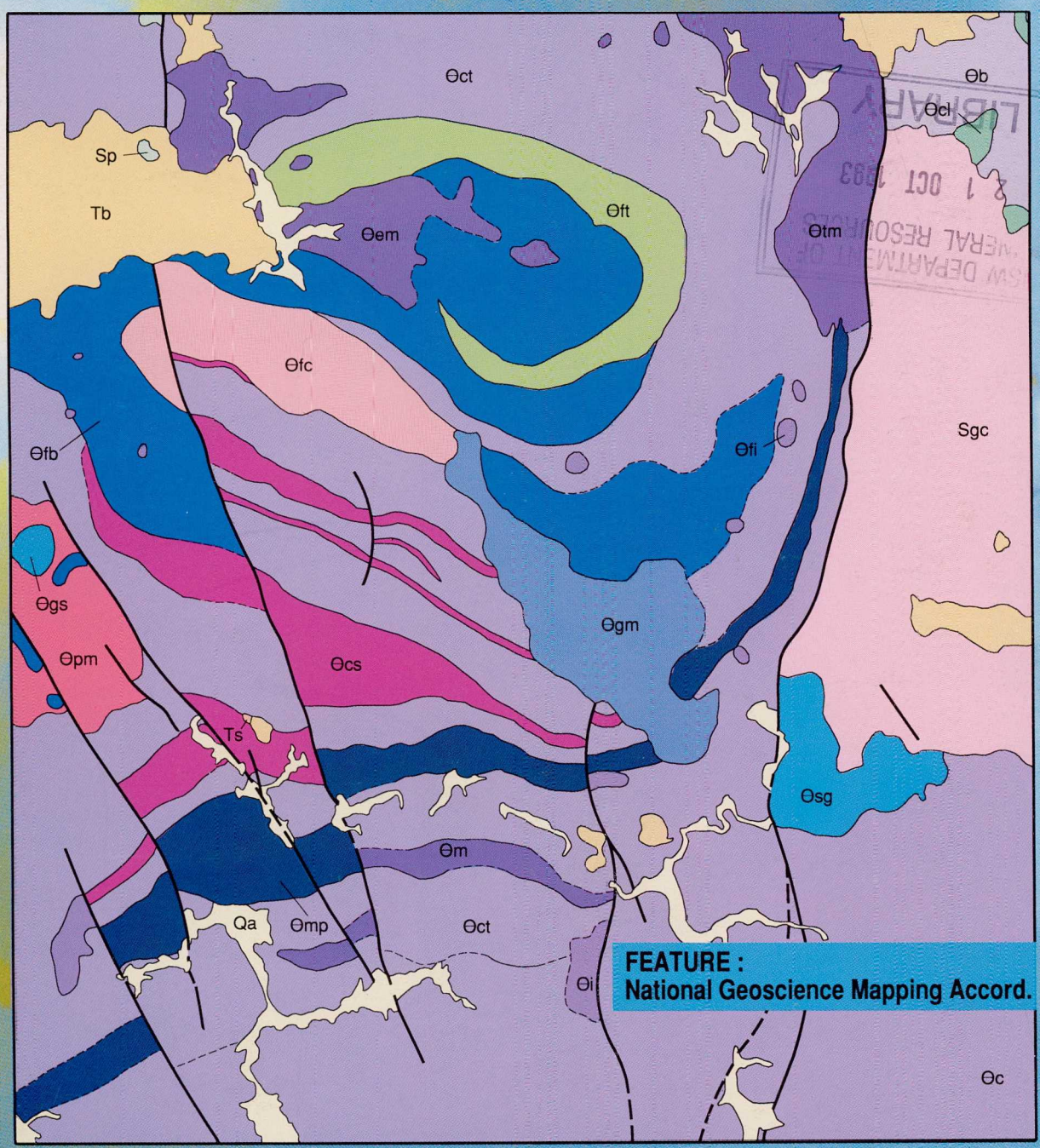
Minfo

New South Wales Mining and Exploration Quarterly

No. 41

OCTOBER 1993



FEATURE :
National Geoscience Mapping Accord.

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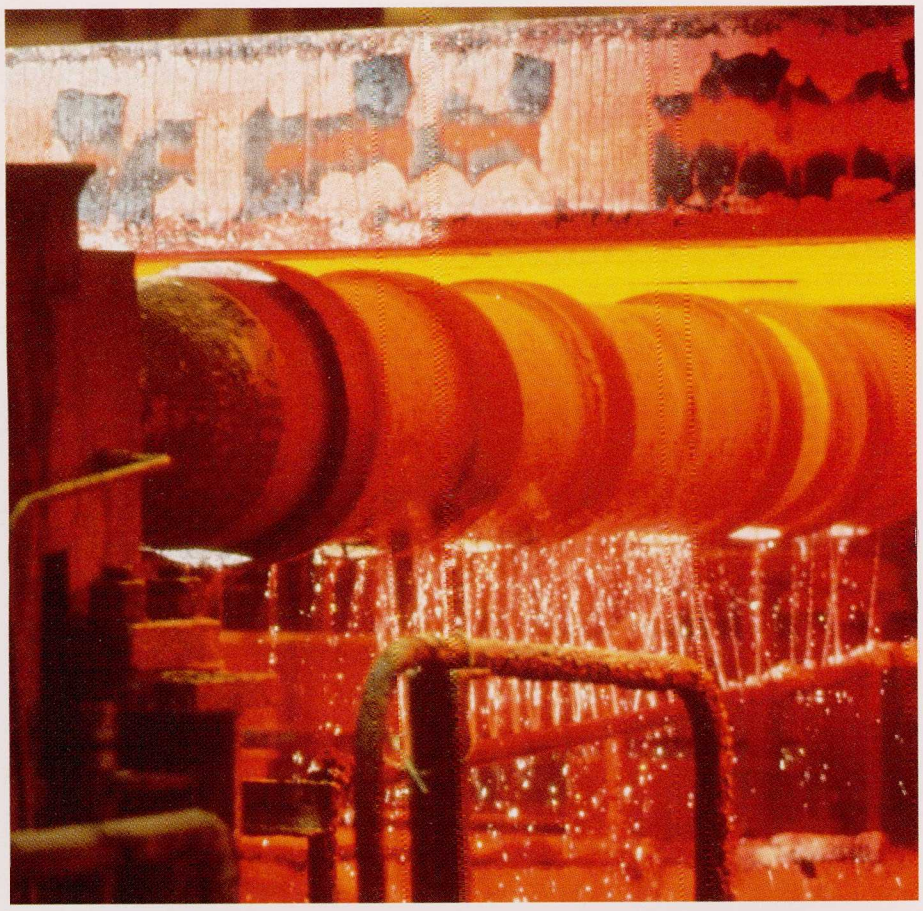

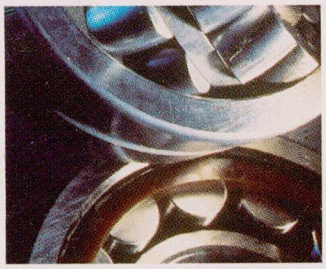

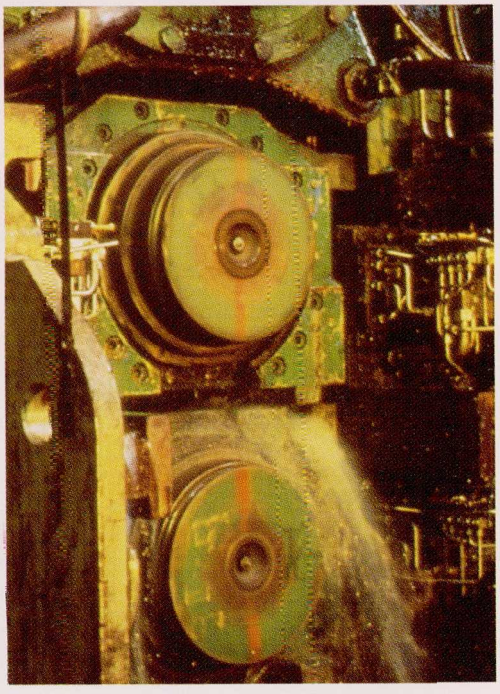

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New South Wales Mining and Exploration Quarterly
No. 41

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COVER PHOTO:
The Forest Reefs volcanic cauldron mapped by AGSO as part of the National Geoscience Mapping Accord
(see page 5 of Feature)

COVER BACKGROUND:
Colour zoning in a top-quality blue New England sapphire. Specimen is 6x8 mm. Photo by David Barnes

Issued October 1993
ISSN 0812-0293

Published under the authority of the Minister for Mines
1993

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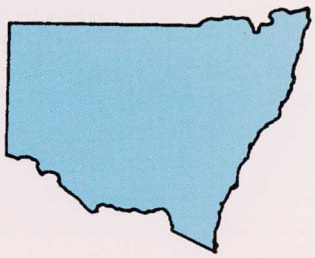
MAPPING BOOST TO NEW SOUTH WALES MINERAL POTENTIAL



A new generation of geological maps and geoscientific digital databases for Australia is being produced under the National Geoscience Mapping Accord.

The National Geoscience Mapping Accord (NGMA) integrates aspects of the resource assessment and mapping programs of the Commonwealth's Australian Geological Survey Organisation (AGSO) (formerly the Bureau of Mineral Resources — BMR) and the various State Geological Surveys in areas of high priority for mineral and petroleum exploration over the next 20 years.

The Geological Survey of New South Wales and AGSO are collaborating in two projects under the Accord: the Lachlan - Kanmantoo Fold Belt Project (investigating mineral prospectivity) and the Eastern Australian Basins Project (petroleum based) (figure 1). The other current NGMA mineral projects are North Queensland, Eastern Goldfields, Arnhem Land, Kimberley - Arunta, Musgrave Block and Northern Tasmania. The four petroleum provinces currently being investigated are the Canning, Eastern Australian, Otway and Officer–Eucla Basins.

OBJECTIVES

The main objectives of the Accord are to:

* optimise the environment for mineral and fuel exploration in Australia at a time when significant exploration expenditure by Australian companies is being directed offshore;
* provide a more up-to-date and reliable information base for the assessment of potential mineral and fuel resources; and
* provide geoscientific baseline data for sound environmental management and for the development of sustainable land use and management strategies.

NEED FOR A NEW GENERATION OF GEOSCIENTIFIC MAPS

In what was a remarkable effort, most of the Australian continent was geologically mapped at reconnaissance level in a 25 year period from the mid 1950s through the 1960s and 1970s. The BMR made a major contribution to this mapping effort, particularly in northern Australia, while most of the mapping of southern Australia was carried out by the State Geological Surveys. A decline in Commonwealth and State mapping in the 1980s lead to the Woods' Review of the BMR, published in 1988, which recognised the need to update the existing map data set through increased mapping effort, and recommended the establishment of the National Geoscience Mapping Accord.

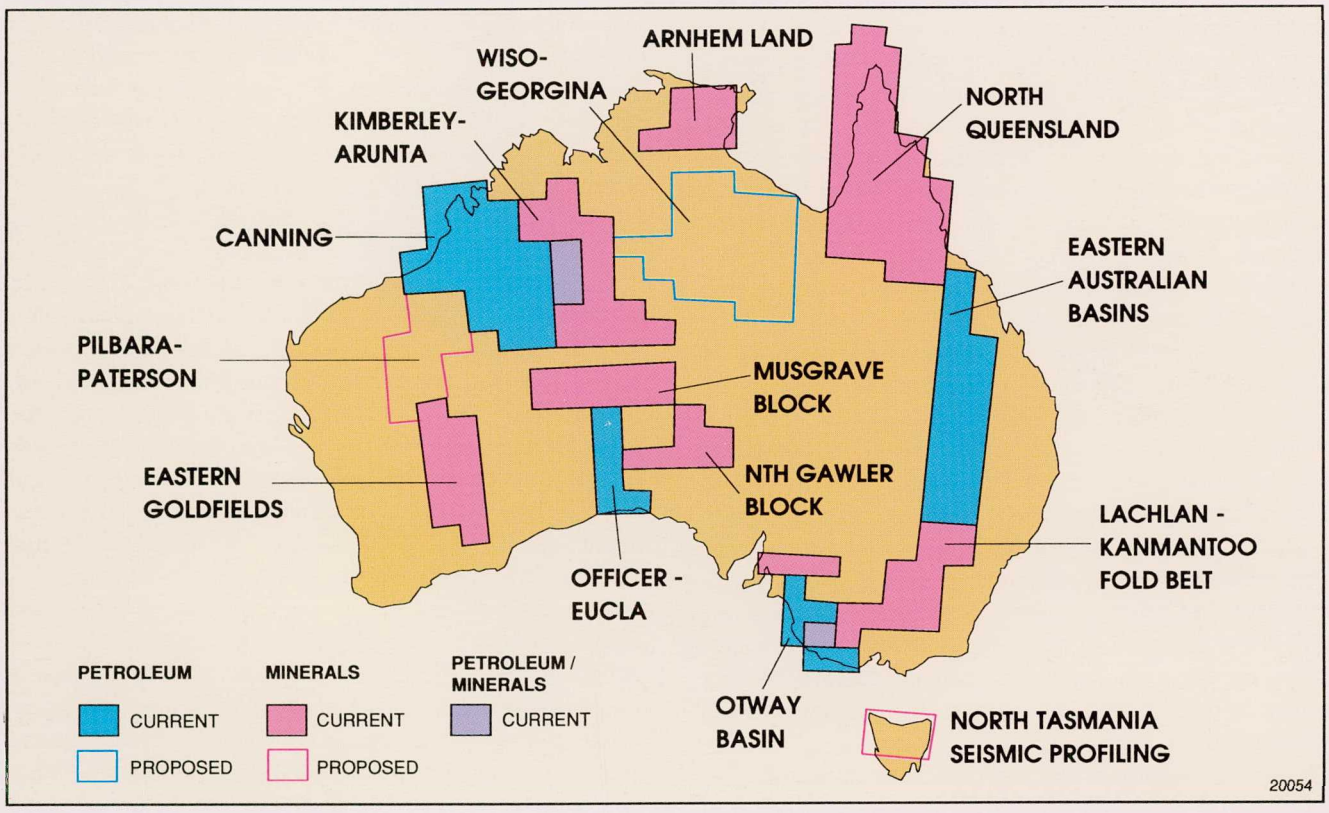


Figure 1 *National Geoscience Mapping Accord project areas*

RESEARCH TOWARDS 2005

The need for enhanced mapping activity **as a matter of priority** to replace the reconnaissance maps has been widely recognised by industry and Government. In a paper in the *New Scientist* in May last year, titled "The Seven Home Truths of Australian Research", Professor Don Aitkin, former Chairman of the Australian Research Council proposed "Mapping the Geology of the Landmass" as one of the six most important areas demanding an enhanced research effort.

A working party of the Australian Geoscience Council recently completed an investigation into research in the Australian earth sciences for the Australian Research Council. This report: "Towards 2005: A Prospectus for Research and Research Training in the Australian Earth Sciences", emphasised the importance of geological mapping, and recommended that the National Geoscience Mapping Accord be used to produce new generation geological maps for the whole of the Australian continent in a timely manner.

The need for a sound geological map database for land use management, resource assessment and utilisation, and environmental protection has also been recognised by other countries. For example, the United States Congress passed the National Mapping Act of 1992 to redress a similar decline in geological mapping activities at both Federal and State level by providing substantially increased funding for a mapping program very similar to the NGMA.

A recent review of AGSO for the Commonwealth Government by a team led by Dr Max Richards, Managing Director of Aberfoyle Ltd, concluded that there are substantial benefits to Australia from a modern, broadly based, strategic geoscientific mapping program. The beneficiaries would be much wider than the minerals and petroleum industries which have been seen as the traditional clients of geological surveys. The review team was convinced that such mapping benefits agriculture, water resources and forestry, while at the same time being relevant in resource management and environmental issues. The review recommended substantially increased funding to accelerate and broaden AGSO mapping programs and was very supportive of these mapping programs being carried out through strongly developed linkages with the State Geological Surveys.

In responding to the Richards Review in the context of the 1993/94 budget, the Commonwealth Government has recognised the wide range of benefits that flow from AGSO's program. Specifically, AGSO's contribution to the NGMA benefits both governments and industry. The Commonwealth has decided that the multiple benefits arising from this program should be reflected in its funding arrangements. The Commonwealth will be opening negotiations with the States and Territories to formalise an accelerated NGMA in keeping with the recommendations of the Richards Review and to encourage States and Territories to apply additional funding to the NGMA to match an increased Commonwealth contribution.

In New South Wales the provision of high-quality geoscientific maps has boosted exploration activity in a number of identifiable prospective regions, notably in the Broken Hill and Cobar areas. Good geoscientific information enables companies to operate more effectively by identifying areas likely to have greater potential and also by limiting duplication of previous exploration activity.

THE MINERAL PROVINCES

The focus of the National Geoscience Mapping Accord in mineral provinces is to produce a new generation of geoscientific maps and databases using new airborne magnetic and gamma-ray spectrometric (radiometric) data (flown at the NGMA standard 400 m line spacing and 100 m flight height) supported by specialist research in geochronology, geochemistry, regolith studies, petrology, structure and mineral deposit studies.

The emphasis will be on producing new 1:250 000 scale geological, geochemical and regolith mapping, Geographic Information System (GIS) packages, predictive models of mineral resource potential and descriptive and interpretive reports and papers.

Lachlan–Kanmantoo Fold Belts Project

Geoscientific knowledge of the Lachlan and Kanmantoo Fold Belts is generally poor despite its long history of mineral production including gold, copper, lead, zinc, silver and tin.

The decision to focus mapping activity in the Lachlan Fold Belt is based on the priority given to the region by industry, the age of the available maps, the amount of new information that has become available since those maps were published, the level of exploration activity in the region and the very substantial contribution of the mining industry in the region to the State's economy. Mines in the Lachlan Fold Belt produce most of the gold and nearly half the base metals mined in New South Wales. The high potential for further discoveries in the Lachlan Fold Belt is recognised by industry, which is currently allocating about two-thirds of the State's minerals exploration budget to this region.

The Lachlan - Kanmantoo Fold Belts Project, a joint project by AGSO and the Geological Surveys of New South Wales, Victoria and South Australia, commenced in 1990. In New South Wales the project is focused on rock and structural associations with known ore deposits such as the Ordovician magmatic rocks in central New South Wales (copper, gold, platinum), Gilmore Fault Zone (gold) and tin granites of the Wagga Metamorphic Belt (tin, tungsten, bismuth). The areas to be covered by the first stage of the project in New South Wales are the Bathurst, Forbes and Dubbo 1:250 000 sheet areas (figure 2). There will also be work on the Narromine, Cootamundra and Wagga Wagga 1:250 000 sheet areas.

The major outcomes of the project will be new maps and digital geological data supported by tectonic, metallogenic and geomorphic/regolith interpretations. The projects will involve geological and regolith terrain mapping using new technologies including airborne and remotely sensed data and results from image processing and spatial analysis (GIS). Other activities are petrological and geochemical studies and geochronological studies of key rock units.

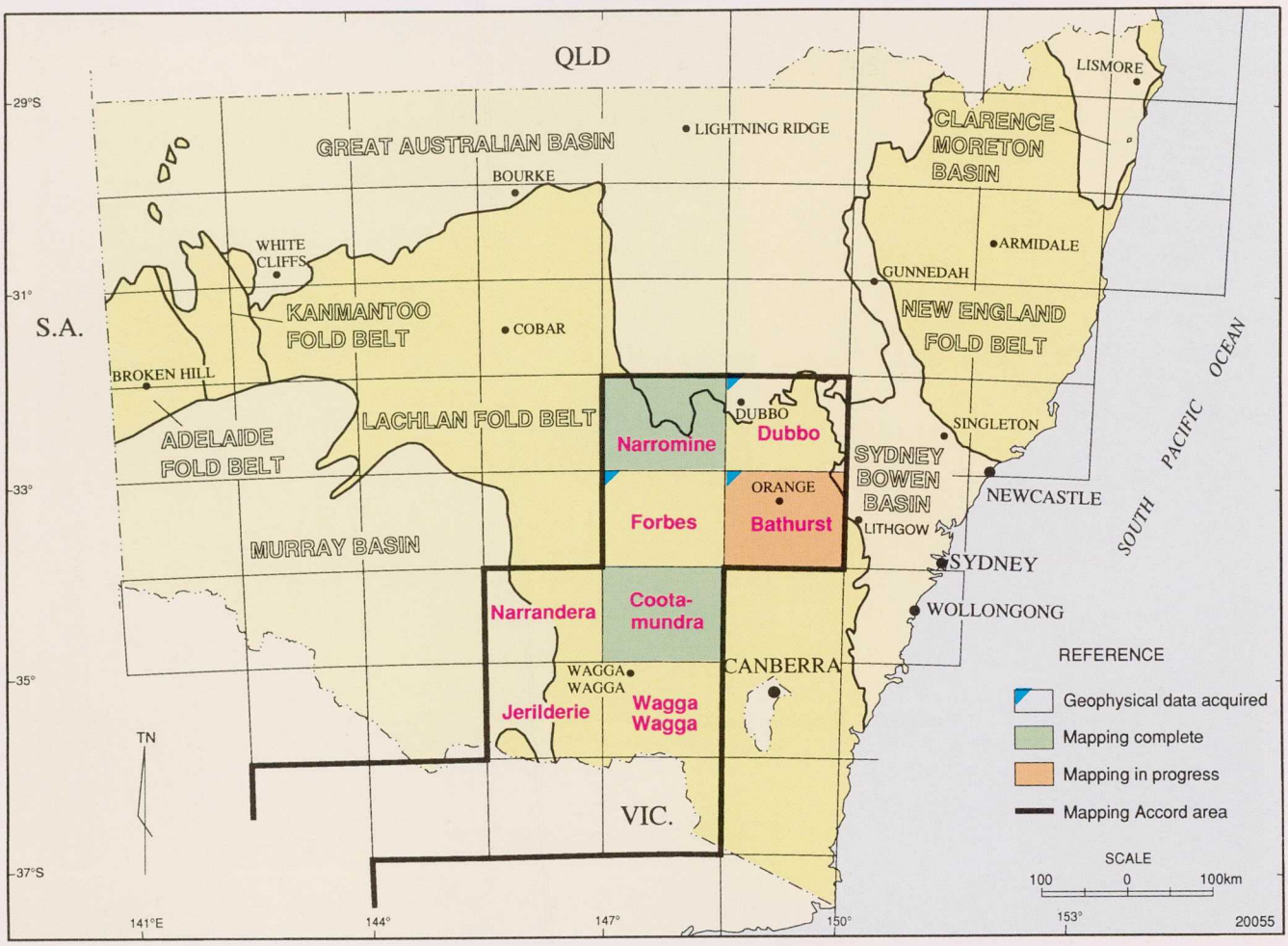


Figure 2. *Current Mapping Accord projects in the Lachlan Fold Belt*

To the end of June 1993, high-resolution airborne magnetic and radiometric surveys of Bathurst, Dubbo, Forbes and part of the Wagga Wagga 1:250 000 sheets were completed, amounting to approximately 184 300 line km of new data. These datasets are providing new insights into both the basement geology and the regolith and will result in changes to existing maps. An example of the new high-resolution geophysical data is shown in figure 3.

Geological and regolith mapping has focused on the Bathurst 1:250 000 sheet area (figure 4) where AGSO has completed geological mapping and preparation of digital maps of the Blayney and Oberon 1:100 000 sheet areas. Preliminary plots of the two sheets at 1:300 000 scale are shown in figures 5 and 6. The Geological Survey has completed the mapping and compilation of the Cowra and Orange 1:100 000 sheet areas. Mapping of the Molong and Bathurst 1:100 000 sheet areas by both AGSO and the Geological Survey of New South Wales is continuing.

Regolith landform mapping over the Bathurst 1:250 000 sheet has been completed and shows that transported materials are not widespread in the region. However, analysis of the palaeodrainage patterns has revealed a complex geomorphic history dating back as far as the Cretaceous. The mapping has enabled areas of actual and potential land degradation to be outlined and has generated considerable interest in environmental, exploration and agricultural groups.

Bathurst Mapping Project

On the Blayney and Oberon sheets, areas of Ordovician volcanics, volcaniclastic units and intrusives have been considerably refined compared with earlier maps. On the Oberon sheet the prospective Rockley Volcanics (shown in green in figure 6) are much more extensive than on previous maps. On the Blayney sheet the Forest Reefs Volcanics, in the north-western corner of figure 5 (θf on cover diagram), form an elliptical subsidence zone about 6 km across. The area is thought to be underlain by a large Ordovician intrusive complex that underwent fractional crystallisation, and evolved a metal-rich fluid phase. The effect of this fluid on the volcanic rocks at the present surface is indicated by the wide-scale development of pyritic alteration. Demagnetisation of the volcanics is evident in the aeromagnetic data over an area of about 20 km^2. The system has analogies to the Lihir Island caldera in Papua New Guinea, which has gold reserves of 42 million ounces (PNG Resources, July-December 1992). Intrusive plugs of monzonite and quartz syenite surround the subsidence zone, and at one locality a quartz - muscovite - tourmaline greisen has developed on the margin of a plug.

On the Orange 1:100 000 sheet, the Ordovician volcanic/volcaniclastic sequence has been subdivided locally. Lithofacies subdivision of the Mullions Range Volcanics and

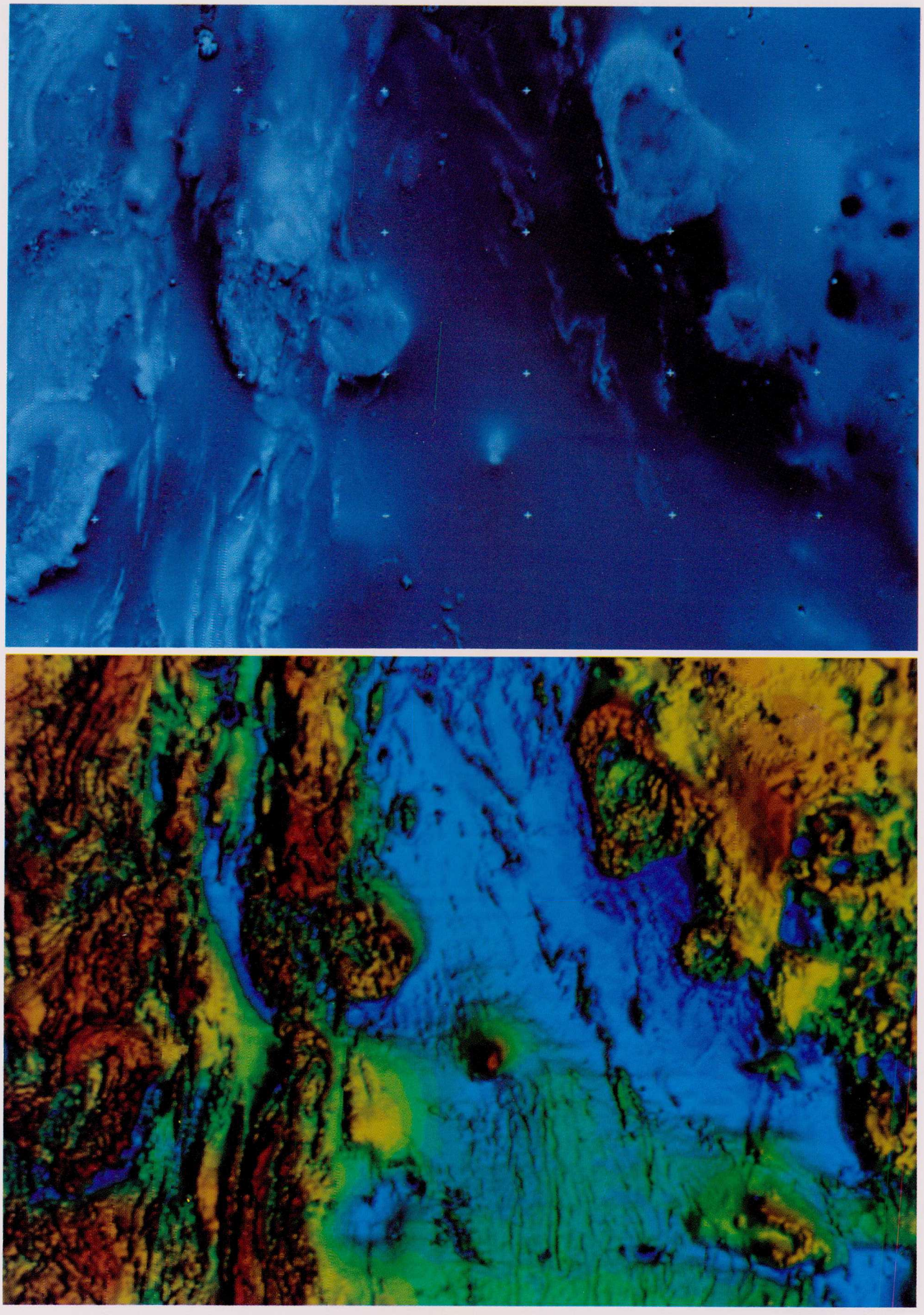


Figure 3. *Greyscale (top) and pseudocolour (bottom) total magnetic intensity images of the Dubbo 1:250 000 sheet area (joint project of the Geological Survey of New South Wales and AGSO)*

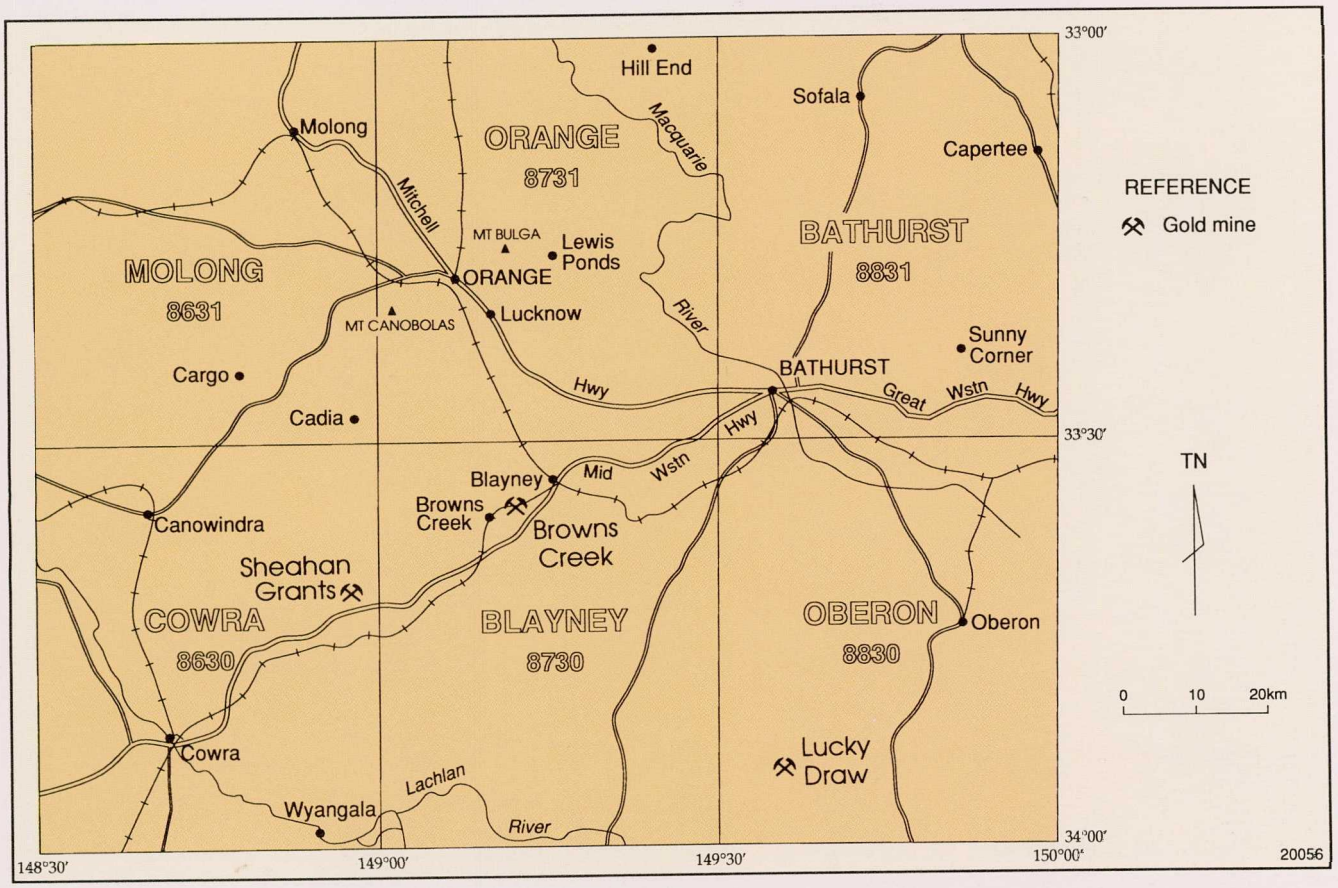


Figure 4. *Locality diagram, Bathurst 1:250 000 sheet area*

associated sedimentary packages of the Hill End Trough has been documented east of Orange. This suggests the copper–gold base metal mineralisation in the Mount Bulga - Lewis Ponds area lies at a particular stratigraphic level. In the area south of the Icely Granite the trough sequence is strongly imbricated and includes a large fault block of strongly gneissic metasediments of presumed early Palaeozoic age.

