



## Kalgoorlie–Boulder: new faces, new office, and new directions



*New Regional Office, Kalgoorlie–Boulder*

The Geological Survey has embarked on a major expansion in the City of Kalgoorlie–Boulder in order to further support the exploration and mining industry in Western Australia and promote W.A.'s prospectivity. This has involved the establishment of a new regional office and the recruitment of a large number of new faces. The Kalgoorlie regional office has grown from only one geologist, Dr Shefa Chen, several months ago to seven geologists and one geoscience information/GIS officer. The new faces that bring a wealth of experience to this important regional office include Dr Ivor Roberts, Dr Bruce Groenewald, Dr Angela Riganti, John Greenfield, Matt Painter, Amanda Jones, and Marian McCabe.

Dr Roberts, the new regional manager, says that the new Kalgoorlie team is young, enthusiastic, and very eager to tackle the challenges ahead and will significantly lift the profile of the Geological Survey within this major mining and exploration city. All the new geologists either have completed or are nearing completion of their doctorates, and thus will be able to play an important professional role in Kalgoorlie–Boulder.

Associated with this increased presence is the need for modern and larger office accommodation. A significantly better new office complex has now been rented from the Western Australian School of Mines. Situated at the intersection of MacDonald and Cassidy Streets, the new office complex is adjacent to the Lord Forrest Olympic Pool, and within the precinct of the Western Australian School of Mines and the Kalgoorlie campus of Curtin University. The new office will be a 'one-stop-shop' where industry, prospectors,

other government departments, and the general public can obtain a wide range of geoscientific information and advice about Western Australia, but with a strong focus on the East Yilgarn. ►

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◀ The establishment of the new Kalgoorlie office and geological team is part of a recent government initiative to further the promotion of Western Australia as a prime place to explore. A major component of this initiative will be the construction of a drillcore library that will be integrated with the operational base, and a geoscience information centre. The new Kalgoorlie office will therefore only be temporary. When the new facility is completed, in about two years, the Kalgoorlie team will again be moving but this time to a custom-designed building.

The expansion of the Kalgoorlie office and geological team is the GSWA's response to providing

geoscientific information in a climate of rapidly changing technology. The office will continue to represent a base for field studies in the Eastern Goldfields and Southern Cross areas, but will, over the next two years, also build and maintain a new multidisciplinary regional database, containing all geological, geophysical, geochemical, and mineral resource information for the East Yilgarn. From this database it will be possible to generate a range of seamless maps and related digital products at various scales to be available on demand to industry and the general public. The information collected will not only represent work by the Survey but all regionally relevant

and validated information generated by industry, universities, and other sources.

The new Kalgoorlie team will thus be taking on a new direction and will become the *Terrane Custodians* for all geoscientific information in the East Yilgarn — an area covering 523,248 km<sup>2</sup> and 195 map sheets at 1:100 000 scale. As Marian McCabe, the new geoscience information officer has pointed out, the East Yilgarn is a huge area and only slightly smaller than the country of France! The major advantage of the Kalgoorlie–Boulder location is that the *Terrane Custodians* will be able to continuously assess the needs of industry and provide them with relevant 'on-the-spot' advice. □

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## KALGOORLIE '97: a great success

The Kalgoorlie '97 Conference, titled *Crustal evolution, metallogeny and exploration of the Yilgarn Craton — An update*, was held in the Kalgoorlie School of Mines WMC Conference Centre from 1– 4 October 1997, and was a resounding success. The conference attracted more than 320 delegates from Australia and overseas. GSWA was amongst the sponsors and Assistant Director Dr Tim Griffin chaired the Organizing Committee.

GSWA staff organized and ran two pre-conference excursions in the northern part of the Eastern

Goldfields Province and the south-central Yilgarn Craton. Both were subscribed to with enthusiasm and, unfortunately, all who wished to participate could not be catered for. However, GSWA has published excursion guides for both in the Survey's Record series (see Recent publications on back page) and these are available for sale in Perth and Kalgoorlie.

