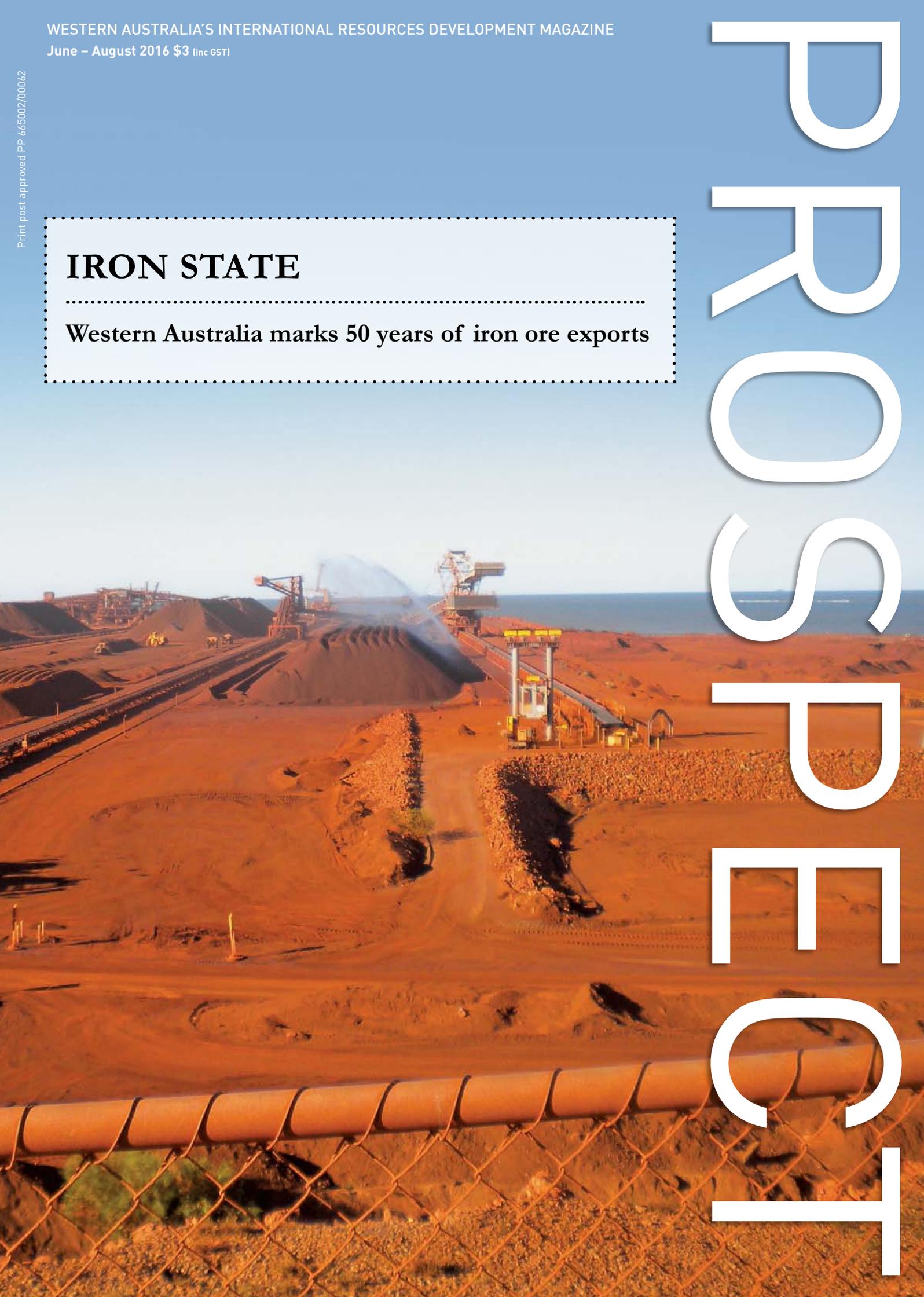


IRON STATE

Western Australia marks 50 years of iron ore exports

PROSPERITY





This edition of *Prospect* marks a significant milestone in Western Australia's resources sector – 50 years of iron ore exports from the State.

Three first shipments of iron ore exports commenced in 1966, with a start-up tonnage of 2.2 million tonnes per annum (story page 2).

Our industry has grown over the past 50 years to a total of 9 billion tonnes of iron ore exports and Western Australia is now the world's largest iron ore exporter.

Western Australian company Roy Hill shipped its first ore in December and the company is continuing to ramp up production this year (story page 7).

Iron ore has played a hugely significant role in the growth and development of WA and the State Government will continue to work together with industry and the Western Australian community to ensure another 50 years for WA as a major global player.

This edition of *Prospect* sees a change in ministerial responsibilities for the State Development and Mines and Petroleum portfolios (stories page 8 and 10) and renewed focus on the growth of other key export markets for the State, including agribusiness (story page 12).

As history has shown, Western Australia has a dynamic and innovative resources sector with world-class commodities coupled with experience and expertise to propel future growth.

Bill Marmion
MINISTER FOR STATE DEVELOPMENT

Sean L'Estrange
MINISTER FOR MINES AND PETROLEUM

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Cover photo: Rio Tinto Cape Lambert iron ore stockpile area with stacker reclaimer equipment and using water for dust suppression. Photo: Department of State Development (story page 2).

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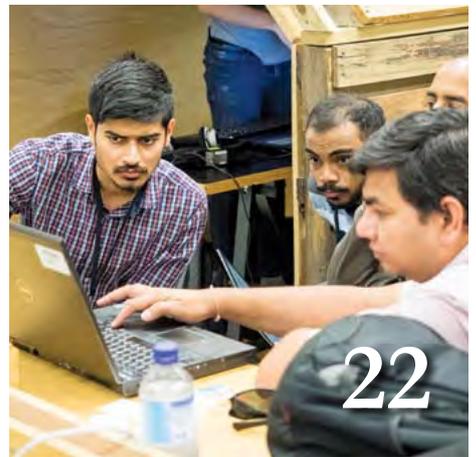
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FIFTY YEARS OF



Reclaimer equipment used to load stockpiles of iron ore at Rio Tinto's Cape Lambert project. Photo: DSD

THIS YEAR SEES WESTERN AUSTRALIA REACH 50 YEARS OF IRON ORE EXPORTS – A MOMENTOUS MILESTONE FOR OUR EXPORT-BASED STATE WITH A HISTORY AND IDENTITY INTRINSICALLY LINKED TO THIS VALUABLE RESOURCE. PROSPECT REFLECTS ON THE INDUSTRY OVER THE PAST HALF CENTURY.

Nine billion tonnes and still expanding

Iron ore exports from Western Australia commenced in 1966 with first shipments recorded from Koolanooka (March), Mount Goldsworthy (June) and Mount Tom Price (August).

An export iron ore industry from the State began to crystallise as a result of the redevelopment of the Japanese steel industry and the two industries have been closely interdependent over many years.

Four companies, or joint venture groups, established with the State Government the framework for the long term future of a major industry in the Pilbara region – Mount Goldsworthy Mining Associates (MGMA), Mount Newman Mining Joint Venture (MNJV), Hamersley Iron and Robe River Iron Associates. Through the mutually beneficial instrument of State Agreements, the State Government formulated and facilitated the form in which the industry and region developed.

These four groups have persisted through to the current time, but have been incorporated under the management and majority ownership of the two major company groups of BHP Billiton Iron Ore and Rio Tinto Iron Ore. Out of a total 9 billion tonnes of exports over the 50 years to March 2016, the four groups have contributed nearly 8 billion tonnes and were responsible for the initial development of the ports, towns, power and much of the overall social and industrial infrastructure of the State's Pilbara region.

Lifting of the iron ore export embargo

In April 1938, the Commonwealth Government placed a ban on the export of iron ore from Australia. Ostensibly this was because of the shortage of defined resources to support the long-term future of a domestic steel industry in Australia.

The scarcity argument persisted well into the 1950s. Neither the State's Geological Survey or the Commonwealth's Bureau of

Mineral Resources had identified significant increases, with one important exception relevant to the export history, the Ellarine Hills (Mount Goldsworthy) deposit initially evaluated by the Geological Survey.

In November 1960, a partial lifting of the embargo was given for small deposits for exports up to 1 million tonnes per annum (Mtpa) and for total export sales of no more than half of the total defined deposit size.

The State called for tenders for the export of iron ore from Mount Goldsworthy. On 15 May 1961, after reserving areas for future Ministerial allocation, the State Government allocated rights to 164 temporary reserves.

The State proceeded with the tender process for Mount Goldsworthy and a State Agreement, negotiated with the joint venture, set the terms on which an export industry would be developed. The joint venture later became known as Mount Goldsworthy Mining Associates (MGMA), operated by Goldsworthy Mining Ltd (GML).

WA IRON ORE EXPORTS

50 YEARS

In 1961, Lang Hancock persuaded Rio Tinto to inspect his Hamersley Range findings, which introduced the State's second players in the export industry. In 1963, the Iron Ore (Hamersley Range) Agreement was entered into for the development of Mount Tom Price.

Stan Hilditch had identified the Mount Whaleback deposit (at Newman) in 1957 and, together with backer Charles Warman, was later granted rights to iron ore over the Ophthalmia Ranges. In 1963 AMAX became involved and created subsidiary Mount Newman Iron Ore Sales. CSR took equity in 1964 and the MNJV was formed.

The Robe River titles were acquired by Cleveland Cliffs in 1962 and a State Agreement was entered into in 1964 with Cliffs' subsidiary Basic Materials Pty Ltd for development of the Middle Robe River mesas.

Establishment of an export industry

The following years of exploration, development of project concepts and feasibility studies of these four joint ventures led to the establishment of a long-term export based iron ore industry in the Pilbara.

The joint ventures had firmly established the need not only to develop the iron ore project, but also to develop greenfields sites with competitive deepwater shipping facilities, railways and the extensive social infrastructure required to support the workforce and general project needs.

Commitments by the State through State Agreements, and by consumers through long-term contracts, eventually convinced overseas companies and their lending institutions to invest in the untried and untested region of Western Australia.

There were various changes in ownership and project definition as operations were developed and grew in scale. Japanese mills and trading houses became parties to some of the changes in ownership, as well as parties to the supply contracts.

Ports at Dampier, Cape Lambert and two in Port Hedland rapidly expanded to eventually accept Cape-size vessels to compete in a growing seaborne market.

In the early 1960s, the State entered into the Talling Peak Agreement with Western Mining Corporation, allowing the first export development State's from the Koolanooka deposit through Geraldton port. The project was operated under joint venture between Western Mining, Hanna Mining and Homestake. The first shipment sailed on 16 March 1966 based on a more modest development, compared to other projects, of a 5.1Mt contract with six Japanese mills over eight years at 500 to 700,000 tpa.

From the start up combined tonnage in 1966 of 2.2Mt, export levels had achieved over 50Mtpa by 1972 and peaked at nearly 86Mt of exports in 1974. This supported the growth in Japanese steel industry demand, as well as supply into Europe. Between 1966 and 1973 the Japanese steel output had grown from 48Mtpa to 119Mtpa.

GML in 1972 and Hamersley Iron in 1973 made their first shipments to China, but it was 25 years later that the focus of the producers moved from a Japanese-dominated market towards China.

A period of consolidation – the hard times

Through the 1970s and 1980s there was a global economic slowdown which resulted in most iron ore producers operating below capacity. Exports stagnated in the 70-80Mtpa range. In 1983 the billionth tonne of iron ore was exported from the State, 18 years after commencement of exports.

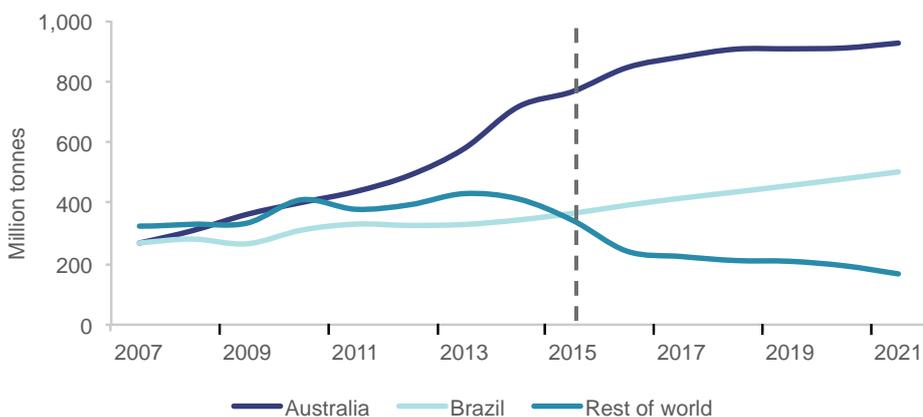
Annually negotiated benchmark prices continued to rise during the latter half of the 1970s when Pilbara operators were committed to growth to establish themselves with a solid production base in the market place. Having peaked at the equivalent of \$US21/tonne free-on-board for 62 per cent iron ore fines in 1982, the next 20 years saw fluctuating prices and overall difficult economic conditions for miners and steel mills.

To add to the stagnating demand, industrial disputes were becoming prevalent in the Pilbara, with companies often needing to use force majeure clauses in their contracts. Reliability of supply became an issue for Japanese customers. As a result, after import reliance on the State had exceeded 50 per cent in the mid-1970s, the Japanese steel mills' reliance on Western Australia as a supplier dropped to the mid- to low- 40s from the late 1970s and throughout the 1980s and even went as low as 39 percent in 1987.

Industrial issues significantly improved by the 1990s. There was a high demand for direct charge quality lump ore produced by Mount Tom Price and Mount Whaleback, but lower demand for higher alumina fines. The companies, with royalty incentives from the State Government, realised that the economy and longevity of the operations required maximisation of product output. A market strategy was developed that required consumers to take lump as well as fine ore under their contracts in proportion to the natural split from production.

