

PROSPECT

On the horizon

Big future for Mid West Karara iron ore



New Year heralds new beginnings

As 2009 draws to a close, the New Year brings renewed optimism for Western Australia's resources industry.

After beginning 2009 in the midst of the global economic downturn, Western Australia is now looking to enter the next decade firmly in the positive.

We are on the cusp of a period of significant economic activity and growth in Western Australia and the State Government is well prepared to ensure that opportunities are created and developed for the resources industry in this State.

Our percentage of national mineral and petroleum exploration spending has increased, with petroleum exploration in Western Australia and adjacent Commonwealth waters worth a record A\$817.4million for the 2009 June quarter. For 2008-09, the figure totalled A\$2.9 billion with 77 per cent of Australian petroleum expenditure in Western Australia.

The Western Australian proportion of Australian mineral and petroleum exploration expenditure was 70 per cent for 2008-09.

The figures are encouraging and confirm WA's position as the centre of the Australian mineral and petroleum sector.

The past year also saw the State Government begin a major overhaul of the approvals process with the establishment of two new departments – State Development and Mines and Petroleum – and a Ministerial Taskforce on Approvals, Development and Sustainability, with the aim of streamlining the approvals system.

Further reform initiatives followed throughout the year, culminating in the introduction of the Lead Agency Framework in October.

These strategic developments are significant steps forward in revolutionising the approvals system in WA to ensure improved, efficient and transparent service delivery.

The new system welcomes investment in WA and will see the State Government working closely with industry to stimulate economic development in WA and ensure that investment provides long-term benefits for all Western Australians.

Colin Barnett
PREMIER OF WESTERN AUSTRALIA & MINISTER FOR STATE DEVELOPMENT

Norman Moore
MINISTER FOR MINES AND PETROLEUM

Prospect

Western Australian Prospect magazine is published quarterly by the Western Australian Government's Department of Mines and Petroleum (DMP) and Department of State Development (DSD).

Editorial management: Rebecca Atkinson, DSD Communications and Marketing Division.
Tel: (08) 9222 0417 • Fax: (08) 9222 0505

Disclaimer

Prospect has been compiled in good faith by the Department of Mines and Petroleum (DMP) and Department of State Development (DSD). Opinions expressed in Prospect are those of the authors and do not necessarily represent the views, or have the endorsement of DMP and DSD. DMP and DSD has used all reasonable endeavours to ensure the material contained in this publication is correct, but it is intended to be general in nature. No representation is made with regard to the completeness or accuracy of the information contained herein. DMP and DSD disclaims any or all liability for loss or damage whatsoever suffered or incurred resulting from the use of or reliance on information contained herein. Readers of this publication should make and rely on their own enquiries, research and judgements in making decisions affecting their own or any other persons interest.

Cover photo: Pioneering earthworks for the magnetite concentrator.
Photo courtesy of Gindalbie Metals.

DEPARTMENT OF STATE DEVELOPMENT

Western Australian Global Network Trade and Investment Services

1 Adelaide Terrace
East Perth, Western Australia 6004
Tel: +61 8 9222 0490 • Fax: +61 8 9222 3862
Email: invest@dsd.wa.gov.au
www.dsd.wa.gov.au

INTERNATIONAL OFFICES Europe

European Office • 5th floor, Australia Centre
Corner of Strand and Melbourne Place
London WC2B 4LG • UNITED KINGDOM
Tel: +44 20 7240 2881 • Fax: +44 20 7240 6637
Email: europe@wago.co.uk

India — Mumbai

Western Australian Trade Office
93 Jolly Maker Chambers No 2
9th floor, Nariman Point • Mumbai 400 021 • INDIA
Tel: +91 22 6630 3973 • Fax: +91 22 6630 3977
Email: middleeastindia@dsd.wa.gov.au

India — Chennai

Western Australian Trade Office - Advisory Office
1 Doshi Regency • 876 Poonamallee High Road
Kilpauk • Chennai 600 084 • INDIA
Tel: +91 44 2640 0407 • Fax: +91 44 2643 0064
Email: middleeastindia@dsd.wa.gov.au

Indonesia — Jakarta

Western Australia Trade Office
Wisma Budi Building • floor 5 Suite 504
JI H R Rasuna Said Kav C-6
Kuningan, Jakarta 12940 • INDONESIA
Tel: +62 21 5290 2860 • Fax: +62 21 5296 2722
Email: southeastasia@dsd.wa.gov.au

Japan — Tokyo

Government of Western Australia, Tokyo Office
13th floor, Fukoku Seimei Building
2-2-2 Uchisaiwai-cho Chiyoda-ku
• TOKYO 100-0011 • JAPAN
Tel: +81 3 5157 8281 • Fax: +81 3 5157 8286
Email: wa.tokyo@wajapan.net

Japan — Kobe

Western Australian Government Office
6th floor, Golden Sun Building • 4-3-6 Nakayamate-dori
Chuo-Ku • Kobe 650-0004 • JAPAN
Tel: +81 78 242 7705 • Fax: +81 78 242 7707
Email: wa.kobe@wajapan.net

Malaysia — Kuala Lumpur

Western Australian Trade Office
4th floor, UBN Tower • 10 Jalan P Ramlee
KUALA LUMPUR 50250 • MALAYSIA
Tel: +60 3 2031 8175/6 • Fax: +60 3 2031 8177
Email: southeastasia@dsd.wa.gov.au

Middle East — Dubai

Western Australian Trade Office • Emarat Atrium
PO Box 58007 • Dubai • UNITED ARAB EMIRATES
Tel: +971 4 343 3226 • Fax: +971 4 343 3238
Email: middleeastindia@dsd.wa.gov.au

People's Republic of China — Shanghai

Western Australian Trade and Investment Promotion
Room 2208 • CITIC Square
1168 Nanjing Road West
SHANGHAI 200004 • PEOPLES REPUBLIC OF CHINA
Tel: +86 21 5292 5899 • Fax: +86 21 5292 5889
Email: china@dsd.wa.gov.au

People's Republic of China — Hangzhou

Western Australian Trade and Investment Promotion
Hangzhou Representative Office
Room 1705 • World Trade Office Plaza
Zhejiang World Trade Centre
122 Shuguang Road • Hangzhou 310007
PEOPLES REPUBLIC OF CHINA
Tel: +86 571 8795 0296 • Fax: +86 571 8795 0295
Email: china@dsd.wa.gov.au

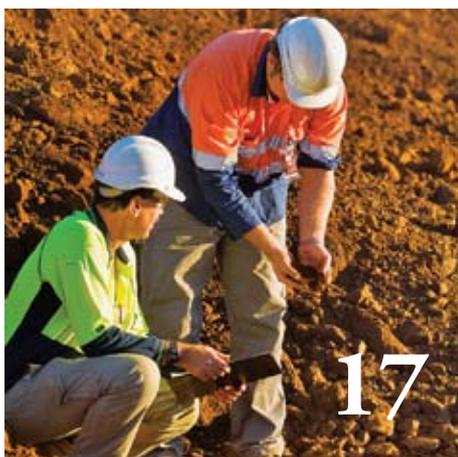
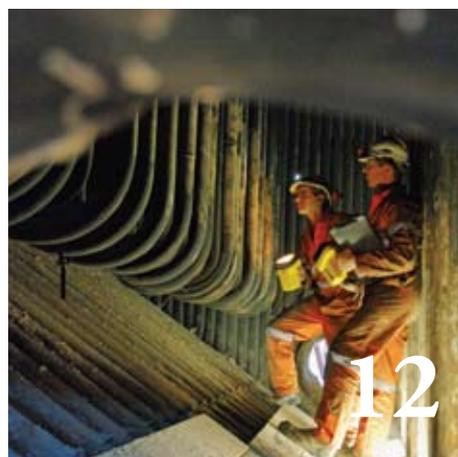
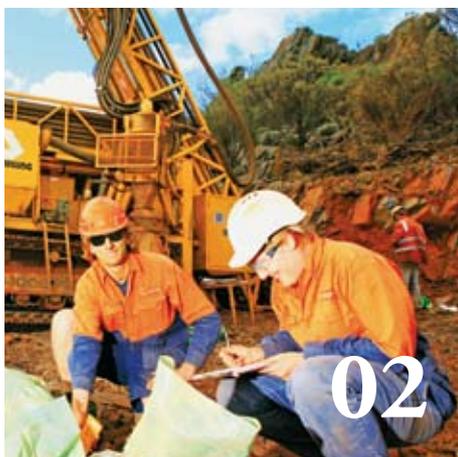
South Korea — Seoul

Western Australian Trade and Investment Office
11th floor • Kyobo Building
1 Jongro 1-Ga, Jongro-Gu
Seoul • South Korea 110-714 • KOREA
Tel: +82 2 722 1217 • Fax: +82 2 722 1218
Email: japankorea@dsd.wa.gov.au

United States The Americas — Los Angeles

Western Australian Trade and Investment Office
Howard Hughes Centre, 6080 Centre Drive, 6th Floor
Los Angeles, CA 90045 • USA
Tel: +1 562 59243 42
Email: usa@dsd.wa.gov.au

In this issue



02 A giant emerges

Work begins on Karara—set to be Western Australia's fourth iron ore major

06 Devil Creek bounty

Devil Creek Development Project to deliver domestic gas boost

12 Leading the charge

Carbon capture and storage projects play lead role in the battle against climate change

17 Rare Earths

Western Australia poised for supply role of the world's most intriguing minerals

25 Resources safety

Safety and health reform for the resources industry

26 Discovery Trails to Early Earth

Take a tour of Western Australia's Pilbara region as it was 3.5 billion years ago



Department of **Mines and Petroleum**
Department of **State Development**

Department of Mines and Petroleum
www.dmp.wa.gov.au

Department of State Development
www.dsd.wa.gov.au

NEW IRON ORE

giant on the horizon

Work has begun on the creation of the fourth iron ore major in Western Australia.

When Gindalbie Metals' Karara iron ore project in the State's Mid West is fully operational and at peak capacity, it will be Western Australia's fourth biggest iron ore producer.

The mostly magnetite operation, which was given final regulatory approval in early November, is expected to produce 30 million tonnes per annum (Mtpa) by 2017.

Corporate Affairs and Investor Relations Manager Michael Weir said Gindalbie was quick to move into action after environmental approval had been given.

"It's all starting to happen for us," Mr Weir said.

"A team is already on site and work has started on the preliminary earthworks and clearing.

"We expect to have in the vicinity of 500 people working on the site by January, building up to approximately 1000 by mid next year.

"Three major contract packages with a total value of approximately A\$400 million will be awarded in the next few months.

"These are the earthworks and concrete package for the concentrator, construction of the main Karara Village and development work at Geraldton Port.

"Other major contract packages will include construction steel works, a rail spur line, a water pipeline and power transmission line."

Initial production is expected to commence in early 2011 from the project's hematite reserves before the operation is expanded in the middle of 2011 to capitalise on its vast magnetite reserves of 2.4 billion tonnes.

The mine, 225km east-southeast of Geraldton, is expected to have a 40-year lifespan with a strong possibility of further discoveries extending its life.

The Karara project is also testament to the value the Chinese steel industry has placed on Western Australia's iron ore sector.

China's second-largest steel producer, AnSteel, owns 50 per cent of the project and has committed to a 100 per cent offtake agreement for the life of the mine.

It has invested A\$573 million in the project and is arranging project debt funding of US\$1.2 billion through the China Development Bank.

The Karara project has been earmarked as the primary feed source for AnSteel's new Bayuquan Steel Mill, where the partners will also build a jointly-owned 4Mtpa pellet plant.

AnSteel has agreed to pay the benchmark fines price as well as a premium for Karara's high quality concentrate, which, after processing, will have an iron concentration of 68.2 per cent.

Mr Weir said AnSteel, which has been mining iron ore for 90 years, had been searching the world for more iron ore sources to feed its new Bayuquan Steel Mill.

"AnSteel got approval for, and built the Bayuquan Steel Mill, but did not have sufficient internal resources to feed it, despite also being China's biggest iron ore producer," he said.

"AnSteel went looking around the world for a long-life, strategic and high quality project that could underpin the feed for Bayuquan.

"Karara is a perfect feed source for AnSteel because it is extremely high quality and low in impurities.

"AnSteel needs high quality inputs because it makes high quality steel, including the steel for things like Audi car panels. Because so much internal Chinese iron ore production is high cost, Karara will be one of AnSteel's cheapest sources of ore."

Karara, as well as being a high quality iron ore deposit, is also fortuitously close to an existing rail network which feeds into Geraldton Port.

Coincidentally, the project is also about 10km from the site of the first iron ore mine in Western Australia.

Karara Mining will connect a high capacity rail line to the existing network and will increase the tonnages exported from Geraldton Port after new berths and a shiploader have been constructed at the port.

Karara's remaining capacity is expected to be met by the Western Australian Government's Oakajee bulk commodity port, which will be about 20km north of Geraldton. The Karara project alone is expected to underwrite 50 per cent of the proposed port.



Drilling at the Karara project.



Lochada Construction Camp.

Mr Weir said Karara Mining was fully supportive of Oakajee and the Mid-West region.

“Early on in the life of Karara we made a long term commitment to the Geraldton Port, which meant we were not reliant on the development of Oakajee to get into production,” he said.

“This long-term commitment has enabled us to get capacity at Geraldton suitable for our start-up production rate of approximately 10 million tonnes per annum.

“Longer term we fully support the development of Oakajee because it gives us the ability to increase the production at Karara to its full potential of more than 30Mtpa for more than 30 years, to really take advantage of the multi-billion-tonne ore body.

“The Mid West region is very important to us as Karara is a long-life project.

“Therefore, for all of our contractors and suppliers we have implemented a Local Preference Policy, with an order of preference starting with the Mid West region, WA and then Australia.

“Contractors will also be required to adhere to the Local Preference Policy for any sub-contracting that may result from their packages. This way, we will ensure that the Mid West region gains as much economic benefit out of the construction of this project as possible.

“We will do what we can to encourage employment from the Mid West as well, including drive-in, drive-out and flexible rostering that should suit the farming communities.” ■



Ball mill shell being loaded at Fremantle Port.

NORTH WEST GAS DEVELOPMENT

30 years on—a legacy of continuing reward

A far sighted Western Australian Government decision, 30 years ago, that secured development of a natural gas supply, continues to return massive rewards not only to the State, but also to the nation.