We were much encouraged by the response to the two excursions and the suggestion by participants that we should organize such events more often.

Nine conference papers were presented by GSWA staff covering subjects ranging from the tectonic evolution of the Yilgarn Craton, through geochronology, regolith geochemistry, structure and metamorphism, controls on gold mineralization, and the statistical use of regolith geochemical data to identify potential mineralization.

Extended Abstracts have been published and are available from AGSO in Record 1997/41. □

# Iron ore resources and reserves towards the year 2000

A national conference on **Ironmaking Resources and Reserves Estimation** organized by the Perth branch of the Australasian Institute of Mining and Metallurgy (AusIMM) was held at the Burswood Convention Centre from 25–26 September 1997. The Geological Survey of Western Australia presented five papers as listed below, and all papers were well received.

Western Australia has established a global reputation for reliable supply of high-quality iron ore. In 1996 Western Australia exported 133.5 Mt of iron ore worth about \$3 billion, representing 95% of the Australian total. Western Australian exports now account for about 31% of the world sea-borne trade in iron ore.

Of particular interest at the conference was the discussion on industry practice and appropriate standards in the estimation of resources and reserves. This is always a contentious issue and one where standards (the JORC reporting code) are now in place for all companies who report resource information to the Australian Stock Exchange. The JORC code is prepared jointly by the Australasian Institute of Mining and Metallurgy, the Australian Institute of Geoscientists, and the Minerals Council of Australia. Australia and New Zealand are the first countries to have their reporting standards for mineral resources and reserves set by industry bodies, and forming an integral part of the Listing Rules of the national stock exchange.

This conference, with its emphasis on iron ore resources and reserves, is one of a series of resource and reserve workshops and conferences

being held throughout Australia over 1997 and 1998. An attempt is being made not only to update the Australian JORC code but to cover all aspects of the world's best practice in the estimation of mineral resources and reserves. The next conference in this series was the seminar on **Gold and Nickel Ore Resource Estimation Practice** held in Kalgoorlie on 31 October 1997.

The end product of the series of workshops and conferences will be a comprehensive manual on the best practice in the estimation of resources and reserves to be published in the year 2000. The manual will include chapters on the key aspects of exploration data collection, resource estimation, metallurgical testing, reserve estimation, risk assessment, reporting, and bankable feasibility

studies. The manual may be adopted as a supplement to the JORC code.

The Australian JORC code is already starting to be recognized as the international standard, with at least the UK, USA, and Canada examining some form of the JORC code for their own resource and reserve reporting guidelines. The new manual will have global circulation and is a significant step towards standard international definitions for mineral resources and reserves. □

Presentations by Geological Survey staff members at the National Conference on Ironmaking Resources and Reserves Estimation were:

Pietro Guj, Geological Survey Director, gave a plenary presentation : *Trends in exploration investment — perceptions and realities.*

Andrew Sanders and Paul Morris : *Assaying and check assaying and maintenance of geochemical databases for the regional regolith geochemical mapping program.*

Tim Griffin and Ian Tyler : *Geological mapping at the Geological Survey of Western Australia — exploration, mining and the future.*

David Townsend and Don Flint : *Iron ore resources of the Hamersley Basin — where to now?*

Bob Gozzard : *Setting up a sound geological database.*

Conference proceedings are available from the AusIMM.

# New Core Libraries for Kalgoorlie and Perth

## The proposal

The urgent need for major core storage facilities in Western Australia was identified through geoscience forums including the Geological Survey Liaison Committee, Chamber of Mines and Energy, Association of Mining and Exploration Companies (AMEC), and the Australian Petroleum Production and Exploration Association (APPEA).

As drilling is often the most expensive aspect of exploration, and since drillcore libraries provide an invaluable archival and reference facility for mineral and petroleum explorers, such collections may prevent re-drilling of previously explored areas, with potential savings of hundreds of thousands or even millions of dollars. In addition to assisting in the formulation of new exploration models, and the re-assessment of deposits previously considered sub-economic, it has also been recognized that facilities of this type have directly contributed to new mineral and petroleum discoveries.