The structural framework of the western Hill End Trough margin is dominated by mainly north-north-westerly trending east dipping thrust faults cut by some north-trending right-lateral strike faults. A similar east-dipping thrust system bounds the western flank of the Hill End Anticlinorium to the east. The thrust systems on the western margin of the Hill End Trough have caused repetition of Ordovician basement and Siluro-Devonian cover sequences in the zone east of Orange.

A distinctive radiometric signature has allowed the trachytic rocks to be delineated within the Mount Canobolas Volcanic Complex. Enhanced radiometric/magnetic images have also greatly assisted stratigraphic mapping in the Hill End Trough. Second-derivative magnetic images have proved very useful in delineating structure.

Mapping of the Molong 1:100 000 sheet and the remainder of the Bathurst 1:100 000 sheet will be completed during the coming year.

Data on the mineral deposits of the Bathurst 1:250 000 sheet area were last collected systematically in 1969. A total of 463 deposits was recorded in mine data sheets which were published, together with the Bathurst 1:250 000 Metallogenic Map, in 1972. A metallogenic study was compiled in 1973 and published in 1975. The Bathurst map and data sheets were the first in the Department's metallogenic map series designed to cover the State.

Because of the very substantial amount of new information available, a revised mineral deposit inventory of the Bathurst 1:250 000 sheet area is being compiled by conducting a rapid search of available data sources with the emphasis on more recently acquired exploration report information. This review is designed to provide an additional, important "layer" of information to accompany the Bathurst Mapping Project products. For each deposit, the inventory will contain information such as accurate location, commodities present, production, major geological parameters (e.g. host rocks and structures), deposit form, mineralisation characteristics and main references. Digital and hard copy products are planned.

The digital database is designed to be compatible with corporate databases in use at both AGSO and the New South Wales Department of Mineral Resources.

Three styles of mineralisation on the Bathurst sheet

New concepts of mineralisation styles have been developed for the Bathurst 1:250 000 sheet area, which should generate a large number of exploration targets based on the new mapping:

1. The porphyry and epithermal style associated with large Ordovician intrusive complexes is exemplified by the Forest Reefs area described above. A large new low-grade

Figure 5. *Preliminary ARC/INFO plot of AGSO mapping on the Blayney 1:100 000 sheet, scale 1:300 000*

gold deposit is presently being delineated by Newcrest Mining Ltd at Cadia. This deposit occurs near the north-western margin of the Forest Reefs structure.

2. Analyses of precious metals in the Ordovician magmatic rocks indicate a high primary gold, platinium and palladium content (*BMR Research Newsletter* October 1990). There is an inverse correlation of gold content with metamorphic grade, indicating mobilisation of gold from the Ordovician volcanic pile during metamorphism. Chemical and structural traps adjacent to metamorphosed Ordovician volcanic sequences could be ideal sites for gold concentration. The Lucky Draw deposit on the Oberon sheet is possibly an example of this style of deposit. Analyses of rocks of amphibolite facies in the Rockley Volcanics from the Oberon sheet area and the eastern part of the Blayney sheet area are lowest in gold of all analysed Ordovician rocks (commonly <1 ppb Au, where typically values of 5 ppb Au are present in less metamorphosed samples). An original high gold content of the Rockley Volcanics can be predicted based on the palladium content,

Figure 6. *Preliminary ARC/INFO plot of AGSO mapping on the Oberon 1:100 000 sheet, scale 1:300 000*

with palladium apparently unaffected by metamorphic grade.

3. New mapping of Silurian felsic volcanic sequences of the Hill End Trough indicates the presence of a number of separate volcanic centres near the base of the sequence. These include the Mullions Range and Kangaloolah Volcanics, and a newly recognised centre informally known as the 'Vale Creek volcanics' to the south of the Bathurst Granite. The newly recognised distribution of these centres can be used as a basis for exploration for submarine volcanic exhalative massive sulphide deposits. Such potential deposits in the Bathurst 1:250 000 sheet area can be predicted to have relatively high gold content if the Ordovician volcanic basement is involved in their generation. This conclusion is supported by the high gold content indicated by new drilling at the Lewis Ponds deposit which lies within a sequence of siltstones, volcaniclastics and carbonates overlying the Mullions Range Volcanics (4.88 g/t Au in 15 m drill length of massive sulphide).

Granites in the Lachlan Fold Belt

A map and GIS of granites in the Lachlan Fold Belt has been published by AGSO. The map, accompanied by an associated digital database of 3000 geochemical analyses (geochemical data supplied by the Australian National University), provides a classification of individual granite bodies according to various parameters, including mineral potential.

For further information on the mineral provinces projects contact John Cramsie, Director Geological Survey of New South Wales, on (02) 901 8300, Fax (02) 901 8256 or Dr Lynton Jaques, Chief, Minerals and Land Use Program, AGSO on (06) 249 9745, Fax (06) 249 9983.

THE PETROLEUM PROVINCES

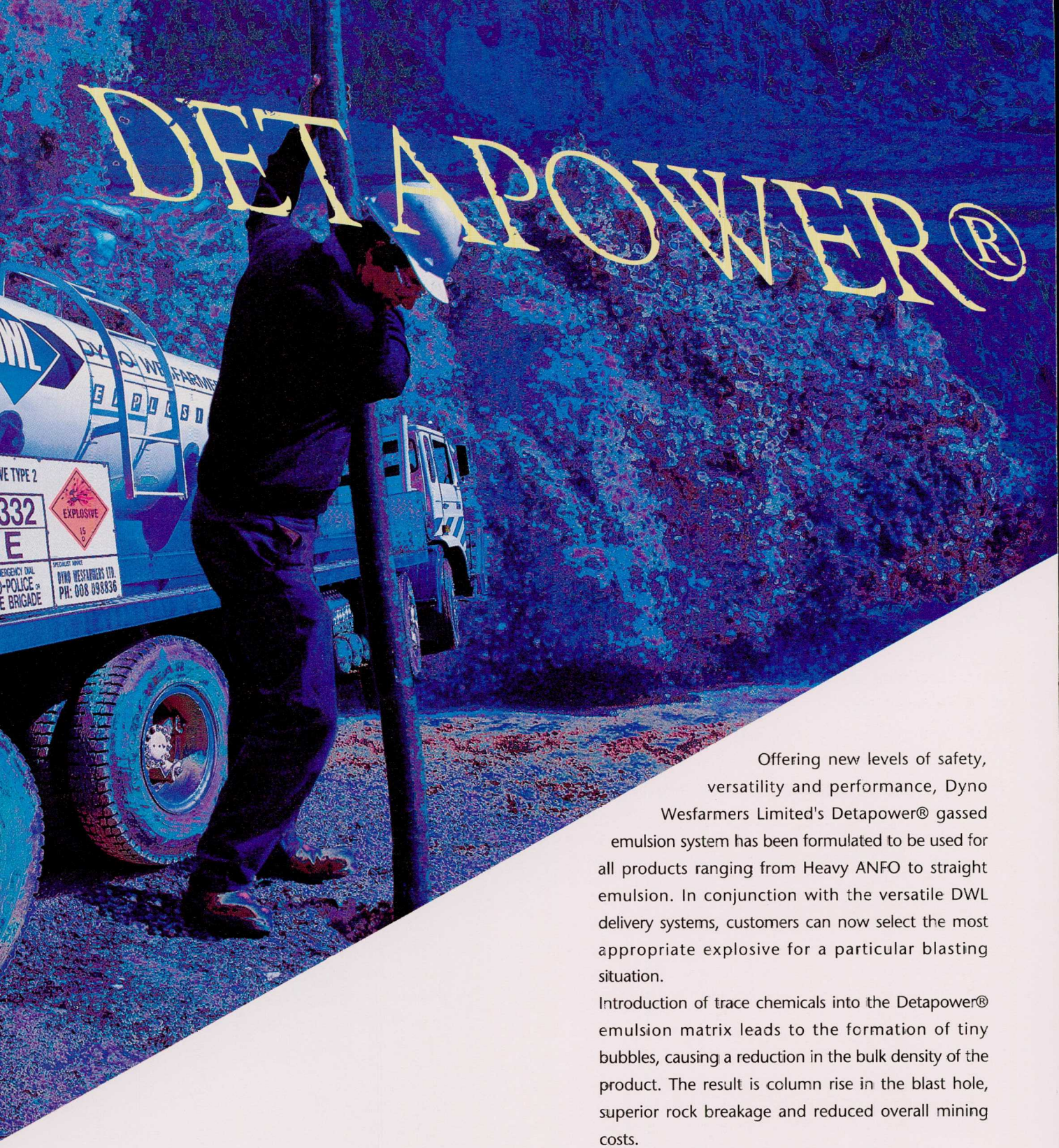
Eastern Australian Basins Project

The objectives of the NGMA in petroleum provinces are to explain the evolution of the basins and to aid assessment of petroleum potential. Activities include defining basement structure, establishing the subsidence/uplift history, defining the basin phases and characterising the fill history of each phase, determining areas of higher potential for hydrocarbons and defining the character, timing and distribution of petroleum system elements. This involves a variety of research techniques, including deep seismic reflection profiling to constrain basin geometry, the mapping of sedimentary sequences in regional networks of seismic lines to examine the geometry of basin fill, organic geochemistry and biostratigraphy.

Information products generated as a result of mapping the Petroleum Provinces will be maps, cross sections, seismic interpretations and digital databases documenting the concepts and ideas developed during the project.

In New South Wales, the major focus of work under the National Geoscience Mapping Accord has been the acquisition, processing and interpretation of over 250 km of deep seismic reflection data in the Gunnedah Basin and New England Fold Belt (see *Minfo* June 1993). Preliminary interpretations of the deep seismic data were presented at the New England Orogen (NEO'93) Symposium in February 1993 and at the New South Wales Petroleum Symposium (Petroleum Exploration Society of Australia) in June 1993, and were published in the symposia volumes.

For further information on the petroleum provinces projects contact Dr Russell Korsch, Onshore Sedimentary and Petroleum Geology Program, AGSO on (06) 249 9495, Fax (06) 249 9983, Dr Tom Loutit, Chief, Onshore Sedimentary and Petroleum Geology Program, AGSO on (06) 249 9397, Fax (06) 249 9983 or Dr Dick Glen, Senior Research Scientist, Geological Survey of New South Wales, on (02) 901 8346, Fax (02) 901 8256.



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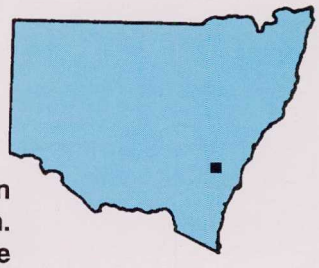
INNOVATIVE DEVELOPMENT AT MARULAN LIMESTONE QUARRY



Marulan Quarry, the largest limestone quarry in Australia and one of the largest in the Southern Hemisphere, is well into Phase 1 of a significant development plan. The mining operations within the southern quarry are undergoing considerable change, and rehabilitation on an intensive scale in this area will follow.

Marulan Quarry is located 165 km south-west of Sydney, near Goulburn in the Southern Tablelands of New South Wales (figure 1). The quarry, which is adjoined by spectacular natural features and scenery, is bordered by Bungonia State Recreation Area in the south and Morton National Park in the east. The limestone deposit plays a vital role in the mineral wealth and development of the State and the nation, and its surroundings share an important place in the recreational and social wellbeing of residents of the Sydney and Wollongong areas.

USES OF MARULAN LIMESTONE

Marulan limestone is mainly used:

* in cement production,
* in steelmaking,
* in the manufacture of quicklime and hydrated lime, and
* for industrial mineral fillers.

Cement originating from Marulan limestone contributes nearly half of that required for the State's annual need.

About athird of Marulan's annual limestone output is used as flux in the steelmaking process. The limestone-based flux attracts and binds with impurities in the iron ore. This mixture floats to the surface as 'slag'.

For many years, blast furnace slag was regarded as a waste product. Now, innovative technology has harnessed the inherent cement-like qualities in these otherwise wasted steel by-products by careful processing and manufacture of blended cements containing slag.

HISTORY

Limestone quarrying in the Late Silurian Bungonia Limestone at Marulan has been carried out to varying degrees since about 1875. The current site of the Marulan Quarry has been worked by a number of companies since the 1920s. By the 1970s there were two major adjoining quarries, each independently owned and operated. The quarry in the south supplied limestone for the Maldon cement works of Associated Portland Cement Manufacturers (Aust.) Ltd (APCM(A)). The quarry in the north was operated by Southern Portland Cement Ltd (SPC), a subsidiary of The Broken Hill Proprietary Co. Ltd. As well as providing limestone for the Berrima cement works, the northern quarry was a major supplier of limestone to the Port Kembla steelworks.

In 1974, APCM(A) and SPC merged to form Blue Circle Southern Cement Ltd (BCSC). One of the significant benefits of this corporate merger was the amalgamation of the two formerly separate quarrying operations. While the amalgamation would not permit the recovery of a greater quantity of limestone, it did allow BCSC to advance new quarry development and operational strategies.

In 1987, BCSC became a subsidiary of Boral Ltd.

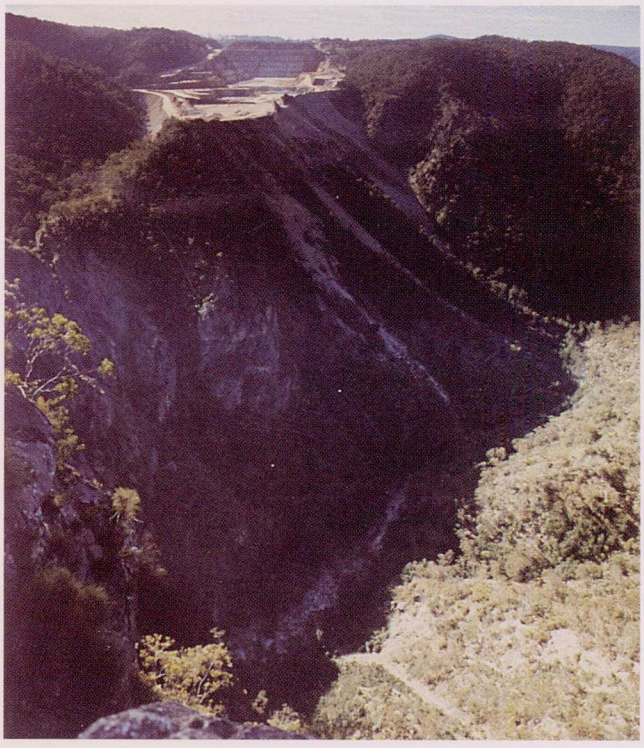
Since 1929 approximately 35 million tonnes of limestone have been extracted from the deposit. Current annual production is about 2.4 million tonnes.

DEVELOPMENT PLAN

The development plan embodies a quarrying strategy in which rehabilitation, minimum surface disturbance and the removal and emplacement of mullock as a constructive and remedial activity are integral parts.

Phase 1

At the commencement of Phase 1, the quarry was divided into two areas: one to the north and the other to the south of a high earth wall which was specially constructed. The wall was designed to provide a sight screen for the northern end of the quarry, as viewed from Bungonia Lookdown.



Marulan Quarry — Phase 1

* Article prepared from material supplied by Blue Circle Southern Cement Ltd

In Phase 1, quarrying proceeds to a point 365 m asl. This point is referred to as the 'maximum rim circumference' and is reached when the quarry is some 215 m above the level of Bungonia Creek. Important aspects of the first phase of the quarry development plan focus on operations around the perimeter of the quarry. The careful mining development of a quarry rim, together with specially developed rim firing techniques, minimises the potential for material to escape from the quarry itself.

On current indications, the maximum rim circumference will be reached by about the year 2005.

Phase 2

On development to 365 m asl, quarry operations in the southern end will change and will be conducted internally. Quarrying will proceed internally to a final floor level of 275 m asl, and will be contained within the shell of the quarry hillside. Importantly, this phase will provide access to the lower slopes affected in earlier years by scree. Their rehabilitation and revegetation will begin.

On current predictions, the second phase will be in operation from 2005 to about the year 2010. Its completion will signal the start of one of the key environmental elements of the overall quarry development plan.

Phase 3

Extraction of limestone in the southern end of the quarry will have been completed by the end of Phase 2. Quarrying will then be in the northern area, hidden by the progressive rehabilitation of the southern quarry area. A benefit of the concentration of present quarrying in the southern end is to foreshorten the time during which the quarry operations are most visible.

But there are other sound reasons underlying the development plan.

Originally, the APCM(A) quarry in the south may have been able to have been revegetated, but it would have been impossible to redress the alteration to the land shape created by quarrying.

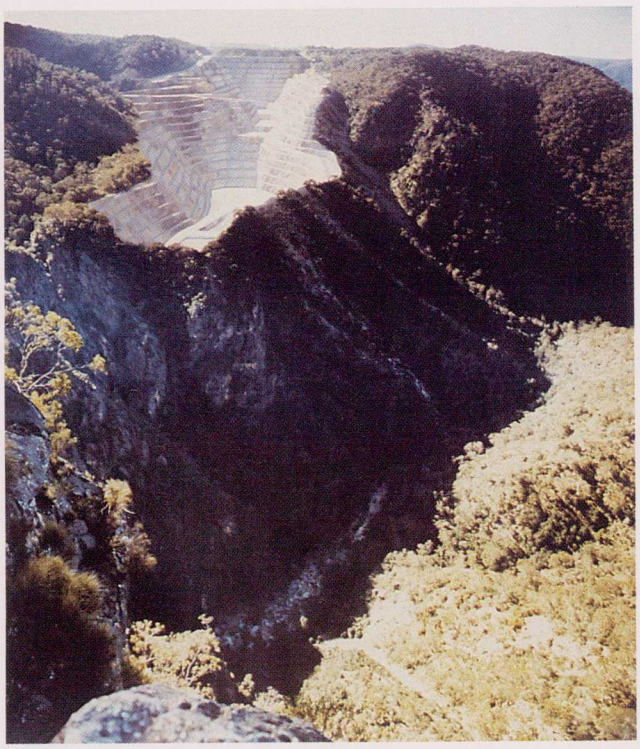
Now, the mullock from the future development and operation of the northern quarry will be available to backfill the depleted a rea in the south. Sufficient mullock is available to enable emplacement and remedial contouring to a profile consistent with the surrounding topography.

Equally important is that this plan also minimises the extent and effect on additional areas that would otherwise have been required in other to accommodate mullock generated in the northern quarry.

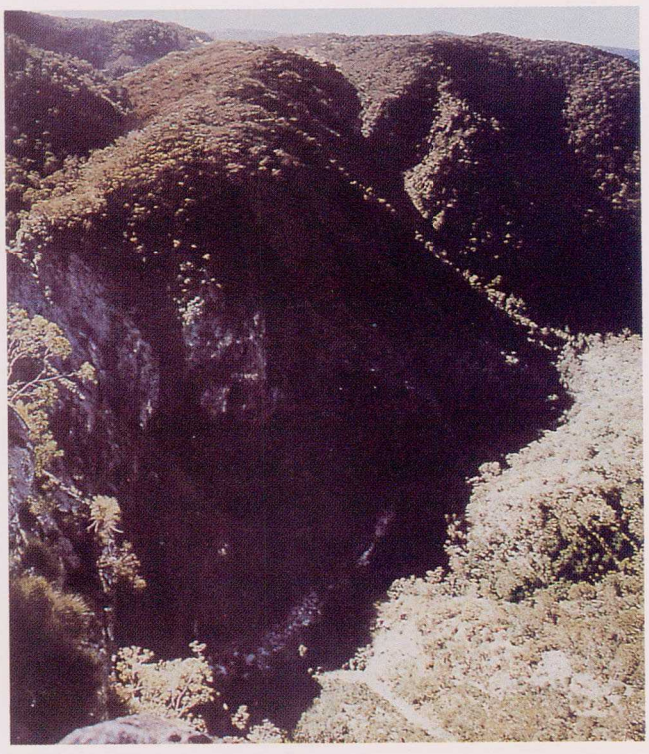
By about 2025, mullock removed from the northern quarry will have been emplaced in the southern end and will provide about 80% of the total volume required for planned rehabilitation. Revegetation will be well advanced by this time and emplacement of the remaining 20% will take place over a longer period and will be screened from view.

The Marulan Quarry development plan has been designed specifically to minimise mining effects, contain the operation to the smallest area possible and, in particular, to leave unaffected the view from Adams Lookout.

Quarry operations are being conducted to minimise the short term effect on the visual environment. The consolidation of the two earlier quarries has reduced significantly the legacy of earlier operations, and will enable, within a reasonable time frame, massive rehabilitation in the southern area.

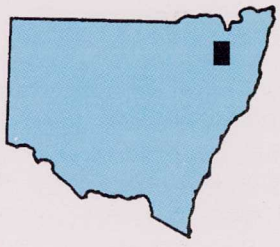


Marulan Quarry — Phase 2



Marulan Quarry — Phase 3

NEW EXPLORATION DATA — INVERELL 1:100 000 SHEET



The Department has released a comprehensive two-volume exploration data package reviewing the mineral deposits and metallogeny of the Inverell 1:100 000 sheet area (figure 7).

The package is a product of a study of the New England region (refer *Minfo* ***36***, p. 22).

The package (Geological Survey report GS1993/049) includes a dyeline map at 1:100 000 scale depicting line geology and letter symbols on a topographic base and showing all recorded mineral occurrences as oriented, numbered symbols. The areal extent of the numerous, and in many cases very large, alluvial and deep lead occurrences is shown in fine detail.

One volume of the package comprises a discussion on **geology, mineral deposits, exploration and geochemistry**. The second volume is a set of **mineral deposit data sheets** with an explanation of the data sheet format. The data are available in DBIII, Lotus, Q&A, and ASCII formats on disk. A discussion of the mineral deposits of the subject area was published in *Geological Survey of New South Wales, Quarterly Notes* **91**.

The geology of the area features extensive Tertiary basalt, sedimentary and volcaniclastic rocks overlying areally extensive granitoids, volcanic rocks of the Wandsworth Volcanic Group and metasediments of the Sandon and Texas beds. Granitoids include the ?Permo-Triassic Webbs Consols Leucogranite, the Early Triassic Gilgai Granite, Elsmore Granite and Tingha Adamellite, and the Early Permian Bundarra Plutonic Suite.

Five hundred and sixty-seven mineral occurrences have been identified and described, and most have been visited and sampled. Deposit types include lode Pb-Zn-Ag±As±Sn(±Mo±Cu), lode cassiterite, alluvial and deep lead cassiterite, diamonds and sapphires, and a range of industrial minerals including fluorite, bauxite, clay, crushed aggregate, rhodonite and sand and gravel.

Lode cassiterite deposits have been emplaced by the Gilgai and Elsmore Granites in the form of veins, pipes and disseminations. Ore production from individual deposits has seldom exceeded several tens of tonnes, with the major producers being the Leviathan, Brickwood and Butchart lodes.

Base metal deposits are developed throughout the Gilgai Granite and to a lesser extent the Tingha Adamellite and Webbs Consols Leucogranite. Deposit categories include vein type Pb-Zn-Ag-Cu-As±Sn±Mo, disseminated Pb-Zn-Ag-Cu-As±Sn± Mo, disseminated As-U and disseminated and vein Mo. Most deposits have produced less than several tens of tonnes of ore, although the Conrad mine is credited with more than 175 000 tonnes containing zinc–silver–copper–tin. The Conrad lode, upon which the Conrad mine is developed, has been prospected discontinuously over a total length of 7500 m, and was worked locally to a depth of 300 m.

The Tingha tin field has produced more than 70 000 tonnes of concentrate since 1871 from alluvial and deep lead sources. Major alluvial deposits include Copes Creek, Middle Creek, Darbys Creek, Cope - Hardinge Creek, Sutherlands Water, Murrays Water, Sheep Station Creek and Ponds Creek. Major deep lead producers include the Toppers Mountain, Gilgai, Borthistles, Brickwood, Red Hill and Elsmore Valley leads.

