 Mt @ 0.65% Cu, 0.22 g/t Au
<i>Total measured, indicated and inferred resources:</i>	<i>192 Mt @ 0.81% Cu, 0.26 g/t Au</i>

Exploration

Four holes were drilled as part of a feasibility study into a lower block cave operation. Promising intersections indicate that the Prince Lyell resource remains open to depth below the current resource base and is not, as previously interpreted, truncated by the Great Lyell Fault and/or Owen Conglomerate.

Employment

Employment at the end of the year totalled 274, comprising 87 employees and 187 contractors.

GOLD**Goldfields (Tasmania)
Limited — Henty mine**

During its third year of production the Henty mine increased ore production by 40% to 141 800 tonnes. Production was dominantly from bench retreat stoping (40%), with the balance from sill drives and flat back stopes. Waste mined totalled 170 877 tonnes.

Milling

The mill processed 134 986 tonnes of ore, an increase of 20% over the previous year, and considerably above the plant nameplate capacity. The average grade was 22.0 g/t gold, down 8% on last year, and recovery was consistent at 98%. Gold production increased by 38% to 92,442 ounces gold.

The total cost per ounce of gold from the Henty mine was \$413, an improvement on \$532 for 1997/1998.

Developments

Over \$13 million was spent on capital expenditure during the year.

The Sill Zone Decline was extended by over 1000 metres during the year to provide a drilling platform to test the Intermediate Zone. The decline broke through to the development in Zone 96 and now provides an alternative egress. The Southern Decline was extended by over 250 metres towards Mt Julia. A project to further extend the decline by over a kilometre to test the Tyndall Zone has been approved by the board.

A gravity circuit was commissioned to reduce costs and improve recovery. The installation is performing in line with expectations, recovering over 30% of gold production.

Ore reserves

Proved reserve:	208 700 t @ 21.2 g/t Au
Probable reserve:	296 200 t @ 15.7 g/t Au
Indicated resource:	595 500 t @ 17.6 g/t Au
Inferred resource:	731 000 t @ 7.6 g/t Au

Exploration

Underground exploration programs were completed in the Intermediate Zone, Zone 15 and to the north of Zone 96. Preliminary drilling has commenced on the Tyndall Zone immediately south of Zone 15 with some encouragement. Over 26 000 metres of diamond core was drilled from underground during the year. Exploration expenditure on the Mine Lease exceeded \$3.5 million.

Environmental initiatives

Environmental management has largely focussed on establishment of an environmental management system, including a review of objectives and targets, development of a document control system and review procedures. A Site Closure Strategy was completed and approved and rehabilitation trials were undertaken on native seed viability.

Henty was a finalist in the inaugural Tasmanian Awards for Environmental Excellence – Minister's Award for Sustainable Development.

Employment

Employment at 30 June 1999 comprised 73 employees and 69 contractors.

Beaconsfield Mine Joint Venture — Tasmania mine

Construction work associated with the redevelopment of this mine has continued throughout the year. Some ore was mined and stockpiled.

Mining

Ore production was 17 980 tonnes at 17.23 g/t Au (dry), with waste mined totalling 197 068 tonnes (wet). There was no shipment of ore.

Development

There was 3559 metres of full-face waste development completed during the year. This total includes both capital and other development and represents linear metres advanced regardless of the size of the opening. It includes 393 metres of vertical development.

The main items of mine construction activity were:

- Completion of the Hart Shaft upgrade, installation of skip loading and unloading facilities, completion of the headframe and skyshaft and completion of the overland conveyor leading from the shaft to the surface stockpile area;
- Completion and commissioning of the fresh air rise and second means of egress;
- Installation of dewatering infrastructure;
- Installation and commissioning of the majority of the underground mobile mining fleet;
- Development to access the initial production stopes;
- Completion of a second dedicated 22 kV power supply from George Town;
- Completion of the internal haul road over Cabbage Tree Hill;
- Construction of the changehouse and stage 1 office facilities at the Hart Shaft;
- Commencement of the return air rise;
- Commencement and 85% completion of construction of the processing plant;
- Construction of the tailings dam;
- Commencement of construction of the backfill plant.

Capital expenditure, which totalled almost \$47 million, was directed at:

- Capital works — mining (\$12.4 million);
- Capital works — processing (\$20.7 million);
- Exploration (\$308,000);
- Pre-production expenditure (\$13.5 million).

Ore reserves

Reserves of ore were reported as:

Probable reserves:	1.42 Mt @ 16.9 g/t Au
Indicated resource:	1.37 Mt @ 19.0 g/t Au
Inferred resource:	0.54 Mt @ 13.1 g/t Au

Exploration

Work continued on systematic exploration of adjacent Exploration Licences, with expenditure totalling \$307,568 for the year.

Environmental initiatives

Rehabilitation has been progressively undertaken across the site as part of the construction process. Environmental monitoring has continued in areas of noise, dust control and water quality. Regular maintenance has been carried out at the wetlands and around the mine site and programs have been extended to cover new developments across the site.

Employment

The total workforce at June 30 was 15 contractors and 85 direct employees.

Williams Hill Mining Group

Open cut production at Linton, in northeast Tasmania, was 20 tonnes of ore assaying 7.0 g/t Au. Gold collected in carbon was 100 grams and was not shipped. There was 200 tonnes of waste produced.

Development

Development was carried out on Number 3 Reef. Expenditure on development and exploration totalled \$11,500.