In 1979, the State Government signed an agreement with six partners in the North West Shelf Venture (NWSV) that has underpinned a petroleum development project valued in current terms at more than A\$50 billion.

The NWSV partners are:

- BHP Billiton Petroleum (North West Shelf) Pty Ltd
- BP Developments Australia Pty Ltd
- Chevron Australia Pty Ltd
- Japan Australia LNG (MIMI) Pty Ltd
- Shell Development (Australia) Pty Ltd
- Project operator Woodside Energy Ltd.

The agreement, under the *North West Gas Development (Woodside) Agreement Act 1979*, is managed on the State's behalf by the Department of State Development.

Under the agreement, the State Government committed to building a \$450 million, 1500km natural gas pipeline and to a 20-year, take-or-pay contract for more than 400 terajoules of gas per day.

The \$2.5 billion first phase of the North West Shelf (NWS) project, which included constructing offshore production facilities, a subsea pipeline, the Karratha Gas Plant and storage

facilities, and other infrastructure, was at the time Australia's largest, most expensive resource development.

The enormous impact this project has had is outlined in a new report: "Nation Builder: How the North West Shelf Project has driven economic transformation in Australia"—commissioned by the NWSV partners to celebrate 25 years of gas production, prepared by ACIL Tasman, and released in October 2009.

It shows that the introduction of natural gas has transformed the Western Australian economy, helping create tens of thousands of new jobs, foster new businesses and develop new industries.

Since 1984, when gas first flowed from Dampier to Perth, domestic natural gas consumption has grown by an annual average of seven per cent.

Also since then, Western Australia's natural gas pipelines have almost trebled in length and reach into most of the vast State's mining areas.

At 350 petajoules per year, natural gas consumption is almost 20 times the pre NWS project level.

Electricity generation accounts for 46 per cent of this consumption and minerals processing, including alumina, nickel and chemical production, consumes a similar amount.

In addition, with the expansion of oil and gas exploration and production in Western Australia and, with it, the acquisition and development of relevant technology and skills, Perth has become a petroleum sector services centre with

a wide range of businesses providing expertise and products to the industry, in both local and overseas markets.

Also according to the report, from 1989, when LNG production began, until 2009 the NWS project has:

- Earned almost A\$60 billion in export revenue
- Increased Australia's Gross Domestic Product by A\$70 billion
- Increased Western Australia's Gross State Product by A\$90 billion or five per cent
- Expanded its annual LNG production capacity from 5 million tonnes to 16.3 million tonnes.

Annually, the project contributes taxation and royalty benefits totalling A\$4 billion to the Australian Government, and another A\$900 million to the State Government and local governments.

The project has also invested more than A\$300 million in community infrastructure and development in Karratha and the Shire of Roebourne.

Currently the North West Shelf Venture provides 65 per cent of Western Australia's domestic gas, accounts for more than seven per cent of global exports of LNG and produces almost 200,000 barrels of condensate and crude oil per day.

Now, with major new LNG and domestic gas development underway, both Western Australia's and Australia's economy are poised for a new and exciting period of development. ■

DOMESTIC GAS BOOST

Apache lands at Devil Creek

The start of construction of the Devil Creek Development Project in September 2009 underlined significant new directions in Western Australia's resources and energy economy.

As well as increasing the State's natural gas supply by up to 20 per cent of current levels, the project has a key role in the emergence of a new magnetite iron ore sector.

The A\$1 billion joint venture between Apache Energy, one of the world's largest independent petroleum exploration and production companies, and Santos Limited, a major Australian petroleum developer, will create Western Australia's third significant natural gas production facility.

Apache Energy Managing Director John Bedingfield said the company, which has offshore based facilities, is excited about its first onshore gas infrastructure project.

"Domestic gas is our core business in Western Australia and we are currently the only company investing in new domestic gas production," Mr Bedingfield said.

"We are looking forward to interacting with the community in constructing and operating this project."

The project will see natural gas piped 110kms from an automated production platform in the offshore Reindeer gas field, 80kms north west of Dampier, to the Devil Creek plant, located 10kms inland and about 45kms south west of Dampier.

It is underpinned by a contract, signed in January 2009, to supply approximately 154 billion cubic feet of gas over seven years, to a 450MW power station, being built as part of the A\$3.5 billion CITIC Pacific Sino Iron magnetite project at nearby Cape Preston (Prospect March-May 2009).

Construction will create an estimated 300 jobs, while about 20 employees will oversee the gas plant operations.

The Devil Creek Development Project is scheduled to begin operating in the second half of 2011.

The plant, sited close to Western Australia's 1600km Dampier to Bunbury Natural Gas Pipeline, will remove purities and water from the natural gas and initially produce dry natural gas equivalent to 110 terajoules per day (TJ/d), or about 10 per cent of the State's current domestic gas supply.

It will also produce an estimated 500 barrels (80,000 litres) of gas condensate each day, which will be transported to the BP Refinery in Kwinana for processing as transport fuel.

The facility will have the potential for daily production to be doubled to 220Tj of natural gas and 1000 barrels of gas condensate.

With statutory requirements met and most design, manufacturing and construction contracts awarded, work is underway both at the Devil Creek site and heavy manufacturing sites in key industrial centres.

The Devil Creek site was selected after consideration of alternatives, including at an existing Apache gas production facility on Varanus Island and at established industrial sites near Karratha.

Mr Bedingfield said the company was familiar with the location, having used it as a layout site when building a pipeline from Apache's offshore Stag petroleum production facility in 1998.



Apache Managing Director in Australia John Bedingfield, Minister for Energy Peter Collier, Elders Tim Douglas and Wilfred Hicks, and Apache CEO Rod Eichler attended the official launch of construction of the Devil Creek Development Project.

“Compared to other locations near Dampier, the facility at Devil Creek will have a relatively small Aboriginal heritage and environmental footprint and the site is fairly flat so minimal earthworks are required,” he said.

The project involved extensive studies to establish its technical feasibility and to enable management of the impact of construction and operations on both the marine and land environments.

The gas pipeline will cross the coast underground, minimising its impact on the Forty Mile Beach, a popular camping and fishing area.

The project has also reached agreement with the area’s traditional owners the Wong-Goo-Tt-Oo and the Yaburara/ Mardudhunera peoples.

While a final investment decision for the Devil Creek Development Project was made in April 2008, the Global Financial

Crisis, and its impact on demand, saw development suspended late in 2008.

The subsequent agreement with CITIC Pacific revived the project shortly afterward.

Mr Bedingfield says growth in gas demand, which slowed with the financial crisis, is returning to the market.

“Devil Creek will be a major addition to Western Australia’s gas infrastructure, and Apache is a long term player,” he said.

The project is also a forerunner of significant new investment in Western Australia’s domestic gas supply capacity.

Demand for natural gas as an accessible, competitive and environmentally responsible fuel source will grow both globally and in Western Australia.

As well as substantial domestic and industrial consumption, natural gas

supplies almost 50 per cent of the energy used for electricity generation in Western Australia.

Further increase in demand for gas generated electricity is likely, as a result of Western Australia’s economic strength and population growth and the continuing development of minerals extraction and processing, especially energy intensive magnetite iron ore concentration.

Increased demand will partly be met through the Western Australian Government’s requirement that petroleum producers reserve 15 per cent of natural gas production for domestic use.

In 2008-2009 the State’s output of liquefied natural gas (LNG) for export increased by 15 per cent, to total A\$8.5 billion and account for more than seven per cent of global production. ■

MINES AND PETROLEUM TO LEAD RESOURCES REGULATION



*Norman Moore
Minister for Mines and Petroleum*

Approvals reform is the State Government's major priority for the Western Australian mining and petroleum industry.

The Government has announced several agencies will be part of a "lead agency framework" to overhaul approvals across a broad range of Western Australian industry sectors.

The Department of Mines and Petroleum (DMP) is now the lead agency responsible for the regulation of mining, petroleum, geothermal and carbon capture and storage proposals in Western Australia.

The lead agency framework works by determining specific government departments as the first point of call for a project or application. The lead agency is responsible for coordinating this approval process for each proposal.

The relevant department will then guide proponents through the approvals process across the different agencies involved.

In announcing the new framework, Premier Colin Barnett said Western Australia was on the cusp of another period of sustained activity.

"The Liberal-National Government is committed to ensuring a sustained period of economic development over at least the next 20 years," he said.

"We need an approvals system that welcomes investment and stimulates economic development, not one that stymies it."

DMP Director-General Richard Sellers said there were many benefits to the lead agency approach.

"Firstly, it minimises the administration involved in having multiple parties involved in approvals for the same project," he said.

"It reduces red tape and time delays, and provides agencies a clearer distinction of responsibilities and accountabilities."

Mr Sellers said DMP was preparing for its new role in a number of ways.

These included establishing a regulatory reform team to coordinate the transition and provide advice to him, and clarifying new roles and responsibilities with staff and key stakeholders.

"The department is also implementing external agency and approval tracking, monitoring and reporting mechanisms to evaluate the timeliness of advice from other agencies," Mr Sellers said.

"Finally, we are looking at developing guidelines and training staff regarding case management and levels of assistance for small and medium proposals."

The lead agency model was implemented on the recommendation of the Ministerial Taskforce on Approvals, Development and Sustainability.

DMP has supported approvals reform through a range of administrative and legislative initiatives.

These include establishing approvals timeline targets and performance measures and publishing the department's quarterly compliance with these on its website.

The third quarter 2009 results showed that compared with the second quarter mining proposal environmental assessments improved from 68 per cent completed within 30 business days, to 76 per cent.

One hundred per cent of petroleum environmental approvals for management plans and oil spill contingency plans were approved within the 30-day target, and 96 per cent of petroleum and geothermal tenure applications for exploration permits were approved within the 120-day target.

DMP has also developed a number of sophisticated business systems that offer online tracking of assessments by industry.

These show whether an application is under assessment by DMP or another agency, if it is on hold, and whether it has been approved, rejected or withdrawn from the process.

Furthermore, DMP has reduced the backlog of pending mining tenement applications from nearly 19,000 two years ago to fewer than 8,700 today.

Chamber of Minerals and Energy (CME) of Western Australia Director Nicole Roocke said there was a range of improvements that could be made to the State's development approvals system without compromising environmental protection or stakeholder engagement standards.

"CME has welcomed the Government's commitment to reforming the approvals process since coming to office and we have been actively participating in these processes," Ms Roocke said.

"We are looking forward to the roll-out of further reforms as more needs to be done to achieve fundamental improvements to the system."

CME also supported the concept of a lead agency.

"It is important that such an approach is designed appropriately for Western Australia's needs and we have provided some suggestions to Government as to how this might work," she said.

The next step is to develop end-to-end approval tracking for the whole approval process across Government. ■

State Development takes the lead in moving forward



Premier Colin Barnett
Minister for State Development

With its focus firmly on the future of Western Australia, the Department of State Development is showing the way forward in the State's resource and industry sectors.

Working with fellow public sector agencies and with industry and the community, the department has embraced the new lead agency framework adopted by the Western Australian Government.

The State Government has listened to and accepted widespread concerns and made improving project approvals processes a high priority.

Providing leadership across Government and with industry and the community, the department has a key role in promoting responsible development, thereby securing the future of all Western Australians.

It's an easy thing to say, but a much harder thing to do, but the agency is committed to providing leadership in the area of responsible development.

Under the Government's new framework, the department will take a leadership role in managing specific projects through planning, environmental, Aboriginal heritage and native title and other relevant approvals processes.

This approach will help improve timelines, reduce duplications and increase certainty about processes and outcomes.

The Department of State Development is the Western Australian Government's lead agency for:

- major resource, industry and infrastructure projects
- key State Government projects.

Director General Anne Nolan said the department is focussed on making things happen, but stressed this should not be taken to imply development at any cost.

The new approach will not affect the statutory requirements or the rigour with which they are applied by agencies responsible for specific approvals.

"Our emphasis will be on working with project proponents to identify and meet the requirements of government approvals processes," Ms Nolan said.

"It also means working with the relevant agencies to see reasonable requirements established and reasonable timelines set, and managing so that these timelines are met.

"The level and nature of the support we provide will vary with each project's needs and its strategic significance to Western Australia, and may vary from making appropriate referrals to establishing a high level project team. The approach and the leadership involved will depend on the circumstances.

"The support the department can provide goes beyond approvals processes. We also work with the proponent and the relevant agencies to secure the land, infrastructure and services they need to make the project a success, and to help resolve other issues impeding development.

"In special circumstances, especially with major projects, which may require significant State participation, this may involve negotiating statutory agreements, which outline the responsibilities of both the State and the proponent in relation to the project.

"We are also working to identify, establish and obtain relevant clearances so that project ready land approved for heavy industry is available, and other approvals processes can be accelerated."

The current Gorgon project, along with examples such as the Oakajee Mid-West development and Ord East Kimberley expansion provide clear examples of where the department has shown leadership.

"There is absolutely no doubt that these projects are potentially nation building projects. Not just in terms of the investment and revenue they will generate, but also because they offer the opportunity for transformational change", Ms Nolan said.

"Our job, on behalf of the Western Australian community, is to facilitate the developments in such a way that the potential benefits are realised and the return on investment flows to the community. This will require a careful and considered approach that is tailored to balancing the rigour required with the need to get things happening. We are committed to doing just that." ■

RESOURCE ROYALTIES

underpin State growth

Western Australians need no reminding of the importance of the resources industry to their State's economy—mining and petroleum projects generate thousands of direct jobs, and each of these provides an estimated six further positions in support industries.

Every new project provides new business for suppliers of infrastructure, transport, catering and other goods and services, in turn fostering growth in wages, the housing market and retail sector.

What many Western Australians might not know is that resources development provides close to a quarter of the State Government's revenue through the mining and petroleum royalties systems.

These royalties are used to fund law enforcement, education, health, roads, community development and many other vital services for the ongoing growth and development of Western Australia.

The royalty system in Western Australia is maintained by the Department of Mines and Petroleum (DMP).

DMP Acting Royalties General Manager Angelo Duca said the value of royalties paid to the State was at an all-time high.

"Royalty values have risen with the incredible growth of the resources industry during the past few years, including through the worst of the economic downturn," he said.

"In 2008-09 combined minerals and petroleum royalties were worth A\$3.2 billion—an increase of 41 per cent on the previous year's result."

Iron ore provided the overwhelming bulk of the total at A\$1.9 billion, followed by petroleum at A\$811 million.