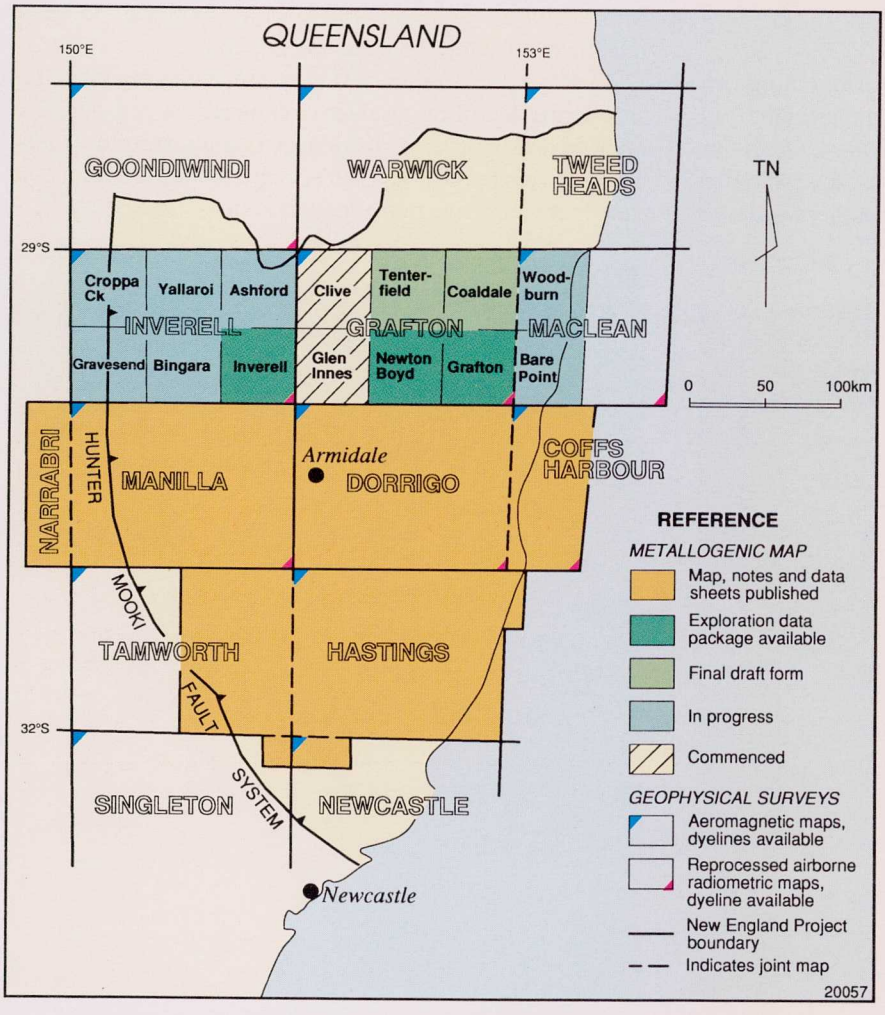


Figure 7. *Current status of geological and geophysical mapping in New England*

Diamonds have been mined from many watercourses and deep leads in the Copeton area. Major diamondiferous alluvial deposits are associated with Copes, Maids and Quart Pot Creeks. Diamond-bearing deep leads include the Mount Ross, Ryders, Collas Hill and Soldier Hill leads.

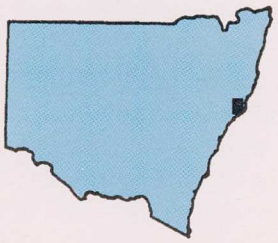
Rich and extensive sapphire deposits occur throughout the northern half of the subject area. These are mined from Tertiary and Quaternary placers which have formed from a primary Tertiary volcaniclastic source.

The highlights of the study results are:

* The delineation of numerous small, previously undocumented base metal deposits within the Gilgai Granite.
* The recognition and mapping of widespread and numerous lode cassiterite deposits.
* The recognition of the high exploration potential for major alluvial cassiterite, sapphire and diamond deposits, lode base metal deposits and small though rich cassiterite lodes.

The data package is available from the Information Counter at Head Office and from the Armidale Office (prices for individual products on application). For further information contact Jim Stroud, Senior Geologist, or Bob Brown, Geologist, Armidale Office, on (067) 70 2100, Fax (067) 70 2121.

HEAVY MINERALS SANDS MINING PROPOSALS*



RZM Pty Ltd have announced proposals for three new heavy mineral sands mining projects in the Forster area (see figure 8).

Twenty-seven stockpile sites containing economic concentrations of rutile and zircon to an average depth of 0.7 m are scattered over a distance of about 8 km north of existing mining operations at Wang Wauk. These sites were used as titanium minerals stockpile areas during previous mining in the region in the late 1970s - early 1980s. The proposed mining area within each site ranges from 0.02 ha to 0.31 ha and the total mining area will be about 2.68 ha. Eighteen sites are located on Crown land and nine sites are situated on private land. Mineral Claims and Private Mining Agreements have been formalised for the proposed mining operations. All excavated material will be transported to the current Plant 10 site (to the south at Wang Wauk) for processing. Each site will be mined and rehabilitated progressively, ensuring that there will only be three or four sites 'active' at any one time. The mining operation will be completed over a period of about 1 month.

Wellers Project - MLA 1 Coffs Harbour, 10 km south-east of Nabiac. The proposed mining area comprises about 21.5 ha, and contains identified reserves of about 5850 t of heavy minerals, including rutile (27%), zircon (26%). Proposed dry mining methods to a maximum depth of 4 m will proceed from west to east over a period ofabout 15 weeks. This project will be a replacement for the company's mining operations 4 km to the south at Wang Wauk.

Failford East Project - MLA 131 Coffs Harbour, 9 km north-north-west of Tuncurry. Proposed mining operations involve dredging for mineral sands to a maximum depth of 4.7 m. Material will be concentrated in an on-site plant and hauled to the company's Tomago mill for further processing. The bulk of the proposed mining area was previously mined in the late 1960s; however, improved mining and processing technology now make some older mined areas such as this commercially viable for re-mining. It is proposed to mine and concentrate approximately 26 000 t of heavy minerals, including about 8000 t of rutile and about 9750 t of zircon. Mining in the area is expected to be completed within 14 months of commencement.

These three mining projects, if development is approved by Great Lakes Council, will together provide continuous direct employment for 12 on-site personnel and indirect employment for the company's 190 personnel involved in associated activities. It will also provide an economic boost to the Forster–Tuncurry community.

At the request of the company, the Department of Mineral Resources convened a **Planning Focus** meeting for these three projects on 14 July. Inspection of the project sites by representatives of relevant Government agencies accompanied by RZM personnel was followed by an afternoon meeting at the offices of Great Lakes Council to discuss any outstanding issues and work towards an agreed timeframe for development approval consideration by Council. The on-site inspections were most useful to this process, and facilitated discussion and resolution of a number of issues.

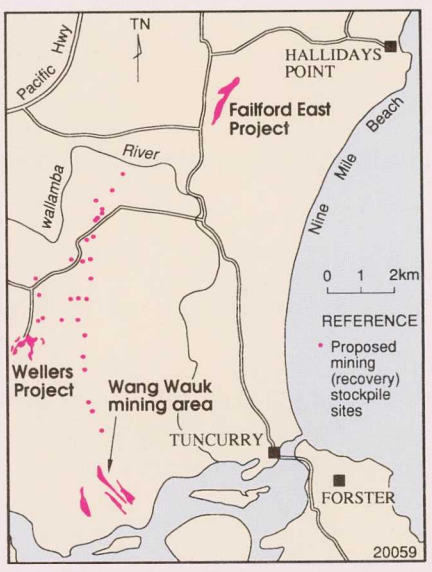


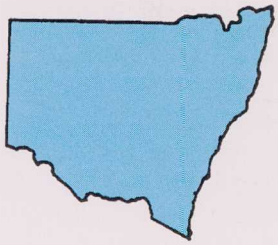
Figure 8. Locality diagram

Development applications for these projects have been submitted to Great Lakes Council. Mining of the stockpile sites and Wellers area is proposed to commence in late 1993, and mining of the Failford East area in early 1994.

For further details please contact Trevor Barnard, RZM Pty Ltd, phone (049) 64 8081, Fax (049) 66 5492.

* Article prepared from material supplied by RZM Pty ltd

NEW DIMENSION STONE INFORMATION PACKAGE



A new information package on New South Wales dimension stone is now available.

Dimension stone is natural stone that is cut to specific dimensions for use in the building, construction and monumental industries. The main types produced in New South Wales are granite, marble, sandstone and slate. Local dimension stone, particularly granite and sandstone has been used in many buildings in Sydney and elsewhere, and in recent years the industry has expanded significantly and an export industry is developing.

The package contains summary information on all active dimension stone deposits in New South Wales, production and import/export statistics, contacts for further information on the Australian dimension stone industry, and discussion of selected aspects of dimension stone and its use.

The information package includes an extract from the Department's computer database (dBASE IV) containing information on stone type, colour, geology, location, producers, primary processors, mining titles and production.

The **New South Wales Dimension Stone Information Package** (Geological Survey of New South Wales, Report GS1992/354) is available from the Information Counter (price $12.00).

For further information on dimension stone, contact Helen Ray, Geologist, on (02) 901 8362, Fax (02) 901 8379.

STOP PRESS — GEMSTONE UPDATE

The industry-based **Australian Gemstone Industry Council** (AGIC), which was established in 1990 following the work of the former Australian Minerals and Energy Council (AMEC) Working Party on Gemstone Processing (refer *Minfo* **26**, p. 30) announced two significant events concerning Australia's gemstone industry at its meeting held in Melbourne on 19 August 1993.

PROCLAMATION OF OPAL AS AUSTRALIA'S NATIONAL GEMSTONE

On 28 July 1993 the Commonwealth Government announced that opal had become a new national symbol.

AGIC has now endorsed a committee formed to co-ordinate activities for the promotion of Australia's National Gemstone. Major activities will include the development of an appropriate logo, a special exhibition to be held at The Earth Exchange, an opal catalogue, a gala dinner to celebrate and commemorate our National Gemstone, and a proposed stamp release.

For further information contact Andrew Cody, Cody Opals (Australia) Pty Ltd, phone (03) 650 1688; Fax (03) 654 1460.

PUBLICATION OF 'GEMSTONES IN AUSTRALIA'

This book, to be published by AGIC in early October 1993, contains a review of the gemstone industry and the first published national assessment of gemstone resources. The book is based on a study carried out in 1990 by a group of government and industry geologists for the former AMEC Working Party on Gemstone Processing. 'Gemstones in Australia' contains over 80 pages of data and references, including relevant maps and geological survey results, highlighting the discoveries, government involvement and geological breakthroughs of recent years.

The full price of this publication is $50.00 per copy; however, AGIC is accepting pre-paid orders prior to 15 October 1993 for $30.00 per copy. For enquiries and further information contact the AGIC Secretariat, GPO Box 102, Sydney 2000; phone (02) 267 1310; Fax: (02) 267 1928.

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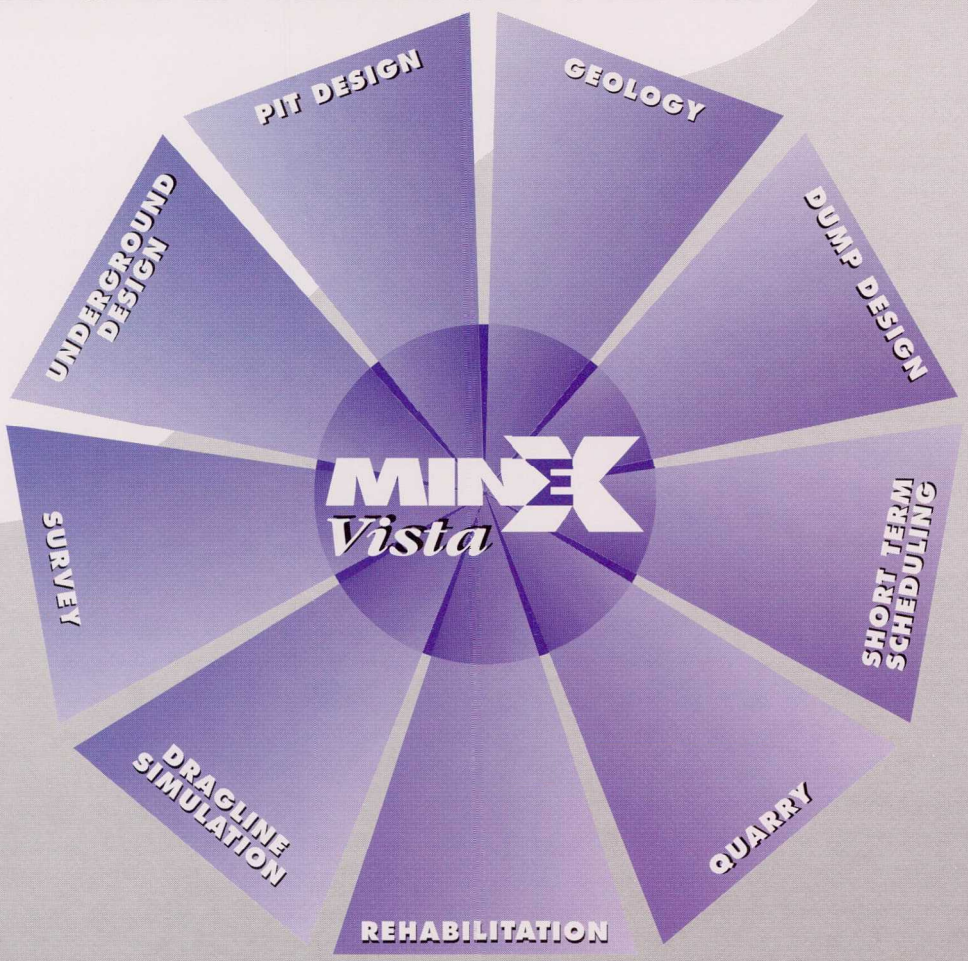

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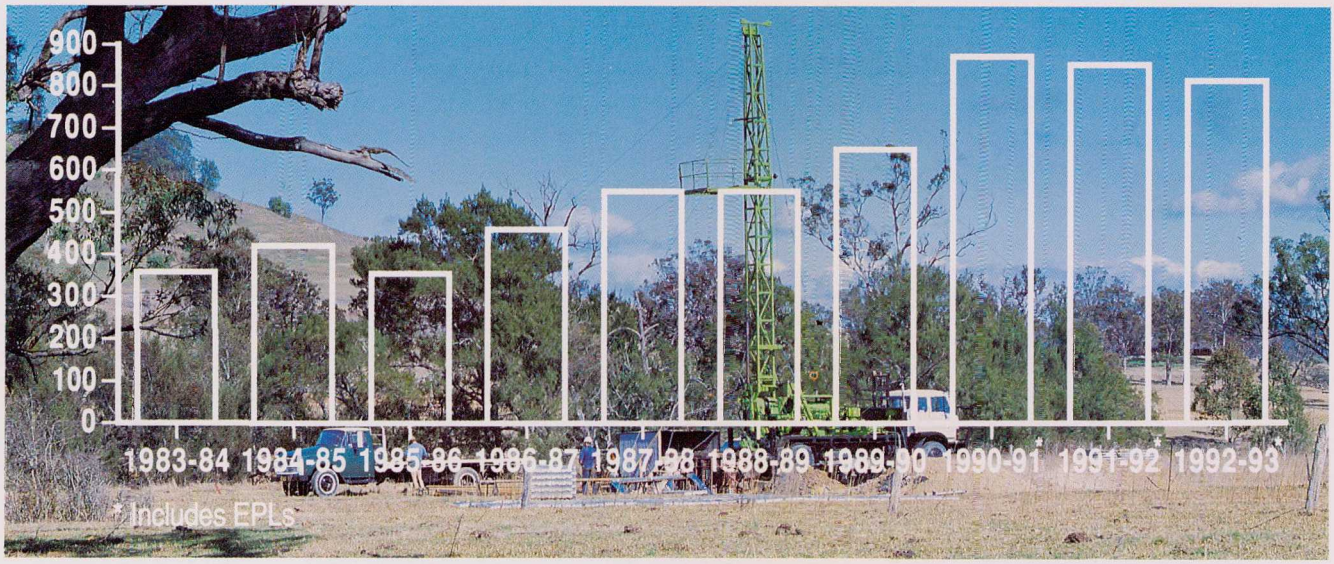
EXPLORATION LICENCES

NUMBER OF EXPLORATION LICENCES IN FORCE 1983-84 TO 1992-93



EXPLORATION LICENCES GRANTED APRIL–JUNE 1993

No.	Mining Div'n*	Holder	Area$	Expiry date+	Min grp#
4495	BH	Helix Resources N.L.	100.0 U	15.04.95	6
4496	NE	Commercial Minerals Ltd	20.0 U	19.04.95	2
4497	AR	Cluff Minerals (Aust.) P/L	1.0 U	05.08.93	1,6
4498	WA	Somerset Mining P/L	5.0 U	12.05.95	1
4502	OR	Newcrest Mining (WA) Ltd	89.0 U	20.05.95	1
4503	OR	Newcrest Mining (WA) Ltd	75.0 U	20.05.95	1
4504	CM	Eddaglide P/L	40.0 U	25.05.95	1
4505	GO	Astley Consolidated Holdings P/L	83.0 U	25.05.95	1
4506	SY	CRA Exploration P/L	21.0 U	25.05.95	1
4507	OR	Peko-Wallsend Operations Ltd	57.0 U	25.05.95	1
4508	OR	Peko-Wallsend Operations Ltd	40.0 U	25.05.95	1
4509	OR	Peko-Wallsend Operations Ltd	61.0 U	25.05.95	1
4510	OR	Peko-Wallsend Operations Ltd	57.0 U	25.05.95	1
4511	OR	Peko-Wallsend Operations Ltd	78.0 U	25.05.95	1
4512	OR	Dowmill P/L			
		Nosebi Mining & Management P/L	54.0 U	01.06.95	1
4513	SY	Platinum Search N.L.	80.0 U	02.06.95	1
4514	OR	Central West Gold N.L.			
		Mount Conqueror Minerals N.L.	2.0 U	06.06.95	1
4515	OR	Newcrest Mining (WA) Ltd	41.0 U	06.06.95	1
4516	CO	Peko-Wallsend Operations Ltd	15.0 U	06.06.95	1
4517	CO	Peko-Wallsend Operations Ltd	2.0 U	05.02.95	1
4518	CO	Peko-Wallsend Operations Ltd	1.0 U	05.02.95	1
4519	OR	Peko-Wallsend Operations Ltd	100.0 U	09.06.95	1
4520	BH	Aberfoyle Resources Ltd	288.0 U	15.06.95	1
4521	BH	Aberfoyle Resources Ltd	75.0 U	15.06.95	1
4522	WA	CRA Exploration P/L	97.0 U	16.06.95	1
4523	CO	Peak Gold Mines P/L	66.0 U	17.06.95	1
4524	OR	CRA Exploration P/L	167.0 U	22.06.95	1
4525	OR	CRA Exploration P/L	198.0 U	22.06.95	1
4526	OR	CRA Exploration P/L	169.0 U	22.06.95	1
4527	OR	CRA Exploration P/L	116.0 U	22.06.95	1
4528	OR	CRA Exploration P/L	53.0 U	22.06.95	6
4529	OR	CRA Exploration P/L	72.0 U	22.06.95	1
4530	OR	Peko-Wallsend Operations P/L	67.0 U	24.06.95	1
4531	OR	Peko-Wallsend Operations P/L	87.0 U	24.06.95	1
4532	OR	Peko-Wallsend Operations P/L	6.0 U	24.06.95	1
4533	OR	CRA Exploration P/L	79.0 U	24.06.95	1
4534	SY	Southern Highlands Quarries P/L	1.0 U	29.06.95	5

REFERENCE

* AR Armidale
BH Broken Hill
CH Coffs Harbour
CM Cooma
CO Cobar
GO Goulburn
IN Inverel
LR Lightning Ridge
NE Newcastle
OR Orange
SI Singleton
SY Sydney
WA Wagga Wagga

$U = Graticular system units

\# Group 1 - Elemental minerals (metallics)
Group 2 - Non-metallics
Group 3 - Semi-precious stones
Group 4 - Hard rock minerals
Group 5 - Clay minerals
Group 6 - Diamond, sapphire
Group 7 - Opal

+ ELs with passed expiry dates may either be subject to renewal applications or continue by virtue of "flow on" applications

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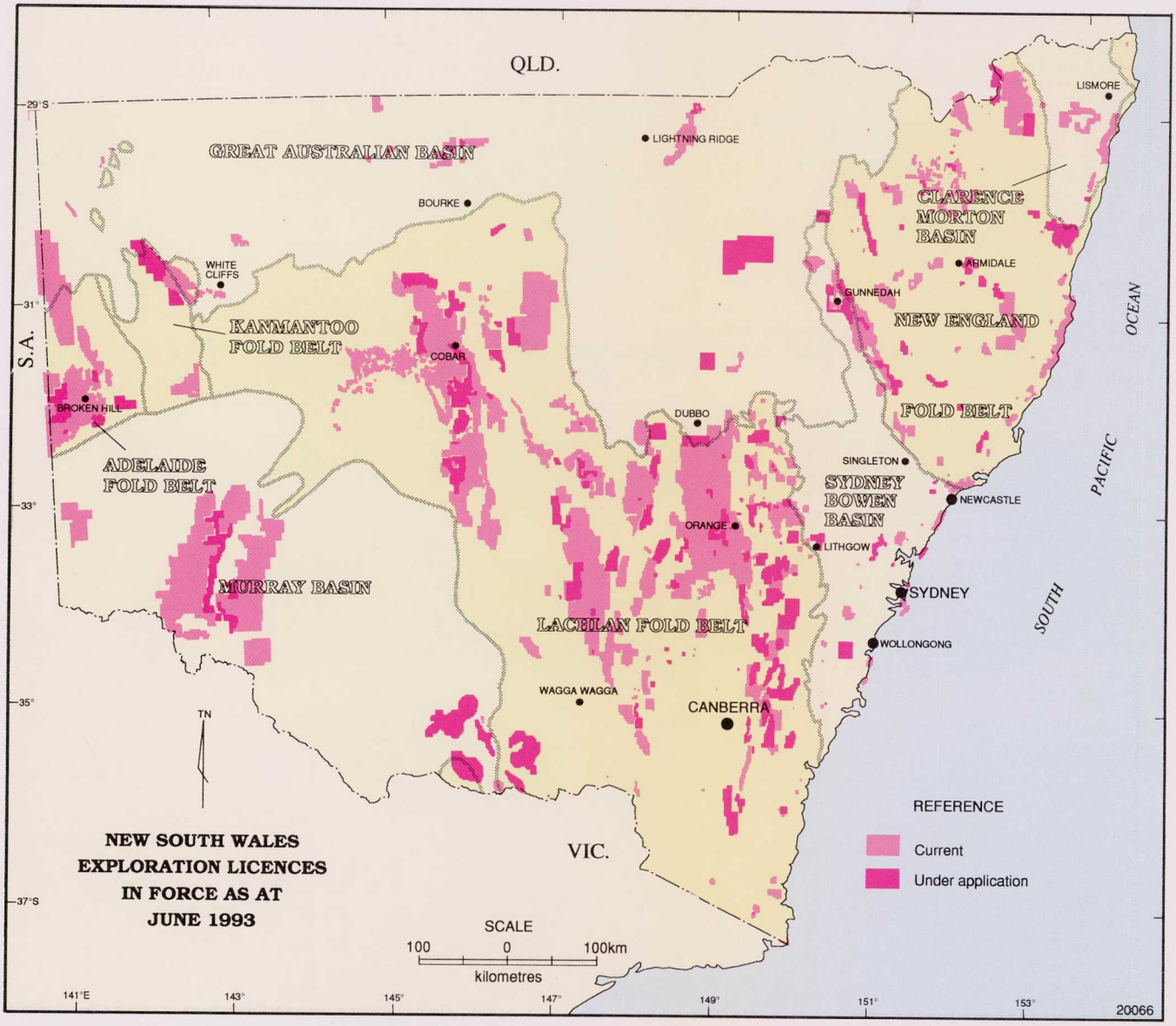
EXPLORATION LICENCES IN FORCE JUNE 1993



SUMMARIES OF TERMINATED EXPLORATION LICENCES*

EXPLORATION LICENCES CANCELLED/EXPIRED APRIL–JUNE 1993

Reports on these ELs are no longer confidential; note that reports on EPLs are generally not included.

EL 2945 **Newcrest Mining Ltd**
Location: 5 to 25 km S of Ballina
Objective: Heavy mineral sands

Combined heavy mineral sand resources of some 5 Mt at 0.9 to 2.2% heavy minerals (HM) were defined in the Wardell, Broadwater and Evans Head deposits. This area was a strategic holding while the Newrybar mine was operating but contains insufficient resources to justify a 'stand alone' mining operation. Attempts to sell this property were unsuccessful.

EL 3094 **Newcrest Mining Ltd**
Location: 1 km N of Ballina
Objective: Heavy mineral sands

Inferred and Measured resources of 25.2 Mt at 0.8% HM have been delineated within this licence (including 7.2 Mt at 0.7% HM at the existing Newrybar mine). Relinquishment of this licence followed closure of the Woodburn sand mining operations at Newrybar in 1992.

* **ERRATA**: *Minfo* **39**, p. 40. 'EL 2749' should read 'EL 3749'. *Minfo* **40**, p. 38. 'EPL 892' should read 'EPL 1096'.

EL 3100 **Newcrest Mining Ltd**

Location: Yamba

Objective: Heavy mineral sands

Exploration defined a Measured Resource (sub-economic) of 5.7 Mt at 0.9% HM (cut off of 0.6% HM). This licence was relinquished following unsuccessful attempts by Newcrest to sell or farm out the project.

EL 3285 **Peko-Wallsend Operations Ltd**

Location: 25 km SE of Tenterfield

Objective: Volcanic-hosted gold deposits

Stream sediment geochemistry identified nine areas of base metal or gold anomalism. A Pb-As-Ag anomaly was diamond drilled, intersecting a mixed sediment–volcanic sequence with narrow zones of silica–chlorite–sericite alteration. Anomalous base metals (to 1000 ppm Cu and 3350 ppm Zn) are associated with sulphide veins and strong chlorite alteration. No anomalous gold was encountered.

EL 3536, 3546 **Aberfoyle Resources Ltd**

Location: Murray Basin

Objective: Heavy mineral sands

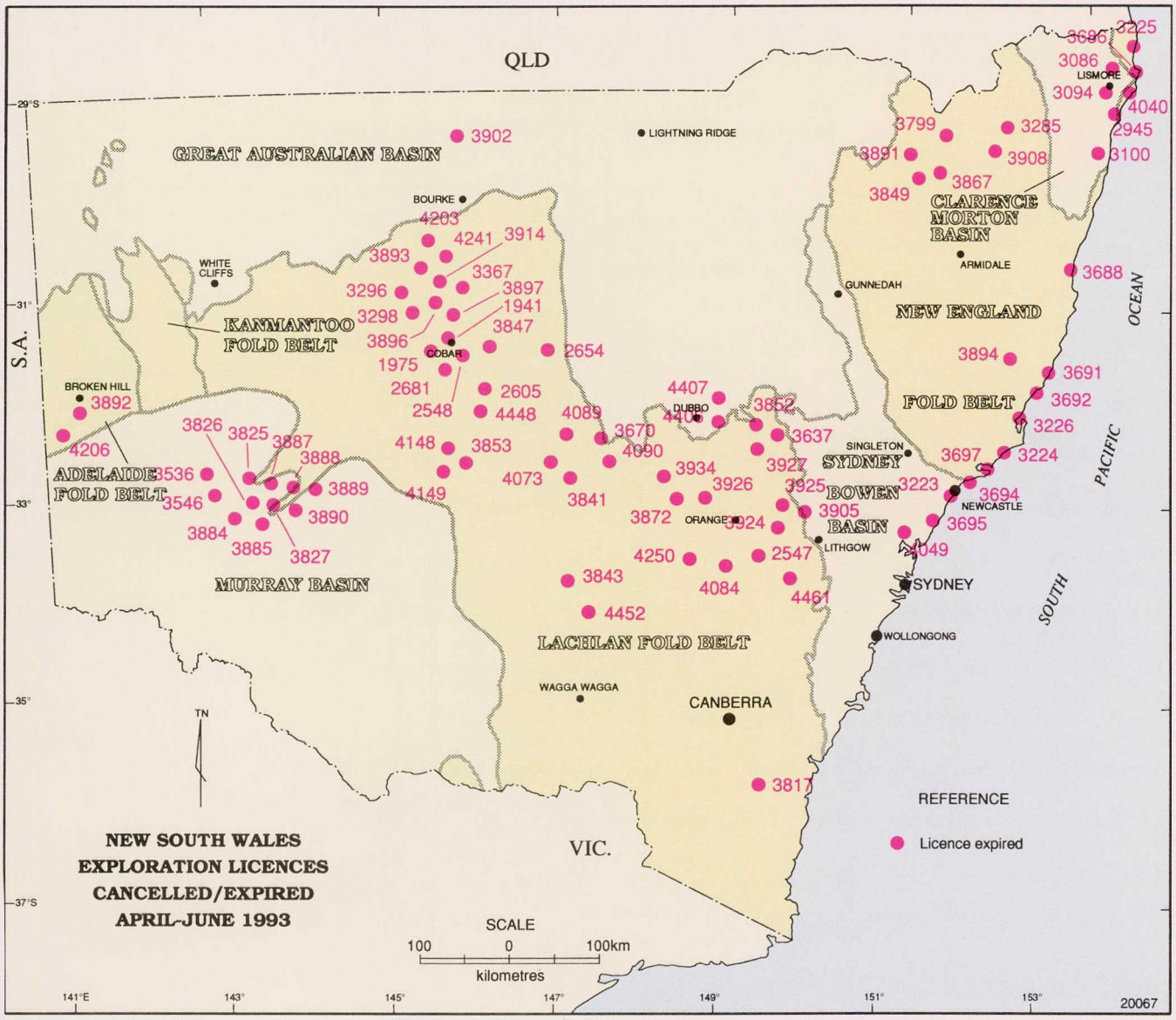
Reverse circulation drilling encountered generally clay and gravel sequences, interpreted to be non-prospective sediments of the Calivil Formation. Drilling on areas to the east and north of these licences also encountered mainly fluvial sediments.

EL 3637 **Compass Resources N.L.**

Location: Gulgong

Objective: Gold

Ground magnetics, and rock chip and soil sampling failed to generate drill targets. Although narrow zones with anomalous base metals exist north of the Gulgong–Ulan road, no significant magnetic anomalies are associated with these zones. A rock chip sample at the Road Shaft prospect north-east of Gulgong returned a best result of 1.90 ppm Au.