Additionally there was a need to diversify from producing solely premium ores and develop other ore bodies for blending.

Continued next page.



Iron ore exports – Australia, Brazil and the rest of the world. Source: Resources and Energy Quarterly, March 2016, Department of Industry, Innovation and Science.

FIFTY YEARS OF



The Japanese steel mills had come to expect consistent product from the Australian producers. There was a push back initially when the Newman output moved from 3 per cent up to 15 per cent Marra Mamba in the blend, but eventually it was realised that to exploit the resource base fully, Marra Mamba had to be brought into the mix.

A move to diversity and export expansion

From a period of stagnation of exports in the 70 to 80Mtpa range, the late 1980s saw exports exceed 100Mtpa (1989) and cumulative exports pass two billion tonnes in 1993, ten years after the first billion tonnes.

One of the most iconic partnerships entered into in 1987 was Hamersley's joint venture with the Chinese Government's China Metallurgical Import and Export Corporation (CMIEC) in the Channar Joint Venture. At the time, it was the largest overseas mining investment by China.

The 1990s saw a slight lessening of reliance on the Japanese steelmakers, as China's and South Korea's demands increased and Taiwan appeared as a consumer. However, market dominance in seaborne trade was still controlled by Japan and quality control and consistency of product continued to play a big part in the market place.

Improvements in export demand and diversity of product coming from the mines required upgrades of the handling and blending facilities at the ports of Dampier and Port Hedland. BHP expanded rail and export capacity first to 64Mtpa then to 80Mtpa and in 1997 an under harbour tunnel linked Nelson Point with the Finucane Island facilities completing flexibility and integration of MNJV and MGMA port handling operations. By 2000, Dampier port had a handling capacity of 67Mtpa, exports from the State had exceeded 150Mtpa and a cumulative milestone of 3 billion tonnes was reached.

A new millennium of riches – tapping China's economic growth

The steady growth in supply availability and diversity, quality control and reliability as a shipper increased the Japanese steel mills' dependency on Western Australia to around 55 per cent in the latter half of the 1990s and then to around 60 per cent early in the 2000s. However there was still limited movement in prices to reflect better demand.

It looked as though growth might take off from 1997 as China and Japan both showed strong demand to support almost 150Mt of State exports, but the figures dropped back in line with the overall trend the following year.

1999 was the first suggestion of a Rio Tinto-BHP merger of their Pilbara operations.

Europe as a market for Western Australian iron ore was declining, while China was running at around 20 per cent of the State's exports up to the turn of the century. It was from then on that growth took off on the back of Chinese steel demand. Growth averaged around 20 per cent per annum over the next seven years up to the global financial crisis. By 2004, China had overtaken Japan as the State's major market outlet and has continued to increase its dominance since then.

At the outset of the massive China growth phase, there was a degree of hesitation from the majors to commit to major expansion expenditure. However, it was soon realised that the Chinese steel demand and therefore iron ore production needs was not going to be short-lived. World seaborne iron ore growth was never going to catch up with the rampant growing demand from China. Prices for 62 per cent Fe fines free on board (FOB) almost doubled to around \$US 40/tonne.

Price growth was rapid, reaching around \$US90/tonne FOB (nearly \$US140/tonne

delivered to Chinese ports) in 2008. India was exporting more than 100Mtpa on a spot market price base and a number of new players for Western Australia had entered the spot market. This price was generally higher than the benchmark price. The majors, led by BHP, campaigned for more of a market-based pricing system than the annually negotiated benchmark. From early 2008 market index pricing commenced, based on Indian product qualities delivered to China. The annual benchmark persisted into 2009, but then disappeared in preference to the market indexed pricing for product delivered to Chinese ports.

Western Australian and Indian developments took more advantage of the growth than other key market players, such as Brazil and South Africa. In Western Australia there was almost exponential growth. Export levels of 200Mtpa were reached in 2003 and 300Mtpa in 2008. Milestones of total exports of four billion tonnes and five billion tonnes were achieved in 2005 and 2009 respectively.

Underpinning the boom were a number of expansion and replacement ore developments by Rio Tinto and BHP. A number of greenfields developments were initiated during this period, including joint ventures with other Western Australian companies and consumers from China and South Korea.

The price hikes in iron ore began to attract a number of junior companies throughout the State, which had previously been largely focussed on gold. They already held tenure which also had iron ore potential in the Mid West, central Yilgarn, Eastern Goldfields and north Pilbara regions. These included Mount Gibson, Murchison Metals, Atlas Gold and Gindalbie Gold.

Some operations were initially planned for short-term quick return on spot market prices during a boom cycle, others had plans for more longevity progressively moving to a series of relatively small deposits or to different, perhaps more

WA IRON ORE EXPORTS

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Aerial view of the Rio Tinto iron ore operations at Hope Downs, Western Australia. Photo: Rio Tinto

costly, ores with more substantial resources, as time progressed.

The mid-2000s saw China wrest control of the market from the Japanese steelmakers. It resulted in an easing of quality constraints in volume and price control. China had such a diverse and large iron and steelmaking sector and was building up an overcapacity at many mills, that the impact of lower quality ores was less obvious. Many of the new developers introduced low quality ores into the market and initially without commensurate penalties. The high demand also meant that the majors were going for volumes of ore rather than the strict quality control of the Japanese dominated period. As well as lower iron, higher alumina and phosphorus ores started to be added to blends and tolerance levels were widened, particularly in levels of undersize material in delivered lump ore. The period provided a bonus for a fuller utilisation of Western Australia's resource base.

Through the first decade of this century China had assumed a dominant position for Western Australian iron ore supply, taking 70 per cent of its production. On the reverse side, Western Australian ore was struggling to maintain 40 per cent share of China's imports, compared to 70-80 per cent penetration of the other main East Asian consumers.

The global financial crisis and beyond

The peak prices of early 2008 were hit by the Global Financial Crisis (GFC) of 2008–2009 and plummeted to a low of \$US60/tonne FOB for the benchmark and the equivalent \$US50/tonne in the new indexed market. A number of high cost producers disappeared from the market, including most of India's export tonnage.

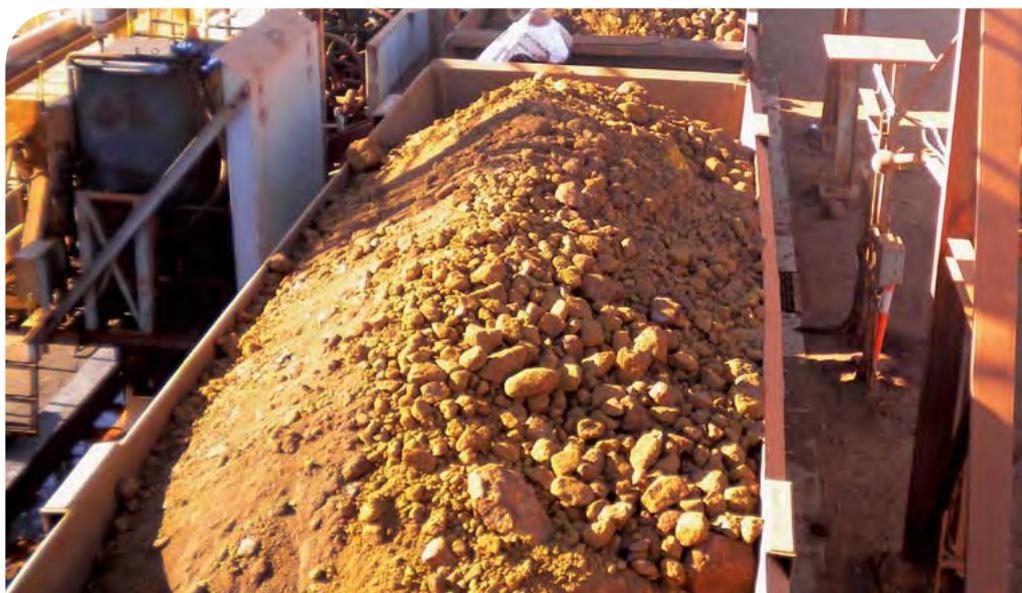
Western Australian producers fared better on the back of a much lower Chinese steel growth (2.3 per cent) than it previously experienced, but not negative like almost all other significant steelmaking regions. The GFC caused a temporary deferral of commitments to expansion, a reining in of capital expenditure and implementation of various cost saving measures, including reductions in employment.

The post GFC period showed a rapid rise in iron ore price, equal to the declined in late 2008–early 2009. Prices peaked in late 2011 at the equivalent of \$US160/tonne (FOB), before fluctuating quite intensely to around \$US120/tonne at the end of 2013. The Pilbara fines product prices eventually replaced that of India.

In 2009 Rio Tinto and BHP again proposed the idea of an operations joint venture in the Pilbara with a reported saving of \$US10 billion through the synergies of the two companies. This was resisted by strong opposition from consuming regions and competition laws made it difficult for the proposal to proceed. Although the companies could not reach agreement on their original proposal, negotiations with the State Government eventually allowed integration of infrastructure to be undertaken across the companies' State Agreement projects.

Growth in WA resumed as before the GFC with Rio Tinto and BHP both announcing ambitious plans to expand production to 330 and 240Mtpa respectively.

Continued next page.



Iron ore carriages, Rio Tinto Cape Lambert operations. Photo: DSD



Ship berthed at Cape Lambert jetty. Photo: DSD

Fortescue Metals Group (FMG), which had emerged as a new producer just before the onset of the GFC, was on a planned growth path to 155 Mtpa, including its development of Solomon ore bodies and a five berth capacity at Anderson point in Port Hedland.

Atlas Iron (formerly Gold) continued to pick up other companies with iron ore portfolios and other new producers appeared in the State, such as Moly Mines, BC Iron and Mineral Resources in the Pilbara, Gindalbie and Mineral Resources in the Mid West and central Yilgarn, as well as Kimberley Metals Group and Pluton Resources in the Kimberley region.

A series of port developments and port planning took place for many of these developments and also for new projects in the pipeline.

There were 16 producers at the peak of operations allowing exports to successively achieve the six, seven and eight billion tonnes cumulative export milestone in 2011, 2012 and 2014 respectively. Annual export levels had reached 600Mtpa by late 2013.

After long periods of construction, the first two magnetite operations started exporting from the State in 2013 at Karara (Gindalbie – Ansteel JV) in the Mid West and Cape Preston (CITIC Pacific) in the west Pilbara, with both projects fully underwritten by Chinese entities.

China slowdown – 2014 onwards

China's strong economic growth post the GFC eventually receded in 2014. Growth in steel output was less than 1 per cent in 2014 and then receded in 2015 (-2 per cent) and is currently showing a further 4.5 per cent decline in the first quarter of this year.

Prices went into 'free-fall' through 2014 and into 2015, then fluctuated extensively in the \$US40 to \$US65/tonne range (FOB) 62 per cent iron ore fines in the last year. This has put a toll on some Western Australian producers, particularly when realised values can be significantly less than this index on account of quality adjustments.

Seven Western Australian operations have closed over the past year, based on economics, depletion of resources or technical issues and others have had to take other measures to stay afloat. A major feature of all operations has been cost saving to achieve productivity gains. Innovative technologies and practices have come into the production cycle. This has kept Western Australian producers in the forefront of new operating technologies and in the lowest quartile of costs among the global seaborne market producers.

All companies have cut capital budgets and the majors, having got the infrastructure framework in place for expanded operations, have placed emphasis on brownfield expansions at the present time.

Western Australia is now 80 per cent dependent on the China market, and most significantly over the past four years, it has grown its market penetration into China to greater than 60 per cent, a 20 per cent rise for the period. With Japan, South Korea and Taiwan steelmakers taking 60-70 per cent from Western Australia, the State's export future looks bright.

What the structure is will depend on many factors, but it is suggested that the portfolio of, and resources defined by, the four 1960s-70s players, within in a different ownership structure, will continue to be a major influence in the Western Australian export scene for many years. If a current export level of 800Mtpa is sustained, then high and medium grade measured and indicated resource estimates of nearly 24 billion tonnes would last around 30 years. With further exploration, and assuming magnetite becomes established in the production mix, then the State could expect to be a major player in the global seaborne trade for at least another 50 years. ■

Article provided by Bill Preston, Department of State Development. All tonnages are reflected as wet metric tons.



The \$10 billion Roy Hill project during construction. Photo: Roy Hill

ROY HILL IRON ORE MINE SHOWCASES WA'S MINING TECHNOLOGY

State Development Minister Bill Marmion last month toured the Roy Hill project, the State's newest – and the nation's biggest – single-pit iron ore mine, and the latest showcase of Western Australia's global leadership in automation and mining technology.

"At full capacity, five ore trains per day will run between the mine and port facilities at Port Hedland, all controlled by Roy Hill's state-of-the-art remote operations centre in Perth," Minister Marmion said.

"Roy Hill celebrated its first shipment in December 2015, and is now in the process of ramping up to its full production capacity of 55 million tonnes per annum," he said.

Mr Marmion said the Roy Hill project would yield significant royalties, and was expected to operate for more than two decades.

"It has already generated extensive economic benefits for the State, with the construction workforce peaking at 6300 and ongoing operations employing almost 2000 people," he said.

Roy Hill has an outstanding local content record, with 72 per cent of all project expenditure, A\$6.6 billion, spent or committed within WA during construction.

Western Australia is the world's largest producer of iron ore, accounting for 37 per cent of global production in 2014. Annual production is forecast to grow by three per

cent each year to 2018-19, bolstered by projects such as Roy Hill.