## The plan

Early this year the State Government accepted a Department of Minerals and Energy proposal to construct an integrated system of drillcore storage facilities to support the exploration and mining industry in Western Australia, at a cost of \$9 million over four years. These core libraries would receive and store representative drillcore, cuttings, and other samples from the minerals industry, as well as all samples from petroleum wells.

Facilities are planned for Kalgoorlie and the main repository at DME's Carlisle operations site in Perth. There is also provision for facilities in selected country centres

subject to future demand.

Construction of the Kalgoorlie core library should commence late in 1997/98. This facility is to be integrated with the operational base of the Geological Survey's Kalgoorlie Regional Office and will have a total floor area in excess of 1500 m<sup>2</sup>. Construction of the larger Perth core storage facility will commence early in 1998/99 and will cover an area of about 3500 m<sup>2</sup>. It is expected that this first phase of construction will be capable of handling about 5% of core drilled per year, for 15–20 years. This represents about 35 km of core per year at current drilling rates. Policies have been developed to ensure that the appropriate 5% is selected for retention.

At the conclusion of mineral exploration projects, companies would liaise with the Department to determine the archival value of acquired core. The Department will have the option to choose representative core from a particular exploration area. Companies may opt to retain core sets during the life of the project but will have a duty of care to ensure collections are maintained in good condition. However, the core

must be offered to the Department prior to, or at the end of projects. Companies would deliver core to the Department packed in a standardized manner according to a set of industry guidelines that will be made available well before the new facilities are complete.

## A day in the life of a core library

A typical day in the life of a core library starts with the delivery of a truckload of core that has been selected from a company's recent drilling program on a newly discovered mineralized area. Once unloaded, pallets of core are moved to inspection tables, complete with rollers, so that the core trays can be spread out for verification, barcoding, and recording in DME's database. When this has been completed, the pallets are repacked and moved to a pre-arranged point in the library. Here a special electric stacking machine lifts the pallet to its allocated storage space, which may be up to 7 pallet tiers (about 10 metres) above floor level. Once in place the position of the pallet is confirmed through the bar code tracking system.

Selected core and rock specimens from current tenements are held in



*Current core storage in the Pilbara highlights the urgent need for better facilities.*

confidence by the Department and may only be viewed by DME staff and corporate owners, until such time as the material becomes eligible for public release as determined by the relevant Mining and Petroleum Acts.

During the day customers arrive to view core or other specimens by previous arrangement with the curatorial staff. Pallets of requested material have been located through the database and barcoding systems, and lifted from the shelving by the high-lift stacking machine. The cores may have been split lengthways by a rock saw as required and then spread out in core trays for customer inspection. Clients will have the choice of seeing core either in natural light or indoors under bright artificial light. Owners of confidential material may examine their core in private viewing areas. When viewing is complete all the material is repacked and returned to its correct place in the pallet racking system.



Rows of core tray pallets stacked 6 tiers high (South Australian Core Library)

Meanwhile, staff are busy on other duties, such as the ongoing maintenance of the collection, particularly in relation to older

samples which may be in need of repackaging, barcoding, and re-cataloguing to current standards. They attend to customer requests to view other core sets, or supply core-splits or ditch-cuttings for offsite analytical work. They may also reshelve core within the library or move material to other sites. Naturally, with all these activities it is vital to continuously update the database so that the status and location of all stored material is kept up-to-date.

In summary, these new core storage facilities will provide companies with an invaluable source of exploration data, which would otherwise be extremely costly to replace. □

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## Empress 1A – GSWA's deepest well

The Petroleum Initiatives team has recently returned from the Great Victoria Desert with the deepest core ever drilled by the Geological Survey of Western Australia. The Empress 1A drillhole, located between Laverton and Warburton along the Great Central Road, near the western margin of the Yowalga Sub-basin of the Officer Basin, was continually cored to a depth of 1625 m. The Officer Basin in Western Australia extends from the Little Sandy Desert just east of Newman to the Nullarbor Plain where the Trans-Australian Railway crosses into South Australia.