Mining royalties are collected under the *Mining Act 1978* or State Agreement Acts negotiated with companies for individual projects.

The holder of a mining tenement is required to submit quarterly royalty returns to DMP.

Mining royalties are calculated through three different methods: specific rates (rate per tonne); profit-based (percentage of profit); and ad valorem (a percentage of value).

Ad valorem, the most common calculation employed, allocates a 7.5 per cent royalty rate for bulk material, 5 per cent for concentrates and 2.4 per cent for metal.

"It's been a State Government priority for a number of years for resources operators to move into value-adding," Mr Duca said.

"The lower royalty rates for concentrates and metals are a means of encouraging this type of activity."

Petroleum royalties are administered and collected under both State and Commonwealth legislation because offshore oil and gas resources are often outside Western Australian waters.

The royalty rate is usually set between 10-12.5 per cent of the wellhead value of petroleum produced.

The State Government agreed to ease the royalty concession rate for tight gas operations to five per cent in July 2009.

"The tight gas sector in Western Australia is in its infancy and the Government wishes to remove impediments to investment in this area," Mr Duca said.

"The lowered royalty rate recognised the fact that tight gas operators have higher start-up and operational costs than other petroleum producers."

Royalties were firmly in the spotlight following the 2008 Western Australian State election, which saw the Liberal Party form government with the Nationals after agreeing to support that party's Royalties for Regions program.

The program guarantees the equivalent of 25 per cent of the State's mining and onshore petroleum royalties will be spent on programs in regional Western Australia each year.

"WA has a huge schedule of new mining and petroleum projects and expansions for the coming years, which will ensure resource royalties continue to be a major driver of the State's development into the future," Mr Duca said. ■

Royalty receipts for 2007-08 and 2008-09

Commodity	2007-08	2008-09	Difference	
	Total \$A	Total \$A	\$A	%
Alumina	80,535,398	75,982,728	-4,552,670	-6
Diamonds	43,436,045	18,838,566	-24,597,479	-57
Gold	99,481,977	116,420,727	16,938,750	+17
Heavy Mineral Sands	21,110,828	26,681,513	5,570,685	+26
Iron Ore	964,429,941	1,946,717,875	982,287,934	+102
Nickel	158,404,647	81,829,169	-76,575,478	-48
Petroleum	811,026,024	868,761,581	57,735,557	+7
Other	118,234,147	104,423,890	-13,810,257	-12
Total Revenue	2,296,659,007	3,239,656,049	942,997,042	+41

BOND FREEZE to foster recovery in resources industry

The State Government has again deferred a rate rise on environmental bonds for mining projects, to offer further financial relief to companies recovering from the economic downturn.

Environmental bonds provide assurance against companies failing to fulfil their obligations to rehabilitate Western Australian mine sites to a satisfactory state.

An initial 12-month moratorium on increased rates was due to expire at the end of 2009.

The new extension will see the standard rates for environmental bonds remain unchanged until the end of 2010.

The minimum rate for a waste dump or tailings facility, for example, was set to increase to A\$20,000 per hectare, but will now remain at A\$10,000 until the end of 2010.

High risk facilities and landforms (such as those that are highly erodible) will continue to attract a higher rate as determined on a case-by-case basis.

Minister for Mines and Petroleum Norman Moore said extending the moratorium for another year was a responsible policy decision because the economic recovery of the resources industry was ongoing.

“The Western Australian Government continues to monitor the economic climate and while there are increasing signs of recovery, there is a need to foster this recovery rather than introduce additional cost pressures at this time,” he said.

Chamber of Minerals and Energy Western Australia Director Nicole Roocke said the group welcomed the Government’s decision.

“The global financial crisis has undeniably had a major impact on

resource companies over the past year and it makes good sense to provide some relief from increased costs while recovery gets underway,” she said.

Association of Mining and Exploration Companies National Manager of Policy and Government Relations, Darren Brown, also applauded the decision.

“Sensible decisions such as this will help to restore investor confidence, which will in turn help expedite the long and risky process of converting our natural resources into royalties that ultimately pay for police, schools and hospitals,” Mr Brown said.

However, Minister Moore cautioned that environmental bond rates were unlikely to remain at their current levels and that tougher rules would be part of the future requirements for the mining sector.

“We should, however, not rely entirely on bonds to deliver good environmental outcomes and that is why I have asked the Department of Mines and Petroleum to consider what other powers they need

to enforce to complement an increase in environmental bonds,” Minister Moore said.

Department of Mines and Petroleum (DMP) Environment Director Phil Gorey said increasing environmental bonds alone would not deliver the best outcomes for the industry, community and environment.

He said DMP was committed to improving its capacity to encourage companies to take more responsibility for their environmental legacy.

“The Environment Division is currently updating its guidelines for mineral exploration and rehabilitation activities in order to improve clarity and detail in outlining the process of closing a mine site,” Dr Gorey said.

“We are committed to engaging with industry representatives and other stakeholders and to considering their interests in developing effective future regulatory arrangements in mining securities.” ■



Environmental bonds ensure companies fulfil their obligations to rehabilitate Western Australian mine sites.

WESTERN AUSTRALIA

leading carbon capture charge

Western Australia is playing a leading role in the battle against climate change with major carbon capture and storage demonstration projects currently planned or proposed in the State.

One of these projects is associated with the massive Gorgon natural gas project, the single largest resource development in Australia's history.

The other is tied in with the Collie Hub in the South West.

Reflecting this, the State Government recently designated the Department of Mines and Petroleum (DMP) the lead agency for the development and deployment of carbon capture and storage (CCS) in the State.

Carbon Strategy Coordinator Dominique Van Gent said it was vital for Australia as a whole to find ways to prevent carbon emissions from fossil fuel-based electricity generation and industrial activity.

"Despite our advances in developing renewable energy such as geothermal, wind and solar energy, the vast majority of Australia's electricity is still generated by coal-fired power stations," Mr Van Gent said.

"Although in Western Australia we have a more diversified fuel mix with natural gas being predominant in the South West Integrated System.

"The huge resource and industrial expansions tipped for Western Australia in particular during the next few years will create significant carbon output that must be managed if Australia is to reach its target of a 60 per cent reduction in emissions by 2050.

"Australia is also the world's largest coal exporter and the fourth largest coal producer, which makes the development of carbon capture and storage vital to protecting the employment and wealth created by this sector."

Carbon capture and storage involves capturing carbon dioxide that would otherwise be emitted to the atmosphere, compressing it, transporting it to a suitable site, and injecting it into deep geological formations to trap it for thousands or millions of years.

The State Government's efforts to implement this technology are aligned with a national strategy to tackle climate change and make significant cuts to greenhouse emissions.

The Australian Government has established two bodies to drive the deployment of low emissions coal technologies — the National Low



Callide Oxyfuel Project - preparing the turbine. Photo courtesy of CS Energy.



Callide Oxyfuel Project - inside furnace. Photo courtesy of CS Energy.

Emissions Coal Council, and the Carbon Storage Taskforce.

The Barrow Island Act 2003, which governs the development of the massive Gorgon project, is currently the only piece of legislation in Western Australia that allows for the development of CCS but this is limited to Barrow Island.

Joint venture partners Chevron, ExxonMobil and Shell made a final investment decision on the A\$43 billion Gorgon project in September 2009.

Its CCS component will be the world's largest commercial operation of its kind.

"This project in particular has the potential to put Western Australia on the map in terms of the commercial development of carbon capture and storage technology," Mr Van Gent said.

The proposed Collie Hub would be a multi-user CCS project featuring five companies — Griffin Energy, Verve Energy, BHP Billiton Worsley

Alumina, Wesfarmers Premier Coal and Perdaman Chemicals and Fertilisers.

International petroleum services company Schlumberger is progressing investigations through the Lower Lesueur Carbon Dioxide Geosequestration Study, which is testing the validity of suitable locations to store carbon dioxide in the Southern Perth Basin between Bunbury and Mandurah.

The 12-month study commenced in May 2009 and followed a preliminary study by the CO2CRC that identified the Southern Perth Basin as having potential for CCS.

Wesfarmers Premier Coal spokesperson Rob Swan said the company had taken an active interest in possible technological solutions to reducing carbon emissions from coal-fired electricity generation.

He said CCS was a significant potential development in this field.

"While we're not an electricity generator, we believe that the responsible thing to

do is to support the development of low-emission coal technology," Mr Swan said.

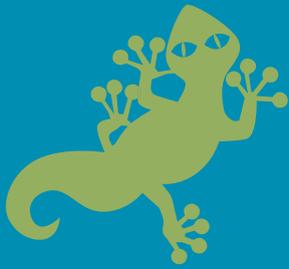
He said the appointment of DMP as the lead agency for the regulation of CCS in Western Australia was beneficial.

"It's an advantage to be able to deal with a local department on these critical matters, particularly as the coal industry in Western Australia is quite small on the national scale and there is the danger of being swamped by Eastern States interests," Mr Swan said.

He said there was good justification for a CCS demonstration project in the Collie area.

"Collie coal has been shown to be suitable for carbon capture via gasification technology that separates carbon dioxide and clean burning gases, and a potential geosequestration site is located in the region," he said.

"This would be a significant development on a national scale." ■



GOLDEN GECKO
Awards for Environmental Excellence

And the Gold



Sodexo and Woodside representatives Gary Mickler and Betsy Donaghey, Minister Norman Moore, and St Barbara's Jeff Waddington.

2009's Golden Geckos Awards for environmental excellence in the resources industry were awarded to Woodside, which helped increase Western Australia's scientific knowledge, and Sodexo, for projects that reduce waste from remote mining villages.

The awards, run by the Department of Mines and Petroleum, recognise the innovative and dedicated approach the State's resources industry applies to managing and protecting the environment.

Mines and Petroleum Minister Norman Moore said the two recipients highly deserved their awards.

"The companies' individual efforts have added to Western Australia's collective

scientific and industrial knowledge on how best to manage and protect our sensitive environment," he said.

"The efforts of these companies stand as a benchmark for the resources industry and I am confident they will inspire others to strive for environmental excellence."

Woodside was awarded a Golden Gecko for its research into the effects of marine seismic and drilling appraisal on coral reef environments.

The company's research, which was conducted by Australian and international scientists during appraisal of the Torosa hydrocarbon reservoir in the Browse Basin off the Kimberley coast, demonstrated that seismic activities did not affect fish hearing.

Woodside also refined existing drilling techniques in order to capture well cuttings and drilling fluids to prevent turbidity impacts on the coral reef communities at Scott Reef. It was the first use of this kind of technology in Australia.

The company's Senior Vice President of the Browse Liquefied Natural Gas (LNG) development Michael Hession said sustainable development was central to the way Woodside conducted business.

"We consistently strive to set high standards in areas of environmental performance," he said.

"Our performance was the result of a collaborative effort, with our exploration, geomatics, drilling and completions, and environment teams working together to get the best result.

en Gecko went to ...

WOODSIDE ENERGY LTD

Reservoir appraisal in coral reef environments



"The achievement of winning the Golden Gecko reinforces the pride that Woodside, and all the individual contributors, felt in the successful execution of these activities."

Woodside is continuing a range of technical and environmental studies for its Browse LNG development.

Sodexo Remote Sites took out joint top honours for its sustainable alternative to waste management at remote mining villages.

Its resource recovery program, which has been employed at 13 villages, has been a great success with 864 tonnes of material recycled.

Up to September 2009, the program also saved:

- 2093 cubic metres of landfill
- 14,983 gigajoules of energy
- 697 tonnes of carbon dioxide emissions
- 16,823 kilolitres of water.

All of the proceeds from the program have been donated to Princess Margaret Hospital and the Royal Flying Doctor Service through the Ruggies Recycling Program.

Sodexo's Environmental Manager Jake Healy said the program was a collective effort and the first on a big scale for such clients as Barrick, Rio Tinto, Woodside and Newmont.

"It's been an entire team performance, from the people on the site, to those working behind the scenes with our logistics and supply contractors," he said.

Mr Healy said that in the past the trucks that delivered food and other equipment would come back to Perth empty.

"But instead of going back empty, they're coming back with recycled materials like cardboards, cans, glass and plastics," he said.

The program has been expanded and also includes converting canola oil into bio-diesel to run vehicles onsite, recycling fluorescent tubes,

SODEXO REMOTE SITES

Resource recovery initiatives for mining villages



printer cartridges and batteries, and implementing reusable plastic pallets for transporting food.

Sodexo is also looking at composting food wastes on site.

Mr Healy said the program, which includes an education component to encourage village residents to recycle, had been internally driven from the top of the company.

He said the team was very proud of receiving a Golden Gecko Award.

"There have been positive effects from having won it," he said.

"Following the award win, we have been contacted by agencies in other regions to see if we can help them with their waste management strategies.

"An agency in the Northern Territory has been asking how they could do the same for Indigenous communities."

Entries for 2010's Golden Gecko Awards open in February. Visit www.dmp.wa.gov.au/goldengecko/ for further information. ■



MINARA RESOURCES CONTINUES TO IMPROVE MINE CLOSURE PLANNING

Waste landform rehabilitation in October 2009. Photo inset: Waste landform rehabilitation at Murrin Murrin.

Following its receipt of a Golden Gecko Award in 2008, Minara Resources has continued to apply its successful key performance indicators for rehabilitation at its Murrin Murrin nickel cobalt mine.

The company won its prestigious award from the Department of Mines and Petroleum (DMP) for developing a framework for minesite closure and rehabilitation, using key performance indicators (KPI) that can be adopted statewide.

The company engaged DMP and the Department of Environment and Conservation to discuss the development of the KPIs and also obtained technical expertise in erosion modelling, revegetation and landform construction.

Since 2007 the company has rehabilitated approximately 305 hectares of land at Murrin Murrin within the KPI standard.

“The standard has resulted in Minara developing KPIs for rehabilitation success, to improve rehabilitation planning, design and adaptive management, and increase certainty and clarity in assessing rehabilitation performance,” Murrin Murrin Environment Manager Tim Stevens said.

The rehabilitation project is the culmination of significant research and development which occurred over a four-year period and was designed to achieve consistent and sustainable rehabilitation outcomes.

The KPIs were developed to reflect five distinct stages of the rehabilitation

process: planning, construction, initial performance, monitored performance and sustainability.

Mr Stevens said Minara adopted the KPI framework to create certainty for its rehabilitation responsibilities at Murrin Murrin and to provide a mechanism to objectively and quantifiably assess rehabilitation.