Environmental initiatives

All stripped topsoil has been stockpiled ready for rehabilitation. Additional surface stripping for the year to June 30 comprised less than 1000 cubic metres.

Employment

There were three employees during the year at the open cut at Linton, one person being employed in administration.

Paraclete Resources Pty Ltd*Developments*

Production work was halted on the King and Queen River mining projects during the year while corporate and financial structures were established.

Ore Reserves

Inferred resource is reported as 250 000 tonnes at 4.0 g/t Au, which includes an indicated resource of 78 000 tonnes at a similar grade.

Employment

There were two direct employees and two part-time contractors during the year.

TIN**Renison Bell Limited
— Renison mine**

Shortly after the restructuring of RGC Limited in 1997, the Renison tin mine was sold to Brisbane-based Murchison United NL. Murchison's managing director, Paul Atherley, stated that the company's interest was in developing existing resources that have the potential to generate high operating margins. This certainly looks possible for the Renison mine, which generated a profit of \$8.1 million in 1997/1998. The new operators have since reduced costs further with major operational changes and restructuring of the workforce.

Mining

Ore mined at Renison totalled 739 364 tonnes at an average grade of 1.72% Sn. The tonnes mined was 2% less than the previous year due to an increased focus on mining quality, which was evidenced by an 18% drop in dilution. The grade mined was lower than the previous year due to less contribution from the rich Rendeep ore bodies.

The total of 1866 metres of development carried out was lower than the previous year as the main Rendeep decline neared completion.

Milling

Ore processed totalled 743 234 tonnes @ 1.70% Sn head grade to produce 9236 tonnes of tin in concentrate grading 62.5% Sn (for an average recovery of 73.1%). The production of tin was lower than the previous year as a result of lower mill feed tonnage, grade, recovery and mill utilisation.

Ore reserves

Proved reserve:	2.3 Mt @ 1.85% Sn
Probable reserve:	1.4 Mt @ 1.80% Sn
Measured resource:	2.2 Mt @ 2.07% Sn
Indicated resource:	1.9 Mt @ 1.90% Sn
Inferred resource:	3.4 Mt @ 1.81% Sn

Developments

No major projects have been undertaken since the change of ownership from Renison Limited to Murchison United NL. All efforts have been, and are still being made, to make the operation debt-free and this, coupled with a sustainable operating cost base, will eventually enable an exploration and development program that may give rise to major projects.

Environmental initiatives

A third and final year of research by the CSIRO into acid mine drainage of the tailings dams was completed. The aim of the project has been to develop a fundamental understanding of the geochemical and hydrogeological processes with a view to developing a reactive transport model for the tailings dams.

Employment

Significant restructuring during the year saw the workforce reduced by 82 persons to a total of 225 employees, of which 145 are directly employed by Renison Bell Limited.

IRON ORE
**Australian Bulk Minerals
Tasmanian Operations
— Savage River mine**

A total of 5 682 190 tonnes of ore was mined from the Savage River open-cut iron ore mine, representing an increase of over 120 per cent on production in the previous year. Waste rock stripped totalled 17 346 550 tonnes.

Production

Iron ore pellet production at Port Latta totalled 1 855 870 tonnes at 65.54% Fe, with 17 148 tonnes of iron ore concentrate at 67.10% Fe being produced.

Shipment of iron ore pellets from Port Latta totalled 1 882 482 tonnes, with 47 657 tonnes of iron ore concentrate being shipped.

Developments

Development was limited to 17 846 550 tonnes of overburden stripping.

The capital expenditure invested in the Savage River–Port Latta redevelopment totalled \$11 million in 1998/99.

A feasibility study of a pig iron, and more recently vanadium, plant continued. A trial of 500 tonnes of Savage River concentrate was processed through the Rio Tinto HISmelt Plant in Western Australia.

Ore reserves

Total resources of recoverable magnetite as at 30 June comprised:

Measured reserve:	64 263 469 t @ 52.98%
Indicated resource:	64 337 691 t @ 52.05%
Inferred resource:	66 499 669 t @ 51.92%

Diluted recoverable ore reserves comprised:

Proved reserve:	39 167 661 t @ 50.93%
Probable resource:	25 785 595 t @ 49.49%

Environmental initiatives

Land within the former Savage River township was remediated on behalf of the Department of Primary Industries, Water and Environment. This work included a weed management program.

Classification and segregation of waste rock in clay lined cells in the Broderick Creek valley has continued as part of a mine waste management program.

Work has been carried out, in association with the Department of Primary Industries, Water and Environment, on the Savage River Rehabilitation Project.

Revegetation of land to the west of the site at Port Latta is almost complete with only minor weed management required. Dust deposition measurement and noise monitoring around Port Latta continue.

Employment

The total workforce at June 30 was 194 contractors and 162 direct employees.

Tasmania Mines Limited — Kara mine

The Kara mine produced 62 071 tonnes of magnetite and 5.5 tonnes of scheelite. Sales consisted of 62 175 tonnes of magnetite and 20 tonnes of scheelite.

Capital expenditure at the mine totalled \$556,226. The installation of a replacement ball mill was completed during the year while construction of a new tailings dam continued.

Ore reserves

Reserves of scheelite-bearing ore at June 30 comprised:

Proved reserves:	102 000 t @ 0.46% WO ₃
Measured resource:	230 000 t @ 0.91% WO ₃
Indicated resource:	462 000 t @ 0.61% WO ₃
Inferred resource:	339 000 t @ 0.92% WO ₃

Reserves of non-scheelite bearing magnetite ore at June 30 comprised:

Proved reserves:	952 000 t @ > 30% Fe
Proved reserves:	313 000 t @ < 30% Fe
Measured resource:	197 000 t @ > 30% Fe

Employment

The average number of employees at the mine was 25.