ELs 3777, 3779, 3825, 3826, 3827, part 3780 — **Aberfoyle Resources Ltd**

Location: Murray Basin

Objective: Heavy mineral sands

Drilling within ELs 3777, 3779 and 3827 intersected non-prospective sequences of alluvial clay, sand and gravel. Possible Parilla Sand intersected in several boreholes contained heavy minerals of less than 0.2% to 0.3%. Within the western part of EL 3780, possible Parilla Sand was intersected but no significant heavy minerals were noted beyond an estimated 0.5% HM.

EL 3817 — **J.R. & A.G. Wilson**

Location: 60 km S of Braidwood

Objective: Alluvial gold

An area of old workings along Snowball Creek was tested by fourteen pits. Panning found traces of gold in three of them. Most of the pits were 2 to 3 m in depth and deeper gravels remain untested.

EL 3847 — **Strategic Minerals Corp. N.L.**

Location: 50 km E of Cobar

Objective: Gold

This licence was acquired to test for extensions of the Mount Boppy mine. Previous drilling under EL 1324 had obtained a best intersection of 20 m of calcareous siltstone containing up to 1.43 g/t Au at a depth of 70 m. Attempts to find a joint venture partner proved unsuccessful and no exploration was undertaken.

ELs 3887, 3888, 3889, 3890 — **Aberfoyle Resources Ltd**

Location: Murray Basin

Objective: Heavy mineral sands

Work was restricted to a review of previous drilling. These holes are either dominated by clays and clayey sands or sands interpreted to be channel-fill alluvial deposits. These are not considered prospective for heavy mineral sands.

EL 3894 — **P.W. English & W.G. Saul**

Location: 35 km SW of Wauchope

Objective: Limestone

Geological mapping of the Comboyne Caves Limestone Deposit delineated a resource of almost 500 000 t of limestone suitable for agricultural and industrial uses, and amenable to open cut mining. Mineral claims were applied for over this deposit upon relinquishment of this licence.

EL 3905 — **Hyrock P/L**

Location: 10 km N of Capertee

Objective: Limestone

Exploration was undertaken for white limestone for use as ground calcium carbonate filler. Drilling of the Excelsior limestone deposits (currently mined for road base and agriculture uses) located some high-grade limestone, but overburden is too thick to allow extraction. No other suitable deposits were found in EL 3905.

EL 3927 — **Hire Powe rP/L**

Location: 5 km NE of Gulgong

Objective: Gold

A line of boreholes was drilled to a maximum depth of around 30 m through a sequence of alluvial sands, silts and gravels. The best result was 0.08 ppm Au from 2 m depth. Most samples contain less than the detection limit of 0.01 ppm Au.

EL 4040 — **Newcrest Mining Ltd**

Location: 25 km SW of Ballina

Objective: Heavy mineral sands

Drilling defined an Inferred Resource of 375 000 t at 1-1.9% HM. There is limited potential for heavy mineral sand deposits in excess of 1 Mt based on results obtained so far.

EL 4049 — **PGH Ltd**

Location: 10 km W of Gosford

Objective: Clay and shale

A shale deposit of suitable quality for use in brick making was located within the licence. However, the area is currently being mined for sand and the two activities are apparently incompatible.

EL 4084 — **Climax Mining Ltd**

Location: 25 km SW of Blayney

Objective: Gold and base metals

This licence covers the old Gallymont gold mine. Field work was restricted to reconnaissance mapping and rock chip sampling. Gold in the range 0.05 g/t to 66 g/t was recorded from grab samples from the mine dumps.

EL 4206 — **Placer Exploration Ltd**

Location: 40 km S of Broken Hill

Objective: Gold and base metals

A linear magnetic anomaly adjacent to an inferred intrusion was explored for epigenetic gold and base metal mineralisation. Aircore drilling showed that this anomaly is related to a magnetite-rich gneiss and no mineralisation was detected.

EL 4250 — **Placer Exploration Ltd**

Location: 15 km N of Cowra

Objective: Porphry style copper–gold mineralisation

Field observations and the results of a rock sample indicated that the Cowra Granodiorite is an 'S-type' granite and therefore not prospective for porphry style copper–gold mineralisation.

ELs 4406, 4407 — **CRA Exploration P/L**

Location: 30 km E of Dubbo

Objective: Copper, gold

These two licences were taken out to explore Ordovician volcanics of the Molong Anticlinorium for porphyry-related copper–gold mineralisation. Jurassic sediments cover much of these licences and examination of waterbore data failed to reveal any prospective geology.

EL 4452 — **CRA Exploration P/L**

Location: 25 km NNW of Temora

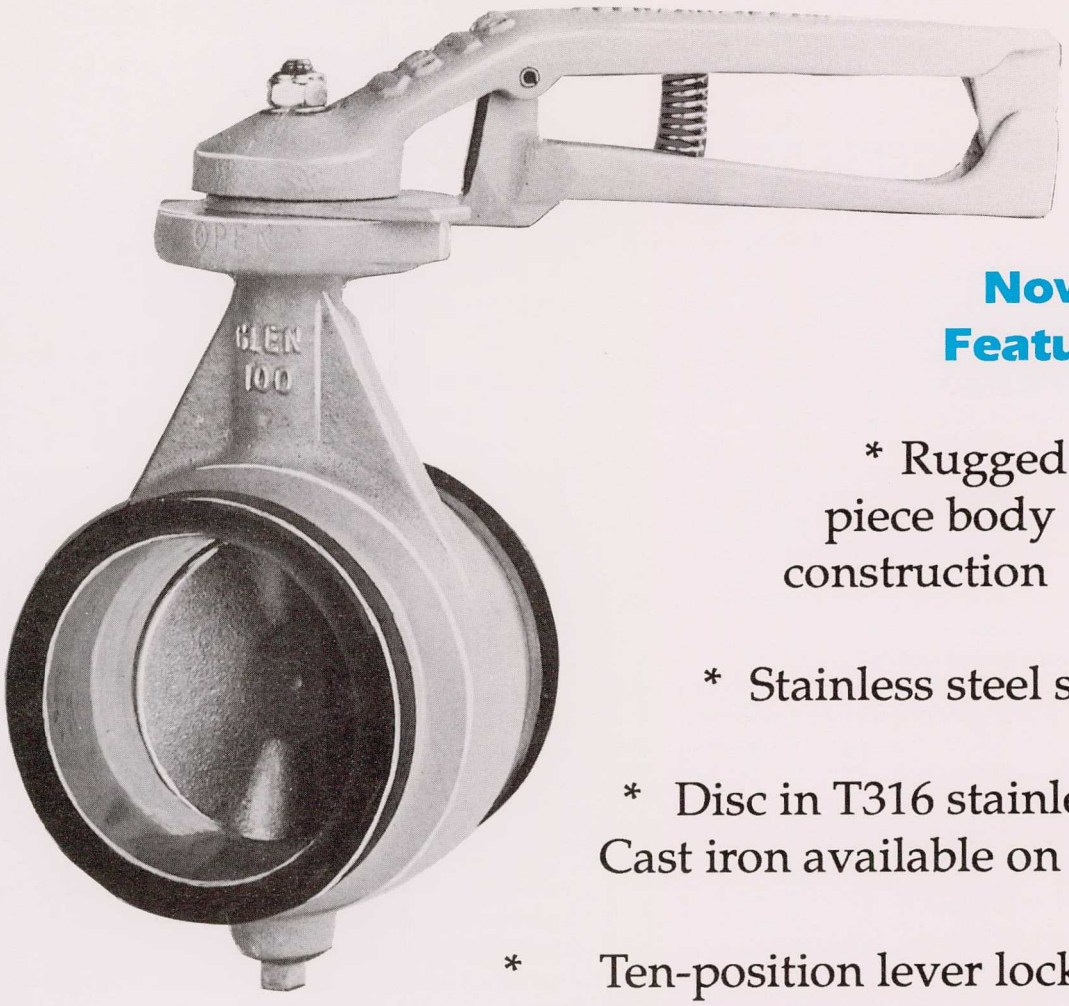
Objective: Porphyry copper deposits

This one- unit licence was cancelled early and the area incorporated in a larger licence held by CRA. No exploration was conducted during the brief term of EL 4452.

Other Exploration Licences cancelled or expired

At the time of compilation, final reports had not been received for the following licences:

THE NEW KLAMBON BUTTERFLY VALVE



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* Rugged single - piece body construction

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TELEPHONE: (02) 624 3755; FAX: (02) 624 5561

ELs 2547, 2605, 2654, 2681, 3086, 3223, 3224, 3225, 3226, 3296, 3298, 3367, 3670, 3686, 3688, 3691, 3692, 3694, 3695, 3697, 3799, 3841, 3843, 3849, 3852, 3053, 3867, 3872, 3884, 3885, 3891, 3892, 3893, 3896, 3897, 3908, 3914, 3924, 3925, 3926, 3934, 4073, 4089, 4090, 4148, 4149, 4203, 4241, 4448, 4461.

Reports for the following licences remain confidential because 'follow on' titles have been lodged:

ELs 1941, 1975, 2548, 3902.

EXPLORATION LICENCES TERMINATED PRIOR TO APRIL 1993

Reports on ELs that terminated prior to this quarter and have been placed on open file include the following:

EL 2337 **RGC Exploration P/L**
Location: 50 km S of Bathurst
Objective: Gold

Exploration was for disseminated and structurally controlled gold mineralisation within the Rockley–Burraga district at the southern end of the Hill End Synclinorial Zone. Exploration located the Lucky Draw gold deposit, which was subsequently mined from 1988 to 1991, and the nearby Hackneys Creek gold deposit which contains a marginal gold resource of almost 170 000 t at an average grade of 2.37 g/t Au. The Hackneys Creek deposit is covered by a mining lease application. A number of other prospects were evaluated but no further significant deposits were discovered.

EL 2825 **CRA Exploration P/L**
Location: 20 km N of Cobar
Objective: Base and precious metals

Exploration was for concealed Cobar type deposits in Devonian Cobar Supergroup sediments. Aeromagnetics and geochemical sampling identified a number of prospects. Drilling results were poor with the best intersection being 0.95 m at 2.9% Cu and 2.8% Pb at the Kendi anomaly. Planned follow-up work on three of the prospects was not completed.

EL 3156, 3660, 2725 **Newcrest Mining Ltd**
Location: 20 km NE of Parkes
Objective: Gold, base metals

Stream sediment sampling, geological mapping, rock chip sampling and soil sampling were conducted. This work highlighted many areas of interest. At Reedys Creek, rock chip samples contain up to 102 g/t Au and 40% Cu. At the Gumble mine, samples contain up to 7.4% Ag and 6.3% Zn. The Nangar Anticline was also considered prospective. Further work is considered warranted in some areas of these licences.

EL 3257 **Peko Exploration Ltd**
Location: 75 km S of Cobar
Objective: Gold and base metals

Reconnaissance stream sediment and rock geochemistry gave some elevated results. Anomalous gold (to 0.44 ppm Au) at the Wyce Anomaly is associated with a small zone of quartz veinlets in the Amphitheatre Group. Two other weak bulk leach extractable gold (BLEG) anomalies are thought to be derived from widespread Tertiary sands and gravels.

EL 3647 **Commercial Minerals Ltd**
Location: 16 km N of Gulgong
Objective: Kaolin

Reconnaissance mapping and airborne radiometric interpretation showed that the licence area is dominated by Mesozoic Sydney Basin sediments that overlie the Gulgong Granite. Radiometric data from the granite is indicative of fresh or decomposed granite with no areas of kaolinised granite being identified.

EL 3699 **Triako Resources Ltd**
Location: 32 km N of Condobolin
Objective: Gold, silver, copper

Exploration consisted of a literature review and a very brief inspection of the Murrays gold mine which contains a previously estimated open cut resource of 45 000 t at 1.8 g/t Au. Attempts to joint venture this licence were unsuccessful.

EL 3717 **Commercial Minerals Ltd**
Location: 10 km E of Gulgong
Objective: Kaolin

Reconnaissance mapping and airborne radiometric interpretation showed that the licence area is dominated by Mesozoic Sydney Basin sediments that overlie the Gulgong Granite. Radiometric data are indicative of fresh or decomposed granite with no areas of kaolinised granite being identified.

EL 3769 **Commercial Minerals Ltd**
Location: 45 km N of Newcastle
Objective: Kaolin

Alluvial kaolin deposits in the vicinity of existing kaolin mining operations at Swan Bay were evaluated. Although drilling defined a resource of almost 50 Mt, laboratory analyses indicated that the kaolinite is not suitable for either paper-coating or ceramic applications. A high alkali content also makes it unsuitable for refractory applications.

EL 3787 **W.K.M. Boede & G. Harcourt**
Location: 130 km NW of Cobar
Objective: Gold and base metals

Soil and rock chip sampling were carried out over a small area 3 km from Louth. The best result was from a rock chip sample that assayed 130 ppm Cu, 30 ppm Pb and 650 ppm Zn.

EL 3870 **Peko Exploration Ltd**
Location: 75 km NE of Cobar
Objective: Gold and base metals

Exploration concentrated on two magnetic anomalies. Ground magnetic surveying was followed by lag sampling and shallow auger sampling but these gave no encouraging results.

EL 3871 **Peko Exploration Ltd**
Location: 60 km NE of Cobar
Objective: Gold and base metals

Ground follow-up of an aeromagnetic anomaly suggested that the anomaly is sourced from one or two shallow bodies, possibily dolerites. Drilling of another anomaly just outside this licence intersected lamprophyre, indicating the possibility that the anomaly in EL 3871 could also be caused by lamprophyre.

EL 4212 **Dominion Mining Ltd**
Location: 35 km S of Bathurst
Objective: Gold and platinum group metals

This licence was explored for gold and platinum group metals associated with Ordovician mafic volcanics and sediments. Geochemical sampling over selected targets failed to indicate any significant mineralisation. Previous work by RGC Exploration Pty Ltd is believed to have adequately tested the remaining parts of this licence for gold.

ELs 4408, 4409, 4410, 4411 — **CRA Exploration P/L**
Location: 40 km NW of Peak Hill
Objective: Porphyry style copper–gold

These licences were taken out to explore for porphry style copper–gold mineralisation associated with interpreted Ordovician volcanic rocks. A review of the area revealed that Quaternary cover is too extensive to justify detailed exploration.

EL 4451 — **Helix Resources N.L.**
Location: 8 km N of Fifield
Objective: Diamonds

The diamond potential of Alaskan type intrusions in the Fifield area was evaluated. These have been previously explored for platinum group mineralisation. Inspection of heavy mineral concentrates from earlier rotary air blast (RAB) drilling of buried alluvials failed to find any diamonds or diamond indicator minerals. RAB samples from the lateritic profile of the Owendale Intrusion were consequently not analysed.

EL 4463 — **Helix Resources N.L.**
Location: 8 km S of Fifield
Objective: Diamonds

The diamond potential of Alaskan type intrusions in the Fifield area was evaluated. These have previously been explored for platinum group mineralisation. No work was done on this licence because of disappointing results in the nearby EL 4451.

EL 4464 — **Helix Resources N.L.**
Location: 60 km SW of Tottenham
Objective: Diamonds

The diamond potential of the Hillview intrusion was investigated. This Alaskan type intrusion has been primarily explored for platinum group mineralisation in the past. Analysis of heavy mineral concentrates obtained by RAB drilling from buried alluvial systems failed to find any diamonds or diamond indicator minerals.

PART RELINQUISHMENT REPORTS

Reports covering partial relinquishment of title, and which have been placed on open file, include the following:

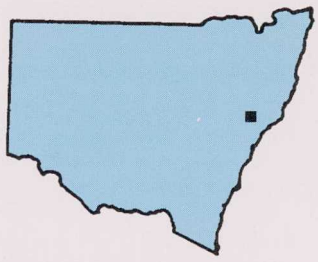
EL 3728 — **Cyprus Gold Australia Corp.**
Location: 15 km N of Molong
Objective: Gold, silver and base metals

The Fairbridge Volcanics were targeted for their potential to host porphyry copper–gold mineralisation similar to that at Copper Hill. Regional stream sediment sampling failed to identify any anomalies in the area relinquished.

EL 3862 — **Aberfoyle Resources Ltd**
Location: 300 km SE of Broken Hill
Objective: Heavy mineral sands

Exploration was for heavy mineral sand deposits in the Early Tertiary Parilla Sand. Drilling in the relinquished part of EL 3862 intersected a sequence of clay and sandy clay, with sporadic fine and very coarse sand at depth. This sequence is interpreted to be fluvial sediments of the Calivil Formation and contains only trace heavy minerals.

COAL TAILINGS DISPOSAL IN FLUIDISED BED COMBUSTION POWER PLANT*



There is now a potential cost-effective means of permanent disposal of coal tailings: firing in fluidised-bed combustors to produce steam to drive electricity generating turbines.

The fluidised bed combustion technology provides a method for permanent disposal of coal tailings in an environmentally responsible manner while generating low-cost electricity and producing a benign, solid by-product (dry ash) suited for use in restoring mined areas.

The first application of this method in New South Wales could be the Redbank Power Project, a privately owned 100 MW power plant in the upper Hunter Valley near Singleton that will dispose of washery and ponded tailings from two local mines. The proposal for this project is now being considered by the Government.

REDBANK PROJECT

The Redbank Power Plant will consume coal tailings from the Warkworth and Lemington mines. The electrical power will be sold to Shortland Electricity, the distribution authority for the Hunter Valley and Newcastle. The power plant will employ approximately 50 people and occupy an area of 6-10 ha. Design and engineering are planned to begin early in 1994, with operations to commence in early 1996 subject to the project obtaining all necessary Government approvals.

PROJECT PARTICIPANTS

The Redbank Project is being developed by the National Power Co. of Oakland, California, in conjunction with ESI Energy Inc. of West Palm Beach, Florida. Both companies have extensive experience in alternative, environmentally responsible power projects.

Combustion Power Co., a subsidiary of National Power, has developed and installed fluidised-bed combustion technology in power plants in the San Francisco Bay area of northern California, a region with an international reputation for the highest environmental standards, as well as at other locations in the United States.

COAL TAILINGS

Coal produced at many mines in New South Wales is beneficiated to meet the specifications of customers, particularly in the export market. Coal preparation involves reducing the size of coal particles to the point where most of the coal and ash solids are liberated from each other. The differing specific gravities of coal and ash (1.3 to 1.5 for coal compared with 2.6 - 3.0 for ash) are used to separate the two by a process described as washing.

As is not possible to completely separate the coal and ash, the reject material can contain a substantial percentage of coal.

Tailings consist of very fine material suspended in water. With its high moisture content and fine-sized solids and clays, tailings present significant disposal difficulties. Conventional practice has been to pump the tailings to large settling ponds or dams which consume large areas of land. Dams can take years to dry out to the stage where they can be covered with overburden and revegetated.

There are also maintenance costs associated with tailings dams to ensure their stability. Space for this method of tailings disposal is becoming increasingly limited and is likely to be subject to increasing constraints in the future.

In 1991-92, New South Wales coal mines produced 101.1 million tonnes of coal. Coal preparation plants produced a total of 17.2 million tonnes of reject. By the end of the 1990s, at least 21 million tonnes of reject will be produced annually, of which half is typically tailings.

FLUIDISED BED COMBUSTION OF COAL TAILINGS

Tailings produced from the upper Hunter Valley washeries are commonly 60-85% water, 5-20% rocks and minerals (measured as "ash"), and only 5-20% coal fines. Material containing that much water will not burn and must be mechanically dewatered to a moisture content below 40% to be considered as fuel. In the Redbank Project, the water content will be reduced by centrifuges or belt press filters to form a thick, moist, dewatered-tailings fuel with the physical properties of "black toothpaste".

The process to be used in the Redbank Project is illustrated in figure 9. The dewatered-tailing fuel will be fed via high pressure piston pumps to the fluidised-bed combustor for firing. Fluidised-bed combustion is especially attractive for firing low-grade fuels with high moisture and ash content because of the large thermal mass of the hot bed. Variations in moisture and ash content do slightly affect combustion since the fuel is typically only a few percent of the suspended solids which constitute the "bed" in the combustor.

The Combustor Power boilers use a rising stream of air (and combustion gases) distributed uniformly across the bottom of the refractory-lined combustor to suspend the hot ash-generated solids into a "fluidised bed", which serves as the prime combustion zone. For the Redbank Project, each of the two boilers will contain more than 300 tonnes of bed solids at 800-850° C.

Fine-sized particles which are swept from the bed in the rising gases are separated in refractory-lined cyclones and recycled back to the combustor bed. Only the smallest particles escape from the combustor as fly ash, which are captured in the fabric filter baghouse after cooling in the convective section (superheaters, evaporator, economiser) and air preheater sections.

More than 400 tonnes/hour of steam, produced in both the combustors and convective sections (while cooling the flue gases and fly ash), will be directed to the steam turbine for power generation via the alternator generator.

* Article supplied by National Power Australasia Inc.

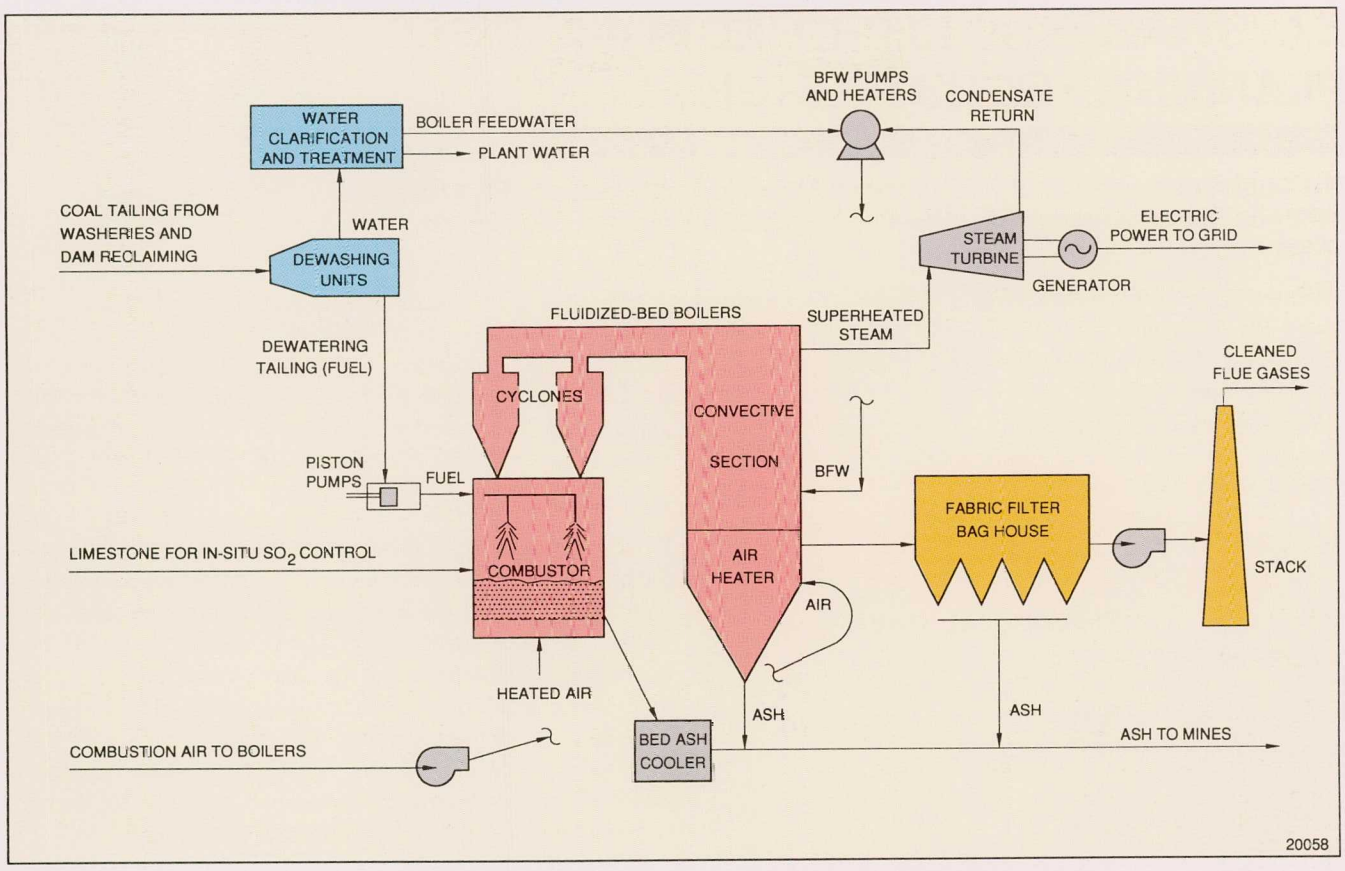


Figure 9. *Coal tailing disposal by fluidised-bed combustion, Redbank Project*

Some other attractive features of fluidised-bed combustion are:

* The low gaseous and particulate emissions, including the control of SO_2 emissions by the in-situ calcination and sulphation of limestone. The limestone, which is injected directly into the combustor in crushed form, is converted to lime, which captures the SO_2 and SO_3 as solid anhydrite ($CaSO_4$) directly in the combustor.
* The low uniform temperatures, compared to conventional boilers, resulting in low nitrous oxide (NO_x) emissions. With the fully oxidising mode of the Combustion Power boilers, carbon dioxide emissions are also quite low and gaseous emissions are below Environment Protection Authority requirements and air quality goals.

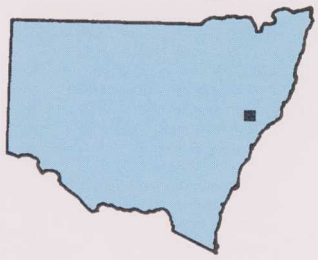
The fabric filter baghouses have proven to be excellent particulate/dust control systems on fluidised-bed boilers with capture efficiencies above 99%.

The captured ash is returned to the mines for use in reclaimed areas or for disposal with overburden. Testing has indicated that the ash, above 95% of which comes from the original rocks and minerals in the coal, is both alkaline and benign. The ash contains a few percent of the $CaSO_4$ and a small amount of lime, which are beneficial for soil use.

The Redbank Power Plant will recycle water separated at the centrifuges/belt press filters. The saline water will require treatment before use in the plant.

For further information contact Denis Casey, Executive Officer Coal, on (02) 901 8511, Fax (02) 901 8520.

BAYSWATER NO. 3 PROJECT — PLANNING FOCUS MEETING



The Department of Mineral Resources and Bayswater Colliery Co. Pty Ltd jointly hosted a Planning Focus meeting for the Bayswater No. 3 Project on 11 May 1993.

Seventeen government departments attended the meeting where the Bayswater Colliery Co. Pty Ltd explained the mining and environmental management issues associated with the proposal.

The proposed Bayswater No. 3 Project is located in the company's Authorisation 437, to the south-west of the existing Bayswater No. 2 Colliery (figure 10).

GEOLOGY

The Calool Syncline is the prominent geological feature of the area (figure 11). The coal seams, which subcrop in the area, belong to the Permian Wittingham Coal Measures and extend from the Whynot seam down to the Ramrod Creek seam. Of these, the only seams considered economic for open cut are the Blakefield, Glen Munro and Woodland Hill seams.

The dip of the coal seams varies within the project area. Coal seams near the Calool Syncline dip from 2° to 3° whereas on the eastern margin of the project area, seam dips of between 15° to 30° have been recorded.

Igneous intrusions have effected the resource potential of various seams throughout the area.

PROPOSED MINING OPERATIONS

The proposed mining operations for the Bayswater No. 3 project consist of four pits: the Saddlers, MacDonalds, Belmont and Calool Pits (figure 11).

The major stages in the development of the mine are:

Years 1 to 3: Prestipping and coal removal will commence from the North Saddlers and MacDonalds Pits as a shovel-and-truck operation, with the Dragline strip mining operation commencing at the end of year 3.

Years 5 to 10: By this time operations in the Belmont Pit will have commenced, with mining continuing in Saddlers and MacDonalds Pits.

Years 10 to 15: Relocation of a 550 KV transmission line will be finished and mining will be able to start in the southern portion of the Saddlers Pit. Mining will be continuing in the Belmont and MacDonalds Pits.

Year 15 to 20: Diversion of Edderton Road will be completed and mining on the western side of the diverted road will be able to commence. The MacDonalds and Saddlers Pits will still be mined and, depending on the economic climate, mining may commence in the Calool Pit.

PRODUCTION

Current operations at Bayswater No. 2 mine are estimated to continue until 2001, although by 1998 the majority of coal produced will be from the No. 3 mine.

The anticipated maximum production of the Project will be 4 million tonnes per annum, with an average of about 3 million tonnes per annum after 1998. The open cut coal product will be suitable for low-ash thermal coal, semi-soft coking PCI (pulverised coal injection) coal and domestic thermal coal.

INFRASTRUCTURE

Existing infrastructure at Bayswater No. 2 will be used until the mine has ceased production. A haul road will be constructed, linking the Bayswater No. 3 pits to the existing Bayswater No. 2 preparation plant. This plant will be upgraded to double its capacity. Mechanical raw coal and product coal stacking and reclaim stockpile facilities will be provided. A dump/crushing station is planned in the Bayswater No. 3 mine during the first 4-6 years. A new conveyor will be constructed to transport coal from the dump station to the preparation plant at Bayswater No. 2.

The rejects from the preparation plant will be trucked to the open cut pits of Bayswater No. 2.

RESERVES AND RESOURCES

Total estimated open cut Indicated Resources within A437 are 207 million tonnes, of which 165 million tonnes are Measured Resources. Large underground resources also exist. Current economic parameters provide open cut Mineable In situ Reserves of 86 million tonnes, or 63 million tonnes of Marketable Reserves.