"The State Government has been a strong supporter of this project, working closely with the proponents to facilitate all necessary approvals and negotiating a State Agreement for the railway," Mr Marmion said.

"Roy Hill is another example of WA's outstanding capacity to attract international investment that benefits a wide range of West Australians, especially from key trading partners such as China, Japan and Korea."

Located 115km north of Newman in the State's Pilbara region, Roy Hill comprises an open pit mine, processing plant, 344km of heavy-haul railway, export facilities at Port Hedland and a remote operations centre in Redcliffe.

The mine is majority owned by Hancock Prospecting Pty Ltd, in a consortium of international investors including Marubeni Corporation, POSCO and China Steel Corporation.

The A\$10 billion project will make Roy Hill Australia's fourth-biggest iron ore producer after BHP Billiton, Rio Tinto and Fortescue Metals Group (FMG). ■



The Roy Hill project celebrated its first shipment in December 2015. Photo: Roy Hill



State Development Minister Bill Marmion.

MARMION HEADS STATE DEVELOPMENT

The Department of State Development has welcomed a new Minister, following Western Australian Premier Colin Barnett's announcement in late March of a change to ministerial portfolios.

The Hon Bill Marmion, MLA was sworn in as Minister for State Development on 31 March, 2016 and will be well-known to *Prospect* readers, having previously held the Mines and Petroleum portfolio.

On 16 May, 2016, he was also made Minister for Innovation, charged with driving the Government's innovation strategy and the \$20 million innovation package announced in the State Budget.

Mr Marmion was born in Kalgoorlie and has a long record of service to the people and the State of Western Australia.

A civil engineer by profession (he also holds a Masters in Business Administration), Mr Marmion spent many years working for the State Government agency responsible for Western Australian roads, with much of his time spent in regional WA, including the Goldfields and the Kimberley.

After leaving the public service, he co-founded consultancy firm Syme-Marmion, which specialised in strategic planning and financial analysis work for the Government and the private sector.

Before entering Parliament in 2008, Mr Marmion served as President of the WA Division of Engineers Australia for three years and chaired the State's Engineering Excellence Awards.

Since his election as Member for Nedlands he has served in a range of roles including Parliamentary Secretary to the Premier and Minister for Commerce; Science and Innovation; Housing, Minister Assisting the Treasurer, Minister for Water and the Environment; and Minister for Mines and Petroleum.

As Minister for State Development, Mr Marmion is committed to attracting investment to Western Australia and assisting the development of major projects based on the State's natural advantages in mining, petroleum and agriculture.

Along with State Development, Mr Marmion holds the Finance portfolio.

Sean L'Estrange is the new Minister for Mines and Petroleum (see page 10). ■

AFRICA DOWN UNDER COMING TO WA

The 14th Africa Down Under Conference and Exhibition (ADU 2016) will be held in Perth in September.

The annual event offers the opportunity for Australian companies to gain knowledge about the African market and industries and for African mining states to promote investment in their resources sectors.

African mining states are expected to promote their mining policies and good governance to counterparts in Australia and, specifically, Western Australia. Last year's ADU featured more than 90 exhibitor booths and attracted over 1,000 attendees.

This year, the Western Australian Government through the Departments of State Development and Mines and

Petroleum will provide high level briefings and a display highlighting the State's strengths and capabilities in mining equipment, technology and services (METS).

ADU is also an ideal platform to build on the State Government's Memorandum of Understanding with the 19 countries forming the Common Market for Eastern and Southern Africa (COMESA). Signed by Premier Colin Barnett in Lusaka, Zambia in 2014, the MOU aims to promote co-operation in mineral and petroleum resources, agriculture, vocational education and capacity building.

COMESA countries include Burundi, Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya,

Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe.

In 2015 Western Australia's bilateral trade with COMESA was valued at \$213 million, and \$1.73 billion with Africa as a whole.

ADU 2016 will run from 7-9 September at the Pan Pacific Perth. For more information visit www.africadownunderconference.com.

For more information on trade and investment in Africa contact the Department of State Development or visit www.dsd.wa.gov.au ■



The new Onslow ring road, funded by the Chevron-operated Wheatstone LNG project, located near the town. Photo: Main Roads WA

NEW RING ROAD IMPROVES ACCESS FOR ONSLOW

The town of Onslow in Western Australia's Pilbara region saw the opening in late May of a new ring road, a key project in the development of the town's infrastructure.

Officially opening the \$14.1 million project in late May, State Development Minister Bill Marmion said the road would benefit residents, industry and tourists and guarantee access to the town, even in cyclonic conditions.

"This is important infrastructure for the growing Onslow community, giving certainty to locals and visitors to the area," Mr Marmion said.

Construction began on the project in November 2015 and included 3.5 kilometres of new highway, new intersections and remedial works on the existing Onslow Road.

The new Onslow Ring Road provides direct all-weather access from the upgraded airport to the town centre.

Mr Marmion said the works were funded by the Chevron-operated Wheatstone Project, a major liquefied natural gas venture located 12 kilometres west of the town.

The Wheatstone Project has committed more than \$250m to social and critical infrastructure in Onslow including health, recreation and utilities.

The State Government has also committed about \$70m to local facilities.

"After extensive planning, new and upgraded facilities are being constructed, including the Onslow Shire Council

administration centre and library, wastewater treatment plant improvements and housing for regional government officers," Minister Marmion said.

A list and map of planned projects for Onslow is available on the Department of State Development website, visit www.dsd.wa.gov.au/onslow. ■



L-R: Main Roads Regional Manager, Andrew Pyke; former Agriculture and Food Minister Ken Baston; State Development Minister Bill Marmion; Thalanyji representative, Anne Hayes; and Shire of Ashburton President, Kerry White. Photo: Main Roads WA

NEW MINISTER DETERMINED TO BUILD ON WA'S GLOBAL DOMINANCE

New Mines and Petroleum Minister Sean L'Estrange MLA is committed to taking advantage of Western Australia's success in being ranked as the world's leading resources investment destination by the highly respected Fraser Institute.

"I am determined to build on our leading status to continue attracting investment," he said.

Mr L'Estrange identified what he sees as two main achievements responsible for the State's top ranking.

"The State Government's rolling red tape reduction program which has sped up approvals processing and cut millions of dollars in mining industry costs and the investment confidence inspired by our transparent regulation and stable, proven royalties system are the successes that have propelled Western Australia to the top of the ladder," he said.

"I know that in the competitive world of global resources, certainty is one of our most precious commodities – and that gives Western Australia the leading edge.

"With the cost curve low and efficiencies high, this is the best possible time to be building a mine in WA and the State Government will be doing everything it can to encourage new mines."

Mr L'Estrange said that he was determined to grow the State as a global centre for mining and petroleum excellence, building on automation, computing and geophysics leadership.

"For instance, WA already produces the lion's share of global mining software and hosts key centres for major operators such as Chevron, BHP Billiton, RioTinto, Oceaneering and Cisco," he said.

"I want to continue our engagement with the IT and start-up sector, to commercialise new mining industry products and services."

The Minister is firmly behind the development of a Western Australian uranium industry and is keen to see WA's first mine begin exporting.

"I will do everything possible to encourage the responsible development of what is potentially a billion-dollar per annum export industry," he said.

Mr L'Estrange is also highly enthusiastic about Western Australia's growing lithium industry.

"With a new lithium mine due to be opened mid-year at Mt Marion in Coolgardie, I am keen to work with industry to examine options for downstream processing of lithium ore to service the burgeoning global battery market," he said.

Mr L'Estrange said the State Government had shown through Budget commitments that it would continue to foster strategies aimed at encouraging exploration and assisting the discovery of the mines of tomorrow.

"One such program, the Exploration Incentive Scheme (EIS), has had more than A\$130 million committed to it since 2009 and has been instrumental in discovering several new deposits," he said.

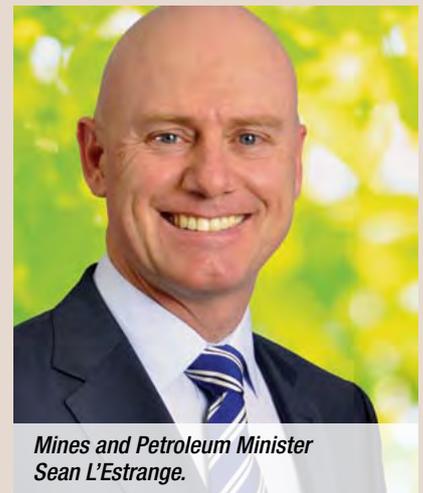
"I've been pushing hard to ensure continued funding of the EIS, so I was extremely pleased we have been able to provide A\$30 million to continue the scheme for the next three years."

Mr L'Estrange said that other initiatives such as expansion of the Perth Core Library, funding of the Mineral Research Institute of Western Australia (MRIWA), and the continuing work of DMP to reduce approval times were all aimed at ensuring the State Government provided the optimal environment to encourage responsible minerals and petroleum exploration.

"Exploration targets are now deeper and harder to reach, and processing is

becoming more complex, so MRIWA's fostering of research, technological innovation and new talent is essential," he said.

"That is why we have committed A\$6 million in funding for this crucial organisation over the next three financial years until 2019." ■



**Mines and Petroleum Minister
Sean L'Estrange.**

Mines and Petroleum Minister Sean L'Estrange is a highly qualified management professional and a soldier with a distinguished career that includes active service in Afghanistan. He continues to serve as a Colonel in the Army Reserve.

Born in Perth in 1967, Mr L'Estrange holds a Masters Degree in Educational Leadership, a Graduate Diploma of Management, a Graduate Diploma of Resource Management, a Bachelors Degree of Education and a Diploma of Teaching. He is also a graduate of the Australian Army Command and Staff College in Canberra.

For six years before entering State Parliament in 2013 as the Member for Churchlands, Mr L'Estrange established and operated a leadership and management consultancy.



Keysbrook Heavy Mineral Sands, first leucoxene shipment. Photo: MZI Resources

TITANIUM TITAN

Western Australian mineral sands company MZI Resources officially opened its flagship Keysbrook Mineral Sands Project in April.

The project is Western Australia's first primary producer of leucoxene, a naturally occurring alternative to rutile as a source of titanium dioxide.

Leucoxene is used in pigments for paints and paper, and in the production of lightweight titanium metal.

The Keysbrook Project is also a major producer of zircon concentrate used in ceramics, refractories and specialty industrial applications.

The opening of Keysbrook, located 70 kilometres south of Perth, followed the commencement of operations at the A\$75 million project in October last year, and the first sales of mineral sands product in December 2015.

The first shipment of zircon concentrate was sent to Xiamen Port in China and was sold under the company's long-term offtake agreement with Tricoastal/Wensheng, China's largest zircon processor.

In March 2016, the first shipment of leucoxene product was exported from the Port of Bunbury to major customer Chemours in the United States.

The Keysbrook deposit is about 1,406 hectares in area and MZI Resources aims to produce over 95,000 dry tonnes of leucoxene products and zircon concentrate annually.

Managing Director Trevor Matthews said with total ore reserves equivalent to more than 15 years' of production, the company expected a long life for the project.

"Keysbrook represents one of the largest new project developments in the Peel region in recent years, and is designed to produce over 95,000 tonnes of high value mineral sands products annually for export to global customers," Mr Matthews said.

"(The) official opening of the Keysbrook Project is a tremendous milestone not just for MZI...but also for the broader Peel region and WA."

The company cited 90 per cent of Keysbrook's 60 workers lived within a 30 minute radius of the site, and the operation is anticipated to spend on average around A\$40 million annually for labour, supplies and services, predominantly within Western Australia, using locally based contractors and suppliers, including local steel fabrication.

Mr Matthews said the Keysbrook Project had a "light environmental footprint."

"Ore processing is chemical-free and involves sluicing, screening and gravity separation of naturally occurring sands to produce heavy mineral concentrate," he said.

"It then undergoes simple electrostatic and magnetic separation at a facility near Bunbury to produce the final zircon and leucoxene products.

"There is no waste, with more than 85 per cent of all process water recycled, and more than 97 per cent of extracted material returned to the mined area, following which the land is progressively rehabilitated to its pre-mining state."

Heavy mineral sands produced in Western Australia include ilmenite, leucoxene, upgraded ilmenite, rutile, zircon and monazite, with the State producing an estimated A\$379 million of Australia's total A\$1,243 million production in 2014.

The United States and China are Western Australia's largest major export markets for heavy mineral sands (USA: 33 per cent and China: 21 per cent in 2014-15). ■

AGRIBUSINESS ON THE RISE



Department of State Development, Special Adviser, Rob Delane – Agribusiness Expansion.

Western Australia is already a significant exporter of many agriculture and aquaculture products and, with the value of the State's exports rising during the past year, the time is ripe for the export-focused expansion of the agribusiness sector.

Expanding agribusiness in Western Australia and better positioning producers and processors to meet growing overseas consumer demand is the motivation behind a range of special measures recently introduced by the Western Australian Government.

A new agribusiness unit within the Department of State Development (DSD) was announced in March, as well as the earlier appointment of dedicated trade officers to Western Australia's Trade and Investment Offices in three key regional growth markets: Indonesia, Singapore and India.

Western Australian Premier Colin Barnett announced the appointment of Rob Delane, the Director General of the Department of Agriculture and Food (DAFWA), to lead the new Agribusiness Expansion Unit within DSD.

"This unit will enhance the Government's efforts in export market development and foreign investment attraction, as well as offering support to major agriculture and associated infrastructure projects," Mr Barnett said.

"(The) prospect for expansion of trade and investments looks promising (and) has a better chance of being realised if the Government redoubles its efforts both to market – especially Asia and the Middle East – and at home."