Each of the five key components is explicitly considered, with a range of specific Murrin Murrin-related KPIs developed for each component.

All rehabilitation activities at Murrin Murrin are overseen by the project’s Rehabilitation and Clearing Coordinator.

Incorporating rehabilitation responsibilities within Murrin Murrin’s mining department has allowed the use of the internal mine equipment fleet to help complete landform rehabilitation.

“This has resulted in between 25 to 50 per cent of rehabilitation activities onsite being completed by the Murrin Murrin mine fleet; building internal rehabilitation skills and experience for mine fleet operators,” Mr Stevens said.

Completion of rehabilitation activities to the KPI standard has created a number of ongoing benefits for Minara Resources, including:

- Quantitative, objective and repeatable evaluation of rehabilitation
- Quality documentation of the rehabilitation planning, construction and monitoring processes

- Establishment of a known level of rehabilitation success
- Streamlining of the rehabilitation bond reduction process
- Significant improvement of the cost-effectiveness of rehabilitation

The KPI process has also established an agreed set of criteria for DMP to measure rehabilitation success.

“Another significant milestone in rehabilitation at Murrin Murrin since the 2008 Golden Gecko Award has been the sign-off and full bond relinquishment of our concave slope landform,” Mr Stevens said.

Completed in early 2005, the concave landform was recommended for full bond relinquishment and sign-off by DMP in September 2008 – only four years after completion of rehabilitation.

The KPI rehabilitation process at Murrin Murrin is ongoing, with planning currently underway for the 2010 rehabilitation program.

The framework enables a process of quality control and continual improvement to be implemented, and also improves the utility of monitoring, as any required remedial works can be easily identified when assessing rehabilitation performance.

“This framework has the potential to improve the regulatory process and partnership between companies and government by allowing the company to self regulate to achieve rehabilitation standards,” Mr Stevens said. ■

RARE EARTHS

Future demand creates new opportunity

As a globally significant exporter of a diverse range of minerals and energy requirements for today's industries, Western Australia is shaping up as a key player in meeting the needs of tomorrow's.

Western Australia already supplies the world with a significant share of its lithium and tantalum; key elements in electronics, communications, information and transport technologies.



*Geologists examining the ore.
Photo courtesy of Lynas Corporation.*

Now, the State is poised to add an important role in the supply of the most intriguing of the minerals—rare earths—17 chemically similar elements, each with unique magnetic, chemical and spectroscopic properties.

Tiny quantities of rare earths in advanced materials are essential components of:

- Rechargeable batteries for hybrid vehicles
- Powerful magnets that drive electronic devices and generate electricity in wind turbines
- Catalysts for reducing vehicle emissions and “cracking” petroleum fluids
- Energy efficient lights
- Specialist glass for camera lenses and digital screens.

Rare earths are generally sold as oxides with prices, depending on the particular element, currently ranging from US\$4-\$500 per kilogram.

While rare earth oxides (REO) are relatively valuable, their price doesn't have a dramatic impact on the sales cost of the consumer items in which they are a tiny component.

Globally, rare earths consumption grew by more than 56% over the eight years from 2000 to 2008, when it was estimated at 24,000 tonnes with a value of approximately US\$1.25 billion.

Perth-based Executive Director of Industrial Minerals Company of

Australia, and a recognised authority, Dudley Kingsnorth foresees demand continuing to increase at rates approaching 10%pa in the near future.

“Over the past decade the average annual growth in demand for rare earths has been about three times the global economic growth rate; so there is no reason to believe that this trend will not resume as the global economy recovers,” Mr Kingsnorth said.

“Additionally, if an outcome of the Copenhagen Climate Change Conference is a significantly increased commitment to hybrid vehicles and renewable energy, the growth will accelerate.”

The intrigue surrounding rare earths doesn't end with their chemical properties, while they aren't especially rare in the Earth's crust, they are difficult to find in commercially recoverable concentrations.

China has about 30% of total estimated global reserves and significantly more of easily recoverable ore, currently accounting for around 95% of current production of rare earths.

China has long recognised the significance of its resource, famously in the early 1990s, China's reformist leader Deng Xiaoping observed: ‘The Middle East has its oil, China has rare earth.’

Mr Kingsnorth said that China acknowledges that its resources are finite and has moved to maximise the domestic employment benefits from this endowment.



Mount Weld pit after the completion of the first mining campaign. Photo courtesy of Lynas Corporation.

“China encourages value adding through the development of domestic manufacturing and currently accounts for about 60% of global rare earths consumption. It has a massive research effort underway to support this development,” he said.

“In recent years it has introduced a range of export taxes and quotas to protect its resources, which for non-Chinese consumers has had the effect of limiting access to, and increased prices of rare earths.”

“To reduce the risks to the long term sustainable supply of their raw materials, manufacturers of high technology items across Europe, America and Asia have a keen interest in securing new alternative supply outside China.

“This would also encourage the development of long term sustainable supplies at reasonable prices, which would also benefit China as the major consumer.”

And this, Mr Kingsnorth said, has created an opportunity for Western Australia.

“While there are many potential projects under study, there is only one green fields rare earths project outside China that is under construction and that has all the necessary environmental and commercial approvals in place,” he said.

“That is the Mount Weld Rare Earths Project located at remote Mt Weld, 30 kilometres south of Laverton, in Western Australia’s eastern Goldfields.”

Project operator Lynas Corp, which acquired the Mount Weld project in 2001, has undertaken a systematic development of a resource that it describes as the world’s richest rare earth deposit.

The company said extensive exploration, drilling and independent validation of its resource to JORC Code standards has

resulted in a valuation of 12.24Mt at 9.7% for 1,184,000t REO—enough to supply 20% of current global demand for 20 years.

During 2007–2008, Lynas completed the initial pre-strip and first mining campaign and successfully mined 773,000 tonnes averaging 15.4% rare earth oxides.

It also began building a plant at the minesite that will process the ore and produce a rare earths concentrate of 40% rare earths.

Construction of an advanced materials plant at Gebeng in East Malaysia also commenced, which will process the concentrate to produce a range of rare earths products for sale to global manufacturers.

The global financial crisis saw the project suspended in February 2009 when project finance debt was unable to be drawn down.

However, during November 2009, Lynas announced success in raising A\$450 million capital, which will enable resumption of the project.

The project’s initial program calls for annual production of 121,000t of ore, which will produce more than 33,000t of rare earth concentrate for shipping to Malaysia for manufacturing 11,000t REO, which Lynas estimates at about 11% of current global demand.

The facilities have been designed to accommodate double this level of production. ■

Rare Earths: Atomic Weights and Symbols			
Element	Atomic No.	Symbol	Atomic Weight
Lanthanum	57	La	138.92
Cerium	58	Ce	140.13
Praseodymium	59	Pr	140.92
Neodymium	60	Nd	144.27
Promethium*	61	Pm	145.00
Samarium	62	Sm	150.43
Europium	63	Eu	152.00
Gadolinium	64	Gd	156.90
Terbium	65	Tb	159.20
Dysprosium	66	Dy	162.46
Holmium	67	Ho	163.50
Erbium	68	Er	167.20
Thulium	69	Tm	169.40
Ytterbium	70	Yb	173.04
Lutetium	71	Lu	174.99
Yttrium	39	Y	88.92
Scandium	21	Sc	45.10

*Promethium does not occur naturally as a stable isotope, although it can be artificially manufactured

Some Key Drivers of Rare Earths Demand

Application	Rare Earths	Demand drivers
Magnets	Nd, Pr, Sm, Tb Dy	Drives for computers, mobile phones, mp3 players, cameras, Voice coil motors. Hybrid vehicle electric motors. Cordless power tools. Mag-lev trains. Wind turbines. Medical imaging (MRIs)
LaNiH Batteries	La, Ce, Pr, Nd	Hybrid vehicle batteries. Hydrogen absorption alloys for re-chargeable batteries
Phosphors	Eu, Y, Tb, La, Dy, Ce, Pr, Gd	LCDs. PDPs. LEDs. Energy efficient fluorescent lights/lamps
Fluid Cracking Catalysts	La, Ce, Pr, Nd	Petroleum production - greater consumption by 'heavy' oils and tar sands
Polishing Powders	Ce, La, Nd	Mechano-chemical polishing powders for TVs, monitors, mirrors and (in nano-particulate form) silicon chips
Auto Catalysts	Ce, La, Nd	Tighter NO _x and SO ₂ standards - platinum is re-cycled, but for rare earths it is not economic
Glass Additive	Ce, La, Nd, Er	Cerium cuts down transmission of uv light. La increases glass refractive index for digital camera lens
Fibre Optics	Er, Y Tb, Eu	Signal amplification

Rare earth products are generally priced in terms of US\$ per kg REO, regardless of the chemical form in which they are sold. Source: "An Overview of the Rare Earths Market", Industrial Minerals Company of Australia Pty Ltd, 2009.

GALAXY RESOURCES

Western Australia's Premier Colin Barnett welcomed the start of construction of Galaxy Resources Limited's Mt Cattlin mine near Ravensthorpe on the State's south coast.

The new mine will start operation by the end of 2010 with a production target of 137,000 tonnes of lithium concentrate per annum over a minimum 15-year life (see Prospect June-August 2009).

Western Australia is a major supplier to global markets of lithium. Lithium from Mt Cattlin will be processed for use in long-life batteries for electric and hybrid vehicles.

"WA is the world's leading mining economy and the expansion of our presence in new and growing markets for minerals like lithium, broadens that strength," Mr Barnett said.



Great Chairman Dr Yuewen Zheng, Galaxy Resources Managing Director Iggy Tan, Premier Colin Barnett and Galaxy Resources Chairman Craig Readhead marked the start of works at the new Galaxy Resources Mt Cattlin lithium mine north of Ravensthorpe.



WESTERN AUSTRALIAN CORE LIBRARY GAINS GLOBAL RECOGNITION

Drill core samples from the Perth Core Library.

Western Australia's geological expertise has been internationally recognised with the former manager of the Perth Core Library asked to share his extensive knowledge in Malaysia.

Gary Williams will assist Kuala Lumpur-based oil and gas company Petronas in the development of a core library archiving and displaying drillcore samples acquired during petroleum exploration.

Gary has been employed with Western Australia's Department of Mines and Petroleum (DMP) since the 1970s, helping to create the department's two core libraries, in Perth and Kalgoorlie.

He began his new Malaysian role in September 2009.

"I initially provided advice to Petronas on a consultancy basis, visiting Malaysia on four occasions for a week at a time," he said.

"On these trips I was involved in identifying and setting-up a site for the core library, designing and laying-out of the facility, and ensuring everything was right for final tender documents.

"Petronas has now finalised the building tender and, once a building contractor has been appointed, I will be involved with monitoring construction and ensuring specialised warehousing requirements and equipment are correctly implemented.

"I will also be responsible for the relocation program as there are six different warehouses at present in

Malaysia that store drillcore, and the core needs to be repackaged and relocated to the new facility.

"Ensuring key processes surrounding occupational health and safety issues are implemented at the facility will also be part of my role."

Gary has accepted a two-year contract with Petronas.

He said the experience gained in developing Western Australia's two core libraries had given him confidence in accepting the opportunity.

"I guess in some respects I thought I was in a very narrow field working with drillcore, which can sometimes be a disadvantage, but this is just one time it has worked to my advantage," he said.

"There are not a lot of people that have had the opportunity to create a core library facility from the ground up.

"I was quite determined to get a facility up and running in Western Australia since the late 1980s when I first began putting in Cabinet submissions to the State Government."

His persistence paid off with a 1998 commitment of A\$10 million to build the Kalgoorlie and Perth facilities, which were completed in 2000 and 2003 respectively.

Gary said he had witnessed client numbers at the Perth library increase dramatically during his time in charge, from around 195 in 2002-03 to 1650 in 2008-09.

"This is a fantastic result and I only see things getting busier and better for the library in the future," he said.

"The A\$80 million Exploration Incentive Scheme, launched by the State Government earlier this year, has also contributed to great promotion for the library and its services."

Gary said the companies that were successful in receiving a funding subsidy from the State Government for their drilling activities in Western Australia's under-explored areas are required to submit their drillcore to the library within six months.

This meant great promotion for the library's services, and the opportunity to obtain and archive valuable drillcore and data to share with other industry explorers.

"It also means that the smaller sized exploration companies get to know who we are and what we do," Gary said.

In addition to the resources exploration industry, the core library's main visitors include academia and DMP's own geologists.

Gary said there has been a great deal of interest in the establishment and development of new drillcore facilities around the world in recent years.

"What typically happens is that the drill holes and wells cost millions and millions of dollars to drill and not a lot of thought goes into what will be done with the valuable core after drilling," he said.

"It just gets stored in a warehouse somewhere and more and more material is collected with warehouses getting full very quickly.

"It gets to a point where people realise that the drillcore is a valuable resource that needs to be accessed easily and kept in good condition.

"Therefore many places around the world are identifying that it's becoming vital to create a library service facility, in addition to the warehouse, that can accommodate these requirements so they can make the most of this valuable drillcore."

In establishing the Western Australian facilities, Gary visited core libraries in Queensland and New South Wales.

He said he took on board things they did well and learnt from their mistakes.

"We also introduced some new technologies and ideas ourselves and really thought about the design and layout," he said.

"For example one major problem many core libraries have had in the past is they get full very quickly, and that's why we have created quite strict criteria for selecting only valuable mineral exploration core here.

"The libraries' modular designs also allow each facility to have an initial storage life of 15 years, the storage area however can be expanded to increase the life of the facility to 30 years.

"Quite a bit of research also went into the storage weight of the drillcore, designing the facility so that there is no danger of exceeding safe weight limits.

"We also fitted special lighting as geologists viewing the core are very particular about identifying certain colours and minerals."

To find out more about Perth's Core Library visit: www.dmp.wa.gov.au/770.aspx

To make a booking to visit the library email: corelibrary.requests@dmp.wa.gov.au ■



Former Manager of Perth's Drill Core Library, Gary Williams.

NEW TECHNOLOGY TO CREATE ONLINE CORE LIBRARY

A new machine at the Department of Mines and Petroleum's Perth Core Library will significantly increase the geological knowledge base for the Western Australian mining and petroleum industry.

The HyLogger, developed by the CSIRO, provides information on the mineralogy of drillcore taken from exploration activity in WA, helping to determine the composition of the Earth's crust up to a depth of 2km.