Non-metallic Minerals

LIMESTONE AND DOLOMITE

Beams Bros Pty Ltd

Production from the Flowery Gully site for the year totalled 141 309 tonnes, an increase of 19%. This comprised limestone and dolomite fines used in agriculture (78 563 tonnes), metallurgical dolomite and limestone (38 762 tonnes), other limestone and dolomite products (11 357 tonnes) and construction materials (12 627 tonnes).

A cutback of the Cressy dolomite quarry is underway, with the overburden used to supply agricultural markets and for road construction. Clay overburden from Flowery Gully will be used for rehabilitation, dam repair and landfill.

Significant capital has been invested on a fine lime plant using air and dust collection equipment and a new primary crusher section. The fine lime is used to neutralise acid liquor in the Beaconsfield Gold plant.

During the year the mine employed 25 persons, including eleven mine operators and ten people engaged in transport or administration.

Circular Head Dolomite and Trading Co. Pty Ltd

Production for the year totalled 58 013 tonnes, comprising 51 024 tonnes of agricultural dolomite and 6989 tonnes of dolomite screenings.

Capital Expenditure of \$69 195 was spent on plant and machinery. Twelve people were employed on site.

David Mitchell – Tasmania

Production for the year totalled 111 000 tonnes (up 36%) which was another record. Production comprised 103 300 tonnes of calciner feed and agricultural lime, 6200 tonnes of crushed rock and 1500 tonnes of screenings. A total of 595 000 tonnes of waste was removed to uncover the ore.

New plant included a new sales loader, bulldozer, dump truck, dust collector and oil handling facilities, which amounted to a commitment of over \$600,000.

There were 27 full time and two part time employees on site during the year.

A major exploration drilling program and dump stability study is planned.

SILICA FLOUR

Cominex

Production of high purity silica increased dramatically from last year to 9970 tonnes. Gravel production was less at 600 tonnes. Waste stripped to win the mineral totalled 7000 tonnes.

The increase in production was the result of better than expected recovery of the Japanese market. Continued steady growth in silica flour demand is expected as cathode ray tubes are replaced by liquid crystal displays (LCD).

Measured reserves of high purity silica have increased from 90 000 tonnes to 600 000 tonnes with the inferred resource steady at 1.6 million tonnes.

The workforce strength at year's end was eight, with contractors employed as required.

KAOLIN

Tongannah clay mine

Sales decreased to 4437 tonnes of kaolin with 17 100 tonnes of raw clay treated. This is in line with projections following the change to calcium carbonate in the paper making process. Seven employees were engaged directly at year end, with a contractor on site as required for rehabilitation work.

Mine 3 rehabilitation is now complete and revegetation of Mine 4 is also at an advanced stage. Extensive rehabilitation earthworks and capping of tailings are ongoing on leases south of the Tasman Highway.

CERAMICS

K & D Bricks and Pavers

Production of clay bricks and pavers continued at the New Town plant.

Pioneer Building Products — Nubrick

Production of clay bricks and pavers in 1998/99 totalled 21 000 tonnes. The reserves of raw materials represent a minimum of 15 years production. Markets were expanded and now include New Zealand, Japan, China, Taiwan, South Korea, Singapore, United Arab Emirates and Italy.

Employee numbers were 31 full time and 2 full time equivalent casuals at year end.

CONSTRUCTION MATERIALS

ML & P Barwick

Production from the Clives Hill quarry increased to 34 000 tonnes for the year, with two people being employed. Rehabilitation work to address visual impact continued.

Boral Construction Materials

Total production statewide was down 6% on last year at 771 650 tonnes. This comprised 354 100 tonnes of crushed aggregate, 359 250 tonnes of crushed road materials, 27 000 tonnes of armour rock and 31 300 tonnes of sand products. The drop in production was due to completion of the armour rock contract for the Bass Highway reconstruction near Burnie.

Minimal capital was spent, with the major item being \$75,000 spent on security fencing at the Launceston quarry. Product bins at Launceston had remote controls installed.

Employee numbers were rationalised due to the depressed market with 44 employees last year reduced to 23 full time employees and seven sub-contractors.

New settlement dams were constructed at the Launceston quarry and blast monitoring was conducted at Launceston and at Flowery Gully. A new access was also put in at Flowery Gully. Estimated reserves at all quarries were in excess of 50 million tonnes.

Rehabilitation of the Mt Nassau limestone quarry near Granton continued. This quarry displays a scientifically important geological feature, with alternating bands of limestone and shale demonstrating cold climate limestone deposition. A part of this feature has been left for teaching purposes.

Brambles Industrial Services

The total production from Brambles' quarries was 250 000 tonnes of road construction material, 200 000 tonnes of aggregate and crusher fines for concrete and brick manufacture and 50 000 tonnes of domestic road base and fill. Production was relatively static.

Following an environmental audit last year, trials have been implemented to improve wastewater quality including the use of flocculent settling and reed beds.

No capital was spent and the construction downturn resulted in the rationalisation of staff numbers from 20 people to 15 employed by year end.

Caroline Quarries

Production from the Railton quarry has slowed dramatically due to a decrease in demand for silica sand. Production was 6856 tonnes of silica sand and 963 tonnes of general sand.