The Premier said he wanted to use Mr Delane's expertise to "push harder into overseas markets and support local industry to capitalise on the growth."

In 2014-15, the gross value of Western Australia's agriculture production rose 0.2 per cent to A\$11.6 billion.

The State's agriculture and food exports were valued at A\$7.8 billion in 2014-15, mainly comprising wheat (38 per cent), barley (13 per cent), canola (10 per cent), wool (6 per cent) and rock lobster (6 per cent).

The value of wheat exports alone rose six per cent to A\$3 billion in 2014-15, in line with average annual growth of six per cent over the past ten years.

Western Australia's major agricultural and food export markets in 2014-15 included China (23 per cent), Indonesia (14 per cent), Japan (9 per cent), Korea (6 per cent) and Vietnam (4 per cent).

Last financial year the value of the State's agricultural and food exports to China rose 30 per cent to A\$1.8 billion.

The Western Australian Trade and Investment Office in Indonesia was expanded in 2015 to include a tourism officer and an agriculture business development officer. Dedicated agriculture business development officers were also appointed in the India and Singapore trade offices, supplementing those already working in the China, Japan and Middle East trade offices.

The Premier said dedicated agriculture officers, as well as tourism officers, would assist the State to focus resources and efforts where there is real potential for growth, particularly with our nearest trading partners.

The Department of State Development is the Western Australian Government's lead agency for international engagement strategies for the State. For more information on trade and investment in Western Australia visit www.dsd.wa.gov.au ■

Mr Delane has joined the Department of State Development in the role of Special Adviser – Agribusiness Expansion, in which he will lead strategies to enhance international market and trade growth and inward investment for the agribusiness sector in Western Australia.

Mr Delane said he was a strong supporter of partnerships between government and industry, as well as innovation in the public sector, to deliver positive outcomes for the State's agricultural sector.

"I'm a keen promoter of regional, State, national and international cooperative initiatives and government-industry partnerships to deliver innovative outcomes that effectively deliver value to the agrifood sector and community of Western Australia," he said.

"There is growing global demand for agrifood products and Western Australia is in a strong position to build on its well-established reputation internationally as a reliable, clean and disease-free State with strong credentials in resources and major project development, as well as an attractive investment destination."

Mr Delane brings to the position extensive experience and a broad knowledge of the agrifood sector with more than 30 years in the industry in WA, including more than six years as the Director General of the Department of Food and Agriculture.

He also spent a year undertaking the joint roles of Deputy Secretary, Biosecurity Services Group and Executive Director, Australian Quarantine Inspection Service with the Federal Government's Department of Agriculture, Fisheries and Forestry.

Mr Delane was awarded a Public Service Medal in 2007 for outstanding service to the agricultural industries and the Western Australian community.



PRAWN EXPORT PROJECT FOR WA

A black tiger prawn. Photo: CSIRO

The first stage of a billion dollar aquaculture project to export prawns to Asian markets is planned for Western Australia.

Australia's largest aquaculture prawn farm operator – Seafarms – is looking to develop a large-scale export project based in Western Australia and the Northern Territory which represents a significant opportunity for economic development in northern Australia.

Seafarms' Project Sea Dragon requires an investment of about US \$1.45 billion during the next eight years, to develop the staged, fully integrated, land-based aquaculture project, which will produce black tiger prawns for export markets in Asia.

The project will be a staged development, with Stage 1 consisting of a founder stock and quarantine centre, located in Exmouth in Western Australia, breeding facilities near Darwin, a hatchery and 1,000 hectares of production ponds, located in the Northern Territory, and processing facilities based in Kununurra, Western Australia.

Wyndham Port in Western Australia's Kimberley region is the preferred port for export of product.

Project Sea Dragon was given major project status by the Western Australian Government in 2015 in recognition of the project's strategic importance to the State – this followed similar recognition by the Federal and Northern Territory Governments.

Seafarms' Dr Chris Mitchell said that the cost competitiveness of aquaculture compared to producing other sources of

animal meat protein meant large scale aquaculture would play an increasingly important role in meeting rising global demand.

"Project Sea Dragon is a unique and world-class aquaculture opportunity designed to meet the growing global demand for seafood, particularly in Asia," Dr Mitchell said.

"The project will be at a scale that enables us to leverage Australia's comparative advantages in biosecurity, marine science, access to key raw materials and expertise in large scale resource and agricultural development.

"A project of such large scale means Australia can be a low-cost producer, and Australia's strong bio-security credentials and the project's relative remoteness will assist in mitigating bio-security risks."

Western Australian Premier Colin Barnett acknowledged the potential of large scale production and export of prawns to generate local employment and business opportunities and contribute to the diversification of the Kimberley's economy, while also making use of regional infrastructure that has been provided through significant State investment.

Stage 1 of Project Sea Dragon is expected to create about 120 direct jobs in Western Australia, increasing to about 700 positions at full operation, as well as providing contracting and local business opportunities within the State.

Seafarms expects to reach a final investment decision on Stage 1 of the project by the end of 2016, with financial close shortly thereafter.

The Department of State Development is the Western Australian Government's lead agency for the project and is working with Seafarms to facilitate the project's land, transport, infrastructure and other requirements.

Australia currently produces about 5,000 tonnes of prawns each year – Project Sea Dragon aims to increase that production substantially, with the project set to produce 100,000 tonnes of black tiger prawns per year when fully operational.

The Food and Agriculture Organization of the United Nations forecasts that aquaculture production will grow by 60 per cent or around 30 million tonnes per annum from 2010 to 2020.

Dr Mitchell said the growing consumption of seafood in China, and Asia more generally, and the rise in aquaculture production, were leading indicators of the significant role aquaculture would play in global food production over the next 40 years.

"China currently accounts for two-thirds of world aquaculture production but has recently switched from being a net seafood exporter to a net importer," he said.

"Project Sea Dragon will significantly improve the value of Australia's prawn exports with the project set to produce A\$1.7 billion per year in export revenues within 10 years." ■



LNG SUCCESS FOR WA



The Western Australian Government LNG 18 display booth.

The 18th International Conference & Exhibition on Liquefied Natural Gas, or LNG 18, has been hailed a success with more than 6000 people taking part over five days in Perth in April.

LNG 18 was the latest event in the LNG X series – a triennial LNG conference and exhibition that alternates between exporting and importing countries.

Perth is the only city to host the series more than once, following LNG 12 in 1998.

For the Western Australian Government, LNG 18 provided an unparalleled opportunity to promote the State's LNG capabilities to a global audience of industry leaders.

Opening the conference, Western Australian Premier Colin Barnett said the Australian LNG industry was in a period of rapid expansion.

"Australia's LNG production capacity will increase fourfold over this decade, likely taking the country to the status of the world's leading producer," Mr Barnett said.

Western Australia's LNG production is expected to more than double in coming

years, rising from 20.6 million tonnes in 2015 to nearly 50 million tonnes by 2018. This increase is driven by the construction of major LNG projects including Gorgon, Wheatstone and Prelude.

Speakers at the conference included the global heads of Chevron, Shell, Woodside, Petronas, CNOOC and ConocoPhillips, among others. Conference sessions focussed on topics as diverse as floating LNG technology, modular construction, gas pricing, shipping and market trends.

Grant King, chairman of the LNG 18 National Organising Committee, said Australia was very proud to have hosted the LNG X series for the second time.

"It was a truly amazing and wonderful week filled with insightful discussions in the program sessions and ample opportunities to network with thousands of industry colleagues," he said.

"LNG 18 was an amazing display of Australia's ingenuity."

The next LNG X event will be held in Shanghai, China, in 2019, with Russia's St Petersburg to play host in 2022. ■

"Every Western Australian knows how oil, gas and resource companies have made enormous contributions to this nation."

Malcolm Turnbull
Prime Minister of Australia

"As the number of producers has increased, so has the range of resources and technology. Australia is now a 'test lab' of conventional gas, coal seam gas, shale gas and floating LNG."

Colin Barnett
Premier of Western Australia

"For us and the LNG industry as a whole, these are interesting times. Market conditions in general are challenging. At the same time, new markets are opening up – markets like Thailand, Pakistan and Poland."

Ben van Beurden
Chief Executive Officer,
Royal Dutch Shell

"Experts project global LNG demand will increase nearly 130 per cent by 2035. To put that in perspective, the world will need more than a Gorgon-sized project every year for nearly 20 years to meet projected demand."

John Watson
Chief Executive Officer,
Chevron

"I expect that the LNG projects of the future will be smarter, greener but not necessarily bigger. Many of them could well be a series of phased projects, with staged developments."

Peter Coleman
Chief Executive Officer,
Woodside Energy

FUTURE OPPORTUNITIES: INVESTOR FORUM FOCUS ON WA

The Department of State Development kicked off the week of LNG 18 by hosting an investor forum for international visitors, with more than 200 participants registering to attend.

The State's most senior government representatives for the oil and gas sector were on hand to provide attendees with an overview of the State's industry and economy, with a focus on opportunities for future investment.

State Development Minister Bill Marmion opened the event, and told attendees that now was the ideal time to invest in Western Australia.

"With export potential up, the State Government understands the most important resources here at LNG 18 – after people and petroleum – are certainty, security and confidence, and these are among our State's greatest assets," Mr Marmion said.

"WA is open for business and we're the best place to do business so invest now while costs are moderating."

The event was one of the Minister's first engagements as State Development Minister, following changes to the Ministry announced on March 29, 2016.

Presenters at the event included the Department of State Development's Director General Steve Wood and Deputy Director General Nicky Cusworth.

Ms Cusworth echoed the Minister's comments regarding costs, noting that while lower commodity prices and the transition between construction and production were creating some challenges, this was also helping to improve competitiveness in other parts of the economy, particularly through the lower exchange rate.

Mr Wood highlighted investment opportunities in the oil and gas sector, fuelled by the rapid expansion of Western Australia's LNG production capacity.

Department of Mines and Petroleum Director General Richard Sellers highlighted Western Australia's stable and transparent regulatory regime for the resources sector – which is one of the key factors behind Western Australia's recent rating as the world's number one destination for mining investment by the Fraser Institute.

Finally, attendees heard from Western Australia's Chief Scientist Peter Klinken, who outlined the State's strength in oil and gas-focussed research and technical innovation.

"The remote locations of Western Australia's LNG projects have brought significant challenges for producers, but these have led to innovative solutions," Professor Klinken said.

The investor forum event was coordinated by the Department's International Trade and Investment division, and promoted through the State Government's network of overseas offices. The event was timed to take advantage of the large number of dignitaries and oil and gas executives visiting Perth for LNG 18.

Reg Howard-Smith, Managing Director of the Chamber of Minerals and Energy WA, was the Master of Ceremonies. ■



State Development Minister Bill Marmion trials virtual reality technology at the ExxonMobil stand.



Western Australian Premier Colin Barnett and media tour the Western Australian Government LNG 18 display booth.

REGIONAL FOCUS AT LNG 18

Opportunities for Western Australian and Indonesian collaboration in the oil and gas sector were in the spotlight during the 18th International Conference and Exhibition on Liquefied Natural Gas (LNG 18).

An Australia Indonesia Business Council (AIBC) breakfast, held to coincide with the conference, included key presentations by Pertamina President Commissioner, Tanri Abeng and Indonesia's Director-General of Oil and Gas Ministry of Energy and Mineral Resources, Wiratmaja Puja, as well as newly appointed Western Australian Minister for State Development, Bill Marmion.

Mr Marmion said Western Australia's capacity for innovation and dependable service were increasingly valuable assets across the region.

"Although Indonesia and WA are both significant exporters of LNG, there are great benefits in working together," Mr Marmion said.

"There are more than 800 global and local energy companies and related equipment, technology and service providers based in Perth, many of which could provide expertise and technical know-how to help improve the efficiency of Indonesia's gas sector to meet increasing domestic demand."

The AIBC event followed an LNG 18 investor forum led by Mr Marmion earlier in the week.

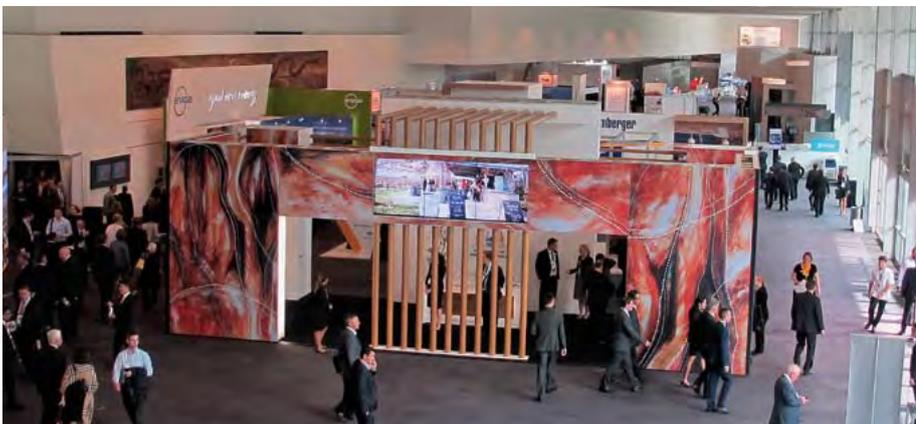
"I am pleased by the strong attendance at both events," he said.

"The investor forum was promoted through the State Government's network of overseas offices – including in Jakarta – and was oversubscribed.

"With export potential up, the State Government understands the most important resources here at LNG 18 – after people and petroleum – are certainty, security and confidence, and these are among our State's greatest assets. So, as we continue to say across the region and



Mines and Petroleum Minister Sean L'Estrange speaking at the Woodside and Siem signing ceremony at LNG 18.



The WA Government booth at the LNG 18 conference and exhibition.

around the world: 'Now is the best time to invest here in the West'."