For further information contact David Agnew, Regional Manager Northern, Coal and Petroleum Administration Branch, on (065) 72 4200, Fax (065) 72 1201.

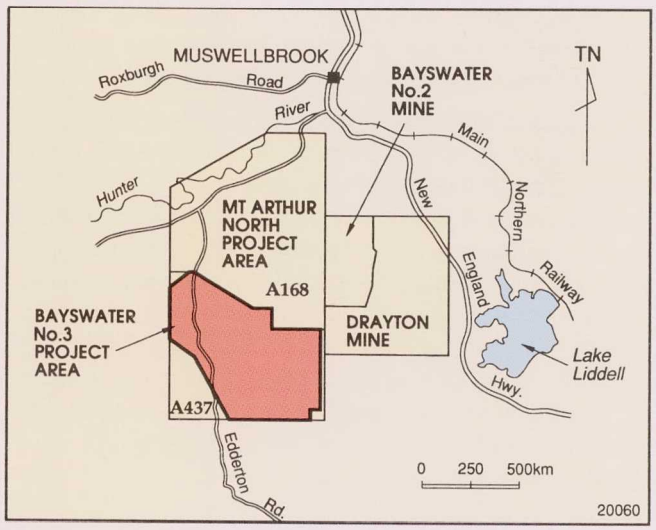


Figure 10. Locality diagram, Bayswater No. 3 Project

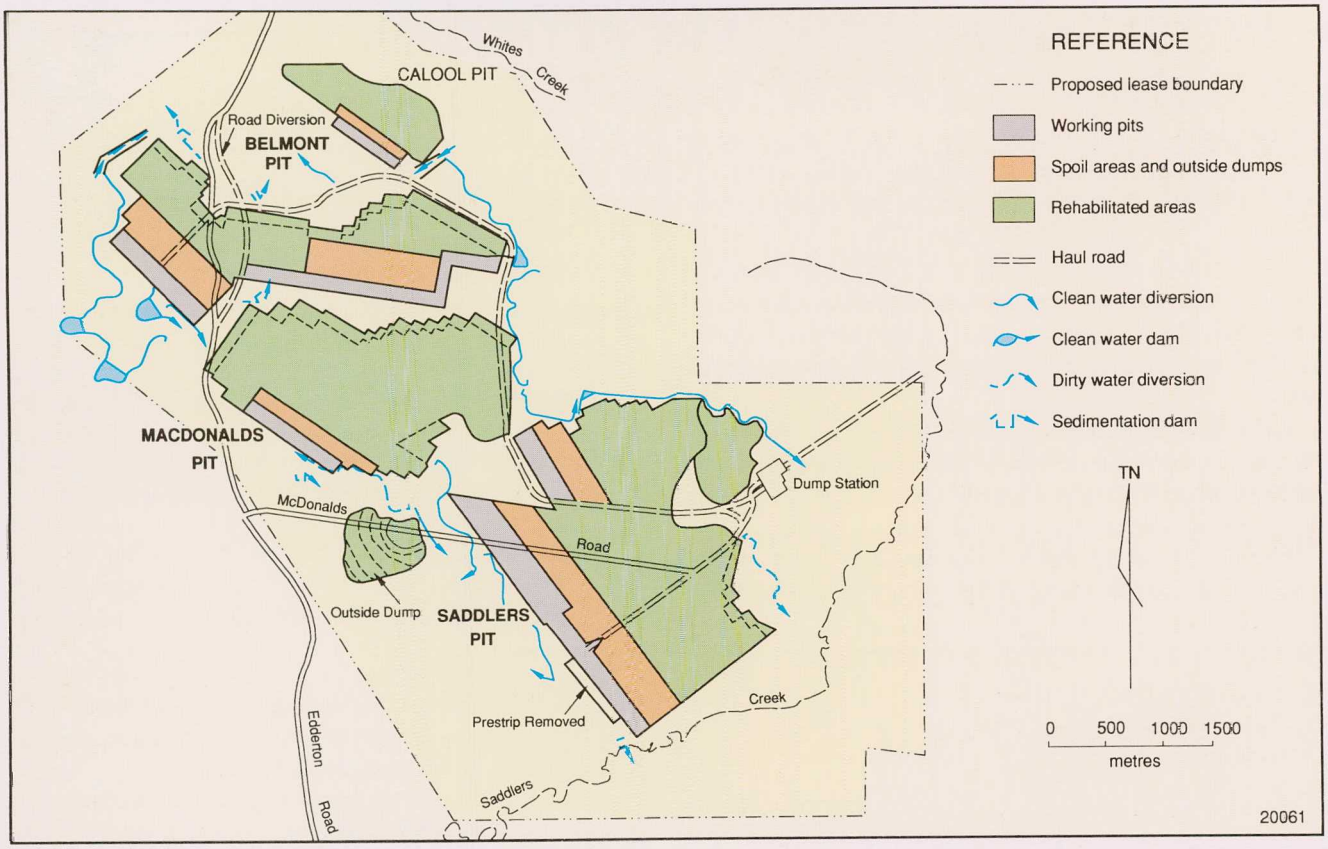
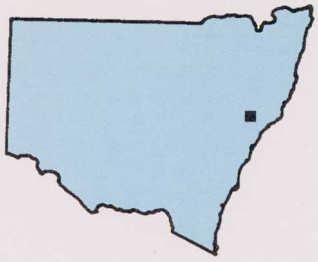


Figure 11. *Proposed mine plan at year 20, Bayswater No. 3 Project*

HUNTER VALLEY COAL MINE EXTENSION



Open cut operations at the Hunter Valley mine at Lemington, 24 km north of Singleton, are to be extended close to the Hunter River.

Coal and Allied Operations Pty Ltd first began open cut mining in June 1979 in the area known as the No. 1 site to the north of the Hunter River (figure 12). Development of the No. 2 site (to the south of the Hunter River) commenced in 1991.

Exploration within alluvial lands between the No. 1 site and the northern banks of the Hunter River confirmed the existence of the Wittingham Coal Measures, in particular the Mount Arthur, Piercefield and Vaux seams.

Because of the environmentally sensitive nature of this area, a Technical Working Party comprising all affected government departments has overseen exploration and technical assessment since the outset of exploration in March 1991.

RESERVES

Drilling has indicated Recoverable Reserves of approximately 22 million tonnes. The strata generally dip at approximately 1 in 20 to the south with a maximum depth of around 95 m to the Lower Vaux seam.

MINING PROPOSAL

A Planning Focus meeting was held at the Colliery on 20 August 1992 attended by 29 people representing 12 organisations and was followed by a site visit.

The company proposes to continue using the truck and shovel method being used at the colliery, with a series of parallel strips, each 300 m wide, oriented north-west to south-east. A location for the final void has been selected away from the Hunter River floodplain within the No. 1 site lease.

FLOOD CONTROL

As the proposed extension is located on the Hunter River flood plain, mine workings will require protection from flooding by a levee bank. This levee bank has been designed based on computer modelling of the river's behaviour under various flood conditions.

The location of the levee bank is between the proposed mining area and the bank of the river, with a set-back from the bank sufficient to ensure the bank is not damaged.

To assist in the design of the levee bank a detailed muti-dimensional hydrology model was constructed. This model was one of the most detailed hydrological models ever contructed in Australia and has enabled the levee design to be tested under all feasible fluvial conditions.

The levee will be constructed using local materials. A typical cross section of the levee is shown in figure 12. The levee will have batters in a ratio of one vertical unit to three horizontal units on the river face while a steeper batter may be used on the pit face if

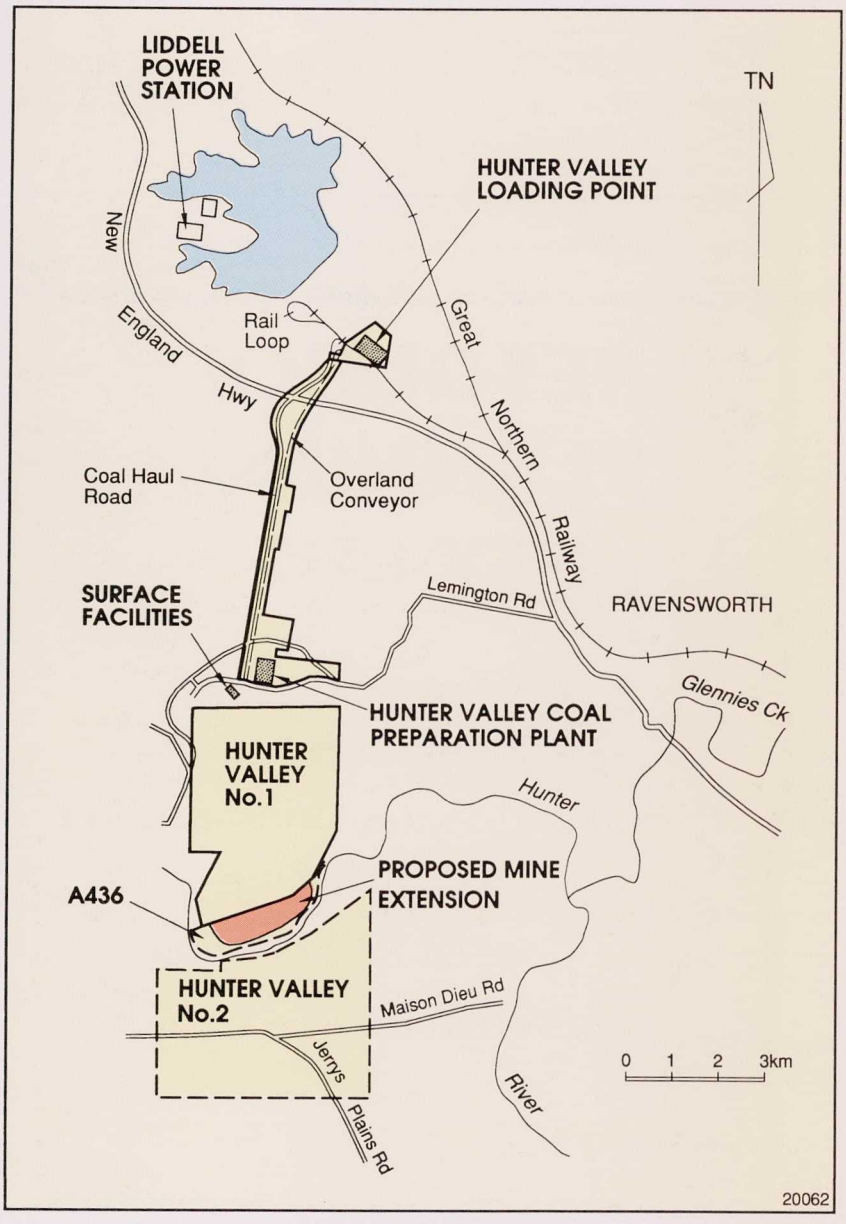


Figure 12. Hunter Valley mine

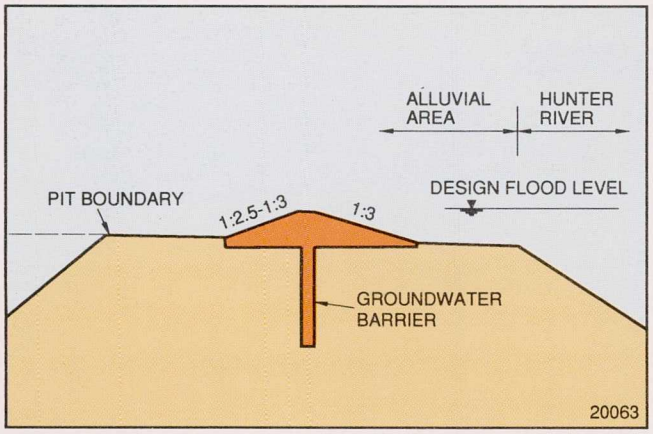


Figure 13. *Levee bank with groundwater barrier to be constructed between the Hunter River and the pit*

detailed design shows this to be practicable. The levee crest will be set at a profile for the 1 in 185 year flood level allowing for uniform overtopping if a flood greater than this occurs.

Ground water will be controlled by the construction of a subsurface impermeable barrier (depicted as the groundwater barrier on figure 13) or cut-off wall between the river and the pit extending from the surface down to bedrock. The wall located beneath the levee will form a continuous barrier to both subsurface and surface water flows.

The area will be dewatered ahead of mining using a trench system augmented by dewatering bores. Water extracted from the alluvium will be pumped to the eastern minewater dam to supply the coal preparation plant and to suppress dust.

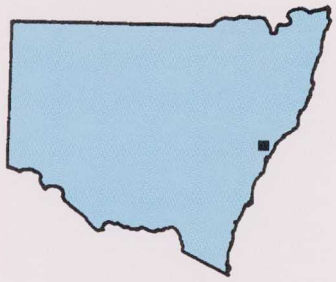
The majority of land in the extension area is not prime agricultural land — in fact it is of very poor quality as a result of gravel deposits. The project has received an unprecedented level of scientific study (even by world standards) into the potential effects of mining of the alluvial flood plain.

The conclusion of the assessment has been that the proposed mining operations will not significantly impact upon the Hunter River, the alluvial groundwater resources or the agricultural capability of the area. In fact the project will generate a number of environmental positives. At present over 70% of the proposed mining area comprises poor-quality land as a result of massive sand and gravel beds deposited by the 1955 floods. After mining the rehabilitation will result in an overall improved status of this land, together with the same amount of prime land as previously. By careful rehabilitation of the mine surface the quality of surface runoff to the Hunter River will result in a lowering of salinity.

Development Consent for this proposal was given by Singleton Shire Council on 10 May 1993 and a mining lease was granted on 19 August 1993.

For further information contact David Agnew, Coal and Petroleum Administration Branch, Singleton, on (065) 72 4200, Fax (065) 72 1201.

HOUSE DESIGNED FOR SUBSIDENCE



The Australian Coal Industry Research Laboratories (ACIRL) has completed a research project to design a house able to cope with subsidence movements in coal mining areas.

The project began in 1989 with combined State and Federal Government funding of $1.5 million and will significantly allay community fears about living in coal mining areas.

The project combined pure research and community education with an overall objective "to develop and demonstrate means by which there can be greater compatibility between underground mining and residential development".

STAGE 1 — FUNDAMENTAL RESEARCH

In Stage 1, experiments were conducted to investigate the processes by which subsidence-induced ground movements are transmitted to foundations and building structures. Two parallel brick veneer walls 3 m high by 15 m long were undermined by longwall mining at Wyee Colliery. One wall was built on a conventional strip footing. The second wall's footing was separated from the soil at the sides by a 200 mm layer of vermiculite and on the bottom by a 50 mm bed of sand. Both walls were surcharged to simulate normal building loads. Both walls were subjected to maximum tensile strains of 1-1.5 mm/m, maximum compressive strains of 5-7 mm/m, maximum tilts of 10-12 mm/m and maximum radius of curvature of 2-4 km. The conventional wall failed due to a radius of curvature of 3.4 km and the wall insulated by vermiculite failed at a radius of curvature of 3.2 km. While about 90% of ground strain was transferred to the conventional footing, only 50% was transferred to the insulated footing.

STAGE 2 — MINING UNDER A CONVENTIONAL HOUSE

Stage 2 was designed to demonstrate the effect of subsidence on a conventional brick veneer house. A conventional house was built and subsided by 300 mm by longwall mining in West Wallsend Colliery. The house was subjected to a compressive strain of 3 mm/m and tensile strain of 1.2 mm/m. Damage to the house consisted of hairline cracks in the external brickwork, fine cracks in internal linings and sticking of two doors. The safety or serviceability of the house was not affected by mine subsidence.

STAGE 3 — TEST SLAB AND BRICK VENEER, SLAB-ON-GROUND TEST HOUSE

Stage 3, the final stage, was divided into two parts, with the laying of a test waffle raft slab at Kurri Kurri Golf Club followed by the building of a specially designed house above Wyee State mine (figure 14).

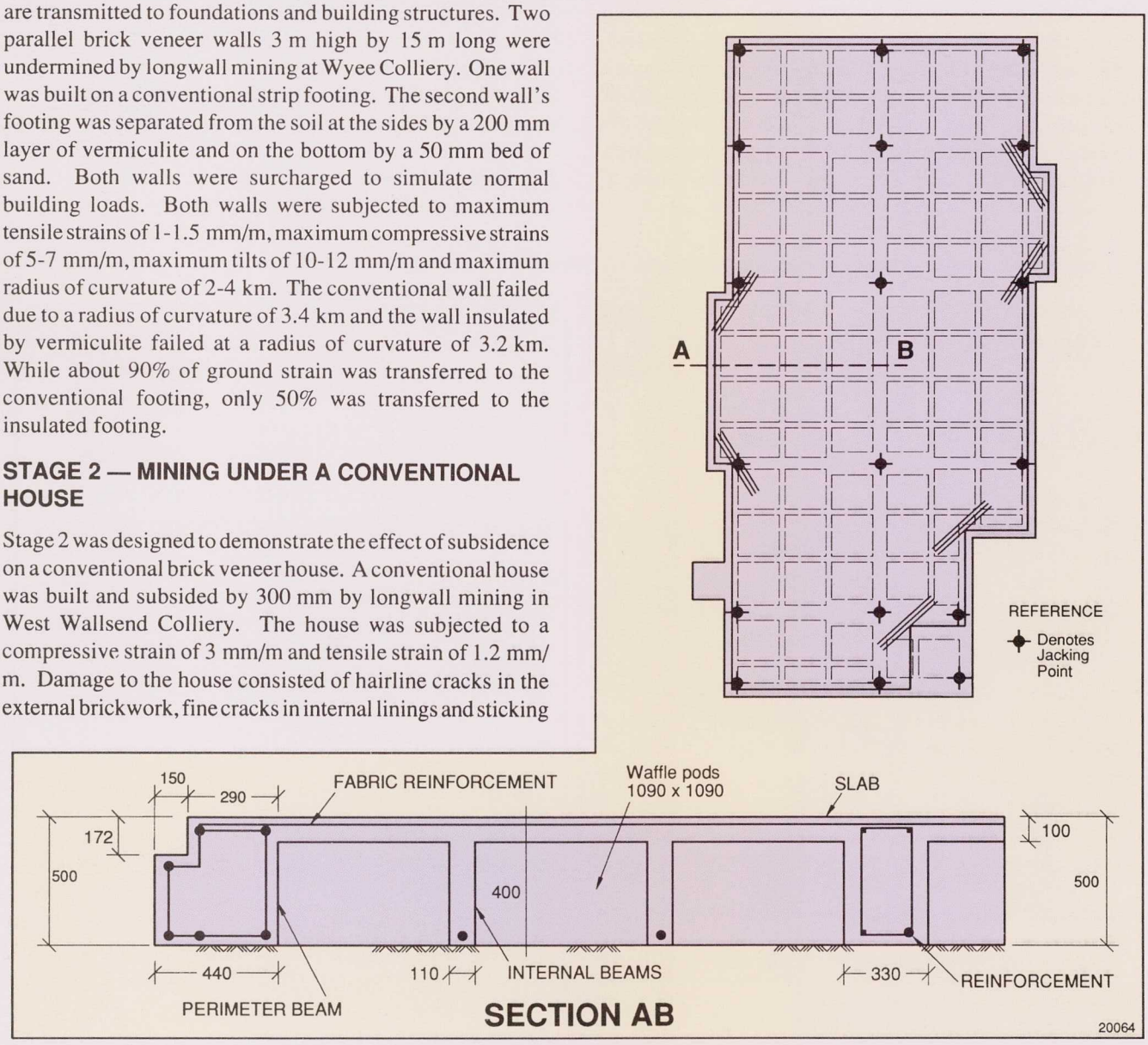
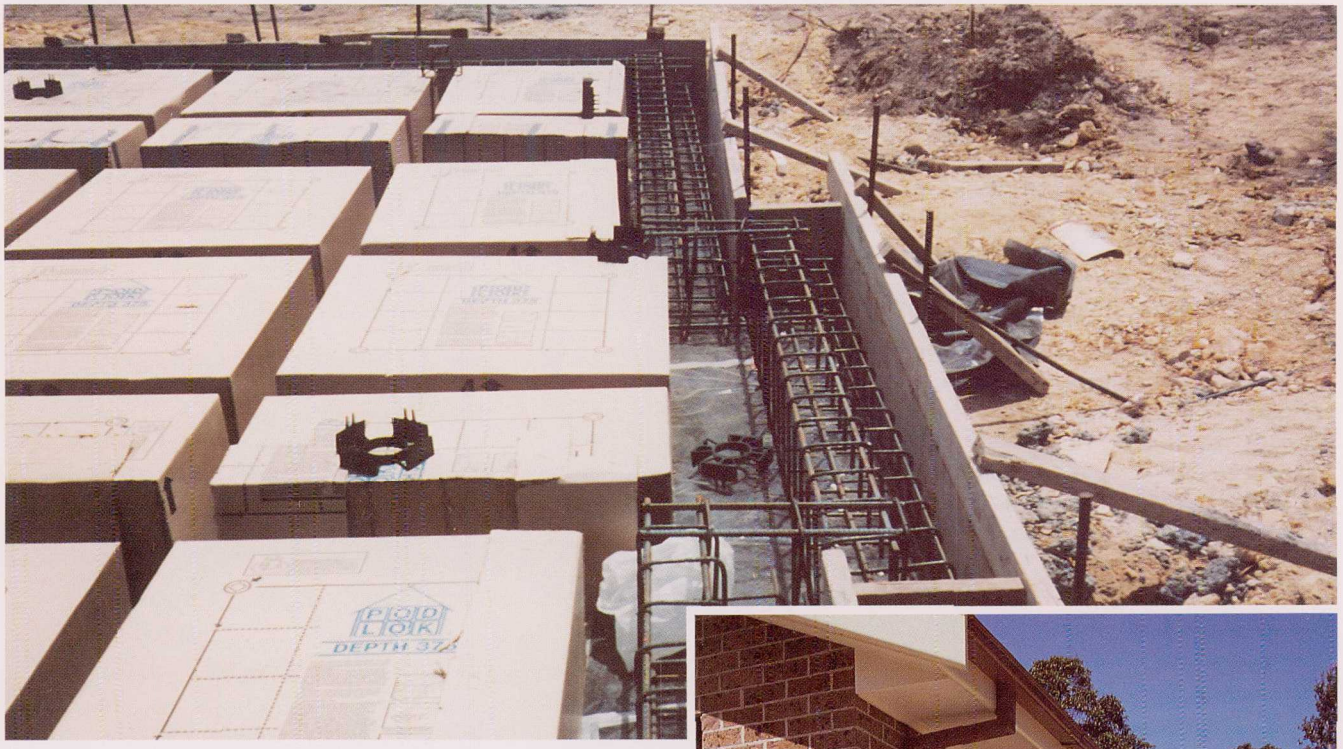
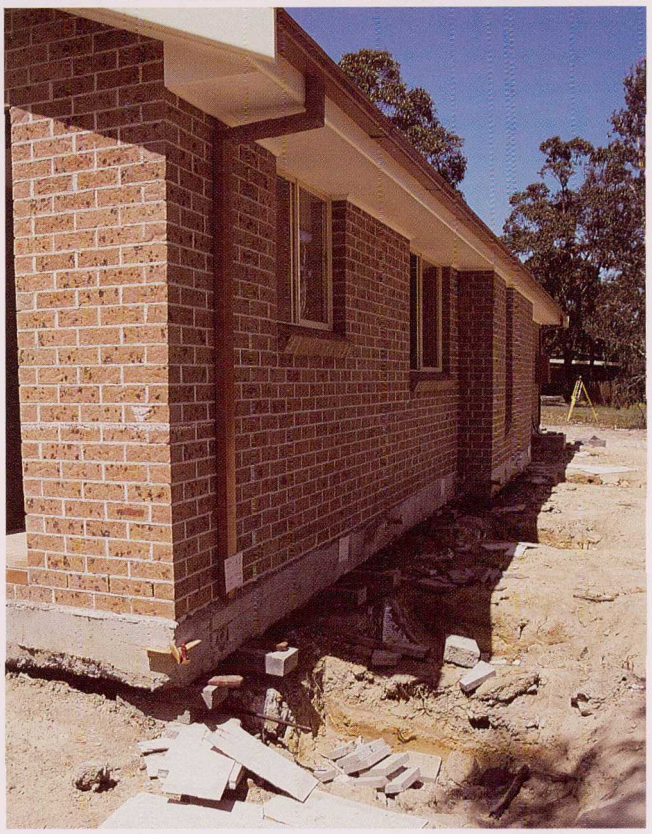


Figure 14. Diagrammatic plan and section of waffle raft slab





Above: The waffle raft slab before pouring concrete for test house at Wyee State mine
Right: Test house at Wyee after relevelling
Photos courtesy ACIRL

The test slab was a waffle raft slab design and incorporated jacking joints, a technique first developed by an Adelaide firm to deal with problems of highly reactive soils. The design comprised a grid of narrow beams within a thin slab bounded by stiffened perimeter beams. The system uses a network of cardboard cartons to create a pattern of voids once the slab is poured. The resultant reinforced webs or beams are cast at about 1100 mm centres in a grid pattern. The slab was intentionally cast out of level and two brick walls were erected on it and surcharged to normal building loads. The slab was relevelled by jacking, thus testing the engineering design of the slab and the jacking system.

A test house was built on a waffle raft slab above a longwall panel at Wyee State mine. The house was a standard, brick-veneer, project home. The house design was inherently flexible, making it ideal for accommodating curvatures imposed by mining and relevelling. Jacking points were created by providing localised stiffened sections of slab at approximately 4 m centres (figure 14). Jacks were temporarily installed to facilitate relevelling.

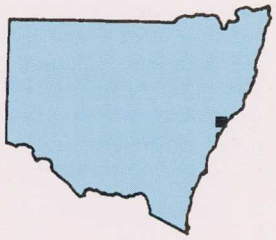
The house experienced a maximum subsidence of 0.87 m. Ground deformations measured over 10 m bay lengths were: 4.2 km radius of concave curvature, 4.0 mm/m of tensile strain, 1.1 mm/m compressive strain and 22 mm/m tilt. Greater values were measured over shorter baylengths. Several surface cracks up to 60 mm wide appeared in the road near the house but the house itself suffered no structural damage. The house was successfully relevelled in October 1992. The project proved that brick-veneer, slab-on-ground homes can be built to accommodate ground deformation due to subsidence and to allow relevelling to correct mining-induced tilts.

PROJECT MANAGEMENT

The project was managed by ACIRL. A Steering Committee overseeing the project consisted of members from the New South Wales Coal Association, ENC Management, ACIRL, the Department of Mineral Resources, the Mine Subsidence Board, Lake Macquarie City Council and Wyong Shire Council. ACIRL has submitted the final report to AMIRA (Australian Mineral Industries Research Association Ltd).

For more information contact Peter Willey or Dr Bruce Hebblewhite at ACIRL, North Ryde, on (02) 887 3777, Fax (02) 888 9912, or Dr Lax Holla of the Department on (02) 901 8593, Fax (02) 901 8584.

INSTITUTE OF COAL RESEARCH



The Institute of Coal Research (ICR) at the University of Newcastle is recognised internationally as a leading contributor to research in coal engineering and science. Since its establishment in 1980 as a focal point for coal research at the University of Newcastle, the diversity and scope of its research interests have attracted growing support from the Australian coal industry.

The ICR has acquired a world-wide reputation as a leading educator through its courses on Coal Technology, on topics ranging from coal formation to environmental protection methods. Because of its unique situation in proximity to major coal mining, transport and shipping facilities, the University of Newcastle has always had a close involvement with the coal industry, and many academic members have participated in projects designed to meet the coal industry's research requirements and educational needs. The ICR's work complements research projects in the University of Newcastle's Departments of Chemical Engineering, Geography, Geology and Mechanical Engineering on aspects of coal geology, coal mining, transport and combustion.

STAFF AND FUNDING

The ICR employs four full-time staff and two part-time researchers. This number will double when the ICR moves to new premises in August 1993. In addition, the ICR can draw on the expertise of eighteen research associates from within and outside the University of Newcastle, including researchers from four overseas institutes. The ICR is a self-funding institute and derives income from members' subscriptions, research grants, contract research projects, course activities and some consulting projects.

Subscribing members include BHP Steel International, Pacific Power, the Joint Coal Board and the Shell Co. of Australia Ltd. Companies and organisations specialising in mining administration, coal analyses, trading, transport and shipping also support the ICR by annual subscription.

CURRENT PROJECTS

Current research projects directly relevant to safety and efficiency in the mining industry include:

* The application of forces from power supports to immediate roof strata in longwall panels.
* The mechanical influence of anisotropic rock fabrics on the disintegration processes of sedimentary rocks under low-frequency cyclic loading.
* Design criteria for a road heading/tunnel boring machine for the rapid development of gate roads and faces in longwall panels.
* Size degradation of coals at the face during extraction, underground transport and stockpiling on the surface.

A recently completed research project on the response of immediate roof strata in longwall panels to low-frequency, medium to high-intensity cyclic loading tested whether brittle sandstones or shales could develop fatigue-type damage patterns in their fabrics as a result of load applications by power supports. The study showed that cyclic loading does damage the rock fabric in a specific pattern and that the application of the supporting forces to the roof strata is occasionally either severely, moderately or slightly modified.