The Perth Core Library is used to display and archive drillcore to aid subsequent exploration activity.

Each State in Australia will receive a HyLogger instrument as part of the creation of an online National Virtual Core Library (NVCL).

The NVCL is being implemented by Commonwealth-funded research organisation AuScope, as part of efforts to create world-class research infrastructure in Australia.

Senior geologist and HyLogger operator Lena Hancock said the new technology would yield detailed information and image data on the mineralogy and composition of drillcore samples.

"The instrument was initially developed to scan mineral core but recent testing has produced encouraging results using petroleum core," she said.

"This is great news for the State, since we are the nation's number one oil and gas producer.

"The information recorded from the HyLogger will then be placed on a national database for the online world to access."

Lena said prior to using the HyLogger, geologists were required to visually log drillcore.

"With different geologists logging the same core, there is room for some differences in their interpretation,

however, with the HyLogger, there is only one consistent reading," she said.

The national library is one of six components that AuScope is coordinating to help make information available outside the research community, resulting in new and improved science, business, educational and policy applications.

The Commonwealth has awarded the organisation nearly A\$43 million to implement these components.



DMP Senior Geologist, Lena Hancock, operates the HyLogger.

STATE MINING ENGINEER ready for retirement

After more than 20 years with the Resources Safety Division of the Department of Mines and Petroleum, the State Mining Engineer Martin Knee has retired to start the next stage of his life.

After travelling the world and working on mine sites in Zambia, Ireland, the Middle East and around Australia before settling into his Western Australian position, Martin said it was time to pass the baton on to a new team member.

"I have seen a lot of changes and a lot of people come and go in the department, and now it's my turn to go," he said.

"One of the things that influenced me in going now is that I am determined to have some fun with the rest of my life.

"I watched my father manage six months of retirement before he died of his first and only heart attack and thought this is not going to happen to me, so time to take your leave while you are still young enough to enjoy the rest of your life."

The third generation engineer started his career in Zambia after completing a degree in his native England as a mining engineer.

After looking around at various types of engineering, Martin said mining engineering offered the best opportunity for travel and broadening horizons.

"My father thought I was seriously deranged that I wanted to go into the mining business and he could not understand why anybody would want to

go into dark holes in the ground, but I never regretted it," Martin said.

"My first job in Zambia as a very green, young engineer was on the Mufolira Mine.

"We had an accident there that killed 89 people and that made a powerful impression on me that has stayed with me my entire career.

"There was a major cave in and inundation by one of the large tails dams at the mine and the damage caused was devastating. It was, however, a good education in terms of what can go wrong.

"It was a very large and well run operation and was more or less like shelling peas until this problem occurred.

"I spent the first couple of years of my career working on the recovery operations from the accident, which included working as a shift boss and mining directly underneath the site of the major cave in that had caused all the problems. This clarifies the mind wonderfully."

After marrying and working for seven years to progress from a junior engineer to an underground manager with 700 staff, Martin decided to take up a job opportunity in Ireland.

"My wife didn't like Zambia as the Rhodesian War was going on and it was very rugged and violent in a lot of cases,

so we left there and went to live for a couple of years in west Ireland," Martin said.

"It was quite an eye-opener after Africa, and I realised why Ireland was 40 shades of green, as it used to rain about 300 days a year.

"I took up a position as the mine engineer with Tynagh Mine and one of the things I was involved in was doing the closure schedule for the mine, so I knew exactly how long it was going to last and got out in good time.

"Then in 1979, I landed a job in the Middle East as the mine manager on the Sohar Copper Project in the Sultanate of Oman.

"You couldn't get a more different environment from the lush green in Ireland we had been living in, to the rocky desert in the Persian Gulf."

After a couple of years in the Middle East and with their second child on the way, Martin and his wife decided to move back to England.

"Oman was a touch primitive in those days and it wasn't a great place to have a new baby, especially with the climate, which was pretty brutal in summer," he said.

"We went back to England for a few months and I thought I better get a job. After some calling around I was offered two opportunities, one in South Africa and one in Australia.



Martin Knee with Department of Mines and Petroleum Director General Richard Sellers.

"I didn't really want to go back to Africa as I had been there and done that, so I decided to head to Australia.

"After flying to Sydney for an interview, I landed a job as general manager of the Gunpowder Copper Mine in Queensland, which I found interesting as it was an underground in-situ leaching operation and very different to what I had been used to in the past.

"It was a short-term job as the mine closed down, so we left Queensland and headed to Leinster in Western Australia, where I started in the role as the chief engineer, and later the mine operations manager.

"After a few years in the job, I decided to try working in an open-cut mine and I got a job with Argyle Diamond Mine.

"My job with Argyle was a bit of a revelation and my first view of the surface mining job was why has a man been beating his brains out down dark holes in the ground all of this time when he could have been doing this?

"Some of the biggest differences were that you could see everything that was going on and if you wanted to speak to anyone you could just pick up the microphone and talk to them on the radio.

"You couldn't do that on underground mines in those days, although all of that has changed quite significantly now with underground communications being improved.

"Although I loved the job, it was fly-in fly-out and hard on the family so I looked around for another job where we could all be together. That's how I came to join the former Department of Mines in 1986."

Martin's first position in the public sector was as the senior inspector of mines in Karratha.

After seven years in the role, Martin took up an opportunity to move back to Perth as the senior inspector of mines for the Perth region, which in those days covered the area from south of Carnarvon to Albany.

Following Martin's promotion to the role as general manager of the mines inspectorate, he was then appointed the State Mining Engineer in 2001.

"I saw some very interesting things during my time in the role. I have enjoyed it although it has been hard from time to time and you still never get used to dealing with families of people who have been injured or killed on a mine site," Martin said.

"You never forget that there are actual people behind the statistics, that's the big lesson you have to learn as it's people's lives you are dealing with."

Martin said the one thing he will take away with him is the memory of the people he has met in both the industry and the public sector.

"I have worked with some really good people and I have learnt a lot from them both professionally and personally," he said.

"There are very high quality people working in the inspectorate and they are technically very competent.

"I guess one of the things that has surfaced in the resources industry is the way the inspectorate will operate going forward into the future. Major changes are on the way.

"It's something that I have been involved with and it has made me conscious that it's time to pass the baton on to someone a bit younger, more enthusiastic and more open to change.

"In any management role, you have to know your use-by date and after 23 years in the department, mine is up."

Martin said his wife was likely to set his immediate agenda after retirement.

"My wife has a long list of jobs she wants done around the house and on my first weekend in retirement I will no longer have any excuse not to do them," he said.

"Travel is not a high priority as we have done quite a bit of travelling already; however, if we want to go to Rio for the Carnival, we can now just get up and do it." ■



THE MEANING OF COMMITMENT

Roy Burton has been an integral part of the State's public service and mining sector for more than 40 years.

In today's era, it's a milestone that will rarely be matched – more than 40 years with the same organisation.

Former Director of Mineral Titles Roy Burton recently retired just shy of 45 years with the public service.

Roy started with the then Department of Mines as a 15-year-old clerk and over many years working in a variety of roles gained a unique, in-depth understanding of his profession.

His extensive knowledge of mineral titles and his calm demeanour led to him being described by some as the department's "Godfather figure" – cool under pressure and all knowing.

Roy was also in the privileged position of seeing firsthand how Western Australia's resources industry grew from the early 60s to the present day.

He was there to see the State's resources industry, which was previously gold based, diversify to include a variety of minerals.

It was this ever-changing industry, the heart of Western Australia's economy that Roy credited with keeping him in the industry for so long.

"The resources industry took over from agriculture and became the main productivity engine for the State," Roy said.

"Every which way you turned along the path there were the various minerals that had their day."

Nickel was one such mineral. Roy said the nickel boom of the late 60s led to a pegging rush reminiscent of the Wild West. At one stage pegging claims were even made at midnight.

One enterprising claimant, Roy recalled, even had the backing of an atomic clock to verify the exact time the peg was sunk, which also involved three men working in tight unison.

"You had people getting in helicopters and trying to peg in water during the wet season (in the Kimberley)," Roy said.

"That was the spark of the entrepreneurial aspect of the industry as we see it today.

"That was where the smaller exploration companies had their grassroots, in the nickel boom."

DMP Director General Richard Sellers said Roy had been an integral and valuable part of the department.

"Roy's colleagues have come to know him as a positive individual and a quiet achiever," he said.

"He is calm, unruffled and certainly knows how to take control of any situation.

"Roy's friendly nature, extensive experience and wealth of knowledge

have made him a highly respected and much valued member of the department."

Richard said Roy had been involved in some significant issues affecting the department and mining industry.

"Roy was involved in the introduction of the *Mining Act 1978* and for the past 25 years has played an instrumental role in the Mining Industry Liaison Committee," he said.

"His strong leadership and input has enabled the committee to approve some positive major outcomes for the mining sector."

Roy's most recent achievements included playing a key role in reducing the number of pending mineral tenements from its peak of 18,000 in 2007 to less than 9,000 today.

He also spearheaded the establishment of a regulatory framework for uranium – Western Australia's latest resource sector.

As for the future, Roy plans to keep working for the next three or four years and then do some well-earned travelling and relaxing.

All his friends at the Department of Mines and Petroleum and State Development wish him the very best. ■

NEW APPROACH TO SAFETY



Terry Siefken (left) and Jim Boucaut, senior mines inspectors based in Kalgoorlie.

Following a spate of mining fatalities and recent independent reviews, the Western Australian Government has committed to overhauling the way safety and health are regulated in the resources industry.

The new RADARS (Reform and Development at Resources Safety) strategy will be coordinated by the Department of Mines and Petroleum's Resources Safety Division—the State's specialist regulator for occupational safety and health of the mining, onshore petroleum and geothermal sectors, and the safe use of dangerous goods.

There are three main drivers for RADARS—legislation, capacity and competency.

Legislation

Resources Safety Executive Director Malcolm Russell said the current regulatory trend of more emphasis on risk management and less on detailed prescription would continue, with a focus on reducing the likelihood and consequences of serious incidents.

"The risk-based approach puts the onus on operators to demonstrate that they understand the hazards and risks of their particular workplaces, and have implemented control measures to eliminate or manage these risks," he said.

"We will look into creating a modern, uniform legislative base to reflect community expectations, and at adopting agreed national resource safety strategies and Council of Australian Governments reforms for occupational safety and health."

Mr Russell said changes to the mines safety and inspection legislation could be considered but would entail extensive consultation and detailed regulatory impact assessment, as required by the Department of Treasury and Finance.

"There is also a need for dedicated petroleum and geothermal safety legislation—separate from administrative arrangements relating to licensing and royalties," he said.

Capacity

Independent reports on safety regulation conducted over the years have identified the need for additional technical and support staff in specific areas at Resources Safety. In particular, the 2009 Kenner Report stated that the current number of mines inspectors per capita of workers was significantly lower than for comparable mining jurisdictions elsewhere in Australia.

"An increase in staff is not only needed to maintain a minimum program of enforcement work, such as inspections and audits, but also to support more proactive and transparent compliance measures aimed at reducing serious incidents," Mr Russell said.

"Case managers will be established across industry sectors and regulatory teams will need to have diverse skills and expertise.

"A dedicated team of experts will be formed to investigate serious incidents, even if no-one has been injured—this will lead to targeted safety initiatives aimed at eliminating the root causes of many accidents."

Under RADARS, enhanced data management and analysis systems will allow decisions about compliance and education work programs to be based on evidence and risk profiles. In addition, staff of the three inspectorates will be able to access compliance and other databases remotely, allowing better use of time and resources.

Resources will also be directed towards staffing regional mines inspectorate offices.

Competency

The State's resources industry has seen unprecedented growth, not only in the number of workers but also the size and complexity of operations and the diversity of commodities. The regulator requires a broad mix of staff with the technical, audit and communications

skills needed to oversee industry sectors adopting systems-based risk management models for safety.

"The risk management approach requires training of both the regulator and industry," Mr Russell said.

"Resources Safety has developed a recruitment and professional development strategy to take us into the realm of 'best practice', including a mechanism to formally recognise the attainment of key competencies and specialist skills at different stages of an inspector's career."

How will RADARS be funded?

The Government's decision to commit to a "best practice" safety regulator is linked to a cost recovery approach, phased in over several years for the three inspectorates, starting with mining.

On 26 November 2009, the Western Australian Parliament passed the *Mines Safety and Inspection Amendment Bill 2009*. The Bill enables regulations to be made to impose a levy payable to the State for the costs of administering the Act. The Bill also provides that the funds will be held in a special purpose account, administered by the Department of Treasury and Finance, to be used solely for administering the *Mines Safety and Inspection Act 1994*.