Duggans Pty Ltd

A total of 70 487 tonnes of construction materials were produced by Duggans Quarries at Cradoc, including 8590 tonnes of aggregate, 7700 tonnes of sub base and 32 500 tonnes scalps.

Duggans now crush additional material to supply the scalps product, which is used for road sheeting. The capacity of settling dams was increased during the year. Two full time quarry operators and one part time laboratory staff were employed.

Hobart Blue Metal Industries

Production for the year totalled 225 500 tonnes, comprising 193 000 tonnes of crushed stone, 6500 tonnes of gravel and 26 000 tonnes of sand. Sharing of resources was commenced with Boral's operation at Brighton to reduce overheads. The workforce at year end was seventeen employees and one contractor, a decrease of two from last year.

Capital expenditure for the year was focussed on crushing, with a new control room and belt weighing equipment installed at a cost of \$90 000. Rehabilitation was ongoing, with tree planting carried out at the Leslie Vale site. The capping of sediment dams is continuing at Clarks Sand prior to tree planting.

Fieldwicks

Approximately 120 000 tonnes of road base, drainage aggregate, sand, sealing and concrete aggregates were produced for the year by six employees.

Environmental initiatives included a new sediment dam at the Forthside quarry to reduce runoff, with tree seeding planned. Capital expenditure for the year totalled \$900 000 on crushing and screening equipment.

**Industrial Sands &
Silica Pty Ltd**

Production for the year was 20 000 tonnes of gravel for road construction and 722 tonnes of washed sand. There were two employees. A new loader was purchased.

Island Resources

Island Resources supply a significant quantity of processed sand and gravel in the northeast. The bulk of the sand is sold for concrete production (25 951 tonnes) while most of the gravel is sold for road construction (17 822 tonnes).

A reduction in sales of up to 40% in these traditional markets has been offset to an extent with new markets and customers. The remaining production (16 214 tonnes) is marketed variously as foundry sand, FCR filler and for domestic retail.

Rehabilitation of the major mine site has been progressive, with native growth re-established over a large area. One casual is employed as well as two staff.

H G Morrisby & Sons

A total of 28 250 tonnes of aggregate was produced by the three partners and one part time employee from their quarry at Sandford.

**Pioneer Concrete (Tasmania)
Pty Ltd**

Production increased marginally from the previous year. The Flagstaff Gully quarry produced aggregates for concrete and asphalt as well as road making materials.

Capital was spent on screen deck enclosures and a dust collection unit on the tertiary crusher, in order to reduce dust emissions in line with best practice. Eradication of pampas grass continue and more trees were planted.

Ten employees and one subcontractor are engaged on site.

Alan Summers Transport

Production from Margetts quarry totalled approximately 4200 cubic metres of material for road making and concrete products.

R M & K R Edwards

This quarry in Kingston was acquired by a new operator in February 1999. Since then 9303 tonnes of road making material has been produced by four employees who are seconded from the earth moving business as required. The primary crusher has been complemented with an impact crusher to increase the scalps fraction. Overburden from stripping is being used to rehabilitate large areas exposed by previous quarrying.

Tolosa Quarry Pty Ltd

The Tolosa quarry in Glenorchy produced 15 934 tonnes of crushed limestone for the year. There is a significant reserve of 1.2 million tonnes on the lease. Capital expenditure of \$110 000 included \$80 000 for crushing equipment. Two people were employed.

Fuel Minerals

Cornwall Coal NL

Duncan Colliery

This mine remained on care and maintenance during the year.

Blackwood Colliery No. 2

Development continued in the 1A Section for a further 250 metres, ending 2200 metres from the portal where cover has reduced to about 90 metres and conditions deteriorated because of water and a weak mudstone roof. Thereafter workings have retreated 700 metres and are now under 260 metres of cover and floor heave is again affecting operations.

Yields varied considerably from a best of about 70% under the mudstone roof, down to 45% where a 600 mm wide mudstone band had to be mined. Yields have stabilised at a normal 60%. Product ash has also varied between 18% and 23–24%.

Blackwood No. 3

Workings on four headings were developed to 900 metres from the portal. Mining height has been at about 2.5 metres with approximately one metre of coal being left in the floor for removal during pillar extraction. Roof material has varied considerably, being either mudstone or sandstone. Connection has been made into old Cornwall Colliery workings which have remained in surprisingly good condition. Coal quality was good. Best result was a yield of 78% and a washed ash content of 18%.

Huntsman No. 2 open cut

Mining has continued in a westerly direction and cover has reduced to a maximum of 25 metres. Growth of trees on earlier rehabilitation is going well and further seeding has occurred up to the currently worked area.

Employment

A total of 88 persons was employed, with 48 working underground, 15 in processing and nine in administration. Ten contractors were employed in coal cartage with a further six contractors working in the open cut. Three shifts (24 hours) were lost due to a national stoppage in December 1998.

Production

Production for 1998/1999 totalled 473 109 tonnes. This coal was sourced from:

Blackwood No. 2	312 875 tonnes
Blackwood No. 3	126 123 tonnes
Huntsman No. 2	34 111 tonnes

An additional 69 317 tonnes of raw coal was purchased from the Stanhope mine.

Total raw coal handled was 584 282 tonnes, with a washery throughput of 539 529 tonnes. Washery production of saleable coal totalled 385 437 tonnes at a yield of 71.4%, with sales of coal totalling 381 149 tonnes for the year.