A new project is being designed to test the response of heterogeneous rocks to mining operations. Several occurrences of roof failures in collieries operating in the Sydney - Bowen Basin can be attributed to sudden bed separation along lithological interfaces. Little is presently known about the stress/strain patterns, stress propagation modes at the interfaces between different rock types and, in particular about the effects of mining-induced stresses on the mechanical cohesion attributes of lithological interfaces. The proposed research project has as its top priority the identification of stress patterns and the effect of lithologically determined response variations in the rock mass to mining-induced stresses.

A research program on the influence of lithological variations in the immediate roof strata will attempt to identify and define indicators and assessment practices relevant to the prevention of sudden roof failures. It is further planned to use the data from the program to identify processes and events in laminated and interlayered roof-strata that lead to lateral shear, bed separation and initial instability during driving of single openings in development panels. This research activity should assist in a much larger project investigating methods of achieving significantly higher driving rates during longwall panel development.

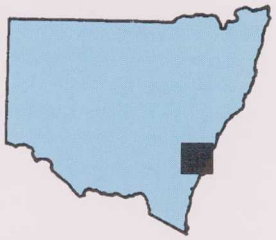
The ICR is currently working on several major consulting projects for coal mining companies and for the Hunter Water Corporation.

EQUIPMENT

The ICR has access to modern analytical equipment in the University of Newcastle, notably a scanning electron microscope and microprobe for mineral identification and detailed petrofabric analyses, as well as a 1993 model MTS 250 kN fracture mechanics test device, polarised light microscopes and the most modern computing facilities. The ICR will soon move into the Pacific Power Advanced Technology Centre within the University's Engineering Complex.

For further information contact Dr Konrad Moelle, Director of the Institute, on (049 21 5400.

SOUTHERN COALFIELD INFORMATION SEMINAR



The Department of Mineral Resources continued its program of coalfield information seminars by organising one for the Southern Coalfield in conjunction with Wollondilly Council. The seminar was held in Campbelltown on 20 July 1993 and followed similar days at Gunnedah and Lithgow.

Although there was a diversity of speakers from the coal mining industry, government agencies and local councils, some common themes emerged. In the opening speech Dr G Lowder, Director-General of the Department of Mineral Resources, emphasised the importance of the coal industry to the region. The coal industry directly employs over 3000 persons and supplies the steel industry in Port Kembla and elsewhere in Australia with one of its essential raw materials. Indirectly, the coal mining generates many other jobs, for example in the transport of coal and in the steel industry.

Dr Lowder also stressed that coal mining in the Southern Coalfield faces a number of difficulties which have to be overcome if it is to survive. A continuing downward trend in the real price of coal and the threat by other land uses to the high-quality coal resources needed to replace mines near the end of their life were two of the problems.

Other speakers, such as Mr T. Curran, President of the Southern Mine Workers, elaborated on the challenges for mines to remain competitive while coal prices and demand for coking coal were both depressed. Mr K. Sullivan, Department of Planning, explained that mechanisms do exist for coal resources to be developed in conjunction with other land uses but that good liaison and communication are required between all concerned parties.

Liaison and communication were discussed by some speakers, who dealt with more local issues than the broad future of the coal mining industry.

Mr E. To of the Mine Subsidence Board explained the functions and responsibilities of the Board and the way in which it provides services and advice for residents in Mine Subsidence Districts. Ms G McLaine of Wollongong City Council gave a case history of a colliery development application which perhaps could have been approved in a shorter time if there had been earlier consultation and education by the applicant.

Several speakers considered those aspects of road haulage of coal of concern to residents, particularly in the Picton and Camden districts. It is obvious that, while the coal mines continue to operate, no economic solution can be reached which is completely satisfactory to all parties. However, acceptable compromises can be made, again if there is adequate communication.

Representatives of the Southern Coalfield collieries made brief presentations on the current status of their mines and the outlook for the future. Several of the mines have difficulties which must be overcome in order for them to remain viable.

The final presentation of the seminar was by Mr T. Harrigan of Amoco Australia Petroleum Co. on the coalbed methane potential of the Southern Coalfield. Results to date have been encouraging and it is possible that a test well will be drilled late in 1993 for extended production testing.

Vigorous questioning, particularly by the many residents who attended, was a feature of both the morning and afternoon sessions. Although not all questions could be answered completely in the limited time available, it gave questioners an opportunity to establish contact with the appropriate representatives with whom to follow up their concerns outside the seminar.

Almost 200 people attended the seminar, with a particularly strong industry representation. The objective of encouraging greater communication between the coal mining industry and affected communities and organisations was definitely achieved. It is intended to hold similar information seminars in the future as the need arises.

For further information contact Mike Armstrong, Principal Geologist Southern and Western, on (02) 901 8506, or Denis Casey, Executive Officer (Coal), on (02) 901 8511, Fax (02) 901 8520.

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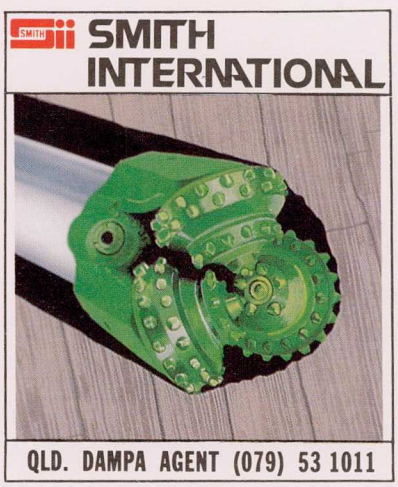

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COAL AUTHORISATIONS/EXPLORATION LICENCES JUNE 1993*

No.	Holder	Nearest town
A6	Dep. Mineral Resources	Campbelltown
A48	Austen & Butta Ltd	Lithgow
A72	Novacoal Australia P/L Mitsubishi Development P/L	Jerrys Plains
A81	Navidale P/L Toyota Tsusho Mining (Australia) P/L DIA Coal Mining P/L	Camberwell
A102	Dep. Mineral Resources	Muswellbrook
A104	Pacific Power	Lithgow
A129	Agipcoal Australia P/L MIM Exploration P/L	Denman
A142	Pacific Power	Lithgow
A168	Pacific Power	Muswellbrook
A170	Genders Mining P/L	Capertee
A171	Bayswater Colliery Co. P/L	Muswellbrook
A172	Bayswater Colliery Co. P/L	Jerrys Plains
A173	Drayton Coal P/L	Muswellbrook
A175	Coalex P/L	Ben Bullen
A176	Muswellbrook Coal Co. Ltd	Muswellbrook
A208	Genders Mining P/L	Capertee
A216	Dep. Mineral Resources	Gunnedah
A219	Newcastle Wallsend Coal Co.	Bulga
A230	Dep. Mineral Resources	Rylstone
A232	Western Main Collieries P/L	Capertee
A238	Pacific Power	Ravensworth
A248	Australian Iron & Steel P/L	Menangle
A250	Mitsubishi Development P/L The Coal Cliff Collieries P/L	Oaklands
A256	The Bellambi Coal Co. Ltd	Aberdeen
A261	Esso Australia Resources Ltd	#
A262	Esso Australia Resources Ltd	Warkworth
A263	Dep. Mineral Resources	Wollombi
A278	Dep. Mineral Resources	Mittagong
A281	Dep. Mineral Resources	Camden
A285	Dep. Mineral Resources	Toronto
A286	Dep. Mineral Resources	Gulgong
A287	Austen & Butta Ltd	Bylong
A298	Pacific Power	Robertson
A307	Hartley Valley Coal Co. P/L	Lithgow
A309	Ulan Coal Mines Ltd	Ulan
A311	B.M.I. Mining P/L	Gloucester
A315	B.M.I. Mining P/L	Gloucester
A321	Genders Mining P/L	Capertee
A324	Clutha Coal P/L	Ben Bullen
A342	Austen & Butta Ltd	Bylong
A349	Austen & Butta Ltd	Sutton Forest
A352	Blue Circle Southern Cement Ltd	Clandulla
A353	Agipcoal Australia P/L MIM Exploration P/L	Jerrys Plains
A355	Idemitsu Boggabri Coal P/L	Boggabri
A360	Dep. Mineral Resources	Rylstone
A373	Wambo Mining Corporation P/L	#
A382	Blue Circle Southern Cement Ltd	Moss Vale
A388	The Coal Cliff Collieries P/L	Oaklands
A394	Mitsubishi Development P/L Novacoal Australia P/L	Muswellbrook
A404	Newcom Collieries P/L	Morisset
A405	Dep. Mineral Resources	Cooranbong
A410	Novacoal Australia P/L	Picton
A412	Genders Mining P/L	Ilford
A414	Blue Circle Southern Cement Ltd	Kandos
A419	Newcastle Wallsend Coal Co. P/L	Cessnock
A420	Clutha Coal P/L	Ben Bullen
A422	Preston Coal Co. P/L	Gunnedah
A423	Hunter Valley Coal Corporation	Ravensworth
A424	Dep. Mineral Resources	Campbelltown
A427	Coalcliff Collieries P/L	Appin
A428	Ulan Coal Mines Ltd	Gulgong
A429	Hunter Valley Coal Corp. P/L	Singleton
A430	Dep. Mineral Resources	Ulan
A434	Preston Coal Co. P/L	Gunnedah
A435	Coal & Allied Operations P/L	Singleton
A436	Coal & Allied Operations P/L	Singleton
A437	Bayswater Colliery Co. P/L	Muswellbrook
A438	Costain Australia Ltd	Muswellbrook
A439	Esso Australia Resources Ltd	Singleton
A444	Wambo and United Mine Workers	Singleton
A445	Newcastle Wallsend Coal Co.	Boolaroo
A446	Oceanic Coal Aust. P/L	Toronto
A449	Dep. Mineral Resources	Ulan
A450	Saxonvale Coal P/L	Bulga
A451	Coalex P/L	Lithgow
A454	MIM Exploration P/L Agip Coal Australia P/L	Denman
A459	Coal & Allied Operations P/L	Aberdeen

EL No.	Holder	Nearest town
4470	Australian Iron & Steel P/L	Camden
4491	Oceanic Coal Aust. P/L, Marubeni Coal P/L, Taiheiyo Aust. P/L, Chelsea Coal P/L, Kokankogyo Aust. P/L	Edgeworth
4499	Novacoal Australia P/L	Narrabri
4500	Novacoal Australia P/L	Narrabri
4501	Novacoal Australia P/L	Gunnedah

AUTHORISATION APPLICATIONS

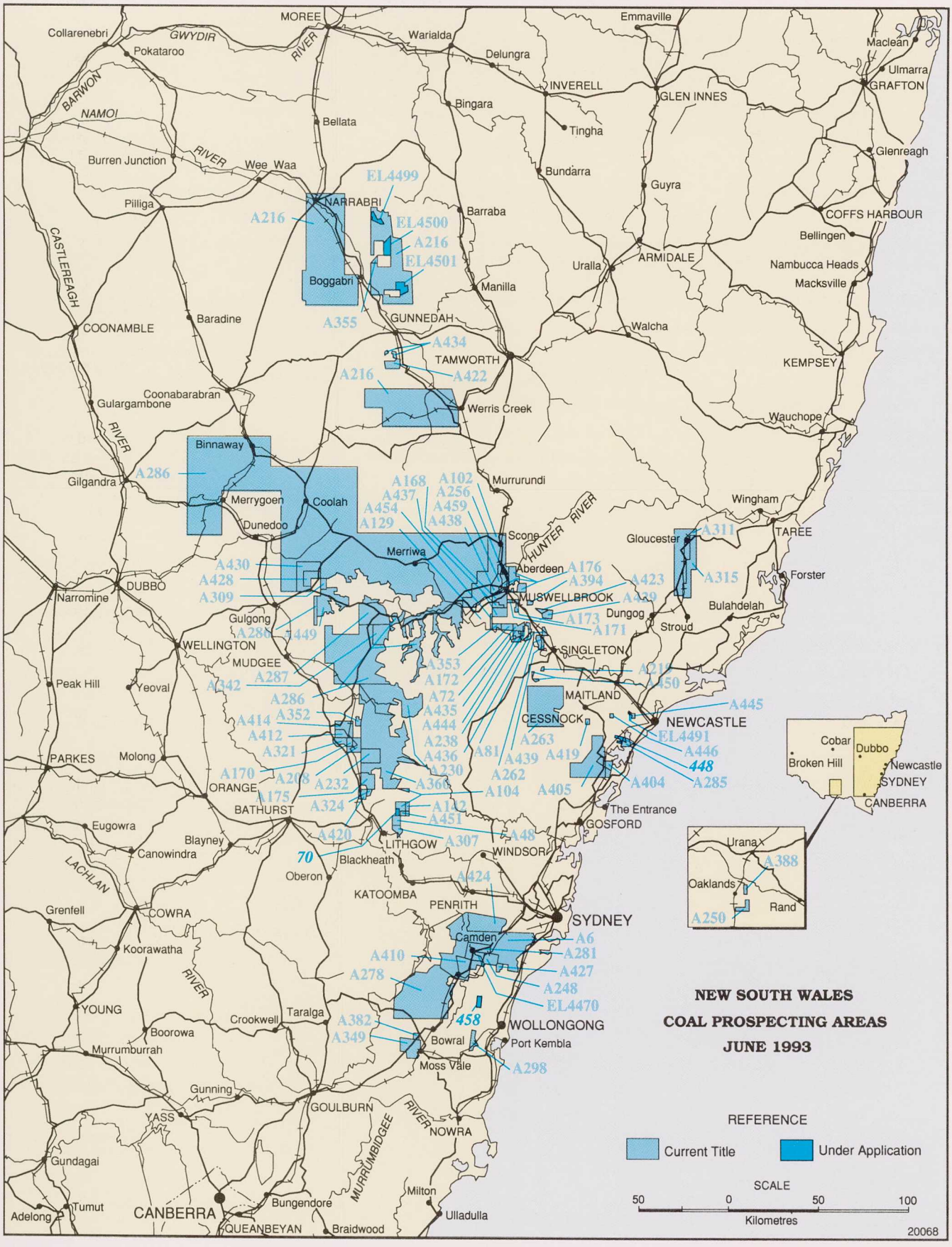
No.	Applicant	Nearest town
448	Elcom Collieries	Toronto
458	Australian Iron & Steel P/L	Bargo

EXPLORATION LICENCE APPLICATIONS

No.	Mining Divn	Applicant
70	Orange	Clutha Springvale Ltd Samsung Development (Aust.) P/L

Note: Section 21A Authorisations are not listed. # Section 20 Authorisation or EL over colliery holding (not shown in diagram)

* The Coal Mining Act 1973 was repealed and the Mining Act 1992 proclaimed on 21 August 1992. Under the new Act, Coal Authorisations are replaced by Exploration Licences for Group 9 minerals - coal.


MOREE
Collarenebri
GWYDIR RIVER
Pokataroo
Warialda
Delungra
Emmaville
Maclean
Ulmarra
GRAFTON
INVERELL
GLEN INNES
BARWON
NAMOI
Bellata
Bingara
Tingha
Glenreagh
Burren Junction
RIVER
Wee Waa
Bundarra
Guyra
EL4499
NARRABRI
Pilliga
A216
EL4500
A216
EL4501
Barraba
COFFS HARBOUR
Bellingen
CASTLEREAGH
Boggabri
Uralla
ARMIDALE
Nambucca Heads
Macksville
Manilla
COONAMBLE
Baradine
A355
GUNNEDAH
Walcha
A434
TAMWORTH
KEMPSEY
A216
A422
Coonabarabran
Gulargambone
Werris Creek
Wauchope
RIVER
Binnaway
A286
Gilgandra
Merrygoen
Coolah
Dunedoo
Murrurundi
A168
A102
A437
A256
A454
A459
A129
A438
Scone
HUNTER RIVER
Wingham
TAREE
Gloucester
A311
Merriwa
A430
A428
A309
DUBBO
Narromine
Aberdeen
A176
A394
A423
A315
Forster
MUSWELLBROOK
A439
Bulahdelah
Dungog
A173
Stroud
A171
Gulgong
A286
A449
WELLINGTON
SINGLETON
MUDGEE
A353
A172
A21
A50
Peak Hill
Yeoval
A342
A287
A72
MAITLAND
A445
A286
A435
A352
CESSNOCK
NEWCASTLE
A414
A444
EL4491
A412
A238
A263
A446
PARKES
Molong
A321
A436
A81
A439
A419
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ORANGE
A366
A104
A405
A175
A324
BATHURST
A142
The Entrance
A451
GOSFORD
Eugowra
A420
LITHGOW
A307
A48
Blayney
Canowindra
WINDSOR
70
Blackheath
LACHLAN
Oberon
A424
KATOOMBA
Grenfell
COWRA
PENRITH
SYDNEY
Camden
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Koorawatha
A410
A281
A278
A427
RIVER
A248
EL4470
YOUNG
Crookwell
Taralga
458
A382
WOLLONGONG
Boorowa
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Bowral
Port Kembla
Murrumburrah
Moss Vale
A298
Gunning
GOULBURN
YASS
RIVER
NOWRA
MURRUMBIDGEE
Gundagai
Milton
Tumut
Adelong
CANBERRA
Bungendore
Ulladulla
QUEANBEYAN
Braidwood
Cobar
Dubbo
Broken Hill
Newcastle
SYDNEY
CANBERRA
Urana
A388
Oaklands
Rand
A250
NEW SOUTH WALES
COAL PROSPECTING AREAS
JUNE 1993
REFERENCE
Current Title
Under Application
SCALE
50 0 50 100
Kilometres
20068

COAL MINING PROPOSALS JUNE 1993

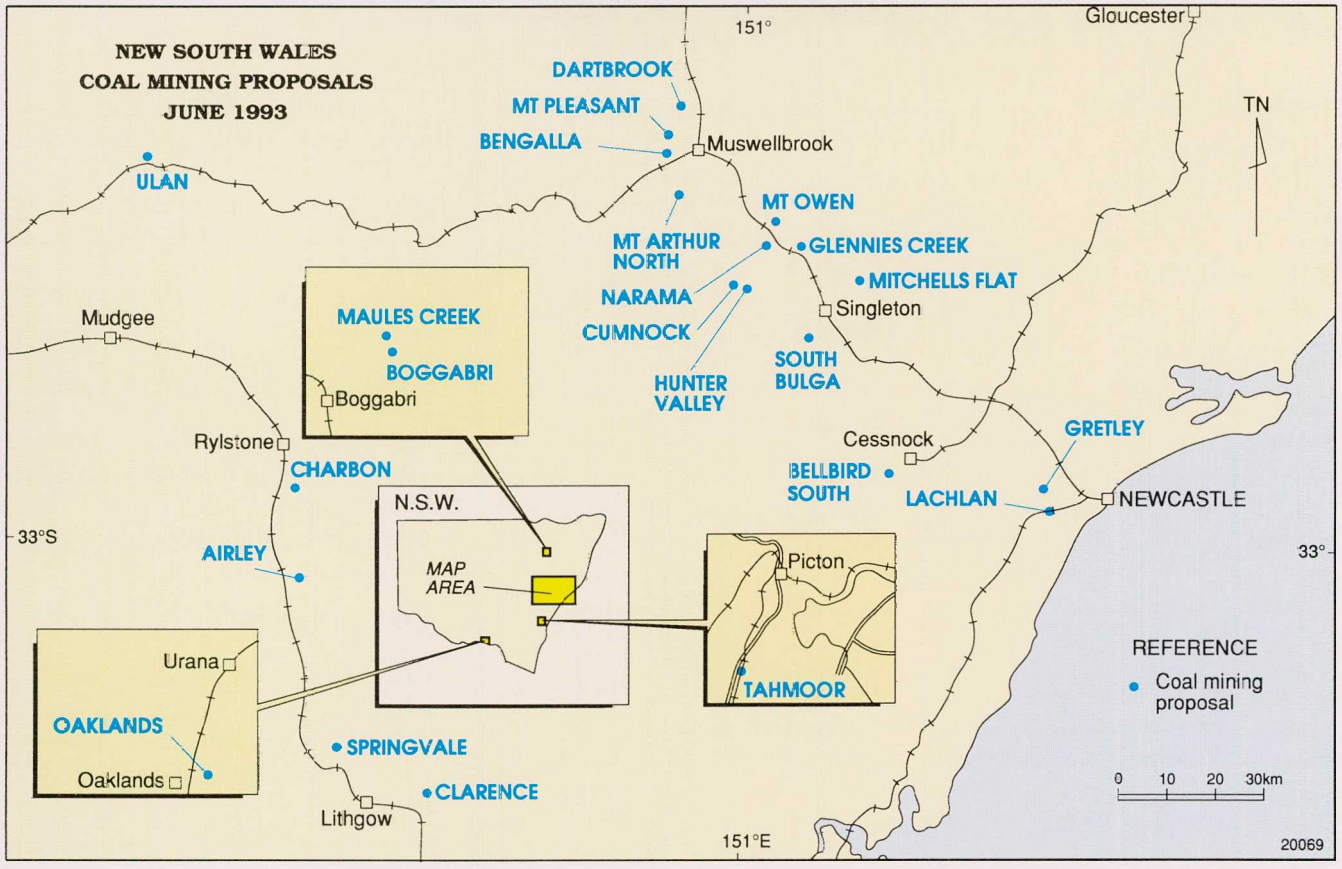
Company	Location	Coal type	Mine type	Development stage
Oceanic Coal Aust. Ltd	Mitchells Flat, 10 km east of Singleton	Thermal/coking	Underground	D*
Idemitsu Boggabri Coal Pty Ltd	17 km north-east of Boggabri	Thermal	Open cut & underground	D
Coal & Allied Operations Pty Ltd	Hunter Valley mine extension	Thermal/coking	Open cut extension	C*
Coal & Allied Operations Pty Ltd	Mount Pleasant, 6 km north-west of Muswellbrook	CWM/thermal/coking	Open cut	A*
Coal Cliff Collieries Pty Ltd	Maules Creek, 20 km north-east of Boggabri	Thermal	Open cut	D
Cumnock No. 1 Colliery Pty Ltd	Cumnock No. 1 extension	Thermal	Open cut	B*
Dartbrook Joint Venture	Dartbrook, 10 km north-west of Muswellbrook	Thermal	Underground	F*
Pacific Power	Mount Arthur North, 5 km south-west of Muswellbrook	Thermal	Open cut	A
Hunter Valley Coal Corporation Pty Ltd	Mount Owen extension	Thermal/coking	Open cut	B
Kembla Coal & Coke Pty Ltd	Tahmoor mine, north extension	Coking/thermal	Underground	B*
Maitland Main Collieries Pty Ltd	Glennies Creek, 12 km north-west of Singleton	Coking	Underground	D
Narama Joint Venture	Ravensworth, 20 km north-west of Singleton	Thermal	Open cut	F*
Newcastle Wallsend Coal Co. Pty Ltd	Gretley mine extension	Coking/thermal	Underground	A
Saxonvale Coal Co. Pty Ltd	South Bulga	Thermal/coking	Underground, South-western Development	B
Oaklands Joint Venture	Oaklands, 100 km north-west of Albury	Thermal	Open cut	A
Oceanic Coal Aust. Ltd	Lachlan, near Wakefield	Thermal/coking	Underground	D
Southland Coal Pty Ltd	Bellbird, 5 km south-west of Cessnock	Thermal/coking	Underground	A
Novacoal Australia Pty Ltd	Airly Mountain, 42 km north-west of Lithgow	Thermal	Underground,	C*
The Kandos Coomber Mining Co. Pty Ltd	Southern extension of Charbon Colliery	Thermal	Underground	D*
Coalex Pty Ltd and Clarence Coal Investments Pty Ltd	Extensions at Clarence Colliery	Thermal	Underground	A
Clutha Coal Pty Ltd	Springvale, 16 km north-west of Lithgow	Thermal/coking	Underground	F*
Roxburgh Coal Consortium	Bengalla, 6 km west of Muswellbrook	Thermal	Open cut	A
Ulan Coal Mines Ltd	Ulan mine extension (No. 3)	Thermal	Underground	B*

* Development stage has advanced since publication of the previous schedule (December 1992)

DARTBROOK JOINT VENTURE	Shell Co. of Aust. Ltd (100%)
ROXBURGH COAL CONSORTIUM	Costain Australia Ltd (25%) Clutha Ltd (25%) Wesfarmers Ltd (25%) Hyundai Corp. for OCDC (5%) KEPCO (5%) Mitsui CD (Aust.) Pty Ltd (5%) Taipower (10%)
NARAMA JOINT VENTURE	Nardell Colliery Pty Ltd (50%) (Renison Goldfields Consolidated Ltd) Costain Australia Ltd (50%)
OAKLANDS JOINT VENTURE	CRA Ltd (60%) Mitsubishi Development Pty Ltd (40%)

Notes:

1. Stages defined
   - A Environmental and preliminary feasibility studies.
   - B Development application lodged environmental impact statement complete.
   - C Development consent determined.
   - D Coal lease granted.
   - E All government approvals obtained.
   - F Construction/development in progress.
2. This table excludes other projects which are either still in the exploration or very preliminary assessment stage.



PETROLEUM EXPLORATION UPDATE

PESA CONFERENCE

The New South Wales Branch of the Petroleum Exploration Society of Australia (PESA) held the first New South Wales Petroleum Symposium at Darling Harbour on 26 June 1993 (see page 59).

DARLING BASIN

Following a significant expression of interest in the Darling Basin at the PESA conference, the Department of Mineral Resources has undertaken to conduct an in-depth study of the Devonian sequences under a special 1-year Prospecting Authority. Company input to this initiative would be welcome. A much more comprehensive data package will result from this study.

The Darling Basin covers an irregularly shaped area of approximately 76 500 km^2 extending from west of Cobar to just east of Broken Hill. The aim of the study is to improve knowledge of the geology by carrying out new geological and geophysical studies, including gravity surveys, vitrinite reflectance (maturity) studies, sampling from existing wells, structural and stratigraphic studies and a better identification of both source and seal rocks. Progress will be reported in subsequent issues of *Minfo*.

GUNNEDAH BASIN

Petroleum Securities Ltd has taken out an application over the south-western area of the basin. Additionally, an application has been received by the same company to drill a well in PEL 238.

SYDNEY BASIN

Pacific Power is drilling a borehole at Botany Bay to test for coalbed methane. The planned depth of the borehole is approximately 1300 m. Pacific Power has drilled two boreholes in PEL 279 at Munmorah which were hydrofractured and then mined through. Good fracturing patterns were displayed. Pacific Power is also drilling in the Gloucester Basin.

Amoco Australia Petroleum Co. has completed the North Castlereagh hole to a depth of 1320 m, bottoming in the Shoalhaven Group marine sediments. The company is currently preparing to undertake a series of shear-wave seismic surveys between Narellan and Richmond.

CLARENCE - MORETON BASIN

The moratorium period for exploration applications following the availability of this region) has closed. The applications and the proposed programs are currently being assessed.

SURAT BASIN

The Coal and Petroleum Geology Branch has commenced upgrading the Surat Basin Data Package. Progress will be reported in subsequent issues of *Minfo*.

For further information contact David Alder, Senior Geologist Petroleum, on (02) 901 8512, Fax (02) 901 8520.