Regional Director of the Western Australian Trade and Investment Office in Jakarta, Chris Barnes moderated a panel session as part of the AIBC event and said holding the event during LNG 18 had provided an ideal opportunity for discussion between the two regions.

"Indonesia is Western Australia's sixth largest export market – valued at A\$1.7 billion – and eighth largest import market – at A\$20 million – and there is great potential between the two partners to further promote and facilitate trade and investment," Mr Barnes said.

"We are very much focussed on broadening ties between Western Australia and Indonesia and the oil and gas sector holds future growth that will benefit both regions." ■

Department of State Development International Trade and Investment Director, Stuart Crockett, and staff at LNG 18 are pictured on page 1, "In this issue."



DELEGATIONS HEAD TO DMP DURING LNG 18

The Petroleum Division of the Department of Mines and Petroleum (DMP) was kept busy hosting delegations from around the world during LNG 18 held in Perth recently.

“An international event like LNG 18 provides a perfect opportunity to meet with government and industry representatives from around the world as Western Australia is well regarded globally for its petroleum expertise,” DMP Petroleum Executive Director Jeff Haworth said.

The event attracted more than 5000 participants including delegates, exhibitors, and trade visitors, with more than 250 exhibitors from over 60 countries.

Mr Haworth and senior staff held a number of high level meetings with trade commissioners from India, Malaysia, Indonesia, Mexico, Canada and Korea.

“Discussions during the meetings covered the state of the industry and markets in the various countries and where Western Australian companies are involved in mining or petroleum in those countries,” Mr Haworth said.

Meetings were also held with Pakistan’s Minister for Petroleum and Natural Resources, the Indonesian Director General of Oil and Gas, and the president of the Australia Indonesia Business Council.

DMP staff made presentations to delegations from Kenya and Ghana and met with leading petroleum companies.

“The delegates described the current situation for resources in Kenya and Ghana, particularly around petroleum exploration and their domestic markets,” Mr Haworth said.

Perth is home to major oil and gas producers, mining companies and service companies, and is rapidly becoming a global centre for research, innovation and technology.

“LNG 18 gave us an opportunity to promote our research skills and innovation as Western Australia already produces the lion’s share of global mining software and hosts key centres for major operators,” Mr Haworth said.

“The event helps to grow the State’s reputation as a global centre for mining and petroleum excellence, and builds on our automation, computing and geophysics leadership.” ■



The Kenyan delegation with senior staff from DMP and DSD.



The Mexican delegation with Tim Griffin (second left) and Jeff Haworth (right) from DMP.



DMP’s Richard Bruce, Jeff Haworth and Richard Sellers at LNG 18.



L-R: Mines and Petroleum Minister Sean L'Estrange; Woodside Chief Operating Officer Mike Utsler; and Siem Chief Executive Officer Idar Hillersoy at the Woodside and Siem signing ceremony.

LNG-POWERED SUPPORT VESSEL ON ITS WAY TO WA

Australian waters will welcome its first LNG-powered marine support vessel after Woodside signed a five-year charter contract with Norwegian company Siem Offshore Australia Pty Ltd early this year.

The announcement was made at a signing ceremony in Perth attended by Mines and Petroleum Minister Sean L'Estrange.

"This decision by Woodside will increase the potential for the LNG marine fuel market to grow, especially given Australia's abundant LNG resources," Mr L'Estrange said.

"There are also real benefits for the environment. This vessel will be environmentally responsible – reducing greenhouse gas and pollutant emission, as well as the reliance on imported diesel.

"It also provides new business opportunities for the State."

Woodside Chief Operations Officer Mike Utsler said the announcement positioned the company as an early adopter of LNG as a marine fuel in the region.

"We're thrilled to be the first company to bring one of these vessels to the southern hemisphere," he said.

"Australia is on track to become the world's largest producer of LNG, so it makes perfect sense to build dual-fuel capabilities for our marine fleets here.

"Our LNG tankers use their cargo to power their engines, making them cleaner vessels that use less diesel. It's natural that we progress this capability through to our support vessels," he said.

Woodside's new vessel will be greener – reducing vessel greenhouse gas and pollutant emissions and the reliance on imported diesel – while providing safe, reliable support to Woodside's assets in the Exmouth and Pilbara regions.

The company said it will continue to seek to expand the application of LNG-fuelling in transportation in WA. ■



Aerial view of the Gorgon Project. Photo: Chevron Australia

NEW MINES AND PETROLEUM MINISTER GETS FIRST-HAND LOOK AT GORGON

The commemoration of Barrow Island's Gorgon Project in April provided an excellent opportunity for newly appointed Mines and Petroleum Minister Sean L'Estrange to take a first-hand look at Australia's largest single resource project.

The significance of the event was highlighted by the attendance of Australian Prime Minister Malcolm Turnbull, Western Australian Premier Colin Barnett, and US Ambassador to Australia John Berry, who joined the Minister on site.

Also in attendance were the joint venture partners, customers and Chevron management, including Chevron Corporation Chairman and Chief Executive Officer John Watson.

Minister L'Estrange said at full capacity the Gorgon Project's three-train liquefied natural gas (LNG) plant, which cools the natural gas to the point at which it condenses to a liquid, would supply 15.6 Mtpa of LNG for export to customers in Asia.

"The liquefaction process reduces the volume approximately 600 times, making

it more economical to transport to global markets," Mr L'Estrange said.

"One of the advantages for Western Australia is our close proximity and economic links to key export markets in Asia, as well as sharing a similar time zone with 60 per cent of the world's population, including China, Japan, South Korea and Indonesia."

He said the Gorgon project was expected to have a life span of 30 to 40 years and represented the future of reducing greenhouse gas emissions.

"Part of the reason Chevron built the project on Barrow Island was the ability to drill down and actually reinject the carbon dioxide that they extract from the gas back into reservoirs deep below the surface, reducing greenhouse gas emissions by about 40 per cent," Mr L'Estrange said.

Gorgon is the latest project in a wave of unprecedented LNG investment and is backed by another three projects still under construction – Prelude, Wheatstone and Ichthys.

"Future demand for LNG is also looking bright with the recent BP Energy Outlook forecasting natural gas to be the world's fastest growing traditional fuel," the Minister said.

Gas consumption is expected to grow by 1.8 per cent a year to 2035, and global gas demand to increase by around 50 per cent to 2040.

"There is no doubt that the long-term outlook for Australia's gas exports is positive with growing demand for more cleaner-burning energy from Asia's emerging economies," Mr L'Estrange said.

He said Western Australia provided a secure place for resources sector investment through its supportive government, strong economy, mature financial and support service sectors, and skilled workforce.

"Western Australia's capital city of Perth is home to major oil and gas producers and service companies, and is rapidly becoming a global centre for research, innovation and technology in the LNG sphere," Mr L'Estrange said.



L-R: Chevron Corporation Chairman and CEO John Watson, Western Australian Premier Colin Barnett, Mines and Petroleum Minister Sean L'Estrange and Australian Prime Minister Malcolm Turnbull at the official opening of Chevron's Gorgon Project. Photo: Chevron Australia

“Not only are we a global energy supplier, Perth is also a major centre for expertise and services to the petroleum industry in Australia and Asia.”

During the commemoration, Chevron Australia managing director Roy Krzywosinski thanked successive governments for their support over the past decade and said the event formally recognised the support from all of Chevron's partners and the efforts of thousands of people involved.

“To engineer, build and operate this legacy project, we have brought together the best and brightest from Chevron, our partners and industry from all around the world,” Mr Krzywosinski said.

“The Greater Gorgon area is estimated to contain around 40 trillion cubic feet of natural gas resources, positioning it well to be a reliable long-term supplier of cleaner-burning natural gas for our customers in the Asia-Pacific region and Western Australia.” ■



The Asia Excellence with the first cargo of LNG from Gorgon. Photo: Chevron Australia

Gorgon Facts

- The project is supplied from the Gorgon and Jansz-lo gas fields located within the Greater Gorgon area, between 130 km (80 miles) and 220 km (136 miles) off the northwest coast of Western Australia.
- It includes an LNG plant on Barrow Island, a carbon dioxide injection project and a domestic gas plant with the capacity to supply 300 terajoules of gas per day to Western Australia.
- The Chevron-operated project is a joint venture between the Australian subsidiaries of Chevron (47.3 per cent), ExxonMobil (25 per cent), Shell (25 per cent), Osaka Gas (1.25 per cent), Tokyo Gas (1 per cent) and Chubu Electric Power (0.417 per cent).
- Chevron Australia leads the development of the Gorgon and Wheatstone natural gas projects and manages its equal one-sixth interest in the North West Shelf Venture.
- As one of the world's largest carbon dioxide injection projects, Gorgon will reduce overall greenhouse gas emissions by 3.6 million tonnes per year.



One of the teams competing in the Perth event. Photo: Uneathed Solutions

UNEARTHING WA'S TECH TALENT

Did you know that about sixty per cent of the world's mining software has its origins in the small Western Australian inner city suburb of West Perth?

What's less well known is that much of this software was created 15 to 20 years ago.

"We have a history in Western Australia of doing very well in this field, but we can't rest on our laurels," Uneathed Solutions Director Justin Strharsky said.

Building Western Australia's technological environment is what drives the work of Mr Strharsky and Uneathed Solutions.

"We exist in a unique moment of opportunity," Mr Strharsky said.

"Australia, particularly Perth, is one of the best places in the world to build and scale technology companies focused on the resources sector.

"The one thing that we lack is a singular vision and a plan for making the most of our potential to build those technology companies.

"Part of what has been missing is recognition of the tech start-up as a vehicle for building that capacity."

This is where the work of Uneathed is focused.

Your time starts ... now

The company is best known for holding a series of "Hackathons" around Australia and internationally.

For the uninitiated, hackathons bring together software developers, designers and industry to develop prototype solutions to real world problems in the resources sector. Teams have 54 hours to come up with their prototype and present it to judges, industry and their peers.

The problems are created using real world data. This is particularly appealing to participants.

"They really enjoy the opportunity to work on live data," Mr Strharsky said.

"If you are a university student studying computer science or data science, it is rare to get a chance to work on both large and significant sets of real world data.

"One of the things we've managed to do with the hackathon is to give opportunities for Australian entrepreneurs to build things on the back of real-world problems. They get pretty excited about having that opportunity."

It is not just the participants that are enthusiastic.

"Industry is very excited to see multiple potential solutions being developed in response to the challenges set during a hackathon," Mr Strharsky said.

"It is fundamentally different to how a company would normally procure a technological solution to a problem.

"Previously you would spec out exactly what you would like, start a tendering process, nominate three or so preferred providers, and eventually commit to the solution.

"You then end up spending significant money on building something that is likely to take longer than expected and cost more than expected, and may not do exactly what you had hoped."

Mr Strharsky said the hackathons had the potential to turn the traditional procurement model on its head.

"What we do, at very low cost, is expose resources companies to multiple solutions," he said.

The first hackathon was held in Perth as a single event in 2014.

"Since then we have run nine events around Australia and one in Cape Town, South Africa," Mr Strharsky said.

"We are also looking at rolling out an international events program to connect resources sector challenges to the best innovators around the world."

This includes plans for events in North and South America.

Challenge accepted

"The resources industry and the innovation community have really taken up the challenge," Mr Strharsky said.

The success of the event is a testament to the work of Mr Strharsky and Uearthed co-founders Zane Prickett and Paul Lucey.

All three had experience in the resources industry. Mr Strharsky and Mr Prickett were running tech businesses focused on the industry, while Mr Lucey was the head of innovation and projects at a mining company.

"Zane and I got talking about how hard it was convincing large resources companies to adopt new technologies – it was a common problem," Mr Strharsky said.

"When we met Paul, he told us that he had found the same challenges even working within a resources company. He said it was difficult to motivate his organisation to trial new products and employ them in operational environments."

In talking, the trio realised there was a significant opportunity to help others overcome some of the hurdles they had experienced.

"We're interested in creating opportunities for the next generation of Australian technologists," Mr Strharsky said.

It is an opportunity the State Government is keen to support.

State Development, Finance and Innovation Minister Bill Marmion officially opened the most recent hackathon in Perth and praised the event's success.

"There is a perception the resources sector is just about digging up minerals and exporting," Mr Marmion said.

"What people don't realise is that the mining and petroleum industry is successful due to technology, including sophisticated software, the majority of which originates right here in Australia."

Mr Marmion also highlighted one of the event's success stories – Newton Labs.

"Newton Labs won the event in 2014 with a boulder detection system set to save the mining industry hundreds of millions of dollars, which is already being rolled out across several mines," Mr Marmion said.

Late last year the company was named winner in the Emerging Innovation category at the 2015 WA Innovator of the Year awards.



Participants gather for the opening. Photo: Uearthed Solutions



State Development Minister Bill Marmion opening the 2016 Perth Hackathon. Photo: Uearthed Solutions

The outsiders

The work of Newton Labs and other participants is attracting a lot of interest from industry.

"One of the things we hear consistently from our industry supporters is how impressed they are that people with very little exposure to the resources industry can offer so much insight regarding a challenge, in such a short period of time," Mr Strharsky said.

"Industry really values seeing what people outside their normal reach can offer.

"These are people who would not necessarily make it through their hiring practices, or have skills that may not be suited to some of their core businesses, but they have a diversity of approaches and insights that are extremely valuable.

"They find ways of doing things that increase efficiencies."

Next level

With the growth of the hackathon events, the team at Uearthed Solutions want to build on that success.

"One of the things we have been successful at to date is teaching the industry what the hackathon is," Mr Strharsky said.

"We have an established reputation for delivering value with these events.

"Now we want to teach people about our accelerator."