Approximate washery yields were:

Blackwood	65.0%
Huntsman	80.0%
Stanhope	68.5%

Approximately 157 092 tonnes of reject material was deposited at the Duncan reject dump.

Reserves

Current reserves exceed twenty years life of the current operation.

Exploration

A series of holes were drilled in the Harefield area on the Cullenswood property and confirm the potential for at least 0.6 million tonnes of saleable coal. Application has been made for a Mining Lease over this area to enable a sample pit to be mined to assess the potential for an open cut operation.

Capital expenditure

A total of \$930,000 was spent on capital items. \$827,000 was spent on various items of equipment at the Blackwood Colliery, including a set of breaker line supports, while a further \$106,000 was spent on equipment at the Fingal Washery.

Rehabilitation

Re-vegetation of Huntsman No. 1 is growing well. The initial stages of tree growth at Huntsman No. 2 are progressing well and seed has recently been applied to an additional area.

The fines stockpile has reduced to 15 676 tonnes. No. 1 and No. 2 dams continue to be progressively covered with coarse rejects.

Safety

No lost time injuries occurred during the year.

Other

International coal prices have reduced and Cornwall has had to respond by reducing local prices to remain competitive with NSW and Queensland producers.

Merrywood Coal Company Pty Ltd

This company continued operations at the Stanhope open cut mine until December 1998. Production was almost exclusively raw coal supplying Cornwall Coal. Additional limited quantities of screened coal were sold to the Royal Derwent Hospital. The company ceased mining after this period and went into liquidation.

Employment

Sixteen persons were employed at Stanhope and two at the Merrywood washery in July, gradually reducing to ten at closure.

Production

The company reported that 78 900 tonnes of raw coal were produced.

Kimbolton Coal Company Pty Ltd

This mine near Hamilton was established at the site of a former bulk sampling excavation following lease approval. The major work program was drilling to confirm reserves of 1.8 million tonnes of coal. A screening plant was erected and production commenced, supplying coal to the Royal Derwent Hospital. The product was tested by Australian Paper in their boilers at Burnie in December. An environmental management plan was drafted to support a permit application for a commercial scale of operation. The matter was still subject to appeal from a neighbour at the end of June.

Production for the year was 2400 tonnes. Two people are employed full time, and up to six contractors have been employed during overburden stripping.

Mineral processing operations

Australian Cement

Production

Production at the Railton cement mill totalled 1.04 million tonnes of clinker and 1.24 million tonnes of cement. Cement shipped to NSW and Victoria totalled 1.05 million tonnes of which 1.01 million tonnes was shipped on MV *Goliath* and the balance moved on MV *Westport*.

Raw materials consumed comprised 1.5 million tonnes of limestone, 110 000 tonnes of clay, 16 000 tonnes of magnetite, 6000 tonnes of silica, 58 000 tonnes of gypsum and 158 000 tonnes of coal.

Capital Expenditure

A total of \$5.786 million was expended during the year. Major projects undertaken were the re-routing of Cement Works Road and the outloading dust collection upgrade on S and T silo.

Development and rehabilitation

Over 1.8 million tonnes of overburden was removed and 330 000 tonnes of limestone stockpiled as part of the development program at the mine.

Rehabilitation work included covering the northern overburden dump with topsoil and spray seeding, maintenance repairs to the western mine final rehabilitation slopes, installation of drainage lines and an extra settling pond east of the railway. Rehabilitation expenditure totalled \$598,000.

Employment

A total of 165 people, including two contractors, were employed in the operation.

Comalco Aluminium (Bell Bay) Limited

Production of aluminium from the Bell Bay smelter totalled 146 962 tonnes. As at 30 June 667 people were employed at the smelter, 69 of who were contractors.

Major capital expenditure

Capital expenditure for the year ended 30 June 1999 totalled \$17.6 million dollars. The value of major projects completed during the year was:

18 day anode rota	\$1,037,372
SCL storage	\$531,568
Capacitor bank 4	\$451,006
Thimble press	\$444,301
Potline direct current metering upgrade	\$441,492
Point break conversion	\$418,946
Capacitor bank 3	\$391,570
Coke storage building	\$286,274
Install wheel on ingot caster	\$282,048
Dry scrubbing	\$267,492
Forklift	\$252,387
Treberg prime mover	\$201,526

Major projects in progress include:

Bath plant upgrade	\$3,854,469
General purpose cranes	\$1,545,289
Works transformer	\$1,346,813
Switchyard circuit breakers	\$924,869
Additional six cells	\$852,047
Cell tending machine	\$716,116
K regulator	\$697,554
Upgrade power supply control	\$200,371

Impact Fertilisers Pty Ltd

A total of 74 685 tonnes of raw materials was used to produce 119 670 tonnes of single superphosphate during the year. Phosphate rock was sourced from Nauru Island (17 716 tonnes), Israel (15 686 tonnes), Christmas Island (7004 tonnes) and China (34 279 tonnes). Sulphuric acid (98%) used totalled 43 989 mono tonnes.

A total of 51 179 tonnes of single superphosphate was shipped to various mainland ports in eight shipments, with a further 9634 tonnes being shipped in containers.

Major projects included the upgrading of the electrical control system in superphosphate manufacture plant, while the installation of a new computerised maintenance management system, a new dryer for single superphosphate and scrubbing plants has commenced. The drying plant is the most significant project underway for the company.