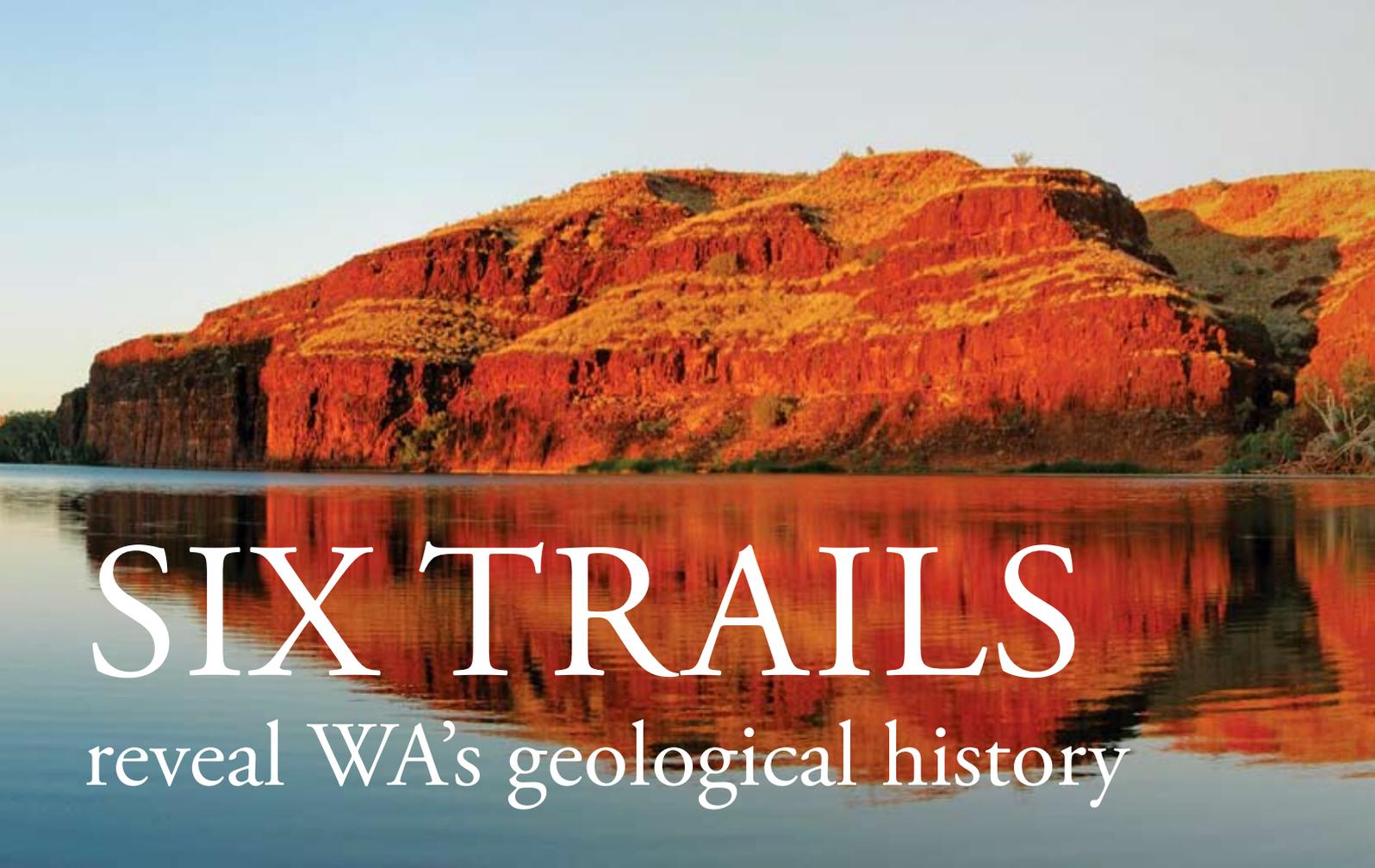
Regulations will be drafted to implement the mines safety levy scheme in early 2010. The scheme will be based on the calculation of the number of industry full time equivalent (FTE) workers on a mining operation. It is proposed that the levy will not apply to small operations with ten or less FTE workers.

Looking to the future

Mr Russell said that responsibility for safety performance was principally with those in industry creating and controlling the risks, and must be managed in consultation with those who are exposed to the risks.

"RADARS is about a proactive safety regulator working with industry to create work environments where a resilient safety culture is the norm, and companies, workers and the wider community are confident that industry is operating as safely as possible," he said.

"For industry, the ultimate outcome will be a reduction in the number and severity of incidents, and another step towards the goal of zero harm." ■



SIX TRAILS

reveal WA's geological history

View across Carawine Pool along one of the trails.

Tourists can now discover what Western Australia was like more than 3.5 billion years ago with the help of a new self-drive traveller's guide to the Pilbara region.

Discovery Trails to Early Earth, released in August, showcases some of the world's best preserved and oldest rocks along six discovery trails that centre on Marble Bar and cross the east Pilbara.

The trails uncover the locations of ancient volcanoes, the origin of the famed Marble Bar from which the town takes its name, and significant geological events that have shaped the Pilbara landscape.

The publication has been created by two geologists, Martin Van Kranendonk and Jean Johnston, from the Geological Survey of Western Australia (GSWA) of the Department of Mines and Petroleum (DMP).

Dr Van Kranendonk said the main aim of the book was to give visitors the opportunity to learn more about some of the most remote and interesting parts of the world and to help increase tourism to the area.

"This guide will help attract more visitors to the Pilbara region and

give them another reason to travel to Marble Bar," he said.

"Many people travel to Marble Bar because of its claim as the hottest town in Australia, and to see the bar itself, but there is little local interest to keep people there.

"The guidebook gives people something concrete to look at from a number of perspectives, and hopefully, will give people a better feel for this lovely and intriguing part of the world.

"It attempts to give some sense of the incredible length of time involved in the formation and evolution of the planet, as well as the changes in the geology that have shaped the places where we live today."

Dr Van Kranendonk has been with GSWA for the past 12 years, and moved from Canada to Australia in 1994 to study the geology of the Pilbara region.

Since arriving in Australia, he has been involved in unravelling the history of events and understanding the geological setting of early life in the region.

He said the idea for the publication arose during his many years of geological field mapping, which he undertook in and around Marble Bar for GSWA.

"I mapped some of the famous outcrops around Marble Bar in some detail, and spent several days on the bar itself," he said.

"People I met during this time, which included tourists and locals, asked me what I was doing on the rocks and asked what they meant.

"As I told them the story of how old the rocks were and how they were formed over immense periods of time, I could see in their eyes the wonder that I first felt when I came to Australia and learnt of the regions' geological history.

"The guide attempts to tell stories of these ancient rocks in the Pilbara region by giving the public a unique opportunity to drive on a series of discovery trails and learn more about their geological history."

Dr Van Kranendonk said the guide was easy to follow with stops along the trails close to the road and directions outlined for people with global positioning system (GPS) coordinates.

Discovery Trails to Early Earth is the second book GSWA has released for the general public, following *Geology and Landforms of the Perth Region*.



DMP Director General Richard Sellers said the publication highlighted the incredibly long historical development of Western Australia's geology.

"The description of each trail provides details on where to view specific landforms and rocks, an account of the geological process that formed the rocks, as well as the landscape surrounding the Pilbara region more broadly," Mr Sellers said.

"It also provides an introduction to the extensive geological field mapping and interpretation of the geological history and mineral potential that has been carried out by the department's Geological Survey team.

"The work of these authors and the rest of the Geological Survey provides us with in-depth knowledge of an important part of our State's geology, and encourages exploration investment by the world's resources industry."

Discovery Trails to Early Earth can be purchased for A\$25 from DMP's Information Centre by calling (08) 9222 3459, or online by visiting www.dmp.wa.gov.au/ebookshop ■



Author Dr Martin Van Kranendonk maps sedimentary rocks on the trail deposited 2700 million years ago.

COAL

Collie - Collie Coal Mine (Ewington I)

THE GRIFFIN COAL MINING COMPANY PTY LTD
Griffin Coal commenced mining its Ewington I coal deposit, approximately 2km east of Collie, in April 2009. The coal mine, which has estimated coal resources of 408Mt, will produce approximately 3.4Mtpa of coal for private sector customers and Griffin Energy's recently commissioned and nearby Bluewaters I power station. The Ewington I coal mine will be an extension of the currently operating Ewington II mine, and will also supply coal to the Bluewaters II power station which is currently under construction.

Expenditure: \$20m.

DIAMONDS

Kimberley - Argyle Diamond Mine

ARGYLE DIAMOND MINES PTY LTD

Development of the Argyle Diamond Mine commenced in 1982 and mining commenced in the main ore body (AK1) in 1985. The mine is operational and in order to extend the life of the mine to around 2024 the company has committed to an underground mine expansion. Commencement of underground operations occurred in Q4 2008 with the first blast of the undercut having been achieved. Due to current global market conditions Argyle Diamonds Limited has slowed down its underground development resulting in a workforce reduction. The company remains committed to the underground expansion and continuing as a local business with 40% Indigenous employment by the time the underground mine is in full production.

Expenditure: \$1.2b.

Employment: Construction: 250; Operation: 500

GOLD

Boddington - Gold Mine

NEWMONT BODDINGTON GOLD PTY LTD

BGM Management Company Pty Ltd, now on behalf of Newmont Boddington Pty Ltd (66.67%) and Saddleback Investments Pty Ltd (33.33%), has developed the Boddington Gold mine based on mining the extensive bedrock resource that underlies the mined-out oxide resource. Early in 2009, Newmont announced that it intended purchasing then joint venture partner, AngloGold Ashanti's 33% interest in the project and this was finalised in June 2009. The first gold pour was reported on 20 September 2009 and the company has also trucked its first shipment of copper concentrate to the port in Bunbury. Production will be around 800,000 oz/a of gold and about 30,000 t/a copper in concentrates over a 24 year mine life.

Expenditure: \$2b.

Employment: Construction: 1500; Operation: 650

IRON ORE

Pilbara - Atlas Iron Pardoo Hematite Direct Shipping Ore (DSO) Mine

ATLAS IRON LTD

Atlas Iron Ltd is an active explorer and developer, focused on iron ore projects within Western Australia. With a growing number of projects and a large landholding in the Pilbara (15,000km²) located close to existing infrastructure, the company is effectively defining resources and reserves capable of being mined with relatively low capital expenditure. Exports commenced in December 2008 starting with its Pardoo Project located some 75km east of Port Hedland. The company is scheduled to commence mining at the Wodgina DSO Project early in 2010 at the rate of 3Mtpa. The company has exploration programs underway across its tenement portfolio, with an exploration target of 160 to 220Mt grading 57-60% Fe. This will underpin an expanded long-term production business for continued iron ore exports.

Pilbara - Iron Ore Mine Rail and Port Development
FORTESCUE METALS GROUP LTD

FMG Chichester operates a 45Mtpa iron ore mine at Cloudbreak in the Chichester Ranges of the eastern Pilbara, serviced by a multi-user railway and port facilities at Port Hedland. FMG Chichester is investigating increasing its production to 120Mtpa from the Chichester Ranges and areas surrounding the Solomon deposits in the western Pilbara.

Employment: Operation: 1600

AGRICULTURE

Ord - Ord East Kimberley Expansion Project
GOVERNMENT OF WESTERN AUSTRALIA

The State Government has committed \$220 million to increase the existing amount of irrigated land in the Kununurra region by adding 8,000 hectares at Weaber Plains. This funding will provide the construction of irrigation channels, roads and off-farm infrastructure to service the future needs of the region's growing population and sustain economic growth. Construction will commence in early 2010.

Expenditure: \$415m.

BAUXITE

Worsley/Boddington - Alumina Refinery - E & G Project Expansion to 4.7Mtpa

BHP BILLITON WORSLEY ALUMINA PTY LTD

BHP Billiton announced in May 2008 the go-ahead for the A\$2.5 billion Efficiency and Growth Expansion Project at its Worsley alumina refinery. The expansion project will lift capacity of the refinery from 3.5Mtpa to 4.7Mtpa through expanded mining operations, additional refining capacity and upgraded port facilities. Construction has commenced and first production is expected in the first half of 2011.

Expenditure: \$2.5b.

Employment: Construction: 1500; Operation: 200

ELECTRICITY

Collie - Griffin Energy Pty Ltd - Bluewaters II, Coal - Fired Power Station

GRIFFIN ENERGY PTY LTD

Griffin Energy is constructing the second of possibly four 208MW coal-fired power stations at the Coolangatta industrial estate, near Collie. Commissioning of the Bluewaters II coal-fired base load power station is expected by late 2011.

Expenditure: \$400m.

Employment: Construction: 600; Operation: 50

Karratha 7 Mile - 7 Mile Power Station

HAMERSLEY IRON PTY LTD

Rio Tinto has proposed a power infrastructure rationalisation program and upgrade for its mining and port operations in the Pilbara region. Hamersley Iron Pty Limited is constructing a new power generating facility at 7 Mile near Karratha. Robe River Mining Company Pty Limited is constructing a 220 kV transmission line and a sub-station at Cape Lambert. The Cape Lambert sub-station will be linked to the 7 Mile main power generator via the new transmission line. Hamersley and Robe will share the generation capacity created by the new power station. This new single station will replace the two aging plants at Dampier and Cape Lambert. Construction of the power station commenced in late 2008 and is targeted for completion in 2010.

Expenditure: \$700m.

HEAVY MINERAL SANDS

Narngulu - Processing Facility Expansion

ILUKA RESOURCES LTD

Iluka is currently upgrading its Narngulu processing facility to treat ore from South Australia to supplement a diminishing supply from its Eneabba mining operations. Iluka will treat up to 600,000 t/a of heavy mineral concentrate from its Jacinth-Ambrosia deposit in SA at Narngulu starting in early 2010. Up to 350,000 t/a of zircon will be produced at the plant.

Expenditure: \$60m.

Employment: Construction: 100; Operation: 8

Tutunup South - Heavy Mineral Sands Mine
ILUKA RESOURCES LTD

Iluka plans to commence development of the Tutunup South mineral sands mine, located approximately 15 km south east of Busselton, in 2010. The project includes the construction of mine pits, screen plant, ore concentrator, solar drying dams, and associated mine infrastructure. The mine is expected to produce over 1.2Mt of heavy mineral concentrate over its five to six year life, which will be transported to Capel for further processing.

Expenditure: \$40m.

Employment: Construction: 150; Operation: 50

IRON ORE

Mid West Region - Koolanooka/Blue Hills Hematite Iron Ore Mine

SINOSTEEL MIDWEST CORPORATION LTD

Midwest Corporation commenced transporting iron ore fines from stockpiles at Koolanooka, about 160km south east of Geraldton, in January 2006 with the first exports shipped in February 2006. Sinosteel Midwest Corporation proposes to re-open the Koolanooka and Blue Hills hematite iron ore mines at a rate of 1-2Mtpa, with timing dependent on the timing of government approvals. The re-opening of the mines is currently awaiting environmental approval.

Expenditure: \$26m.

Employment: Construction: 40; Operation: 60

Pilbara - Rapid Growth Project 4

BHP BILLITON IRON ORE PTY LTD

BHP Billiton Iron Ore has obtained all relevant government approvals and is currently expanding the installed production capacity of its Western Australian Iron Ore operations to 155Mtpa for operation in 2010. The increased production will be achieved through infrastructure upgrades and the creation of a Newman hub. Commissioning activities are well advanced and first ore is currently expected to be produced in Q4 2009. The company is also undertaking a parallel expansion, Rapid Growth Project 5.

Expenditure: \$2.1b.

Employment: Construction: 3500

Pilbara - Rapid Growth Project 5

BHP BILLITON IRON ORE PTY LTD

BHP Billiton Iron Ore is currently in the final stages of obtaining all relevant government approvals for a further installed production capacity expansion of its Western Australian Iron Ore operations to 205Mtpa in 2011. Construction activities for the increased production, which involves mine expansions, railway dual tracking and additional berths at Port Hedland, have commenced. The company is in the study phases for future potential expansions.

Expenditure: \$5.3b.