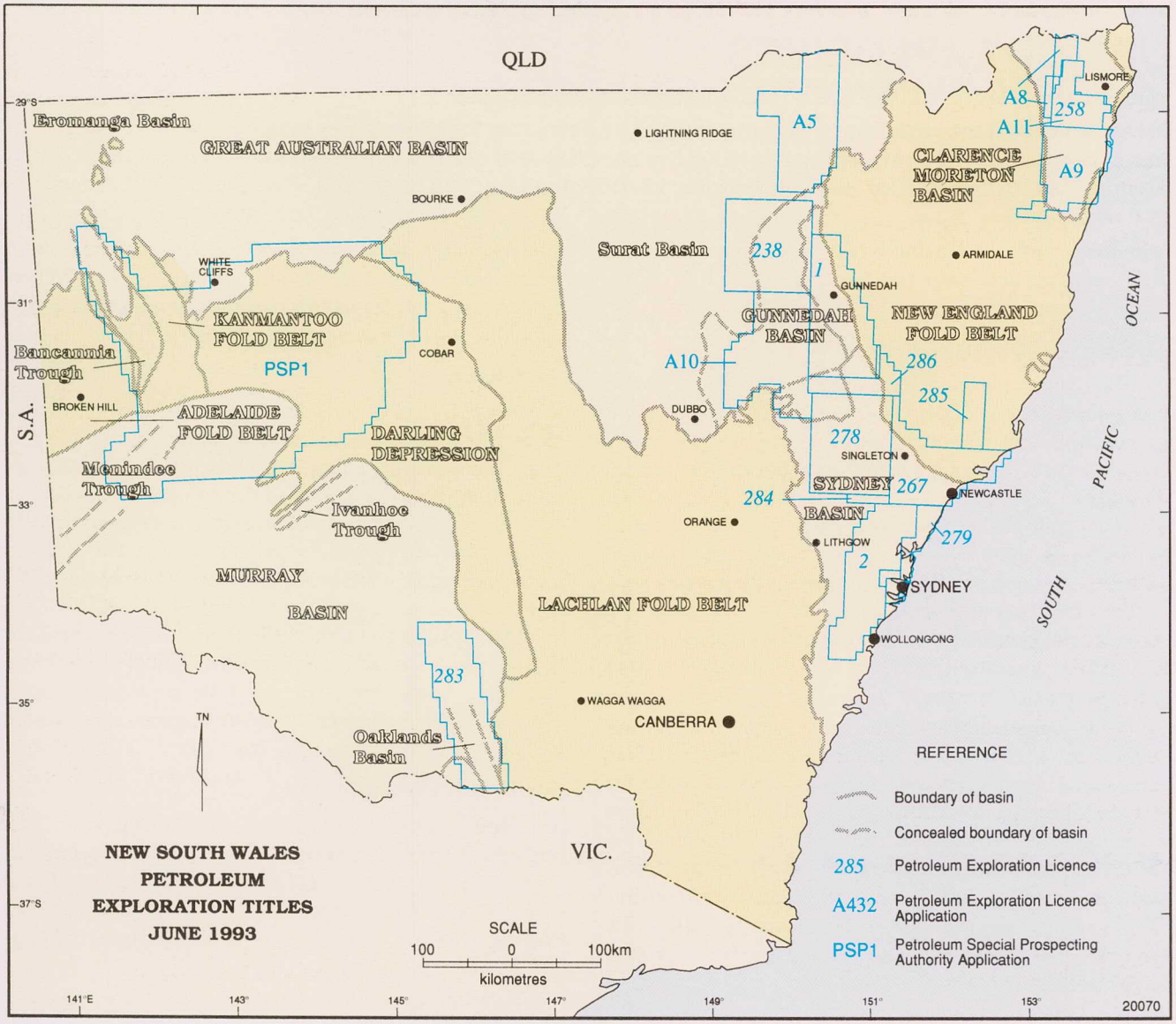
PETROLEUM EXPLORATION LICENCES JUNE 1993

PETROLEUM EXPLORATION LICENCES

No.	Holder	Area (km^2/blocks)$^+$	Expiry date$^\#$
PEL 238	Petroleum Securities P/L, Great Southland Petroleum P/L	9148	31.08.1993
PEL 258	St Barbara Mines Ltd, Claremont Petroleum N.L. Basco Energy Inc., Charterhall Petroleum N.L.	2920	6.01.1993
PEL 267	Sydney Oil Co. (NSW) P/L, Government Insurance Office of NSW	107B	19.01.1999
PEL 278	Pacific Power	5300	16. 04.1993
PEL 279	Pacific Power	1800	16. 04.1993
PEL 283	Bannerblock P/L, Golvom P/L	100B	9.04.1999
PEL 284	Pacific Power	446	15.04.1994
PEL 285	Pacific Power	1730	15.04.1993
PEL 286	Australian Coalbed Methane P/L	24B	10.02.1999
PEL 1	Australian Coalbed Methane P/L	127B	10.02.1999
PEL 2	Amoco Australia Petroleum Co., International Oil P/L	120B	28.03.1999

$^+$ Total area, i.e. area available plus exclusions where relevant.

$^\#$ Title continues where valid renewal application has been lodged.



PETROLEUM EXPLORATION LICENCE APPLICATIONS

No.	Applicant	Area (blocks)	Appln date
PELA 5	Petroleum Securities P/L, Bow Valley (Aust.) Ltd	127B	27.01.1993
PELA 8	Oil Co. of Australia Ltd, Claremont Petroleum N.L., St Barbara Mines Ltd, Pacific Power	19B	29.04.1993
PELA 9	Tara City Mining P/L	88B	30.04.1993
PELA 10	Petroleum Securities Aust. Ltd, Bow Valley (Aust.) Ltd	140B	11.05.1993
PELA 11	Oil Co. of Australia Ltd, Claremont Petroleum N.L., St Barbara Mines Ltd, Pacific Power	41B	24.06.1993

PETROLEUM SPECIAL PROSPECTING AUTHORITY APPLICATIONS

No.	Applicant	Area (blocks)	Appln date
PSPAA1	Department of Mineral Resources	1020B	07.06.1993

REVISED STANDARD FOR HANDLING AND USE OF EXPLOSIVES

In recognition of the importance of using explosives correctly, Standards Australia has just published the revised standard for the handling and use of explosives — an important document for many industries, including mining and quarrying.

Approximately 80% of explosives used in Australia are used in mining, with the remainder being used in development work, construction, road building and blasting for dams, septic systems and swimming pools.

THE REVISED STANDARD

The revised standard, Explosives — Storage, transport and use, Part 2: Use of explosives (AS 2187.2), is the result of extensive consultation between industry and regulatory authorities to further improve the safety of explosives use in Australia.

This comprehensive standard covers: general requirements, site mixing of explosives, operations prior to charging, charging, methods of initiation, firing procedures, misfires, the disposal of surplus and defective explosives and some special considerations such as extraneous electricity, ground vibration and airblast, blasting under water and in hot material, and demolition.

While some of the significant changes update the previous edition for bulk explosives use and signal tube initiation, there are a number of other revisions. For example, the allowable burning rate of safety fuse has been extended from a maximum of 110 seconds per metre to 120 seconds, in recognition of commercial realities. Another revision of particular interest to shotfirers — those who are responsible for preparing, charging and firing explosives — allows the removal of stemming material with the use of compressed air, as well as with water.

The appendices contain information on maintaining blasting records, equipment and its maintenance, fire precautions, preparation of primers and deterioration of explosives, and other topics. Typical blast record sheets are included and supplementary guidance on airblast and ground vibration is also given.

ACCEPTABLE LEVELS OF AIRBLAST AND VIBRATION

There is still debate over appropriate standards for levels of acceptable airblast and ground vibration. The general case is described in the standard and there is guidance on measuring the physical environmental impacts of blasting.

The energy released in blasting to break and move rock can result in ground vibration and airblast which may cause discomfort and damage to blast-site neighbours, adjacent structures and underground services. More useful monitoring equipment is now available to assess these impacts.

Blast-site neighbours often find it confusing and difficult to comprehend these two blast environmental impacts. Some secondary noise is often attributed to the blast but this noise, such as windows and crockery rattling, may have been caused by either of these impacts. Shotfirers should have a good understanding of these impacts, be able to communicate that understanding to blast-site neighbours and have well-maintained monitoring records. (Department of Mineral Resources mining leases have conditions limiting both ground vibration and blast overpressure levels.)

FLYROCK

Control of flyrock is a new addition to the Standard. Flyrock is best defined as 'the undesirable throw of debris from a blast', and occurs when explosive energy in the form of gas expansion energy is vented violently into the atmosphere and propels rocks in front of it. Flyrock is a serious problem for users of explosives, who must ensure the safety of people, equipment and property in the area surrounding the blast.

Many of the factors contributing to the occurrence of flyrock are described in the Standard, including weak rock structure, insufficient front row hole burdens, stemming depth, initiation sequence, blasthole diameter, blast pattern shape and stemming material.

FURTHER COMMENTS

For bulk explosives use, new requirements have been included for mobile mixing appliances. These requirements address the construction and fit-out of vehicles used to mix explosives on site, and recognise the importance of these devices in blasting, relative to the more traditional mixing of ammonium nitrate and fuel oil.

Signal tube initiation, commonly known by trade names like 'Nonel', are also assuming prominence in blasting. Accordingly, many of the Standard's provision for connectors, hazards, misfires and treatment have been updated.

The Standard does not detail procedures for explosives use in demolition, but gives an overview of important factors before and during demolition work.

The Standard does not apply to explosives used in underground coal mines, safety ammunition and propellant powder, pyrotechnics (including fireworks, rockets and fog signals) and purpose-designed and manufactured military explosives. The document does not override statutory requirements but may be used as a set of working rules to be used in conjunction with such requirements.

The Standard is written in a clear and concise style and includes illustrations of equipment and correct practices.

Explosives — Storage, transport and use, Part 2: Use of explosives (AS 2187.2) is available for purchase from any office of Standards Australia.

For further information contact Graham Terrey, Chief Inspector of Mines and Chairman of the review committee, on (02) 901 8470, Fax (02) 901 8468; or Stede Coundouris, Senior Inspector of Mines, on (02) 901 8473.

THERE ARE NO SECOND CHANCES WITH EXPLOSIVES

Once you blow something up... there's no putting it back together. So it's important to conduct blasts effectively and safely the first time.

Standards Australia recognizes the need to ensure the correct use of explosives and, as a result, has just revised the standard, **Explosives—storage, transport and use—Part 2: Use of explosives (AS 2187.2—1993).**

This new explosives standard is important reading for the mining, quarrying, construction and chemical manufacturing industries and is an essential tool for all shotfirers.

This revised edition of the 1983 standard includes significant changes, mainly relating to airblast and ground vibration, control of flyrock, bulk explosives use and signal tube initiation. It includes useful appendices on the maintenance of blasting records, equipment and its maintenance, fire precautions, preparation of primers and deterioration of explosives, and blast record sheets.

AS 2187.2 covers general requirements, site mixing of explosives, operations prior to charging, charging, methods of initiation, firing procedures, misfires and the disposal of surplus and defective explosives.

The standard also includes helpful information on some other situations which may occur — extraneous electricity; blasting under water and in hot material; demolition; and the control of flyrock, airblast and ground vibration to protect nearby equipment, property and people.

To requst a free brochure (including order form) of AS 2187.2 or Part 1 of the explosives series **Storage and land transport (AS 2187.1—1984)**, simply complete the coupon below.

For your free brochure, please telephone our National Sales Centre on (02) 746 4600 or call us free from anywhere in Australia on 008 02 9955. Alternatively, fax us on (02) 746 3333.

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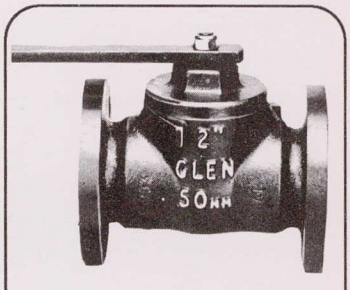
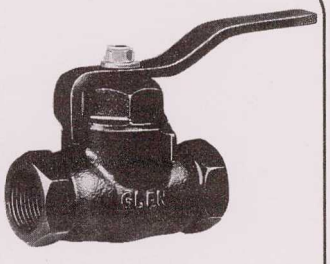


Flanged

Shouldered or Grooved to Threaded



Threaded

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A NEW BLASTING COURSE FOR SHOTFIRERS

A new explosives course has been developed by Mines Inspection Branch and the Rural and Mining Industry Training Division of TAFE specifically for people intending to use explosives in surface mines and quarries.

The aim of this course is to develop the knowledge and skills necessary for the safe charging and initiation of explosives and to improve the safety and environmental awareness of industry.

The course, which is assessed by examination, will include face-to-face teaching with practical field demonstrations over a period of 6 consecutive days.

Eligible applicants for the course must be over 18 years of age, have at least 6 months practical experience on a mine or quarry, and have a good knowledge of General Rule 2 of the Mines Inspection Act 1901 and other relevant legislation.

The new course will be particularly attractive to people who are unable to commit themselves to a full-time explosives course through a college or by correspondence. The content of the new course and standard of competence have been determined in consultation with industry and TAFE.

People seeking to qualify for a Shotfirers Certificate of Competency under the Mines Inspection Act 1901 are required to complete an approved course in the use of explosives. The current explosives course is conducted by selected technical colleges throughout New South Wales over 143 hours or by correspondence through the Open Training and Education Network of TAFE.

Graduates of the course will be eligible to apply for a Shotfirers Certificate of Competency, provided they are 21 years of age and meet the requirements of the Board of Shotfirers.

It is proposed that the course will be offered by TAFE in early 1994.

For further information contact Stede Coundouris, Senior Inspector of Mines, on (02) 901 8473, Fax (02) 901 8468.

Good blast design results in a predicted size construction material product ready for further processing

COAL MINING MECHANICAL ENGINEERING SAFETY SEMINAR — OPENING ADDRESS

On 6 April 1993, the Director-General of the Department of Mineral Resources, Dr Garry Lowder, made the opening address to the third Coal Mining Mechanical Engineering Safety Seminar held at Penrith Panthers. The text of the Director-General's address follows.

Today's Seminar is the latest in a series of events initiated by the Department's Coal Mining Inspectorate to provide a forum for the presentation and discussion of safety issues current in the New South Wales coal mining industry.

Safety is a concern to everybody working in the coal mining industry, but for much of the history of the industry there seemed to be a view that coal mining, particularly in the underground environment, presents a range of hazards that is unique to this activity and in view of that, a poorer safety performance compared with other industries was inevitable. In the late 1980s it was realised that this was not necessarily so and that the industry's record in terms of safety was simply unacceptable. With that recognition came a new thrust to improve safety performance in the coal mining industry and this has been matched by a new level of acceptance within management that safety can and must be addressed more vigorously.

Many new initiatives have been proposed, developed and undertaken by various groups associated directly or indirectly within the industry. One such group is the Department's Coal Mining Inspectorate and it is the activities of this particular group, in providing an impetus to effect a change in the safety culture, that I wish to refer to this morning.

I would expect that all of us attending this Seminar today would be aware of the current standing of the industry's safety performance as measured in the universally accepted manner, that is, Lost Time Injury Frequency Rate (LTIFR). I suspect this may not have been the case a mere 5 years ago.

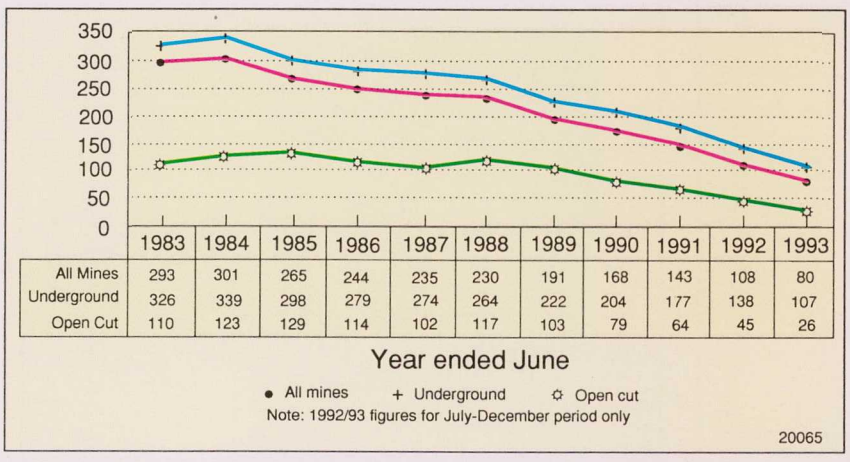
From 1978 to 1984 the LTIFR for all New South Wales coal mines hovered fairly consistently around 300 [figure 15], but since 1984 the index has been steadily declining to the point where in 1991-92 we recorded a rate of 108. Based on trends for the first 6 months of 1992-93 it is quite conceivable that we will achieve a rate of less than 100 for the current year. If this is so, it will be a record of which the industry can be proud and for which many groups are entitled to take credit. An increase in the awareness of the industry's safety record has no doubt been a significant factor in the achievement of the improved statistical measurement of performance, and certainly the Inspectorate has effectively participated in this awareness program.

We have however no cause for complacency. While the trend in reduction of the LTIFR is highly commendable, our expected value for this index in New South Wales this year will still be **three times** that of the coal industry in the United States. We have, I suggest, still some way to go.

In terms of fatalities there was a steady fall in the number of deaths occurring annually from 1984-85 to 1989-90, but unfortunately there has been a return to the pre-1984-85 level for each of the last 2 years. It is important to note, however, that for 1991-92, 'fall of roof' was not a cause of death. This is the first time in the past 20 years that the industry has not had to record this type of event. At least in part this considerable achievement reflects the involvement of the Inspectorate in promoting safe working practices as they apply to the integrity of the roof and its support. This involvement is continuing, with the development of safer procedures in the extraction of pillars.

Any gratification that we may take with regard to the improved safety performance relating to better roof support practices must be tempered by our concern for a spate of recent accidents involving the use of vehicles. Regrettably, some of these accidents have resulted in fatal injury. The Inspectorate has now undertaken a major effort to improve vehicle safety and this Seminar is a part of that endeavour.

It is appropriate to ask 'What can the Inspectorate offer to the industry to assist in reducing the occurrence of these "underground traffic accidents"?' High on the list must be a disciplined process of risk assessment which will provide a mechanism appropriate to both users and manufacturers of vehicles. While the process of risk assessment is well known throughout the industry, it is our belief that the realisation of the benefits to be gained through its use is not as widely and as enthusiastically accepted as it should be. For this reason the Inspectorate will continue to encourage the use of risk assessment and render assistance to industry groups whenever and wherever it can. The issue of approvals required under the Coal Mines Regulation



	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
All Mines	293	301	265	244	235	230	191	168	143	108	80
Underground	326	339	298	279	274	264	222	204	177	138	107
Open Cut	110	123	129	114	102	117	103	79	64	45	26

Figure 15. *Lost-time injury frequency rate, New South Wales coal mines*

Act has been facilitated by the Inspectorate's adoption of the risk assessment process. This has resulted in the Inspectorate gaining a high level of expertise in this area and I invite you to make use of this expertise in every way you can.

The introduction of risk assessment as an integral part of the approvals process has continued to deliver the requirements of the existing legislation whilst amalgamating the general obligations of the Occupational Health and Safety Act for manufacturers or suppliers and users of equipment. The use of risk assessment has resulted in an increased credibility for this long-standing activity of the Inspectorate.

Relevant stakeholders are now directly involved in the approval process and the synergy developed through a consultative approach has improved the quality of the result. The significance of the benefits gained should not be lost on those groups directly associated with the modified approval system.

Other initiatives undertaken by the Inspectorate include publication and distribution of Safety Communiques, such as

* Significant Incident Reports and Safety Alerts;
* the introduction of team-based investigations of fatalities and major events known as System Safety Accident Investigations; and
* facilitating the development of Outburst Management Procedures. Currently the Inspectorate is embarked on a program to obtain accreditation for Quality Assurance for its activities.

Another initiative of the Department, under the auspices of my predecessor Toby Rose, has been to invite the Chief Executive Officers of coal companies to make presentations of their safety programs to the Department. These presentations were intended to open clear lines of communication in regard to safety issues between the industry and the Department and to emphasise in a very demonstrable way that safety "starts at the top". These presentations will continue during my tenure as Director-General and I will ensure that the Inspectorate continues to play its role in bringing about a safety performance in the New South Wales coal mining industry which is second to none.

Without doubt we have much to learn from each other with regard to safety, and the sharing of information and experience is of benefit to us all. This Seminar is an expression of the Department's commitment to safety and your attendance here is confirmation that our commitment is shared by industry.

The recent series of underground vehicle accidents to which I referred earlier makes the theme of this Seminar, namely, **Free Steered Vehicle Safety**, particularly appropriate. I note from the program that there will be a wide variety of presentations from both the Department and industry and I am sure the proceedings will be of interest not only to mine mechanical engineers but also to those involved with the management and operation of vehicle transport, driver training and of course the drivers themselves. The interface between operators and the vehicle, incorporating ergonomic principles, will be of special interest to all.

COPYRIGHT LICENCES FOR AN ELECTRONIC GS REPORT SYSTEM

The Department has obtained copyright licences for company geological reports in the GS Report System. This will enable the Department to continue providing public access to the System and will allow the reports to be produced in several formats, including electronic format on optical discs.

One of the Department's most used and valuable client services is access to the unpublished non-confidential geological reports in the GS Report System.

The GS Report System is a unique collection of unpublished reports of geological investigations carried out in New South Wales by mining and exploration companies, the Department of Mineral Resources and other government agencies since 1875. The System consists of over 16 000 reports — approximately 60% are company exploration reports and 40% are internal Department of Mineral Resources reports.

The company exploration reports cover expired mineral and petroleum exploration titles. Companies are required under Conditions of Title to submit reports on exploration in New South Wales to the Department.

The Departmental component of the GS Report System includes Annual Report compilations, internal geological reports and 4000 Mine Records. The System also includes a separate database of 4000 indexes to coal authorisation reports.

WHO USES THE GS SYSTEM?

A survey of a 12 month period carried out in 1992 showed the users of the GS Report System as follows:

External users:	4882 reports	59%
Departmental users:	3390 reports	41%
Total:	8272 reports	

A more detailed break up of external users is given in table 1.

The top 12 external users of GS reports made 434 visits to the Department's Library and borrowed 2474 reports representing 50.1% of the reports borrowed in the year.

OPTICAL DISC PROJECT

In 1990, the Department began investigating the feasibility of converting the hard-copy GS reports into electronic format using advanced imaging technology.

In January 1991 the Department selected the Data Centre-Delairco Consortium to determine the feasibility of applying imaging technology to the System. The study:

* Provided a statistical analysis and classification of the collection in terms of the suitability of capturing the collection electronically.
* Advised the Department on the feasibility and the range of technologies needed for capturing the data contained in the collection and indicating the most viable alternatives for data capture.
* Converted a representative sample of the collection, incorporating all document types identified during the statistical analysis, with the aim of producing a pilot with full user interface.

Storage of the reports on optical disc resolves problems of manual access and offers a number of significant advantages.

* Unlimited access to reports by multiple users at multiple locations, including, for example, the Departmental offices in Armidale, Broken Hill, Orange and Singleton.
* The original reports can be safely stored while the electronic copies of the collection are used.
* Texts of reports can be searched by key word(s), providing

TABLE 1
EXTERNAL USERS OF THE GS REPORT SYSTEM DURING 1992

	Total number	Number of visits	Number of reports	% reports received
Companies	80	607	3265	67
Government Departments	7	14	57	1
Universities	9	103	501	10
Consultants	36	141	521	11
Category unknown (believed to be students and/or consultants)	115	158	538	11
TOTAL	247	1023	4882	100

REVISED CONDITION OF TITLE
No. 44A (minerals exploration licences)
No. 22 (coal exploration licences)

1. Licence to Use Reports

(a) In respect of reports prepared and to be prepared by or on behalf of the holder, and submitted to the Director General pursuant to condition numbered 4 of this title, the holder hereby grants to the Minister, by way of a non-exclusive licence, the right in copyright herein, to publish, print, adapt and reproduce the work in any form and for the full duration of copyright, subject to a period of confidentiality as outlined in sub-clause (2).

(b) The non-exclusive licence to do acts comprised in the copyright granted hereunder will operate as a consent to disclosure for the purposes of section 365 of the Mining Act 1992.

2. Confidentiality

(a) All exploration reports submitted in accordance with the conditions of this title will be kept confidential while the title is in force, except in cases where:

(i) The holder has agreed that specified reports may be made non-confidential.

(ii) Reports deal with exploration conducted exclusively on areas that have ceased to be part of the title.

(b) Confidentiality of reports will be continued beyond the termination of a title in cases where an application for a flow-on authority was lodged during the currency of the title. The confidentiality will last until that flow-on authority or any subsequent flow-on authority, has terminated.

(c) Continuation of the period of confidentiality outlined in sub-clauses (a) and (b) is subject to the holder submitting a report that covers all exploration conducted on the areas of the title not covered by the flow-on authority.

(d) The Director General may extend the period of confidentiality in respect of reports beyond the time(s) stipulated in sub-clauses (a) and (b) hereof.

3. Terms of the non-exclusive licence

The terms of the non-exclusive copyright licence granted under sub-clause (1) (a) are:

(a) The Minister may sub-licence others to publish, print, adapt and reproduce but not on-licence reports.

(b) The Minister and any sub-licensee will acknowledge the holder's and any identifiable consultant's ownership of copyright in reports in any reproduction of reports, including storage of reports onto an electronic database.

(c) The holder does not warrant ownership of all copyright works contained in any report and, the holder will use best endeavours to identify those parts of the report for which the holder owns the copyright.

(d) There is no royalty payable by the Minister for the licence.

(e) If the holder has reasonable ground to believe that the Minister has exercised his rights under the non-exclusive copyright licence in a manner which adversely affects the operations of the holder, that licence is revocable on the giving of a period of not less than three months notice.

a most powerful searching facility.

* Image processing techniques can be applied to graphic data in the reports, turning static information into data that can be manipulated.

* Users can select the output format that best suits their needs.

* Custom-made data packages can be produced covering reports on a particular area, commodity, geological setting or any other criteria.

COPYRIGHT LICENCES

The electronic storage option raised concerns on the issue of ownership of the reports and who held the copyright on the exploration reports.

Acting upon legal advice, the Department has obtained copyright licences for reports under the previous mining acts prior to August 1992 and for reports post-August 1992.

The Department consulted closely with the New South Wales Chamber of Mines and the New South Wales Coal Association to ensure that the original copyright holders were able to continue to use their reports and to ensure the confidentiality of reports for unexpired titles.

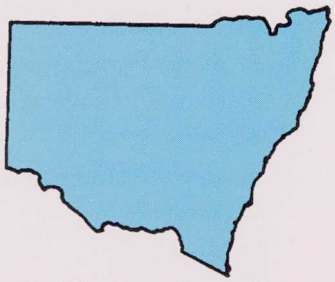
For reports post-August 1992, a refined condition of title has been developed in consultation with industry, giving the Department a non-exclusive copyright licence. All current and new exploration titles contain this condition of title (see box).

The obtaining of the copyright licences allows the Department to produce reports in several formats (including digital) and so continue to improve the service it provides to its customers as well as improve the protection, storage and dissemination of the material held.

The application of advanced technology will lead to an even more useful database of the State's geological framework, an essential element in the Department's commitment to providing information to encourage investment in the New South Wales minerals industry.

For further information, contact Geoff Brookes, Manager, Library Services, on (02) 901 8232.

'LIFTING THE COVER'



Two new state-of-the-art geophysical maps of New South Wales were launched by Dr Garry Lowder, Director-General of the Department of Mineral Resources, at a function held at The Earth Exchange on 21 June 1993. A slightly edited version of his address follows.

Welcome to **LIFTING THE COVER**. This is a special presentation and display of new and recently published map products of the New South Wales Department of Mineral Resources which is 'lifting the cover' on the geology and mineral deposits of the State. You will also hear about the new directions and innovations for mapping that the Department is developing. The key focus this evening is on a series of new State geophysical maps produced by the New South Wales Geological Survey.

A large part of the State is covered by basins and a relatively thin veneer of young rocks which obscure the full areal extent of mineral-bearing fold belts. The full potential for major new mineral discoveries 'under the cover' in New South Wales is yet to be realised. This Department is extending the portfolio of explorable land in New South Wales, including the area under cover, by developing new maps and information products and by promoting new ideas for exploration.

Current and historical exploration activity in New South Wales has concentrated on areas of known mineral deposits and areas with sufficient outcrop to support the development of exploration ideas and the justification of exploration strategies. This means that only half of the State has been largely explored! Exploration activity is associated with major mineral-bearing terrains within the outcropping fold belts of New South Wales, and restrictions to exploration are imposed by the 'cover' [see EL map on page 20 herein].

The potential and motivation for exploring under areas of 'cover' in New South Wales has been largely 'blacked out' by lack of knowledge. The map products that are being launched this evening provide, for the first time, a new, exciting and coherent view of New South Wales. We now have geophysical image products that will immediately help to lift the 'darkness' on the areas of cover and provide a very much improved regional overview of the geology and structure of New South Wales.

'Lifting the cover' on areas that offer real potential for new mineral discoveries, removing the blinkers for mineral explorers in New South Wales, and promoting opportunities for new mineral exploration activity is a key priority for this Department.

The key products on display today — the regional magnetic and gravity images of the State, fill in the areas of 'cover' and open up opportunities for new thinking and new concepts.

The new **Gravity Map of New South Wales** provides a new view of the crustal structures of New South Wales. Some of the major gravity structures in New South Wales, such as the sinuous band of dense volcanic rocks in the central part of the State coincide with the regions in which major new mines have recently opened.

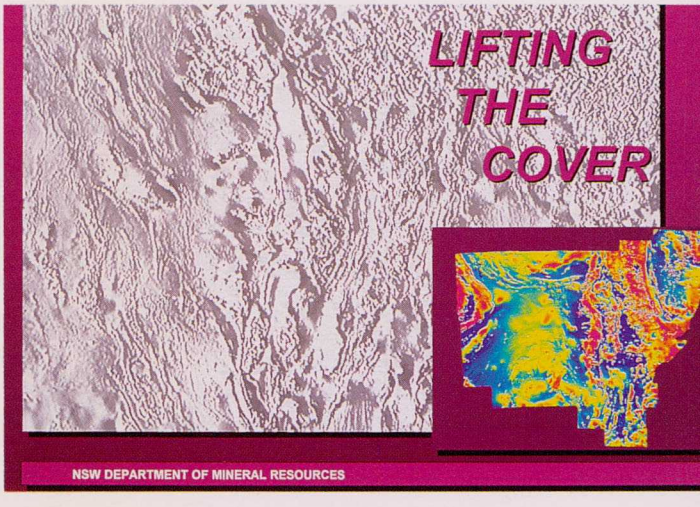
This new map will be an invaluable companion to the new Magnetic Map of New South Wales.

The new **Magnetic Map of New South Wales**, perhaps the most valuable of the products displayed here this evening, represents many decades of regional airborne surveying by this Department and the Australian Geological Survey Organisation (AGSO).

The recognition and understanding of the structure of the major magnetic features, particularly the volcanic sequences and intrusives (now revealed so effectively in the new magnetic images of the State) has real importance for the development of effective strategies for precious metal, copper and base metal search.

The new geophysical maps of New South Wales are not just of value for the areas where there has been a lack of knowledge — they provide a new panorama of the State. In fact, the Magnetic and Gravity Maps of New South Wales represent a valuable new layer of knowledge for the whole State. Regional analysis of these results has already begun as part of the Department's **New South Wales Mineral Resources Audit** initiative. They are providing new insights into the major regional geological features and structures which constitute or control the mineral-bearing rocks of New South Wales and have shifted conventional wisdom on the geology of the State.