Major capital projects for the year were:

- Upgrading a double screening plant at Hobart;
- Emergency lighting installed in manufacturing plant;
- Installation of a fine grade single superphosphate recirculation for the manufacturing plant;
- Installation of a first aid room at Hobart;
- Installation of a bagging plant at Devonport;
- Installation of a new ground phosphate rock weigh feeder in manufacturing plant.
- Rehabilitation/environmental control/pollution control initiatives

An investigation of dust control initiatives, in conjunction with Pasminco Hobart Smelter, was made in relation to the wharf area for inbound and outbound cargo.

Employment

Eighty-six people were employed, including 20 employed in depots and four contractors.

Index Mineral Processors (IMP Silica)

Approximate production of silica for the year totalled 6500 tonnes of 20/250 grade and 1000 tonnes of 40/75 grade. Overall recovery was 64%.

Export shipments accounted for almost all of the production. Markets are developing in the USA and France. The company is maintaining market share in Japan. World trend is toward finer grades of silica.

Projects

Fines reclamation trials and new product developments are currently underway.

Environmental improvement

The bag house dust collection system was reconditioned June 1999.

Employment

Two permanent full time employees and four casual staff were employed.

Pasminco Hobart Smelter

Zinc and alloy production at the Risdon smelter was 214 188 tonnes, 8.7% higher than 1997/1998 and more than 4000 tonnes better than the previous site record set in 1992/1993. Initial improvement was due to improved circuit control and filtration early in the year to overcome the previous year's difficulties with the new paragoethite process. A concerted current efficiency improvement program began in electrolysis in December 1998, and reaped significant benefits by the end of the year.

Raw materials

Zinc concentrates treated totalled 435 474 tonnes, a slight increase over the previous year. Concentrates were mainly sourced from the Broken Hill, Rosebery and Hellyer mines, with minor quantities from Lennard Shelf, Thalanga, Elura and Woodcutters.

Production

Production for 1998/1999 was 214 188 tonnes of zinc and zinc alloys, compared to 197 043 tonnes in the preceding year. Major by-products produced included sulphuric acid, secondary leach residue, copper sulphate and cadmium.

Major projects

Major capital projects to progress in 1999/ 2000 included bund construction of acid tanks and continuation of the foreshore scrubber replacement program. Planned improvements include a new casting machine to further increase EZDA production capacity. New business systems are being installed as part of the Pasminco Business Systems project.

Capital expenditure

A number of capital projects were associated with the biennial planned major shutdown of No. 6 fluid bed roaster in March 1999. This one-month maintenance program and shutdown was completed with minimal loss in production.

Total capital expenditure exceeded \$14 million, with the major projects comprising the venturi tower replacement, No. 6 acid plant cast iron pipework, No. 6 acid plant flue, No. 6 roaster control system upgrade, new acid tanks, new reagent addition system, paragoethite storage and handling and Loogana/Inshallah rehabilitation.

An additional \$2 million was spent on the continuing demolition program.

Environment and community

Pasminco Hobart Smelter enjoyed an excellent all round year, achieving record production tonnage, environmental improvement and consolidation of the previous years' safety achievements. Environmental performance was much improved, with an overall decrease in incidents and a significant drop in the second half of the year. Further progress was made on the rehabilitation of the old jarosite stockpile site, which was prepared for capping and revegetation by the end of the year.

The site's environmental improvements were underlined by the winning of a Tasmanian Government Award for Environmental Excellence. This award recognised the work of all employees in promoting an environmentally responsible culture on site.

Successful community relations programs continue, such as the internal 'toolbox' meetings and meetings with community consultative groups.

Occupational health and safety

The previous year's gains in occupational health and safety were consolidated, with the lost time incident frequency falling from 3.8 to 1.8. Blood lead levels continued their progress downward, with one employee recording a level greater than or equal to 40 mg/dL during the year, and 31 employees exceeding the new benchmark level of greater than or equal to 30 mg/dL.

Initiatives for the next year include the introduction of a universal Permit to Work system, and a complete review of the site's emergency preparedness.

Employment

The total direct employment at Risdon was 625 people.

TEMCO

The TEMCO plant at Bell Bay was sold by BHP in December 1998 and purchased by Billiton Plc., a company based in the United Kingdom.

Production

Production for 1998/1999 comprised 121 388 tonnes of ferromanganese, 114 916 tonnes of silicomanganese and 347 443 tonnes of sinter. Sales for the year totalled 122 311 tonnes of ferromanganese, 140 801 tonnes of silicomanganese and 76 162 tonnes of sinter.

Rehabilitation initiatives

Work is continuing on the propagation of rare and threatened species at the TEMCO wetlands in conjunction with the National Parks and Wildlife Service and the Royal Tasmanian Botanical Gardens. Results to date with some eucalypt species are very encouraging.

Propagation and growing trials are being conducted to provide *Xantheria* for rehabilitation of the Beaconsfield quarry. Nursery trials include the cultivation of small plants recovered from the quarry and attempts to germinate seed using smoked water. Larger plants are being transplanted at the quarry.

Environmental control initiatives

Fire alarms have been installed in the furnace 1, 2 and 3 tapping hall baghouses. The alarm shuts the baghouse and activates the nitrogen deluge system.

Water flows to fume dam 2 have been reviewed to reduce the volume of water entering the dam. Flow meters have been installed in lines to and from the dam to enable continuous monitoring.

A tyre management contract has been let which allows for the recycling or appropriate disposal of heavy equipment tyres.