Pilbara Brockman Syncline 4 - Brockman Syncline 4 Iron Ore Mine

HAMERSLEY IRON PTY LTD

In mid 2008 Hamersley Iron commenced construction of the mine for the Brockman Syncline 4 iron ore deposit, located approximately 60km north west of Tom Price. The planned full production capacity of the mine is 22Mtpa. Completion of construction is targeted for 2010.

Expenditure: \$2b.

Employment: Construction: 1500

Pilbara Mesa A - Mesa A/Warramboe Iron Ore

ROBE RIVER MINING CO PTY LTD

Robe River Iron Associates is constructing the Mesa A mine south of the Pannawonica turn-off, near the North West Coastal Highway. Production is planned to be approximately 20Mtpa. Construction commenced in January 2008 and is targeted for completion in early 2010.

Expenditure: \$1.2b.

IRON ORE PROCESSING

Pilbara - Cape Preston - Sino Iron Project CITIC PACIFIC

CITIC Pacific Mining, a Chinese company, has approval for the development of a magnetite iron ore mine and pellet plant with a capacity of 6Mtpa. Approval was granted in June 2009 for the production and export of 13.6Mtpa of iron ore concentrates. A bulk sample has been completed and construction has commenced on a concentrator, pellet plant, slurry pipeline, port facilities, 640MW power station and 44GL/a desalination plant to be built at Cape Preston, as well as accommodation facilities. The company plans to export the first high-grade pellets to China in 2010.
Expenditure: \$5.2b.
Employment: Construction: 4000; Operation: 500

LITHIUM

Mt Cattlin - Mount Cattlin Lithium Project, Ravensthorpe GALAXY RESOURCES LTD

Galaxy Resources Limited is developing a 1Mtpa lithium and tantalum (over a 15 year mine life) project at Mt Cattlin, north of Ravensthorpe. Galaxy plans to commence mine development and plant construction in Q4 2009 with first production of concentrates during Q4 2010. Lithium (Spodumene) and Tantalum concentrate is expected to be shipped through Esperance. Galaxy's initial fast track project schedule aims to meet the growing demand for lithium-ion batteries currently being fuelled by the rapidly expanding international hybrid and electric vehicle market. Scoping studies for processing of lithium carbonate in China were completed in October 2009.
Expenditure: \$75m.
Employment: Construction: 100; Operation: 75

OIL & GAS DEVELOPMENTS

Barrow Island (Carnarvon Offshore Basin) - Gorgon Gas Processing Project GORGON JOINT VENTURE

The Gorgon Joint Venture (GJV) made a final investment decision on the \$43 billion Gorgon Project on 14 September 2009. The GJV's foundation project on Barrow Island includes a three train LNG development capable of exporting 15Mtpa and a domestic gas project capable of delivering at least 300TJ/d of gas to the mainland. The development on Barrow Island also includes potentially the largest commercial geosequestration project in the world. The project obtained State and Commonwealth environmental approval in August 2009. The project is based on gas from both the offshore Gorgon and Jansz/lo gas fields. Preliminary construction is expected to commence by the end of 2009 with major construction commencing in early 2010.
Expenditure: \$43b.
Employment: Construction: 3500; Operation: 300

Carnarvon Basin - Pluto LNG WOODSIDE ENERGY

Woodside approved the Pluto LNG project in Q3 2007. Construction has commenced on Sites A and B on the Burrup Industrial Estate for export of LNG in Q4 2010.
Expenditure: \$12b.
Employment: Construction: 4200; Operation: 200

Carnarvon Offshore Basin - Pyrenees Oil Fields BHP BILLITON PETROLEUM (AUSTRALIA) PTY LTD

In July 2007, BHP Petroleum announced approval of the Pyrenees oil development, located 45km north of Exmouth. The development comprises the Crosby, Ravensworth and Stickle oil fields which have estimated recoverable oil reserves in the range of 80-120 million barrels. The project involves the development of 13 subsea wells connected via flowlines to a Floating Production Storage and Offloading (FPSO) vessel, which will be capable of producing about 96,000bb/d of oil. First production is expected during the first half of 2010.
Expenditure: \$2b.

Carnarvon Offshore Basin - Van Gogh Oil Field APACHE ENERGY LTD

The Van Gogh oil development, located around 50km northwest of Exmouth, will utilise a Floating Production Storage and Offloading (FPSO) vessel (the Ningaloo Vision) with a processing capacity of 63,000bb/d of oil and storage capacity of 540,000 barrels. It will be linked to two subsea drill centres with 10 production wells. Development drilling and sub-sea production equipment installation is completed, awaiting the arrival in the field of the FPSO, with first oil production expected late 2009. Additional exploration drilling is currently underway north of the field.
Expenditure: \$600m.
Employment: Operation: 80

North Rankin (Carnarvon Offshore Basin) - North Rankin Redevelopment WOODSIDE ENERGY LTD

In March 2008 the North West Shelf Venture participants approved funding of the \$5 billion North Rankin Redevelopment Project which will recover remaining low pressure gas from the North Rankin and Perseus gas fields, and extend the field life to around 2040. The project involves the installation of a new second platform - North Rankin B - with gas compression facilities, low pressure separators, utilities and accommodation. North Rankin B will be connected by a 100 metre bridge to the existing North Rankin A platform and on completion both platforms will be operated as a single integrated facility known as the North Rankin hub. The North Rankin Redevelopment Project also includes the necessary connections to North Rankin A and some refurbishment of the North Rankin A platform. North Rankin B is scheduled for start-up in 2013 and will support the North West Shelf Venture's onshore gas requirements to supply future customer commitments.
Expenditure: \$5b.

Pilbara - Devil Creek Development Project APACHE ENERGY LTD

Apache Northwest and Santos Offshore have commenced construction works for the Devil Creek Development Project (DCDP), a greenfield gas project comprised of an unmanned offshore gas production platform over the Reindeer gas field located about 80km northwest of Dampier; offshore and onshore gas pipelines; an onshore gas processing plant; and a sales gas export pipeline connected to the Dampier to Bunbury Natural Gas Pipeline (DBNGP). The development site is located near Devil Creek, 65km southwest of Karratha where the construction workforce will be accommodated within a purpose built facility. The DCDP is designed to provide up to 200TJ/d of dry natural gas and between 80kl to 160kL/d of gas condensate. All gas from the DCDP will service the domestic gas market in Western Australia, with first gas delivered into the DBNGP Q3 2011.
Expenditure: \$800m.
Employment: Construction: 200; Operation: 20

Wanaea/Cossack (Carnarvon Offshore Basin) - Oil and Gas Fields WOODSIDE ENERGY

The Cossack Wanaea Lambert Hermes (CWLH) fields, 135km northwest of Karratha, have produced 395 million barrels of oil since production began in 1995. The redevelopment work includes the purchase and conversion of the Okha floating storage and offloading facility into a floating production storage and offloading facility to replace the Cossack Pioneer in 2010, as well as the replacement of associated subsea infrastructure. At a total investment of about \$1.8 billion, the CWLH Redevelopment Project will support ongoing safe and reliable production from the CWLH fields beyond 2020.
Expenditure: \$1.8b.

RARE EARTHS

Mt Weld - Rare Earths Mine LYNAS CORPORATION LTD

The Mt Weld deposit, located about 35km south of Laverton, contains an estimated resource of 12.2Mt at 9.7% grade for 1.18Mt rare earth oxides (REO). The development involves an open pit mine and concentrator at Mt Weld. The concentrate will be containerised on site then trucked to a container port for export. The ore will be shipped to a \$300 million processing plant in Malaysia, which will have an initial production capacity of 11,000 t/a REO and then expanding to 22,000 t/a. Lynas has raised \$450 million in equity to enable suspension of the project to be lifted. It is now finalising plans for remobilisation to site and recommencement of project works. United Group Limited has been engaged as engineering contractor.
Expenditure: \$135m.
Employment: Construction: 200; Operation: 90

SILICON METAL

Kemerton - Silicon Metal Plant Expansion SIMCOA OPERATIONS PTY LTD

Simcoa announced in mid October 2009 its decision to expand the company's 32,000t/a capacity silicon metal plant at Kemerton. The first stage expansion involving installation of a third furnace will increase the plant capacity to 48,000t/a and commissioning is scheduled for Q3 2011. Providing world demand for silicon continues to increase strongly, a second stage expansion involving installation of a fourth furnace could take place by late 2013 and increase plant capacity to 64,000t/a.
Expenditure: \$100m.
Employment: Construction: 200; Operation: 40

TITANIUM DIOXIDE PIGMENT

Kwinana - Titanium Dioxide Pigment Plant Expansion TIWEST JOINT VENTURE

The Tiwest Joint Venture partners, Tronox Incorporated subsidiary, Tronox Western Australia Pty Ltd, and Exaro Resources Limited subsidiary, Yalgoo Minerals Pty Ltd approved an expansion at their titanium dioxide pigment plant in Kwinana which will see production capacity increase from 110,000t/a to around 150,000t/a. Construction is well underway, with the additional capacity expected to come online in early 2010.
Expenditure: \$100m.
Employment: Construction: 150; Operation: 12

AMMONIA/UREA

Shotts Industrial Park - Collie Shotts - Coal to Urea PERDAMAN CHEMICALS AND FERTILISERS PTY LTD

Perdaman Chemicals and Fertilisers Pty Ltd is developing a coal to urea plant at the new (to be developed) Shotts Industrial Park, near Collie. The plant will use proven "best in class" coal gasification and fertiliser production technologies. Around 2.7Mtpa of coal will be used to produce approximately 2Mtpa of urea, primarily for export to India. Up to 100,000 tonnes of urea could be made available for local use, which would represent up to 20% of Western Australia's needs. The urea will be transported to Bunbury Port by rail. The company has commenced environmental approval processes and has government approval to obtain land in the Shotts Industrial Park. Supply and off take arrangements are agreed and will be finalised by early 2010. Construction is expected to commence in Q2-3 2010 with the first shipment of urea planned for Q3 2013.
Expenditure: \$3.7b.
Employment: Construction: 1500; Operation: 200

AMMONIUM NITRATE

Burrup Industrial Estate Site D - Burrup Nitrates ammonium nitrate plant

BURRUP NITRATES PTY LTD

Burrup Nitrates Pty Ltd (BNPL), a joint venture between Burrup Holdings Ltd (BHL) of Australia and Yara International ASA of Norway, is conducting a feasibility study into the construction of a circa 350,000t/a Technical Ammonium Nitrate (TAN) plant to be located on the Burrup Peninsula. Ammonia feedstock will be supplied from BHL's subsidiary company Burrup Fertilisers Pty Ltd, which operates its facility directly adjacent to the proposed location for the new TAN plant. It is expected that all manufactured product will be sold into the Pilbara region. Regulatory approval has been requested and is expected to be granted by Q2 2010 with construction commencing after that. The plant is expected to take approximately 30 months to construct and commission.

Expenditure: \$600m.

Employment: Construction: 600; Operation: 65

ELECTRICITY

Collie - Griffin Energy Pty Ltd - Bluewaters III and IV, Coal Fired Power Stations

GRIFFIN ENERGY PTY LTD

Griffin Energy Pty Ltd is planning to expand the Bluewaters Power Station Project with two additional 208MW coal-fired power stations at the Coolongatta Industrial Estate, near Collie. Commissioning of the Bluewaters III base-load power station is expected by late 2013 and commissioning of Bluewaters IV by late 2015.

Expenditure: \$800m.

Employment: Construction: 600; Operation: 50

Meridian Park, Neerabup - Perth - Bioenergy

SPIRITWEST BIOENERGY PTY LTD

SpiritWest is developing a 30MW base load power station at Neerabup, 33km north of Perth. The power station will use timber waste from pine plantations nearby, and other wood residues. Environmental approval was received in 2006, and a final investment decision is expected in 2009 with construction expected to commence in 2010. Commercial operation is scheduled for 2012.

Expenditure: \$115m.

Employment: Construction: 110; Operation: 50

Mid West Region - Centauri 1 Power Project

ENEABBA GAS LTD

Eneabba Gas Limited via its wholly-owned subsidiary Eneabba Energy Pty Ltd (EEPL) is planning to develop a 168MW Centauri 1 gas-fired turbine power station 8km east of Dongara. Generation capacity can be increased to 365MW. The project will be capable of supplying power into the South West Interconnected System network but will be focused on supplying additional volumes of energy for the developing Mid West iron ore industries. As soon as take or pay contracts for Mid West iron ore customers are confirmed, construction can commence on site immediately and the plant can be operational in approximately 14 months. Besides sourcing gas from the Dampier to Bunbury Natural Gas Pipeline, the company is working to develop an underground coal gasification gas supply for the facility.

Expenditure: \$200m.

Employment: Construction: 100; Operation: 4

GOLD

Kalgoorlie (330kms North East) - Tropicana Gold Project

ANGLOGOLD ASHANTI/INDEPENDENCE GROUP JOINT VENTURE

AngloGold Ashanti, as Joint Venture Manager, has undertaken an intensive exploration and resource development program approximately 330kms north east of Kalgoorlie. Plans for the project are to develop an open-cut gold mine and nearby processing plant. So far, a resource estimate of

5 million oz of gold has been identified with a mine life of at least 10 years. The feasibility study is planned to be completed in mid 2010. Commissioning is expected to be around the first quarter in 2013 with production of up to 410,000oz/a. Expenditure: \$500m.

Employment: Construction: 700; Operation: 600

HEAVY MINERAL SANDS

Happy Valley - Heavy Mineral Sands Mine

BEMAX CABLE SANDS (WA) PTY LTD

Located adjacent to the Bemax Gwindinup deposits, the project will involve the mining of the Happy Valley North and South mineral sands deposits situated on private land and in State Forest. The two deposits contain over 750,000 tonnes of recoverable heavy mineral concentrate, with average production expected to be around 150,000t/a over a combined mine life of eight years. The Environmental Review and Management Program document was released for public review and closed in November 2009.

Subject to obtaining all relevant approvals, Bemax expects to commence mining of the North deposit in early to mid 2011 and then plan to transfer mining to the South deposit in 2013. The concentrate will be trucked to Bemax's Bunbury Mineral Separation Plant for final processing.

Expenditure: \$35m.

Employment: Construction: 100; Operation: 30

Jangardup South - Heavy Mineral Sands Mine

BEMAX CABLE SANDS (WA) PTY LTD

The Jangardup South minerals deposit is situated 54km south of the Nannup township and adjacent to the D'Entrecasteaux National Park. Cable Sands estimates that the deposit would provide 2Mt of minerals. Feasibility and environmental studies are well advanced. An environmental impact statement for the project is being prepared.