The objective was to drill a complete sequence of Neoproterozoic rocks in the Officer Basin and, with budget considerations in mind, try to achieve this in under 2000 m. The

core had to be located in a more marginal location than any other petroleum test in the basin to investigate the theory that marginal facies would provide the optimum growth position for cyanobacteria and organic material in the basin. The Yowalga Sub-basin was chosen because it had the best results to date on Total Organic Carbon tests in shales from petroleum exploration wells.

Outcrops are rare in the Officer Basin with less than 10% exposure of Neoproterozoic rocks. The focus was on the Browne Formation, which contains significant evaporite, salt, dolomite, and lesser amounts of detrital sediments. Optimum conditions for the growth and entrapment of cyanobacterial detritus in the sedimentary column occur in such formations in

lagoonal or shallow marine environments below wave base. The Browne Formation is overlain by coarsening-upward cycles of clastic and carbonate sequences of the Hussar and Kanpa Formations. These may provide (subject to lab analysis) reservoir rocks with high porosity and permeability.

A potential contribution to the geology of the state is afforded by the interlamination of stromatolitic dolomite and diamictites at this level. Stromatolites are carbonate-binding forms of cyanobacteria, and two distinct (*Acaciella australica* and *Biacallia burra*) assemblages occurred in the Officer Basin, separated by a significant time span, within the Neoproterozoic. The positive identification of the stromatolite sequence may provide a clue to the ►



## FIELDNOTES

age of some glacial deposits (tillites), settling the debate as to whether they are Marinoan or Sturtian in age.

The tillites grade upward into aeolian to fluvial sandstones currently considered as part of the informally proposed McFadden (previously misnamed Babbagoola) Formation, which is unconformably overlain by the Table Hill Volcanics in Empress 1A. The Table Hill Volcanics are unconformably overlain by a coarse conglomerate that grades upward into Cambrian–Carboniferous Lennis Formation sandstones that are so friable they

have disaggregated in the core trays. The Lennis Formation is unconformably overlain by sediments of the Permian Paterson Formation.

Fresh water was recovered from a bore drilled adjacent to Empress 1A by the GSWA to supply drilling water to the rig. Additional water wells drilled in preparation for Empress 1A indicate abundant fresh groundwater resources in this desert region of Western Australia.

Although Empress 1A does not include a thick sequence of source rocks, GSWA's mapping of organic

facies will be enhanced by the knowledge gained, and we hope to return. Parts of the core have already been looked at by several mining companies and the GSWA will be analysing it in detail. GSWA would like to thank the people of the Warburton community for their cooperation in making Empress 1A a success. □

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## New Mapping Product

### First Edition Plots from 1:250 000 scale mapping now available at 1:100 000

In response to demands from the mineral exploration industry, who are the prime users of our geological maps, the Geological Survey has started to release a new map product called the **FIRST EDITION PLOT** for some 1:100 000 map sheet areas. The first sheets released in this form are **BOYCE (3238)** and **BANJAWARN (3242)** from the **EDJUDINA** and **DUKETON 1:250 000** sheets respectively, in the Eastern Goldfields.

The **FIRST EDITION PLOTS** are seen as a cheaper way of releasing information to industry and the public, taking advantage of recent advances in technology that now allow us to produce complex maps using in-house plotters.

GSWA remains committed to traditional offset lithographic printing of its core map products, as this still provides the best quality. However, in areas of minimal outcrop where 1:100 000 style mapping is limited to a small area, and where only reconnaissance mapping has been carried out for the 1:250 000 sheet revision, lithographic printing of a standard 1:100 000 map sheet is not justified. Many clients have asked that the small areas of detailed mapping be made available at 1:100 000 scale so that they can relate this information to adjacent sheets that have been printed already. In view of this and the recent capacity to mimic closely the colours and screens of the adjacent maps using a plotter, GSWA has introduced the new plotted product.