A soil sampling program has commenced to map the impact on soils of ambient manganese from TEMCO. Results will be compared to the results of environmental fallout monitoring. The room de-dusting baghouse at the sinter plant has been refurbished.

Major expenditure

Major expenditure of \$3,281,922 for the year comprised:

Occupational health, safety and environment	\$445,569
Cost reduction	\$13,124
Process improvement	\$344,456
Capital purchases	\$261,802
Capital replacement	\$2,109,093
Other	\$107,878

Capital replacement included the purchase of a replacement transformer for Furnace 2, (\$1,020,000), fire damage at Furnace 3 (\$285,000), transformer failure at Furnace 2 (\$290,000) and software licensing fees (\$247,000).

Employment

The total employment figure of 306 comprised 47 employees in administration and 281 in production, including 25 contractors.

ANNUAL REPORT

Rehabilitation of Mining Lands Trust Fund

Zeehan Program

This program has been allocated \$82,578, with expenditure of \$71,128 in 1998/1999 and \$11,450 in 1999/2000.

Acid drainage in the Queen Hill area has been identified as a rehabilitation priority. The waters of Silver Lead Creek drain into the Zeehan Rivulet, which runs through the centre of the town on its way to the Little Henty River. Half of the zinc contamination in the Little Henty River (measured at the bridge on the Strahan Road) is contributed by Silver Lead Creek.

The Zeehan program was late commencing. The consultant employed on this project, Earth Systems, has conducted a sampling program which has been brought forward from the 1999/2000 budget and is also conducting remediation trials to evaluate the most promising water treatment option. The water treatment systems under evaluation are:

- Anoxic carbonate drains;
- Successive alkalinity producing system (SAPS);
- Alkalinity addition using ground limestone.

The consultants will submit a report detailing recommendations for rehabilitation in the near future. The report includes recommendations for rehabilitation of adjacent areas, formerly held under a mining lease.

The Trust Fund contributed towards the cost of an Honours project by Kris Taylor, who looked at the possible rehabilitation of the Austral Smelter pyrite tailings.

Archaeological surveys were also completed during the year. The findings will be required for the program planning, discussions with the Zeehan community and permit approval.

North East Tinfields

Expenditure on this program totalled \$158,934. The current rehabilitation stage near Gladstone is now complete. The work undertaken during the last year concentrated on erosion control at the former Endurance and Monarch mines and diversion of clean water from the acid water in Ruby Lagoon.

At the Endurance mine two additional gabions were placed in the N2 gully. The Cat Gully Creek was bridged to allow access for heavy excavators to the tailings area and Ruby Lagoon. This work was performed satisfactorily by Brambles.

A diversion canal has been constructed for Ruby Creek and other creeks to by-pass the Endurance mine's tailings fans and the lagoon. Stornoway completed the work in time and on budget. It is intended that this diversion work will deliver good water to the lower part of Ruby Creek and allow the lagoon to become a repository for the acid water draining from the tailings fan. A survey of aquatic invertebrates was done prior to the diversion with a follow up planned for the coming year in mid summer to allow a comparison. Further water samples will also be taken for comparative pH measurements.

An honours thesis on the generation and transport of acid water in the tailings has been completed by Jacinta de Jong of Monash University. It is anticipated that this work will provide information for future rehabilitation options on the Endurance tailings. A second honours student from Monash University, Rachel Bennett, is studying the toxicity of the tailings in the Star Hill and Endurance area to help explain the reasons for the stunted growth or complete failure of past revegetation attempts. The fieldwork for this study has been finished with the thesis to be completed by the end of the year.

Maintenance was required at the Monash erosion gully where the creek had undercut the bank and diverted around a gabion. Students from Scottsdale High

School have started revegetation trials in this area and will pursue these through the coming year.

It is proposed that any further major work in these areas be postponed while the results of the two honours theses are considered and the relocation of the precipitate dam at Storys Creek proceeds. Funds will be required for ongoing maintenance of the work to date and to fund the remainder of the school revegetation trials.

Shaft Capping

A cover was installed over the Crown Prince Shaft near Ringarooma. This project was allocated \$1,100.

Rossarden

Maintenance work has been completed on selected areas of re-vegetation on the tailings dam. Some minor work was carried out on an ore bin at Storys Creek. Expenditure totalled \$38,960.

Storys Creek

Relocation of the precipitate dam and sealing of the western adit were planned as a major program for the year, to be conducted in conjunction with \$192,000 of Commonwealth funding from the RiverWorks program. Detailed planning and permit applications were completed during the year and the costs of these were met by the Trust Fund. Unfortunately the announcement of Commonwealth funding was delayed and consequently work was deferred to next year.

Consultant John Miedecke has been carrying out field trials on limestone addition and alkalinity generation to evaluate remediation options for diffuse emissions into the creek. This has also been paid for by RiverWorks.

The trials included:

- Limestone addition to Storys Creek;
- Laboratory based limestone additions to tailings;
- Limestone capping of jig tailings;
- Limestone additions to stream banks;
- Anoxic limestone drain to generate alkalinity into the mine water; and
- Precipitate dam investigations.

From a total allocation of \$70,174, expenditure in 1998/99 was \$56,724 with a further \$13,450 allocated for 1999/2000.

The deferral of Commonwealth funding until next year allowed the following programs to be undertaken.

Exploration camp clean up

This project was successfully completed in May. Three sites were involved, all south of Macquarie Harbour within the South West Conservation area. Expenditure totalled \$74,021.