Expenditure: \$60m.

Employment: Construction: 100; Operation: 50

Keysbrook - Heavy Mineral Sands Mine

MATILDA ZIRCON LIMITED

Matilda Zircon proposes to develop a mineral sands mine located near the township of Keysbrook, approximately 70km south of Perth. It has ore reserves of 41Mt, containing 1.2Mt of heavy mineral concentrate. The project is expected to produce 40,000 t/a of leucoxene and 47,000 t/a of ilmenite, high titanium ilmenite and zircon over its eight year mine life. Keysbrook received environmental approval in October 2009. Matilda is now progressing shire development approvals and extractive industry licenses, with the aim of commencing mining in the second half of 2010.

Expenditure: \$18m.

Employment: Construction: 35; Operation: 30

Shark Bay - Coburn Zircon Project

GUNSON RESOURCES LTD

Gunson proposes to develop the Coburn mineral sands project, located south of Shark Bay, which contains total ore reserves of 306Mt at an average grade of 1.2% heavy minerals. All of these reserves lie within the portion of the project area that has received government environmental approvals for mining. At the proposed mining rate of 17.5Mtpa, the Coburn mine life is estimated to be 17.5 years. The Design Definition Study conducted by Sedgman Metals is almost complete and will allow finalisation of the Definitive Feasibility Study and a decision regarding mine development prior to the end of 2009. Discussions with potential investors and offtake partners in China and the Middle East are continuing.

Expenditure: \$100m.

Employment: Construction: 170; Operation: 110

INFRASTRUCTURE

James Price Point - Kimberley Browse LNG Precinct Project

GOVERNMENT OF WESTERN AUSTRALIA

The WA Government is developing a Liquid Natural Gas (LNG) precinct in the Kimberley to enable processing of natural gas from the offshore Browse Basin. The precinct will be capable of accommodating LNG processing and shipping facilities for multiple proponents currently exploring for, and developing, these resources. This approach will minimise the environmental footprint of gas processing in the region while maximising opportunities for local people and businesses to participate in, and benefit from, employment and business opportunities. The final investment decision for the precinct is expected to be made in Q4 2010.

Expenditure: \$20b.

Employment: Construction: 3500; Operation: 360

Oakajee - Oakajee Industrial Estate & Port Project

GOVERNMENT OF WESTERN AUSTRALIA

The Oakajee Port will include common user infrastructure (channel, breakwater, turning basin, navigational aids, provision for tug and pilot boat pens, port administration offices, and roads and utilities); and private use infrastructure (at least one Cape Class iron ore berth, as well as associated materials handling equipment and rail infrastructure). The Port will also include provision for a Panamax berth to provide import/export capability for value-adding industries in the Oakajee Industrial Estate. The 500km railway will link the port to mining tenements north-east of Geraldton. The new rail line will be operated on an open access regime.

Expenditure: \$4b.

Employment: Construction: 2000; Operation: 400

IRON ORE

Cape Lambert - Cape Lambert Iron Ore Project

MCC MINING (WESTERN AUSTRALIA) PTY LTD

MCC Australia Holding Pty Ltd is developing a 15Mtpa iron ore (magnetite) concentrate project at Cape Lambert and aims to ship its first ore by 2013-15. The project comprises a proven 1.56bt iron ore resource, covering 369sq.km. The project would consist of a beneficiation plant (A\$1b), 300MW power plant, a port for exporting concentrate (A\$1b) and other related infrastructure. A feasibility study and public consultation process are currently being conducted by consultancy company GHD and GRD Minproc on behalf of MCC.

Expenditure: \$3.7b.

Employment: Construction: 3000; Operation: 1000

Great Southern Region - Southdown Magnetite Mine

GRANGE RESOURCES LTD

The Southdown Magnetite Mine is situated 90km north east of Albany near Wellstead. Grange Resources Ltd is targeting a 2013 start up with a production of 6.6 Mtpa of magnetite concentrate. The concentrate will be transported via a 100km slurry pipeline from Southdown to the Port of Albany for export and pelletising in Malaysia. The recent merger with Australian Bulk Minerals brings significant magnetite mining and pelletising experience to the Southdown project.

Expenditure: \$1.6b.

Employment: Construction: 2000; Operation: 600

Mid West Region - Extension Hill Magnetite Mine

ASIA IRON

Asia Iron has primary environmental approval to produce up to 10Mtpa of magnetite concentrate, which will be transported by slurry pipeline to the port of Geraldton for export. The company is currently seeking secondary approvals.

Expenditure: \$715m.

Employment: Construction: 1000; Operation: 350

Projects Under Consideration

Mid West Region - Jack Hills Hematite Mine Stage 2

CROSSLANDS RESOURCES

Murchison Metals commenced trucking 1.5Mtpa hematite from its Jack Hills operations to the port of Geraldton in December 2006. Jack Hills Stage 2 would involve a further increase to 15-25Mtpa of hematite and beneficiation feed ore. The ore would be transported by a new railway to a new deepwater port at Oakajee. A definitive feasibility study and exploration drilling program on the Stage 2 project is progressing.

Expenditure: \$750m.

Employment: Construction: 450; Operation: 350

Mid West Region - Karara Iron Ore Project KARARA MINING LTD (GINDALBIE METALS LTD/ ANSTEEL JOINT VENTURE)

The Karara Iron Ore Project is Karara Mining Limited's cornerstone production project in the Mid West region. Karara will deliver some 10Mtpa of iron products, comprising 8Mtpa of high grade magnetite concentrate and blast furnace quality pellets before the end of 2011 and 2Mtpa of Direct Shipping Ore hematite before the end of 2011. The project is underpinned by a world-class JORC-Code compliant resource base comprising a 522Mt magnetite reserve, a 1.853Bt magnetite resource, a 10.9Mt hematite reserve and a 16.2Mt hematite resource. The project is currently awaiting final development approval.

Expenditure: \$1.8b.

Employment: Construction: 1500; Operation: 500

Mid West Region - Weld Range Iron Ore Mine SINOSTEEL MIDWEST CORPORATION LTD

Sinosteel Midwest Corporation proposes to develop a 15Mtpa iron ore mine at Weld Range 65km southwest of Meekatharra, producing a mix of hematite lump and fines. The project is expected to utilise a new rail line and a new deep water port facility at Oakajee. The company commenced an extensive drilling program in June 2006 and has completed a pre-feasibility study. A bankable feasibility study is expected in Q1 2010.

Expenditure: \$800m.

Employment: Construction: 1000; Operation: 500

Pilbara - Balla Balla AUROX RESOURCES LTD

Aurox Resources Limited is a Perth-based metals developer with its primary asset the 100% owned Balla Balla iron ore concentrate project. The project is located west of Port Hedland, in the Pilbara region of Western Australia. Aurox is well advanced in the development of Balla Balla with detailed engineering nearly complete and all long lead items, such as crusher and mills, secured. The company has in place two 15 year sales contracts for a total of 6Mtpa increasing to 10Mtpa concentrate production in year five with major Chinese steel companies. Balla Balla is based on a large homogenous magnetite ore body, which will be developed as one of the lowest cost magnetite operations in Australia. The project also has significant vanadium, titanium and phosphate potential, and is located near major ports, gas and grid power with main highway access. The Balla Balla Feasibility Study demonstrates strong project economics with magnetite iron ore shipments to China scheduled to commence in 2011.

Pilbara - Iron Ore Mine - Roy Hill and Central Pilbara

HANCOCK PROSPECTING PTY LTD

Hancock Prospecting is developing the world class iron ore project of Roy Hill that is located 105km north east of Newman. This project is expected to come into production in 2013 and will produce iron ore for over 20 years after ramp up at 55Mtpa. The project includes the development of mines, a new railway and port facilities at Port Hedland. The Roy Hill Stage 1 Public Environmental Review document was released by the EPA for public comment. Roy Hill project was granted Major Project Facilitation status.

Pilbara - West Pilbara Iron Ore Project API MANAGEMENT PTY LTD

The Australian Premium Iron Joint Venture is proposing to develop the West Pilbara Iron Ore Project. Stage 1 of the project is based on the production of 30Mtpa of direct shipping iron ore from its Red Hill and Mt Stuart mine sites located 30-85km south west of Pannawonica. The ore will be exported via a new heavy haul railway to a new port facility at Mount Anketell. Subject to the successful completion of feasibility and environmental studies, and receipt of government regulatory approvals, the company anticipates that the first shipment will occur in mid 2013.

Expenditure: \$4b.

Employment: Construction: 2000; Operation: 700

Pilbara - Cape Preston - Balmoral South Iron Ore Project AUSTRALASIAN RESOURCES LTD

Australasian Resources Ltd, through its 100% owned subsidiary International Minerals Pty Ltd (IM), is developing a 24Mtpa magnetite iron ore mine with associated infrastructure and processing facilities to produce iron ore concentrate and pellets for export using shared port facilities at Cape Preston. IM has a right to mine 1bt of magnetite ore from the Mineralogy Pty Ltd owned South Balmoral magnetite iron ore deposit, located approximately 30km south of Cape Preston. A bankable feasibility study for the project was completed by IM in 2008. The company expects to commission the project in 2011, with first shipment in 2012.

Expenditure: \$2.7b.

Employment: Construction: 2500; Operation: 800

MOLYBDENUM

Pilbara - Spinifex Ridge Mo/Cu mine MOLY MINES LTD

The Spinifex Ridge Project is located 50km northeast of Marble Bar in the Pilbara region of Western Australia. It is based on a resource of 469Mt at 0.06% molybdenum and 0.09% copper. Moly Mines has completed a definitive feasibility study which has forecast 240Mlbs of molybdenum concentrate and 270Mlbs of copper concentrate will be produced in the first 10 years of the operation. The project's processing plant design capacity is at 20Mtpa. The project is undergoing environmental assessment.

Expenditure: \$1.084b.

Employment: Construction: 400; Operation: 375

OIL & GAS DEVELOPMENTS

Kimberley - Browse LNG Development WOODSIDE ENERGY LTD

Woodside Energy Ltd, as operator of the Browse LNG Development, is proposing to develop the Torosa, Brecknock and Calliance gas fields located approximately 400km from Broome, in the Browse Basin. Together, the fields contain an estimated 14Tcf of gas and 370 million barrels of condensate. Phase 1 of the development is for a 15t/a LNG project. Woodside is currently evaluating the development options for its Browse Basin gas assets, and is aiming for LNG sales within a market window of 2016 to 2017.

Macedon (Carnarvon Offshore Basin) - Gas Field BHP BILLITON PETROLEUM (AUSTRALIA) PTY LTD

The Macedon gas field, about 90km west of Onslow, was discovered in 1992 during drilling of the West Muiron-3 well and is estimated to contain a gas resource of up to 600bcf. BHP Billiton Petroleum Pty Ltd and Apache Energy Limited are currently progressing the necessary approvals for a domestic gas project for Western Australia. The development will involve a number of sub-sea gas wells connected to the gas field, offshore and onshore pipelines, an onshore gas processing plant 15km southwest of Onslow, and a sales gas pipeline connected to the Dampier-to-Bunbury Natural Gas Pipeline. Daily production is expected to be in the

order of 200TJ. Construction is expected to start in mid 2010, and gas production to commence in late 2012.

Expenditure: \$1b.

Employment: Construction: 300

Pilbara - Wheatstone LNG Development CHEVRON AUSTRALIA PTY LTD

Chevron is investigating the feasibility of an LNG project based on its Wheatstone and Iago gas fields, to be located at Ashburton North, near Onslow. The project is also intended to provide gas processing services to facilitate the development of small sub-economic fields in the Carnarvon Basin and an agreement with Apache Julimar Pty Ltd to process gas from the Brunello and Julimar fields was made in October 2009. Chevron entered FEED (Front End Engineering Design) in July 2009 with a Final Investment Decision planned for early 2011. Gas to market is scheduled for 2015. The project is to have an initial capacity of two 4.3Mtpa LNG production trains and a 200TJ/d domestic gas plant.

Expenditure: \$3b.

Employment: Construction: 3000; Operation: 300

SALT

Exmouth Gulf - Yannarie Solar Salt Project STRAITS RESOURCES LTD

Straits Salt is proposing to develop Yannarie Solar Salt, a 4Mtpa salt operation in the east coast of Exmouth Gulf. It has exploration licences over the area and has applied for a mining lease. The proposal was assessed at the Environmental Review and Management Program level by the Environmental Protection Authority (EPA). The Office of the Appeals Convenor has recommended that the matter be referred back to the EPA for further assessment.

Expenditure: \$200m.

Employment: Construction: 100; Operation: 75

TIMBER

Mirambeena Timber Processing Precinct - Engineered Strand Lumber LIGNOR LTD

Lignor Ltd is proposing the development of an Engineered Strand Lumber (ESL) Engineered Strand Board (ESB) plant located at Mirambeena, near Albany. The plant will source most of its timber from the extensive eucalypt plantations growing in the Albany region and will use technology developed by the German engineering company, Siempelkamp or Dieffenbacher. The company is finalising its feasibility study and anticipates still further processing improvements tailored to the specific needs of certain end-user(s).

Expenditure: \$350m.

Employment: Construction: 400; Operation: 125

URANIUM

Yeelirrie - Yeelirrie Uranium Project BHP BILLITON YEELIRRIE DEVELOPMENT COMPANY PTY LTD

BHP Billiton proposes to develop the Yeelirrie Uranium Project in the North-eastern Goldfields. The proposal entails open cut mining of shallow deposits of uranium ore, treatment in a plant to be established at the site, and development of associated infrastructure. The project would produce up to 3000t/a uranium oxide over 30 years. The formal environmental impact assessment process was initiated in 2009 with a view to commencement of construction in late 2011 and mining in 2014. Employment: Construction: 700; Operation: 300

Major Resource Projects — December 2009



Project labels:

PROJECTS OPERATING OR CURRENTLY UNDER DEVELOPMENT WITH AN ACTUAL OR ANTICIPATED VALUE OF PRODUCTION GREATER THAN \$A10 MILLION ARE SHOWN IN BLUE
 PROPOSED OR POTENTIAL PROJECTS WITH A CAPITAL EXPENDITURE GREATER THAN \$A20 MILLION ARE SHOWN IN RED
 PROJECTS ON CARE AND MAINTENANCE ARE SHOWN IN PURPLE