Mr Strharsky said the accelerator program was the next logical step in the start-up process.

"When the prototype solutions emerge from our hackathon events they are fantastic, but they only represent potential. The next step is converting the potential into realised opportunity," he said.

The six-month mentor-driven accelerator program helps the best of these teams and prototypes develop further.

"It gives them access to mentors, site trials, industry membership. All of the things they need to build a growing global business," Mr Strharsky said.

One of the program's alumni is Newton Labs.

Mr Strharsky said Uearthed Solutions was expecting 8-10 businesses to be a part of this year's accelerator program.

"The continued development of the program is something we're really excited about," he said.

"Where we can excel better than any place in the world is in developing technology for the resources sector.

"We've done it before and have everything we need here. We just need to articulate our advantages and encourage and nurture local talent and attract international talent." ■



Department of Mines and Petroleum Director General Richard Sellers at the Guangdong Daya Bay Nuclear Power Station.

DMP ON THE MONEY WITH GOLD AND LITHIUM

Gold and lithium watchers at this year's Mines and Money Conference in Hong Kong could be excused for thinking Western Australia's Department of Mines and Petroleum (DMP) has a working crystal ball.

The classic precious metal and the new gold of energy storage were hot favourites for investor interest, and DMP was right on the money in focusing on Western Australia's growing strength in both commodities.

DMP Director General Richard Sellers placed WA centre stage when he delivered the keynote address at the highly influential conference which attracted a crowd of about 2000, including investors, financiers and mining company representatives, from more than 30 countries.

Former Mines and Petroleum Minister Bill Marmion was scheduled to give the address but was unable to attend due to parliamentary commitments.

"The keynote address is normally reserved for heads of big industrialised miners or Ministers in other jurisdictions, so it was too good an opportunity to pass up," Mr Sellers said.

"The plan was always to promote Western Australia as part of our investment attraction activities to get capital investment during the down cycle because it's particularly important to do this sort of work when industry isn't at a peak.

"We want people to remember why they invested in Western Australia and to bring us new opportunities through that process.

"Luckily, the trip to Hong Kong came hard on the heels of the Fraser Institute report saying that even at the bottom of the downturn, Western Australia is still the best destination for mining investment, ranking number one in the list.

"Armed with that fantastic message, we went over there and focused heavily on two sectors – gold and lithium."

Mr Sellers said that the message he delivered on gold to the conference was a reminder that there had been some very large discoveries of high-grade gold prospects in Western Australia's new mineral provinces.

The Tropicana Joint Venture and Gold Road Resources' Gruyere deposit in the far Eastern Goldfields, Doray Resources' Andy Well mine in the Murchison region, and a

new find at East Kundana near Kalgoorlie were among the highlights of the gold boom promoted at the conference.

"Western Australia's lithium story really drew some interest because of the recognised upside in the market," he said.

Mr Sellers said increased demand had created a powerful opportunity for Western Australia's lithium players to come into the market or increase their exports.

"We've got Greenbushes (Talisson Lithium) doubling its production and it still has a significant mine life, and there's Mt Cattlin in Ravensthorpe (General Mining/Galaxy Resources) coming back into production," he said.

"We've also got Mt Marion in the Goldfields (Neometals/Mineral Resources) coming into production and there are two big projects in the Pilbara (Lithium Australia/Pilbara Minerals) that are going through their approval phases to be investment-ready early next year."

Mr Sellers said that to make sure DMP's message got maximum exposure, all of the slides he presented were in English and Mandarin.

"We actually got better social media feedback to our talk from the Mandarin slides. In fact, there were people in our audience while I was presenting who were using their tablets and mobile phones to photograph our entire slide sets and they put those on their blogs and social media sites, almost at the same time."

During his three days in Hong Kong, Mr Sellers attended a number of high-level talks with CITIC Pacific and Sinosteel International, as well as a major potential investor, GOGC Petroleum.

"We spent a very significant amount of time with GOGC Petroleum and their financier, the China Minsheng Bank," he said.

"Important items of discussion included the due diligence needed to make sure investors minimise their investment risk here in Western Australia and the fact that DMP's excellent geoscience information was freely available.

"We spoke to a range of investors in Hong Kong, but this was an important follow-up meeting to a visit by GOGC to Western Australia earlier this year.

"The company is very keen and looking to invest in gas and oil in the Perth and Canning Basins."

The meeting with CITIC Pacific brought news that all six of the crushing circuits at Cape Preston would be in production later this year.

The Sinosteel meeting covered a number of issues including magnetite supply and demand issues and the extension of one of the largest and most successful joint venture projects in Western Australia "the 30-year Channar Joint Venture between Sinosteel and Rio Tinto" that will enable sales of up to 70 million tonnes of iron ore to Sinosteel Corporation over the next five years. ■



Department of Mines and Petroleum Director General Richard Sellers presented at the Mines and Money Conference in Hong Kong.

Going nuclear

The Hong Kong trip gave the Director General the chance to make his first visit to a nuclear power station, the Guangdong Daya Bay Nuclear Power Station in nearby Shenzeng Province on the mainland.

"There was no government agenda," Mr Sellers said. "It was a fact-finding tour that has resulted in me being better informed about nuclear power generation."

Mr Sellers was amazed by the plant's presentation.

"Everywhere is so clean," he said. "It's more like walking through manicured botanical gardens. I've walked around lots of industrial plants and never seen anything like it."

Looks aside, the plant produces enough power from its six reactors to provide all of Hong Kong's power with a large amount left over for Shenzeng province.

"It was the first civil power station to be built on the mainland and the China General Nuclear Power Group which controls it has improved on the original French technology to the point where it's now the preferred builder for some of the new stations in Europe," Mr Sellers said.

The International Energy Agency has predicted that nuclear demand will increase 86 per cent from 2478 to 4606 terawatt hours between 2013 and 2040.

"Western Australia is highly prospective for uranium, so a great economic opportunity exists here," Mr Sellers said.

10-year milestone marks growth of Western Australia's uranium industry

The Wiluna landscape. Photo: Toro Energy

A decade ago Paul McCartney finally turned 64, Twitter was launched, and the West Coast Eagles beat the Swans by a solitary point to take out their third AFL Premiership.

Also in 2006, Western Australia's fledgling uranium industry registered its first major milestone on 24 March, when Toro Energy Ltd listed on the ASX and raised A\$18 million dollars.

Back then, Wiluna wasn't even on the company's radar, but Toro's project in the Mid West region of Western Australia is now poised to deliver exports from the State's first working uranium mine.

In March this year, the company held a celebration at Wiluna to mark its 10-year journey.

Then Mines and Petroleum Minister Bill Marmion told the gathering that the project highlighted the importance of the State Government's long-term support for Western Australian uranium mining and the business and job opportunities it would generate.

"The State Government's determination to back this industry has already seen more than A\$300 million invested in uranium exploration and development," Mr Marmion said.

"Toro's Wiluna project is expected to employ up to 350 people during construction and then support 170 full-time jobs, with a production life of at least 25 years."

Mr Marmion said it was also good for the global environment, with Toro aiming for annual uranium concentrate exports of 900 tonnes a year from four mine sites in the Wiluna area.

"That translates into a potential saving of 33 million tonnes a year of carbon dioxide emissions, compared to coal-fired power generation," he said.

As Western Australia's Environment Minister in October 2012, Mr Marmion granted environmental approval for mining the Centipede and Lake Way deposits, and a processing facility based at Centipede.

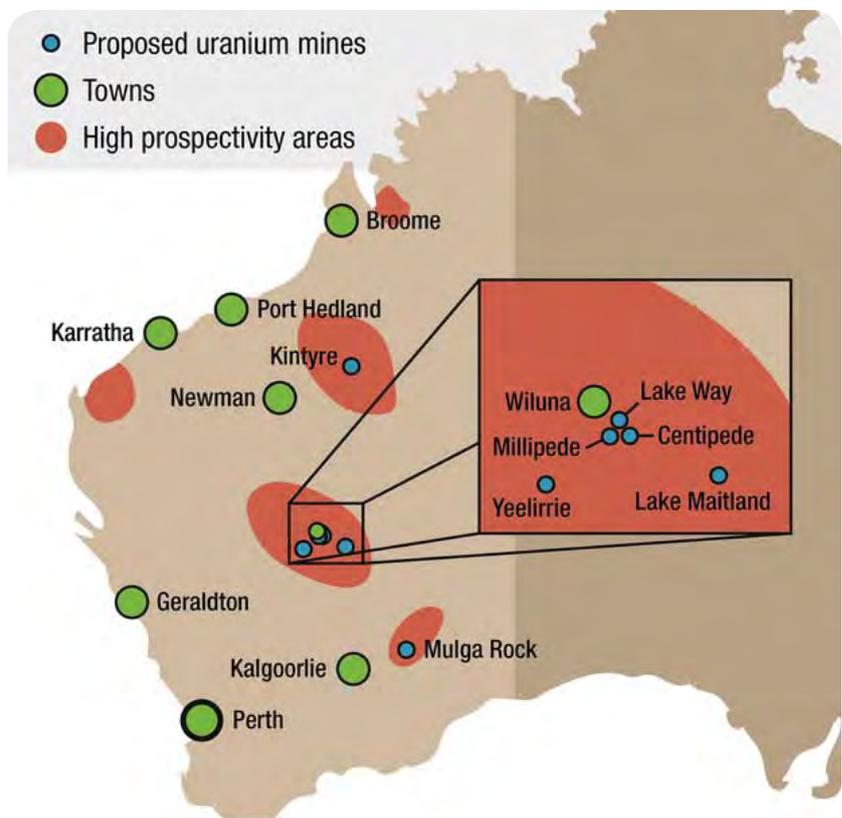
The Environmental Protection Authority is now reviewing public submissions on Toro's expansion plans to include the Millipede and Lake Maitland deposits.

Mr Marmion said Western Australia was well-placed to capitalise on this expansion, with world-leading regulation ensuring safe and responsible development.

"WA's four uranium projects promise to employ 1300 people and create a A\$1 billion export industry, so uranium is good news for local communities and the State as a whole," he said.

New Mines and Petroleum Minister Sean L'Estrange is also a strong supporter of a Western Australian uranium industry and is keen to see WA's first mine begin exporting.

"I will do everything possible to encourage the responsible development of what is potentially a billion-dollar per annum export industry," he said. ■



A map of Western Australia's proposed uranium mines and areas of prospectivity.

- WA's four potential uranium projects are Yeelirrie, Wiluna, Mulga Rock and Kintyre
- Yeelirrie is the largest resource (127.3 million pounds), followed by Wiluna (80.5 million pounds), Mulga Rock (75.03 million pounds) and Kintyre (55 million pounds)



Department of Mines and Petroleum Geological Survey of Western Australia Assistant Director Don Flint at the Western Australian booth at PDAC.

Fraser Institute fame helps sell Western Australia's message in Canada

Will Western Australia attract investment as a result of its strong presence at the recent Prospectors and Developers Association of Canada (PDAC) Conference?

You could say it's on the cards.

The first thing Geological Survey of Western Australia (GSWA) Assistant Director Don Flint and Land Use Geoscience Manager Warren Ormsby did when they sat down at their desks after attending PDAC 2016 in Toronto was to start going through the dozens of business cards they were given during four days working on the DMP booth and networking during the conference in March.

As he has done every year, Mr Flint has replied to each and every person who expressed interest in Western Australia's resources sector and sought further information on investment opportunities at the conference.

"You never know which lead might convert to additional investment in Western Australia," Mr Flint said.

"People came up to me and said they were impressed that in previous years DMP staff had followed through by sending information.

"The number of people at PDAC is mindblowing – about 22,000 this year."

Mr Flint said that people at PDAC were well aware of Western Australia's strong performance in the recent Fraser Institute rankings, scoring first in the world for investment attractiveness and best practice mineral potential, third for geoscience databases, and eighth on the policy perception index.

"A lot of people came up to us to congratulate Western Australia on getting the top gong for investment attractiveness," he said.

"I made a point of explaining that Western Australia was also actually equal top with Finland and Sweden in the geosciences databases index and that our score was 100 per cent, but we had been relegated to third on a 'countback' basis."

Mr Flint said he delivered the message during his talks with people and during his presentation said that the Exploration Incentive Scheme (EIS) was a key reason for Western Australia's success.

"When the EIS started in 2009, we were averaging about 20th in the major Fraser Institute indices and now we've gone to the top of the world," he said.

"EIS funding has enabled us to improve dramatically in the geosciences area by acquiring a huge amount of data, plus we've also improved our data delivery systems.

"But it's not just data. There's a lot of knowledge and knowledge-based products being provided to industry in addition to the data-driven products."

Mr Flint said he stressed the point that GSWA had gathered as much information over the past six or seven years as it probably would have done in 30 or 40 years under normal budget scenarios.

"The boost to Western Australia through our EIS-driven geoscience efforts will add benefits to the Western Australian economy for decades to come," he said.

"All of the States have run incentive schemes but ours has been the biggest and has certainly had the most impact."

Mr Flint said that the most popular attraction at the Western Australian booth was the 'Hot Spots' map.

"It's such a colourful map that the 'wow' factor is enormous," he said. "It just draws people to the booth and they're always impressed by the sheer size of Western Australia and the huge number of mines and deposits," he said.

"They'll come up and goggle at all the gold deposits in the Eastern Goldfields or the huge clusters of iron ore deposits and mines in the Pilbara and just shake their heads in wonder and awe.

"And there are always the people who worked in WA somewhere and they're trying to find the dot showing where they used to work so they can reminisce about the old days." ■



Don Flint with some of the business cards he brought back from PDAC.