To ensure that this product is not confused with the standard 1:100 000 scale geological map the background colour to the sheet has a distinct negative pattern based on the diagonal printing of **FIRST EDITION PLOT**.

It is important to note that separate explanatory maps will not be published for these maps but the description of the geology will be included in the explanatory notes for the revised 1:250 000 sheet.

We expect to be releasing **FIRST EDITION PLOTS** for:

**COSMO NEWBERY (3442)** from the **DUKETON 1:250 000** sheet, and

**DEPOT SPRINGS (2942)** from the **SIR SAMUEL 1:250 000** sheet, in the next 3 months.

First Edition Plots will sell at a price of \$10.

As for all our current maps the **FIRST EDITION PLOT** maps will be also available in digital form. □

*The Geological Survey of Western Australia invites feedback from users of these products by contacting:*

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## Bush Telegraph

**This field season has seen four new GSWA teams in action.**

Franco Pirajno's **Earaheedy Basin** team recently completed their first field season with a full complement of four geologists. A highlight of their season was the opportunity to study some recent drillcore containing unusual lithologies and exceptionally well-preserved textures in an area of poor exposure. Fieldwork has been completed on the NABBERU, METHWIN, and FAIRBAIRN 1:100 000 sheets and this season has allowed them the opportunity to investigate the Teague Ring Structure. Franco and Mike Freeman, who was on holiday from the DME Land Access Unit, have identified shatter cones on the METHWIN sheet, which appear to substantiate the interpretation of the Teague Ring Structure as an impact structure.

The **Southern Cross** team of four geologists, led by Stephen Wyche, has found that things change as you move west from the Eastern Goldfields. They have found a little more topographic relief with good exposure of rock, but have also found themselves resorting to long trousers to get a little relief from the dense and tough vegetation. Despite these obstacles, field mapping on the JOHNSTON RANGE and JACKSON 1:100 000 sheets is progressing well.

In the **Gascoyne**, Ian Tyler and his team have been pleased with a successful sampling program for geochronological work to be carried out by David Nelson. During the season they have completed field mapping on the ROBINSON RANGE 1:250 000 sheet and commenced work on the GLENBURGH sheet. Professor Cees Passchier (Mainz University, Germany), who is an international authority on shear zones, joined the team in mapping the Errabiddy Shear Zone.

In the **Bangemall Basin**, field mapping at 1:100 000 scale is well underway on the ULLAWARRA and ELLIOTT 1:100 000 sheets, working towards a new edition of the EDMUND 1:250 000 sheet. Detailed stratigraphic, sedimentological, and geochemical studies on Bangemall Group rocks have started. Alan Thorne and his team have also compiled 1:500 000 scale solid geology and regolith maps of the Bangemall Basin to support the Bangemall Basin Prospectivity Enhancement study being carried out by another team led by Richard Langford. □

## Did you know ...?

**There's been some moving and shaking at DME**

On 26 September 1997 *Mr Lee Ranford's* appointment as the new Director General of the Department of Minerals and Energy was announced by the Minister of Mines. The appointment followed the resignation of Mr Ken Perry six months earlier. Mr Ranford responded to his appointment by saying "...I am delighted and honoured to have been chosen to lead what I regard as the best and most important Department in this State".

On 30 October Mr Ranford announced that organizational changes at the Department of Minerals and Energy would result in *Dr Pietro Guj*, Director of the Geological Survey since 1992, moving to the position of Executive Director (Corporate Policy, Planning and Finance) in the newly constituted DME Corporate Executive. Dr Guj has joined Mr Ranford



(Apologies to Goscinny and Uderzo)

and *Dr Colin Branch* (Executive Director Corporate Resources and Land Access) as the ruling triumvirate at DME. These changes take effect on 3 November 1997.