This Department, in co-operation with AGSO, has been committed to completing the reconnaissance airborne magnetic coverage and the regional gravity coverage of New South Wales over the past few decades. In fact, it has taken almost 30 years to complete the reconnaissance airborne survey coverage. While much of the older information was considered to have a 'use-by-date', the developments in digital technology over the past 5 years and in particular the very recent Australian developments in image processing for the



geosciences, have provided the vehicle for this Department to 'lift the cover' on the reconnaissance geophysical survey coverage of New South Wales.

A range of new map products is being made available in both hard copy and digital form. The new Magnetic Map and Gravity Map of New South Wales constitute a series of magnetic and gravity image products which will form the foundation of future strategic map and digital products from the Department. We believe that these map products are of exceptional quality and represent the leading edge for regional Australian geophysical image products.

The Geological Survey is currently interpreting these new images of New South Wales which are redefining the view of the geology of the State. New interpretative maps of the State's geology, including **maps of the geological structures and the structural basins of the State** are also mounted in the display. Dr Erwin Scheibner has played a leading role in developing these maps in conjunction with the Geophysical Mapping Section of the Geological Survey which has produced all of the geophysical image products on display this evening.

These products are also enabling the Geological Survey to develop new interpretations of regional geology such as in the Murray and Darling Basins. The Geological Survey is utilising these products to further examine the State's metallogenesis. The products will also provide useful information for petroleum explorers.

New geophysical maps of the State are the first of a number of initiatives that this Department is implementing to 'lift the cover' on New South Wales. A critical component of promoting an attractive environment for exploration is the provision of modern **geological, geophysical and metallogenic mapping and information packages** in both hard copy and digital form (such as the Magnetic Map of New South Wales) — they offer a framework for development of new and innovative exploration strategies in both active exploration territories and in 'green-fields' areas under the 'cover'.

The Geological Survey has a very important role in providing new regional geophysical, geological and metallogenic datasets to the exploration and mining industry. It has recognised this role in the past with notable achievements, being the first State to cover known mineralised areas with reconnaissance geological mapping. More recently, detailed mapping in the Cobar and Broken Hill regions has provided an excellent foundation for detailed company exploration. Recent metallogenic map products for the New England Fold Belt, the Lachlan Fold Belt and the Broken Hill region have been mounted in the display, together with the exciting new geophysical and geological mapping results in the eastern Lachlan Fold Belt.

The next revolution in mapping is already underway in the eastern region of the Lachlan Fold Belt as part of the **National Geoscience Mapping Accord** [see Feature herein]. Part of the display highlights the current geophysical and geological mapping in the Bathurst and Dubbo region. High-resolution airborne geophysical surveys are forming the foundation for this mapping program and these results have already led to major advances in mapping strategies and mapping quality. The evolving use of digital map compilation and composition

Dr Ted Tyne, Principal Geophysicist (centre), and Ross Spencer, Geophysicist (right), of the Department with Steve Webster, General Manager of Austirex International Ltd, at 'Lifting the Cover'

Photo by Otti Mueller

is also providing a means for timely production of new geophysical and geological maps.

In the past year, the **Geological Survey Advisory Committee** has been established to promote closer working links between the minerals industry and the technical programs and staff of the Department and to ensure that our products continue to be what the exploration industry requires. Senior industry personnel from mineral exploration and mining companies are contributing to the work of the Committee. This liaison is working very well and there has already been very constructive input in the areas of strategic program planning, and potential for new technologies in mapping.

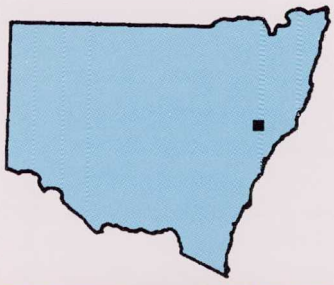
While the level of **exploration activity** has declined in some Australian states, there has been an increase in exploration expenditure in New South Wales from the situation 5 years ago. The State's share of the Australian Exploration Dollar has increased from about 7% 5 years ago to 11% in the past year. The regulatory environment has also improved with the introduction of new mining legislation and a much faster granting of exploration licences. A number of companies have had encouraging exploration results, such as Tri Origin at Lewis Ponds and Newcrest at Marrs Forest.

Many companies have expressed a commitment to explore in New South Wales because the State has a well-developed infrastructure for **mining projects**. During the past year, new mines have commenced production at The Peak near Cobar, and at Girilambone near Nyngan. North Broken Hill–Peko is developing the large Northparkes gold–copper deposit.

The Department is committed to providing the environment for mineral exploration to flourish in New South Wales. The Department has planned to further 'lift the cover' with the presentation of a **1-day conference** with the theme **'New South Wales — The State of Exploration'** [see page 58].

If you want further information, I invite you to contact John Cramsie, Director of the Geological Survey, and his professional staff at our Head Office in St Leonards.

COAL MINES AND WEED CONTROL



The results of research into controlling the weed *Galenia* were presented at a field day in the Hunter Valley on 7 May 1993. *Galenia* is a drought and salt-tolerant perennial plant native to South Africa.

It is most likely that *Galenia* was introduced to Australia as a result of ships dumping ballast in our harbours. *Galenia* has established in many coastal areas of Australia and has spread inland, initially along stock routes.

Galenia is an early and successful coloniser of disturbed ground, and is now common in some regions of the Hunter Valley. It is particularly prevalent in the Singleton - Muswellbrook area along roadside edges, in recreation reserves, urban subdivisions, land operated by coal mining companies and pasture paddocks.

The Department of Mineral Resources expects companies rehabilitating land disturbed by mining to develop appropriate procedures to ensure a relatively weed-free and self-sustaining vegetation cover, compatible with the designated future use of the land. Control of *Galenia* is therefore an important issue for the industry.

***Galenia* is a prostrate weed with an abundance of succulent foliage**

GALENIA - THE WEED

The plant is a prostrate grower, seldom rising to more than 15 cm above the ground surface, and producing an abundance of succulent foliage. Mature plants have been observed with a diameter in excess of 2 m, with thick woody stems and a thick taproot. *Galenia* is inferior in feed value compared to either lucerne or a reasonable quality grass/clover pasture. However, there is no evidence showing *Galenia* to be toxic to livestock.

There is generally a lack of awareness of the weed amongst landholders and public authorities which accounts for the low priority previously given to the development of control methods.

Field trial for the control of ***Galenia*** *on rehabilitated mine land*

THE RESEARCH

Research undertaken by Agriculture and Environment Consulting and co-ordinated by Australian Mineral Industries Research Association (AMIRA) between 1990 and 1992 has assessed the effectiveness of various herbicides, cultivation practices, pasture species, management of grazing livestock and management of top-soil stockpiles as methods for controlling *Galenia*. The research included maintaining and assessment of management trials on coal mines, field plots and control plots in the Upper Hunter. The results of these studies are available and should prove valuable to land managers responsible for the rehabilitation of lands disturbed by mining.

CONTROL RECOMMENDATIONS

The research has identified that effective weed control, particularly for a well-adapted plant such as Galenia, requires a combination of planning, grazing, cultivation and herbicides. In all situations the land manager must consider the impacts and adopt a sustainable, commonsense approach.

The report has recommended a Management Plan combining the most successful of the control procedures examined during the research, under the following headings:

* Control in existing native pastures
* Control when establishing pastures on rehabilitation areas
* Control in topsoil stockpiles
* Control in existing rehabilitated pastures
* Cattle management
* Control when establishing trees

FUTURE APPLICATIONS

The research report has identified herbicides useful in a *Galenia* control program with application on mine sites. Appropriate permits and/or orders for herbicides are being organised.

The problem of *Galenia* invasion and infestation is recognised as a limitation to the otherwise successful rehabilitation of Hunter mines to grazing land capability. While it is accepted that the complete eradication of the weed is unrealistic, the research results have identified sustainable management techniques to control *Galenia*.

The application of the research findings will require attentive management, involving the integration of grazing, species selection, responsible herbicide use and maintenance cultivation.

The Department of Mineral Resources acknowledges the coal mining industry's research initiatives in addressing the *Galenia* problem and looks forward to an enthusiastic response from all land managers within the coal and agricultural industries in field applications.

The research was funded by Coal and Allied Operations Pty Ltd, CPeabody Resources Ltd, Drayton Coal Pty Ltd, Exxon Coal Australia Ltd, Novacoal Australia Pty Ltd, Saxonvale Coal Pty Ltd, Wambo Mining Corp. Pty Ltd and Pacific Power.

For further information contact Greg Summerhayes, Principal Environmentalist, Singleton on (065) 72 1899, Fax (065) 72 1201; John Dore, Director, Agriculture & Environment Consulting, Wagga Wagga, on (069) 21 8168, Fax (069) 21 7495; or Warren Brock, Research Co-ordinator, AMIRA, on (03) 654 8844, Fax (03) 654 8661.

JOINT COAL/MINERALS ENVIRONMENTAL WORKSHOP 1993

A joint coal/minerals workshop was held at Pokolbin in the Hunter Valley on 24-25 May 1993. The theme of the workshop was **Environmental Management - Who Owns It?**

The Department of Mineral Resources has the responsibility for overseeing the environmental management of all mines operating under Mining Act Titles. Both the Coalfields Inspectorate and the Mines Inspectorate maintain close contact with mines in their respective spheres of interest, but the differing culture and history of both metalliferous and coal mines has, in the past, tended to minimise contact between the two halves of the industry.

Notwithstanding this history of separation, the Department of Mineral Resources considers that the environmental field offers an opportunity to promote interaction between coal and minerals. While the constraints imposed by the differing products restrict the area of common ground in mining and beneficiation, the environmental and rehabilitation problems appear to be similar. There is no reason why the lessons learned by one sector of the industry cannot be assimilated and used by other sectors.

Approximately 140 delegates attended the workshop, representing environmental management, line management, government agencies and consultants. They heard papers presented on a wide range of topics dealing with the ownership of environmental problems and their solutions, including

* case studies from coal, metalliferous and mineral sands mines,
* tax implications of rehabilitation expenditure and
* lessons to be learnt from Queensland's recent experience with environmental legislation.

There was a fruitful exchange of ideas, and participants learnt from the experiences of others. A similar workshop is planned for 1994, but will be expanded to include representation from other Government Departments. The theme will be 'Mining and Community Compatibility', dealing primarily with mining in sensitive environments.

For further information contact Greg Summerhayes, Principal Environmentalist, Singleton on (065) 72 1899, Fax (065) 72 1201, or Ken Hollands, Deputy Chief Inspector of Mines, on (02) 901 8471, Fax (02) 901 8468.

1993 AWARD FOR ENVIRONMENTAL EXCELLENCE UPDATE

The State Minerals Advisory Council is pleased with the number and quality of entries in this fourth year of the **Award for Environmental Excellence in the New South Wales Minerals Industry**. When entries closed on 30 July 1993, seven nominations had been received: four from coal mines, one from a coal loader and two from quarrying companies. Interestingly, two of the coal entries were for rehabilitation of old mines which had been developed long before today's rigourous standards of environmental management. The Council was disappointed by the lack of interest from the non-coal minerals industry this year.

The Technical Assessment Panel has begun its job of reporting and visiting, prior to consideration by the Final Judging Panel, chaired by Sir Rupert Myers. The Award presentation will take place on 22 November at The Earth Exchange, Sydney. The **Enviromine** (AusIMM) **Schools Competition** prizes will be also be presented.

Inquiries should be directed to Sally Crossing, Executive Officer, State Minerals Advisory Council, phone (02) 901 8886.

SEPP 34 — MAJOR EMPLOYMENT-GENERATING INDUSTRIAL DEVELOPMENT

State Environmental Planning Policy (SEPP) 34 has recently commenced in New South Wales. The new SEPP will bring greater certainty and efficiency to the development approval process, an essential element in attracting major industrial development to New South Wales.

SEPP 34 — Major Employment Generating Industrial Development commenced on 27 April 1993 and establishes the Minister for Planning (rather than the local council) as the consent authority for major developments specified within the Policy.

The Policy aims to ensure that the broad environmental, social and economic issues of a development proposal which go beyond local importance are taken into account. The Policy also aims to ensure a consistent approach to determining employment-generating industrial developments that are important to New South Wales.

SEPP 34 applies to specified types of industrial developments, including mining and the processing of metals, minerals or extractive materials, if the development will result in at least 100 post-construction full-time jobs or will have a capital investment value of at least $20 million (excluding land). The SEPP does not apply to quarrying, obtaining extractive material or extractive material crushing. Coal mining (where new projects are 'called in' for determination by the Minister for Planning under Section 101 of the Environmental Planning and Assessment Act), offshore mining or extraction, and exploration do not require development consent from the local council and so are not subject to the SEPP.

The Department of Mineral Resources, together with industry representatives, is currently negotiating to have the Policy extended to apply to extractive industries.

The SEPP requires that local councils be consulted and that their views be taken into account in the decision-making process.

The SEPP does not change the permissibility of development. If a proposed development subject to the SEPP is prohibited under existing planning controls, nothing in the SEPP makes it permissible. The SEPP does not change any requirement for the preparation and public exhibition of an Environmental Impact Statement. Third party appeal rights are also retained.

The Department of Planning has produced a **Guide to SEPP 34** which is available from its regional offices and from the Information Branch, GPO Box 3927, Sydney 2000. Inquiries regarding the provisions of the Policy should be directed to David Mutton, Manager, Executive Unit, Department of Planning, on (02) 391 2213, Fax (02) 391 2338.

URBAN BENEFITS OF MINING

The power of modern desktop Geographic Information Systems (GIS) has recently been used to study the flow of expenditure by mining companies on goods and services.

The minerals industry in Australia has long bemoaned its widespread lack of appreciation and understanding by the 85% of Australians who inhabit our cities and large towns. Nationally the industry's output is valued at almost $30 billion annually. Together with the petroleum sector it spends annually about $12 billion (80% in Australia) on the goods and services needed to achieve this output. In New South Wales, annual output of fuel minerals is worth about $3 billion and that of metallic minerals, industrial minerals and construction materials about $1 billion.

Yet relatively little is known formally about where the minerals industry in New South Wales sources its goods and services or about the distribution of its expenditure on these critical inputs. It is believed that a considerable proportion of the expenditure finds its way into the Sydney region, supporting many urban businesses and jobs, but until now little has been done to measure these flows or to determine just how many secondary jobs might rely in the 1990s on a healthy minerals sector.

Starting with a pilot study involving eight to ten operations across a range of commodities and locations, Resource Futures Pty Ltd is mapping the destination of payments to industry suppliers using data from creditor ledgers provided by mining companies. The first project mapped, which was located in the west of the State, showed that over 60% of its expenditure was into the wider Sydney region.

Use of a GIS to analyse these flows will provide a clearer picture, in the form of colour-coded maps, showing by postcode, local government area or electorate, the intensity of supplier receipts in those areas. Higher level analysis of the underlying information could lead to a better understanding of the secondary economic and social benefits in urban Australia resulting from largely rural and remote mining operations. With agriculture in the doldrums, the study should also show the valuable role of mining in supporting many rural communities through difficult times.

A handful of mining companies has assisted by providing relevant information about their purchase of goods and services and payments to governments. Also being mapped is the destination of salary and wage payments which show the impact of direct employment.

The study will take in over 80 larger operations in the State and several remote operations in other States. It is hoped that it will lead to a more comprehensive analysis of the broader benefits of the industry to urban New South Wales.

For further information contact Dennis O'Neill, Principal Consultant, Resource Futures Pty Ltd on (02) 380 5752, Fax (02) 380 5684.

NATURAL RESOURCES AUDIT COUNCIL

The Premier of New South Wales, the Hon. John Fahey, M.P., has announced the formation of a new **Natural Resources Audit Council** (NRAC) to conduct an audit of New South Wales publicly owned land and natural resources.

The Council will prepare regional reports concerning natural resources. These reports, which will be released to the public, will be an information base for the Government to make decisions concerning natural resource use and allocation, establishment of conservation reserves, and other uses of public lands.

The reports are expected to cover mineral and quarry resources as well as forestry and fishery resources and the conservation values of a region.

The Council will have an independent chair to be appointed by the Premier.

NRAC will include seven members representing government resource management and conservation agencies. These government members will include the Director-General of the Department of Mineral Resources.

Other government agencies represented by their chief executive officers will be the National Parks and Wildlife Service, the Environment Protection Authority, the Department of Conservation and Land Management, the Forestry Commission, the Department of Planning and New South Wales Fisheries.

NRAC will also include four independent representatives with specialist skills in disciplines associated with resource management or conservation.

Five million dollars will be provided by the Government for use by the Council in 1993-94. These funds are to be used to accelerate the collection of natural resource information, to fill the current gaps in the collection process, and to compile an information base.

Premier Fahey said that the Council is part of a package of New South Wales government initiatives designed to help balance concerns over sustainable development and the environment.

"Before the Government can make balanced decisions about land use and conservation it must have the facts."

"Both industry and environmental groups want a credible and reliable database on natural resources, including information on both economic and environmental values."

For further information contact Howard Reed, of the Environment and Land Use Branch, Policy Division, on (02) 901 8830, Fax (02) 901 8405.

'NEW SOUTH WALES — THE STATE OF EXPLORATION' CONFERENCE

New South Wales is one of the few Australian states in which the level of exploration has increased in recent years. To encourage the continuation of this positive trend, the Department of Mineral Resources will host a 1-day conference to be held on **Thursday 18 November 1993** at the Sheraton-Wentworth Hotel, Sydney, to present the latest information on why New South Wales is such an attractive state in which to explore.

'New South Wales — The State of Exploration' will be sponsored by the Australian Journal of Mining, and will feature informative presentations by senior geoscientists and government and industry specialists.

The program will include:

* Geological and geophysical initiatives supporting mineral exploration in New South Wales.
* New geophysical images for New South Wales.
* Tectonic controls on mineralisation in New South Wales.
* New South Wales geoscience information systems.
* Legislative and administrative initiatives to encourage exploration in New South Wales.
* New South Wales Mineral Resources Audit results.
* National Geoscience Mapping Accord.
* Presentations by leading mineral exploration companies.

The **Keynote Address** will be made by the Director-General of the Department of Mineral Resources, Dr Garry Lowder, on "The Search for porphyry copper–gold deposits in New South Wales".

An **exhibition** featuring some of the latest geoscientific data products for New South Wales will be held adjacent to the conference venue.

It is anticipated that the conference will be of great interest to a wide sector of the minerals industry, including mineral exploration companies, consultant geoscientists, geoscientific service companies, exploration/mining investment analysts and advisers, and geoscientific research groups.

The registration fee for the conference is **A$195**, which includes conference information package, lunch, morning and afternoon tea and closing session refreshments. For program and registration details, please see accompanying brochure or contact David Barnard, Development Officer, on (02) 901 8463, Fax: (02) 901 8468.

MINERALS INVESTMENT OPPORTUNITIES CONFERENCE

The Department of Mineral Resources will convene the **'Second Minerals Investment Opportunities Conference — New South Wales, Australia'**, a 1-day international conference to be held at the Sheraton-Wentworth Hotel, Sydney, on **Thursday 19 May 1994.**

The conference is scheduled to be opened by the **Premier of New South Wales**, the Hon. John Fahey M.P. and will include a luncheon address by the Hon. Ian Causley M.P., **Minister for Mines**. Authoritative presentations by government and industry specialists will include:

* New South Wales initiatives to facilitate economic development.
* Mining and minerals processing in New South Wales: a competitive analysis.
* International benchmarking of electrical utilities.
* Electro-metallurgical minerals processing opportunities.
* Presentations by high-level industry speakers on a range of specific investment opportunities, including
  - adding value to coal,
  - gold and base metal mining and processing,
  - mineral residue processing,
  - natural zeolites development and
  - gemstone exploration and mining.

The registration fee for the conference is **A$245**, which will include luncheon, morning and afternoon teas, and a conference information package containing summaries of presentations. **Japanese and Chinese translations** of summaries will also be available upon request.

The conference, hosted by the Department of Mineral Resources and sponsored by Pacific Power and 'The Miner', will be of considerable relevance to local and overseas mining companies and institutional investors. An **exhibition** featuring governmental and industry displays will be held adjacent to the conference venue.

The inaugural 1-day international Minerals Investment Opportunities Conference, held in November 1992 (see Feature in *Minfo* **39**) attracted over 200 registrants from Australia and overseas.

The first conference aimed to stimulate investment interest in a wide range of mineral development opportunities in New South Wales, including exploration, mining and value-added minerals processing activities. It focused attention on a range of mineral development projects underway in the State, many of which have subsequently announced commitments to proceed or have attracted the investment commitment necessary for further project development.

The promotion of investment interest in the New South Wales minerals sector will again be the theme of this second conference.

For program and registration details, please contact David Barnard, Development Officer, phone (02) 901 8463, Fax (02) 901 8468.

INTERNATIONAL MINERALS PROCESSING CONFERENCE AND EXHIBITION

The **'XVIII International Minerals Processing Conference'** and associated Exhibition were held at the Sydney Convention and Exhibition Centre, Darling Harbour, Sydney, on 24-28 May 1993.

The Conference, hosted by the Australasian Institute of Mining and Metallurgy, was held in Australia for the first time. The conference provided a forum for discussing the technical, economic and social challenges facing minerals processing in the 1990s and beyond and was attended by over 600 delegates from 32 countries. Five parallel sessions were held during the Conference, together with a number of Plenary Sessions at which major issues were addressed by international authorities. In all, 220 technical papers were presented on all aspects of minerals processing technology and development.

A special Education Day was held on Wednesday 26 May attended by appproximately 1000 school students and 300 teachers. Many mining companies provided information, lectures and project material on current and relevant curriculum topics for students, prepared in collaboration with the New South Wales Department of School Education. Students were able to visit the Exhibition, talk to mining industry professionals and consider a range of careers in science, technology and environmental management.

The next International Minerals Processing Conference will be held in San Francisco, United States, in October 1995.

The **'1993 International Minerals Processing Exhibition'**, held in conjunction with the Conference, was the largest exhibition of its type ever staged in Australia and attracted 156 exhibitors from Australia and overseas. The 5-day Exhibition demonstrated and previewed the latest equipment, technology, products and services available to the world's minerals processing industry.

The Department's exhibition — **"Minerals Investment Opportunities in New South Wales, Australia'** — featured 14 attractive backlit panels indicating some of the many exploration, mining and value-added minerals processing opportunities in the State, including gold, base metals, heavy mineral sands, titanium dioxide, titanium metal, magnesium metal, silicon metal, refractory and fused materials, mullite, advanced ceramics, dimension stone, gemstones and other industrial minerals such as vermiculite, bentonite, limestone and natural zeolites.

The Department's display was augmented by three enclosed free-standing "specimen cases" featuring examples of mined ore (copper ore from Cobar and zinc - lead ore from Broken Hill — courtesy of The Earth Exchange), processed mineral (a variety of New South Wales granite tiles — courtesy of Stonetile Pty Ltd), and elaborately processed, high value-added, mineral products (a variety of advanced alumina ceramics — courtesy of Taylor Ceramic Engineering).

The Department's display and information products such as the brochure *Minerals Investment Opportunities in New South Wales*, the *Register of Minerals Development Opportunities*, and *Minfo* created much interest amongst the 7500 Australian and overseas trade visitors.

For further enquiries contact Garth Holmes, Principal Adviser, Minerals, on (02) 901 8480, Fax (02) 901 8468.

'NEW SOUTH WALES PETROLEUM SYMPOSIUM'

The New South Wales Branch of the Petroleum Exploration Society of Australia (PESA) held the first **'New South Wales Petroleum Symposium'** at Darling Harbour on the 26 June 1993. The symposium was well attended, with over 100 registrants. A volume of proceedings containing 11 full papers was produced.

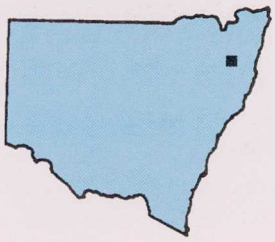
A number of themes were developed as the conference progressed:

* There is still an unwarranted view that New South Wales has no petroleum resources.
* New South Wales is still largely unexplored for petroleum.
* New South Wales has the largest gas market in Australia.
* New South Wales will have a developing gas-supply problem from 1998 to 2006 when the current gas supply contracts in the Cooper Basin expire.
* The development of coal seam methane offers New South Wales its best prospect for secure long-term cost-effective gas supplies.
* The Darling Basin still has sub-basin components which have either no seismic coverage or no test and/or stratigraphic wells.
* The present gas pipeline passes through the Darling Basin.
* New South Wales now has improved legislation in which explorers are granted greater security of tenure in which to explore.

This inaugural conference was well attended with well-received thought-provoking papers. In fact, the Department's forthcoming Darling Basin Project had its genesis at this conference. The resulting volume of papers and extended abstracts will be a reference for any person becoming involved with the potential development of New South Wales energy markets.

Enquiries should be directed to Brett Edwards, Secretary PESA, on (02) 364 4855.

DEPARTMENTAL REGIONALISATION — ARMIDALE OFFICE



The Department of Mineral Resources has expanded its Armidale Regional Office to provide a comprehensive range of the Department's services to clients in the New England and North Coast regions.

The Armidale Office provides Departmental services and expertise in:

* geology and mineral resources,
* titles administration,
* mine safety and
* mine engineering and environmental management.

The Armidale Office serves an area extending from Port Stephens on the coast to the Queensland border, west to Moree, Narrabri and Gunnedah and south to Tamworth. The New England region contains many small and medium-sized mining and quarry operations, and is an important target for exploration companies.

GEOLOGY AND MINERAL RESOURCES

Geologists and technical support staff have expertise in most facets of New England geology and mineral resources. The geologists are presently completing metallogenic maps and notes for the New England region and have prepared a comprehensive bibliography on the region's geology and mineral deposits together with up-to-date geological and mineral deposits maps at various scales. This information is available from the Armidale Office, in digital output from the computerised Mineral Resources Land Information System (MRLIS) as well as in hard copy form. The geological staff are able to give advice on all aspects of mineral exploration and land use.

TITLES ADVICE AND ADMINISTRATION

The Mining Registrar provides advice on mining and exploration titles to miners, landholders and the public.

Exploration Licence and Mineral Claim applications are processed locally for the Armidale Mining Division. Applications for Exploration Licences, Assessment Leases and Mining Leases may be lodged for any area in New South Wales. Mineral Claim Applications for the Armidale and Inverell Mining Division may also be lodged at the Armidale Office. The office is fully linked with the Department's computerised Titles Administration System (TAS).

MINE SAFETY ENGINEERING AND ENVIRONMENT

Mining engineers, an environmentalist and regional mining officers advise clients on engineering, safety, environmental management and administration issues during the planning, operation and rehabilitation of mining operations.

The Armidale Office is located in ABS Finance House in Faulkner Street

The Office is located on Level 2, ABS Finance House, 97-101 Faulkner St, Armidale. Written enquiries should be sent to the Department of Mineral Resources, PO Box 65, Armidale 2350.

Enquiries can be directed to:

* Bruce Kremmer, Regional Co-ordinator/Senior Inspector of Mines.
* Jim Stroud, Senior Geologist.
* Greg Unwin, Environmentalist.
* Andrew Hunt, Mining Registrar.

Phone: (067) 70 2100.
Fax: (067) 70 2121.

REGISTER OF MINERALS DEVELOPMENT OPPORTUNITIES

The Department of Mineral Resources maintains a **Register of Minerals Development Opportunities** to assist minerals investors in New South Wales.

The Register gives details of exploration, mining and minerals processing projects in New South Wales in which companies are seeking investment and/or joint venture participation. Copies of the Register are distributed in Australia and internationally and are available free of charge on application to the Department.

There are currently 27 listed ventures, covering a diverse range of exploration, mining and value-added minerals processing projects. Mining/exploration projects include base metals and gold, mineral sands, opals, vermiculite, zeolites and bentonite.

Value-added minerals processing projects include synthetic rutile, high-technology rare earth magnets, fused minerals and refractories, base metals and dimension stone.

The latest edition of the Register includes, for the first time information on coal and petroleum opportunities.

Companies and project proponents who would like to register specific minerals-based opportunities, or any companies interested in obtaining data and contact details on investment opportunities should phone Dave Barnard, Development Officer, on (02) 901 8463, Fax (02) 901 8468.

PUBLICATIONS RELEASED APRIL–JUNE 1993

1:250 000 METALLOGENIC MAPS

Manilla–Narrabri 1:250 000 Metallogenic Map, by R.E. Brown, J.P. Krynen and J.W. Brownlow $30.00

Bourke 1:250 000 Metallogenic Map, by J.G. Byrnes, L.B. Gilligan and D.W. Suppel $30.00

1:100 000 GEOLOGICAL SHEET

Western Coalfield (southern part), by E.K. Yoo $20.00

QUARTERLY NOTES

No. 91 (Annual subscription post free $12.00) $3.00

Contents

The Late Devonian–Early Carboniferous succession at Slaughterhouse Creek, Gravesend, by J.W. Pickett

Mineral deposits of the Inverell 1:100 000 sheet area, by R.E. Brown and W.J. Stroud

MINFO

No. 39 Gratis

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Mail orders to Information Counter, Department of Mineral Resources, PO Box 536 St Leonards NSW 2065	Fax order through, marked Attention: Information Counter, Department of Mineral Resources.	Only credit card orders will be accepted by phone.

IMPORTANT: Please give contact person and phone number for all orders, and for companies, please also give an order number.

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Fax:(068) 29 0825)

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