TURNING BLACK DIAMOND INTO A COMMUNITY JEWEL

When the sun glistens through the jarrah trees onto the lake at Collie's Black Diamond pit, locals in this coal mining town in Western Australia's South West are used to seeing people turn up to take in the unique scenery.

However, a group of visitors that arrived in April heralded a milestone – the first step towards the rehabilitation of this unmanaged recreation site about five kilometres west of the townsite.

The Black Diamond Working Group – made up of representatives of the Shire of Collie, the Black Diamond Action Group, landowners, the Collie Visitor Centre, the Department of Mines and Petroleum (DMP), the Department of Lands and the Department of Parks and Wildlife – had only been formed the day before and was making its first official site visit.

Black Diamond became a popular tourist spot in the 50s after coal mining ceased and the pit was filled with water.

But despite its beauty, locals have raised concerns about the safety of the pit wall, illegal dumping, unauthorised camping and anti-social behaviour for many years.

As a result, DMP selected Black Diamond as the first of four pilot sites to benefit from the Abandoned Mines Program – using funds from the pioneering Mining Rehabilitation Fund (MRF).

DMP Executive Director Environment Dr Phil Gorey said the aim was to address the site's environmental and safety issues to establish a platform which the community could build on to develop future uses for the land.

“Over the years the Black Diamond site has become an unmanaged recreation area and the local community has understandably raised a number of concerns about the potential safety hazards this brings,” Dr Gorey said.

“A number of environmental issues have also been highlighted, including poor water quality in the pit, illegal dumping and unauthorised camping.

“The introduction of the award-winning MRF has now given us the opportunity to address the environmental and safety problems associated with the site.”

The primary focus of DMP's proposed rehabilitation plans centres on managing the safety risks associated with the steep pit wall on the southern side of the Black Diamond site, as well as revegetation works to improve water quality.

Other work may be undertaken and would be based on the outcomes from the site assessment and ongoing stakeholder consultation.

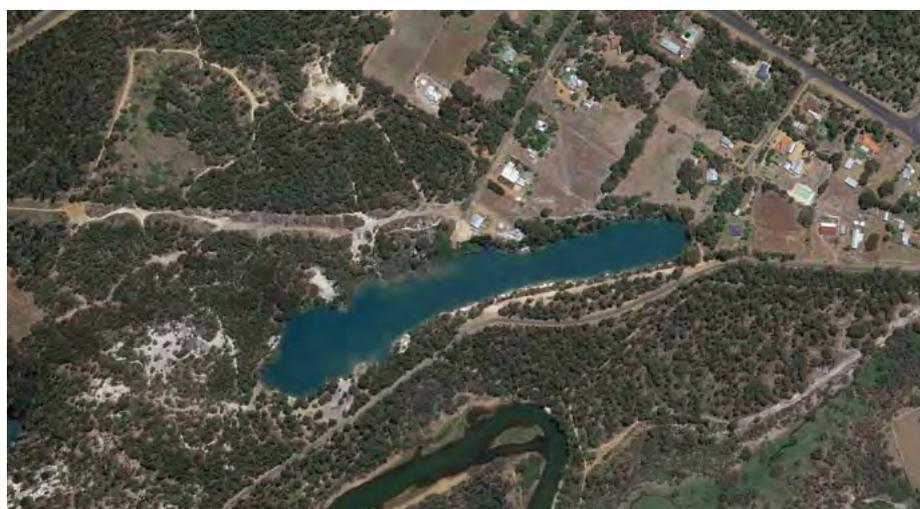
A successful community forum was held at Allanson Primary School last month to give local residents the chance to have their say on the proposed rehabilitation plans.

“The creation of the new Black Diamond Working Group, and the subsequent success of its first meeting is terrific news and a huge step forward towards achieving a long-term solution for this legacy site,” Dr Gorey said.

“The planning group members will form an invaluable part of ongoing rehabilitation plans and will be in a position to provide valuable advice which will greatly assist the department throughout the coming months.

“Extensive consultation with stakeholders, including members of the local community, will be absolutely crucial to ensuring this project is a success.

“That is why it has been so encouraging to see the creation of the working group and the eagerness of so many local residents to attend the first forum and have their voices heard.



An aerial view of Black Diamond.



A picturesque view of the Black Diamond site.

“By liaising with all interested parties we will also be able to assist local people to develop a long-term site solution that meets their needs.”

The proposed works scheduled to be undertaken at the Black Diamond site have been made possible by the introduction of the MRF – a world-first mining security policy contributed to by industry.

Interest generated from the fund can be used to rehabilitate legacy abandoned mine sites throughout Western Australia.

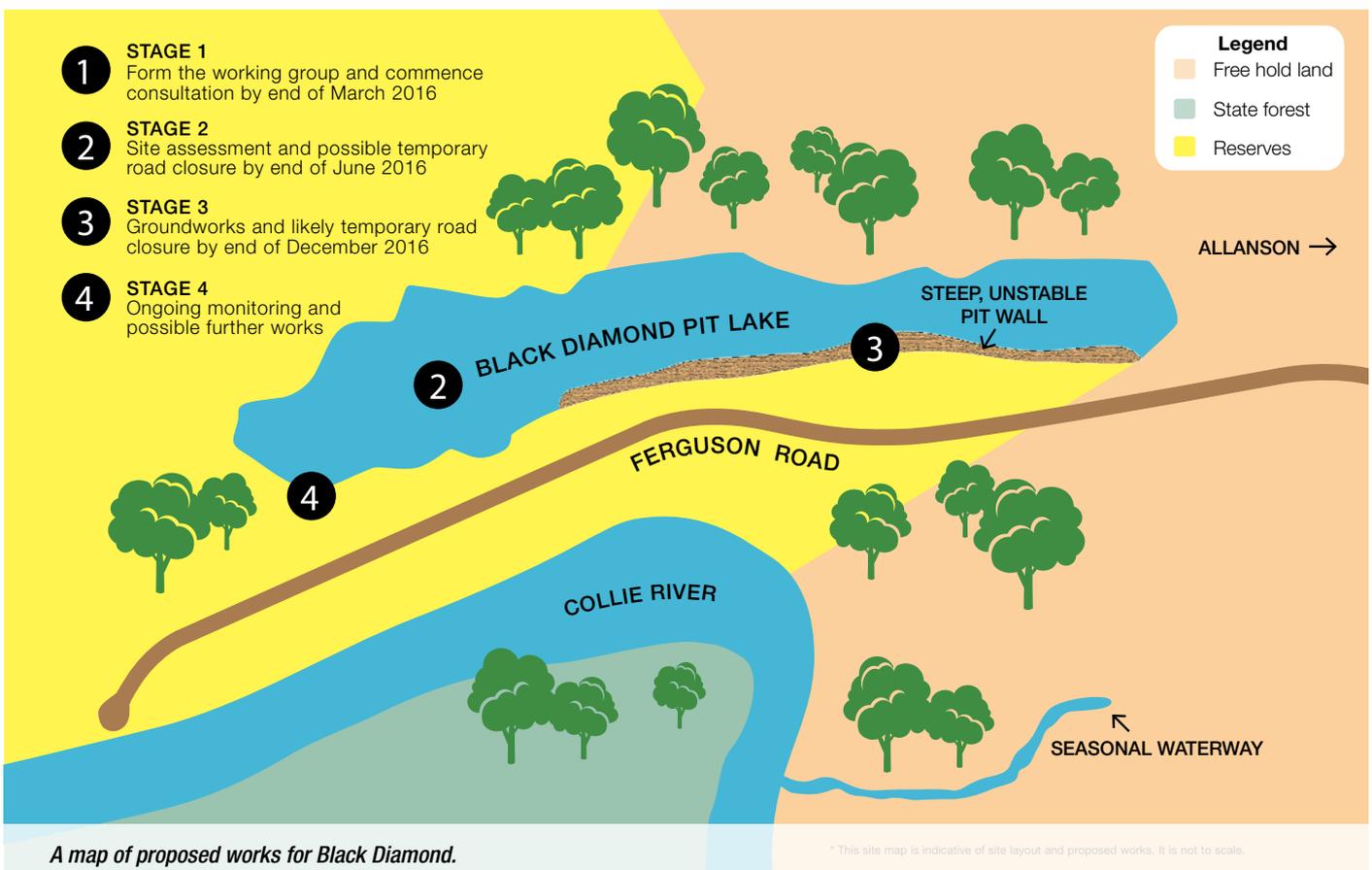
“The MRF has overwhelmingly won the support of government, the community and the mining industry since it was introduced,” Dr Gorey said.

“This pioneering initiative has enhanced the State’s ability to reduce the contingent liability to the State and manage and rehabilitate abandoned mine sites, leading to better environmental and community safety outcomes.

“The MRF was developed through extensive stakeholder consultation and is continuing to have a positive impact throughout Western Australia.

“In addition, for the first time, the State Government is now in a position to access a dedicated funding source which can be used to rehabilitate historical abandoned mines throughout Western Australia.”

Consultation over the proposed rehabilitation at Black Diamond will continue over the coming months with work expected to start in the middle of the year. ■



AGRICULTURE

East Kimberley – Ord – Ord/East Kimberley Expansion Project**WA STATE GOVERNMENT**

The State Government has invested \$322m to construct irrigation channels, roads and off-farm infrastructure to encourage private investment in irrigated agriculture on the Ord lands in the East Kimberley Region. Kimberley Agricultural Investment (KAI) a subsidiary of China's Shanghai Zhongfu Group is developing 13,400ha of irrigation land in the Goomig and Knox Plain areas. KAI is seeking to establish a sugar industry in the Kununurra region, subject to future land availability, and in the short term is producing chia and sorghum. The State has recently released a further 5,000ha of Ord West Bank and Mantinea lands to KAI and TFS, established producers of sandalwood.

Expenditure: \$322m.

HEAVY MINERAL SANDS

Keysbrook – Heavy Mineral Sands Mine**MZI RESOURCES LTD**

The Keysbrook Mineral Sands Project, located near the township of Keysbrook approximately 70km south of Perth, commenced heavy mineral concentrate (HMC) production on 29 October 2015, three weeks ahead of schedule. The project involved the construction of a new mine and wet concentration plant, and upgrades to the existing mineral separation (MSP) plant owned by Doral Mineral Sands in Picton, near Bunbury. Secondary processing of approximately 110,000tpa of Keysbrook HMC commenced at the Picton MSP plant in November 2015. The project is expected to produce 67,500tpa of leucoxene products and 28,700tpa of zircon concentrate, exported from the Bunbury Port. In late December 2015, the first shipment of zircon concentrate was exported to Tricoastal/Wensheng of China under a long-term offtake agreement. The first shipment of leucoxene product was exported to US customer Chemours in early March 2016. The total ore reserves at Keysbrook were recently increased from 26Mt to 72Mt at an average grade of 2.2 per cent total heavy minerals. Based on current production rates, the expected mine life has increased from 5.5 years to 16 years.

Expenditure: \$75m.

Employment: Construction: 100; Operation: 60

IRON ORE

Pilbara – Roy Hill Iron Ore Mine & Infrastructure**ROY HILL HOLDINGS PTY LTD**

The Roy Hill Iron Ore Project is located 115km north of Newman and owned by Roy Hill Holdings Pty Ltd, a private company majority owned by Hancock Prospecting Pty Ltd, with key international investment partners. Capital expenditure for the project was \$10b. Roy Hill took operational control of the Mine, Rail and Port infrastructure from EPC Contractor Samsung C&T on 4 February 2016, and is in the process of ramping up to full name plate production capacity of 55mtpa, which is anticipated by the end of 2016. The project is planned to produce high grade ore for 20 years following ramp-up. The project consists of a multiple pit mining operation, mine processing infrastructure, a 344km heavy haul railway, and significant new port facilities at the Port Hedland inner harbour.

Expenditure: \$10b.

Employment: Construction: 5300; Operation: 2000

IRON ORE PROCESSING

Pilbara – Cape Preston – Sino Iron**CITIC PACIFIC**

The Sino Iron project is located at Cape Preston, 100km south west of Karratha. When completed, it will be the largest magnetite mining and processing development in Australia, with a mine life of more than 25 years. The first shipment of magnetite concentrate to China occurred in late 2013. Since then, optimization of the first two production lines has occurred. Line 3 is currently in load commissioning, with Line 4 to follow shortly. Commissioning of the final two lines will commence in 2016. On completion, the project will comprise in-pit crushers, a 29km slurry pipeline, a pellet plant and annual capacity to produce up to 24 million tonnes of magnetite concentrate. The downstream processing facility has required significant investment in dedicated supporting infrastructure including a new port facility, a 51 gigalitre desalination plant and a 450 megawatt combined cycle gas fired power station.

Expenditure: \$11.1b.

Employment: Construction: 4000; Operation: 1000

OIL & GAS DEVELOPMENTS

Carnarvon Basin – Greater Western Flank Phase 1**WOODSIDE ENERGY**

The Greater Western Flank Phase 1 Project will develop the Goodwyn GH and Tidepole fields, via a subsea tie-back to the existing Goodwyn A Platform. First gas was produced from the Goodwyn GH field in late 2015 with further production from the Tidepole field expected from early 2017.

Expenditure: \$2.5b.

Kalgoorlie – Tropicana Gas Pipeline Project**ANGLOGOLD ASHANTI/APA GROUP JOINT VENTURE**

The 293km Eastern Goldfields Pipeline (EGP) was successfully commissioned in January 2016. The Minister for Mines and Petroleum officially opened the \$140million pipeline on 10 February 2016. The EGP is a significant piece of infrastructure for the State and delivers gas from fields off Western Australia's Pilbara coast to mining projects in the Goldfields region, reducing the reliance on diesel fuel, and provides the potential to bolster the development of new projects in one of the State's most productive resource regions. Despite tight approval timelines all key approvals were provided within project timelines. The project was completed 1 month ahead of schedule and within budget.