*Dr David Blight* will move from his Deputy Director's chair to act in the position of Director of the Geological Survey until a permanent appointment is made. □



## SOME RECENT PUBLICATIONS

### Permian stratigraphy and palynology of the Carnarvon Basin, Western Australia

**REPORT 51** by A. J. Mory and J. Backhouse

Includes stratigraphy/palaeontology map ..... \$40.00

### Program 2 — Industry support : Geological Survey Plan for 1997–98 and subsequent three years

**RECORD 1997/1** ..... \$20.00

### Compilation of SHRIMP U–Pb zircon geochronology data, 1996

**RECORD 1997/2** by D. R. Nelson ..... \$25.00

### Stratigraphic revision of Palaeoproterozoic rocks of the Yerrida, Bryah and Padbury Basins (former Glengarry Basin)

**RECORD 1997/3** by S. A. Occhipinti, K. Grey, F. Pirajno, N. G. Adamides, L. Bagas, P. Dawes, and G. Le Blanc Smith ..... \$20.00

### Industrial minerals in Western Australia — The situation in 1997

**RECORD 1997/5** by J. M. Fetherston, P. B. Abeysinghe, and W. A. Preston ..... \$25.00

### Archaean geology and mineralization of the northern part of the Eastern Goldfields Province, Yilgarn Craton, Western Australia — a field guide: Kalgoorlie '97

**RECORD 1997/7** compiled by S. Wyche ..... \$20.00

### Geology and mineralization of the south central Yilgarn Craton, Western Australia — a field guide: Kalgoorlie '97

**RECORD 1997/8** compiled by W. K. Witt ..... \$20.00

### EXPLANATORY NOTES

#### Geology of the Mount Remarkable 1:100 000 sheet

by S. Sheppard, I. M. Tyler, and D. M. Hoatson

map and explanatory notes ..... \$20.00

#### Geology of the Ravensthorpe – Cocanarup 1:100 000 sheets

by W. Witt

map and explanatory notes ..... \$30.00

#### MOUNT BRUCE 1:250 000 sheet

by A. M. Thorne and I. M. Tyler

map and explanatory notes ..... \$15.00

#### ROY HILL 1:250 000 sheet

by A. M. Thorne and I. M. Tyler,

map and explanatory notes ..... \$15.00

### 1:250 000 GEOLOGICAL SERIES MAPS

BYRO (SG 5010) by J. S. Myers

map only ..... \$10.00

### 1:100 000 GEOLOGICAL SERIES MAPS

Savory Basin:

GUNANYA (3451) by L. Bagas

map only ..... \$10.00

Eastern Goldfields:

MILLROSE (3045) by T. R. Farrell and S. Wyche

map only ..... \$10.00

BANJAWARN (3242) — 1st edition plot by T. R. Farrell

map only ..... \$10.00

BOYCE (3238) — 1st edition plot by S. F. Chen

map only ..... \$10.00

### GEOPHYSICAL MAPS

East Pilbara Total Magnetic Intensity images, 1:100 000 scale

price per image ..... \$300.00

EASTERN CREEK (3054); MUCCAN (2956);

NULLAGINE (2954); MOUNT EDGAR (2955)

Onshore Southern Carnarvon and Northern Perth Basin

Bouguer Gravity and 1st Vertical Derivative Images 1:500 000

price per image ..... \$100.00

Onshore Central Southern Carnarvon Basin

Bouguer Gravity and 1st Vertical Derivative Images 1:500 000

price per image ..... \$100.00

Giralia Bouguer Gravity and 1st Vertical Derivative Images 1:250 000

price per image ..... \$100.00

### MISCELLANEOUS PUBLICATIONS

**Schedule of petroleum exploration wells — Canning, Officer, Bremer, and Eucla Basins** by J. Haworth

hardcopy and digital data ..... \$100.00

### GSWA Catalogue of Pre-1980 Geological Publications

Book and digital version

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### GSWA Catalogue of Geological Maps, 1997 (revised)

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