The Moores Valley and Noddy Creek camp sites were uninhabitable and have been completely cleaned up. Maintenance was carried out on the main complex at the Wart Hill camp and all outbuildings and rubbish were flown out.

The work was conducted in consultation with the Parks and Wildlife Service who will remove some remaining loads of rubbish when they conduct operations in the area over the coming summer. Delays were experienced due to bad weather hindering helicopter use, accordingly protracting the program and increasing the overall cost.

Whalebone Beach, King Island

An area on the west coast of King Island, previously used for the indiscriminate extraction of gravel, was tidied up and regraded. This project was allocated \$1,700.

Oak Dene Road, Scottsdale

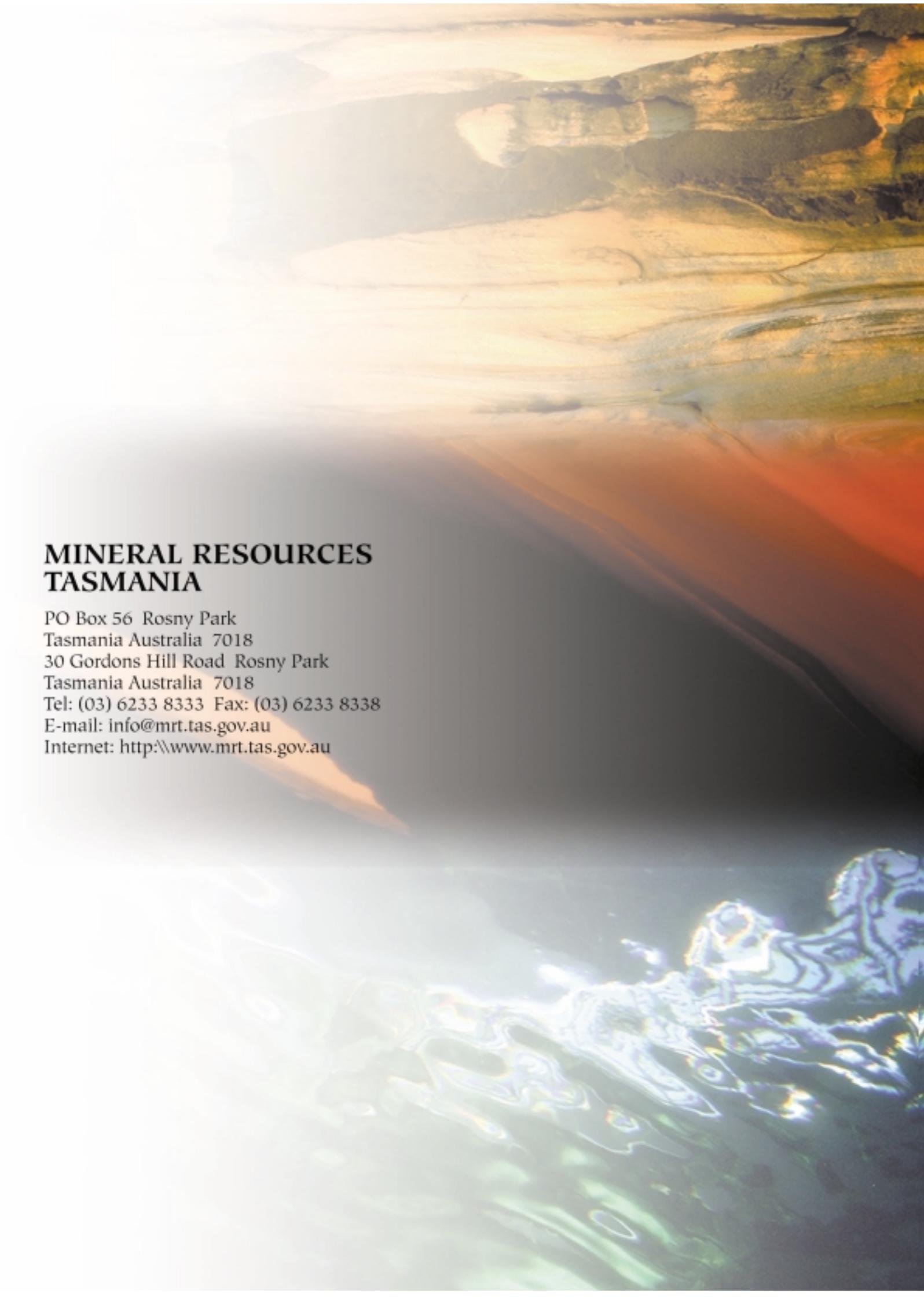
An area that was formerly used for the indiscriminate extraction of gravel is currently being rehabilitated. Earth and drainage works are advanced and revegetation works are to follow. David Steane and Associates Pty Ltd and Bill Johnson are the consultant and contractor respectively.

Expenditure allocation was \$15,000 for 1998/1999 and \$15,065 for 1999/2000.

Gipps Creek

Shaft covers for the Great Republic mine, which is frequently visited by the public, are currently being manufactured. Thompson and Brett Pty Ltd has designed the covers which are being manufactured and installed by P & V Burt.

Expenditure allocation was for \$28,474 1998/1999 and \$23,396 for 1999/2000.



MINERAL RESOURCES TASMANIA

PO Box 56 Rosny Park
Tasmania Australia 7018
30 Gordons Hill Road Rosny Park
Tasmania Australia 7018
Tel: (03) 6233 8333 Fax: (03) 6233 8338
E-mail: info@mrt.tas.gov.au
Internet: <http://www.mrt.tas.gov.au>