Expenditure: \$140m.

Employment: Construction: 250

AMMONIUM NITRATE

Pilbara – Burrup Industrial Estate Site D – Yara Pilbara Nitrates**YARA INTERNATIONAL ASA**

Yara Pilbara Nitrates Pty Ltd (YPN) is an incorporated joint venture between Yara International ASA (Yara) and Orica Limited (Orica). YPN has executed an Engineering, Procurement and Construction contract for the construction of a world class circa 330,000tpa Technical Ammonium Nitrate (TAN) plant to be located on the Burrup Peninsula. Ammonia feedstock will be supplied from Yara Pilbara Fertilisers Pty Ltd which owns and operates its facility directly adjacent to the proposed location for the new TAN plant. Yara will be the operator of the TAN plant and Orica will manage the product sales and distribution of the TAN product. It is intended that all manufactured product will be sold into the Pilbara region. Work on the project has commenced and it is expected that the new plant will be commissioned in 2016.

Expenditure: \$800m.

Employment: Construction: 500; Operation: 65

OIL & GAS DEVELOPMENTS

Carnarvon Basin – Greater Western Flank Phase 2**WOODSIDE ENERGY**

The Greater Western Flank Phase 2 Project will develop 1.6 trillion cubic feet of raw gas from the combined Keast, Dockrell, Sculptor, Rankin, Lady Nora and Pemberton fields via a 35km subsea tie-back to the existing Goodwyn A platform. Initial project start-up is expected in the second half of 2019.

Expenditure: \$2.8b.

Carnarvon Basin – Persephone Project**WOODSIDE ENERGY**

Woodside Energy Ltd, as operator of the North West Shelf Joint Venture is developing the Persephone gas field. The development involves two subsea wells and an 8km subsea tieback to the existing North Rankin Complex. Fabrication activities and offshore brownfield work has commenced, with start-up expected in early 2018.

Expenditure: \$1.2b.

Carnarvon Offshore Basin – Barrow Island – Gorgon Project**GORGON JOINT VENTURE**

The Gorgon Foundation Project on Barrow Island, now in its seventh year of construction, is a three train LNG development with a nameplate capacity of 15.6Mtpa and includes a domestic gas plant capable of delivering at least 300TJ/d of gas to the mainland. Cost estimates for the project construction are expected to total more than A\$55b. The project involves the processing of gas from both the Gorgon and Jansz/Io gas fields and includes potentially the largest commercial CO₂ geosequestration project in the world. Train one start up and first shipment of LNG commenced in March 2016 with trains two and three being commissioned later in the year.

Expenditure: \$55b.

Employment: Construction: 8000; Operation: 300

Pilbara – Wheatstone LNG Development**CHEVRON AUSTRALIA PTY LTD**

Chevron Australia Pty Ltd as Operator of the Wheatstone Project is currently working towards the construction of two LNG trains, a domestic gas plant and port facilities at the Ashburton North Strategic Industrial Area near Onslow. The Project will initially produce 8.9Mtpa of LNG and have a 200TJ per day domestic gas plant connected to the Dampier-to-Bunbury Natural Gas Pipeline. The Project is targeting first LNG by mid-year 2017.

Expenditure: \$29b.

Employment: Construction: 7200; Operation: 400

POWER STATIONS**Boodarie Industrial Estate – South Hedland Power Station****TRANSALTA**

In July 2014, TransAlta Energy (Australia) Pty Ltd announced it will build, own and operate a 150 megawatt power station in South Hedland's Boodarie Industrial Estate. The plant will consist of a combined cycle gas plant, featuring both natural gas and steam turbines. The A\$570 million investment will help meet the future energy needs of the region through a 25-year agreement with both Horizon Power and Fortescue Metals Group. The plant is being designed to allow for expansion and there is a possibility that other customers may be added in the future. Construction commenced in February 2015 and is expected to create up to 250 jobs. Full commissioning is expected to be complete mid 2017.

Expenditure: \$570m.

Employment: Construction: 250; Operation: 20

AGRICULTURE**East Kimberley – Project Sea Dragon****SEAFARMS GROUP LIMITED**

Seafarms Group is a Queensland based producer of farmed prawns. Seafarms proposes to invest up to US\$1.45b over the next eight years in Project Sea Dragon, a large scale, integrated, land based aquaculture project to produce black tiger prawns for export markets in Asia. The aquaculture component of the project will be located in the Northern Territory and is planned as a staged development commencing with Stage 1, 1,000 hectares of ponds and supporting infrastructure with an estimated capex of \$150million. In Western Australia a founder stock and quarantine centre is proposed for Exmouth, a processing plant is proposed for Kununurra with Wyndham port being utilised for export and import. The project will create approximately 300 jobs during construction and Stage 1, 700 direct jobs when fully operational. A Final Investment Decision on Stage 1 of the project is expected in mid-2016 and financial close by the end of 2016.

HEAVY MINERAL SANDS**Shark Bay – Coburn Zircon Project****STRANDLINE RESOURCES LIMITED**

Strandline proposes to develop the Coburn zircon project, located south of Shark Bay and approximately 250km north of Geraldton. It contains total ore reserves of 308Mt at an average grade of 1.2 per cent heavy minerals, all of which lie within the portion of the project area that has received government environmental approvals for mining. At a mining rate of 23.4Mtpa, the project is expected to produce 49,500tpa of zircon, 109,000tpa of chloride ilmenite and 23,500tpa of a mixed rutile-leucocoxene over its 19 year mine life. The company has secured all of the approvals required to commence mining and processing operations at Coburn, and is continuing to pursue discussions with parties interested in becoming a strategic partner in the project.

Expenditure: \$173m.

Employment: Construction: 170; Operation: 110

INFRASTRUCTURE**Bunbury – Multi-User Bulk Terminal Facility – Port of Bunbury****LANCO RESOURCES AUSTRALIA PTY LTD**

Lanco Resources Australia Pty Ltd proposes to construct a 15Mtpa Multi-user bulk terminal facility located at the Berth 14A site within the Inner harbour of the Port of Bunbury. The facility will include ship loading for up to 85,000 tonnes, fully covered and dust suppressed conveyor galleries, a storage shed, with internal stacker reclaimer, up to 750m LOA, 140m wide and 40m high. The train unloading and rail loop load in facility will be able to accommodate Coal, Iron Ore, Bauxite and other bulk ore materials. The Terminal will have capacity to expand. Environmental approvals have been obtained with construction expected to commence by early 2017 ready for operation in 2020.

Expenditure: \$400m.

Employment: Construction: 750; Operation: 100

Dampier Peninsula – Browse LNG Precinct**WA STATE GOVERNMENT**

The State Government is developing the Browse Liquefied Natural Gas (LNG) Precinct approximately 60km north of Broome. By focussing development at a suitable location, the Precinct will minimise the environmental footprint of gas processing and any social impacts in the region while maximising opportunities for the local community to benefit from development of the Browse Basin gas fields. The Precinct will have the capacity to accommodate at least two LNG processing operations, with a combined capacity of up to 50Mtpa. The State Government has acquired the land for the Precinct and will secure all relevant approvals to ensure the Precinct is 'project ready'.

IRON ORE**Pilbara – Balla Balla Infrastructure Project****BALLA BALLA JOINT VENTURE**

The Balla Balla Infrastructure (BBI) project proposes to construct and operate a multi-user transshipment and stockyard facility at Balla Balla Harbour and approx 160 km railway traversing from Balla Balla Harbour between the Milstream Chichester and Mungaroona Range National parks towards the central Pilbara. The BBI project is currently designed to service the Flinders Mines, Pilbara Iron Ore Project as its foundation customer.

Expenditure: \$2.8b.

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 40Mtpa of direct shipping iron ore from deposits, including Red Hill and Mt Stuart deposits, located 35-80km south west of Pannawonica. The ore is to be transported by a 282km heavy haul railway for export via the proposed multi-user port at Anketell. Both facilities are proposed to be constructed and operated by Aurizon Holdings Ltd. State and Federal environmental approvals for the mine, rail and port elements of the project are in place. Subject to the successful completion of feasibility studies, and receipt of final regulatory approvals, the company anticipates construction to commence following a decision to proceed by the joint venturers and completion of funding arrangements.

Expenditure: \$6.8b

Employment: Construction: 3500; Operation: 900

NICKEL**Mt Windarra – Windarra Nickel****POSEIDON NICKEL NL**

Poseidon Nickel Ltd has submitted a project development proposal for the redevelopment of the Mt Windarra underground nickel mine and associated project infrastructure at Mt Windarra.

OIL & GAS DEVELOPMENTS**Canning Basin – Buru Canning Basin Tight Gas BURU ENERGY**

The Buru Energy/Mitsubishi joint venture (JV) is appraising the commercial potential of the Laurel Formation, a large onshore natural gas resource located in the Canning Basin. Following the successful completion of the 2015 tight gas stimulation program on and near Noonkanbah Station, Buru commissioned DeGolyer and MacNaughton, a specialist tight gas and unconventional resource assessment consulting group to undertake an independent assessment of the gas and liquids potential of the Laurel Formation in the Valhalla area. This independent assessment has confirmed that the region contains a nationally significant multi TCF wet gas accumulation. Future on ground works will provide additional contracting, employment and training benefits to Noonkanbah Community who have been heavily involved in on-ground works to date.

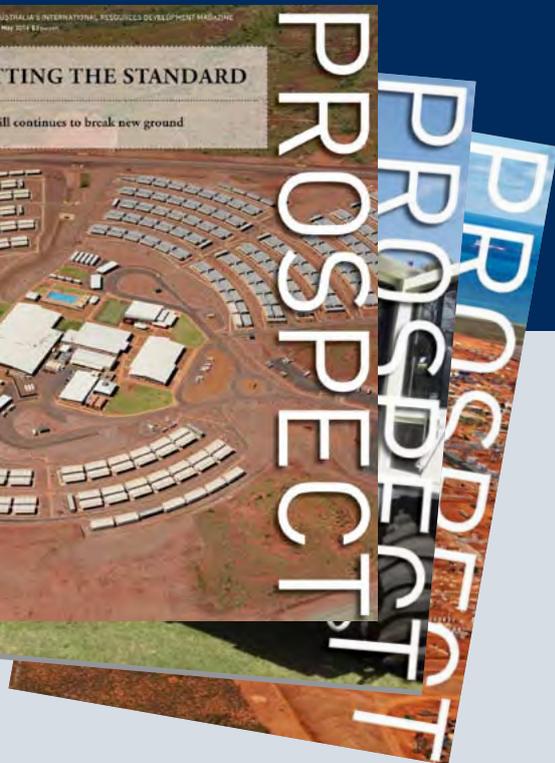
Expenditure: \$40m.

Employment: Operation: 30

URANIUM**Northern Goldfields – Yeelirrie – Yeelirrie Uranium****CAMECO AUSTRALIA PTY LTD**

Cameco Australia proposes to develop the Yeelirrie project in the North-eastern Goldfields, near Wiluna. The project 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 will process up to 2.4mtpa of uranium ore over about 17 years. The resultant uranium oxide will be transported to South Australia by road for export to overseas markets. The environmental assessment process has commenced. Cameco will advance the project at a pace aligned with market conditions.

Employment: Construction: 500; Operation: 225



Significant resource projects in Western Australia

Western Australia continues to lead the way as Australia's premier resources investment destination. There are more than A\$120 billion worth of projects either committed or under consideration for the State during the next few years. These would create more than 30000 construction jobs and more than 5000 permanent jobs.

This section is intended as an overview and does not constitute an exhaustive list of projects within the Western Australia resources industry. Based on company announcements.

Significant Projects as at May 2016

	Project Value (estimated A\$m)	Employment	
		Construction	Permanent
Iron and Steel			
API Management Pty Ltd – West Pilbara Iron Ore Project	6800	3500	900
CITIC Pacific – Cape Preston Mine & Processing Projects	11100	4000	1000
Roy Hill Holdings Pty Ltd – Roy Hill Iron Ore Mine & Infrastructure	10000	5300	2000
Sub Total	27900	12800	3900
Oil, Gas and Condensate			
Browse LNG Precinct	n/a	n/a	n/a
Buru Energy – Buru Canning Basin Tight Gas	40	100	30
Chevron – Wheatstone LNG	29000	7200	400
Gorgon Joint Venture Gas Processing Project	55000	8000	300
Woodside Energy – Greater Western Flank Phase 1	2500	n/a	n/a
Woodside Energy – Greater Western Flank Phase 2	2800	n/a	n/a
Woodside Energy – Persephone	1200	n/a	n/a
Sub Total	90540	15300	730
Other			
Cameco Australia – Yeelirrie Uranium	n/a	500	225
Lanco Resources Australia Pty Ltd – Multi-User Bulk Terminal Facility – Port of Bunbury	400	750	100
Ord East Kimberley Expansion Project	322	n/a	n/a
TransAlta – South Hedland Power Station	570	250	20
Yara International ASA – Yara Pilbara Nitrates	800	500	65
Yara International ASA – Yara Pilbara Nitrates	800	500	65
Sub Total	2092	2000	410
TOTAL	120532	30100	5040

All currency figures are in Australian dollars unless otherwise specified.

Abbreviations Key

b	billion	m	million
EPC	Engineering, Procurement and Construction	Mt	million tonnes
GL	gigalitres	Mtpa	million tonnes per annum
ha	hectares	MW	megawatts
JV	joint venture	t	tonnes
km	kilometres	THM	total heavy mineral
LNG	liquefied natural gas	TJ	terajoules
LOA	length overall	tpa	tonnes per annum

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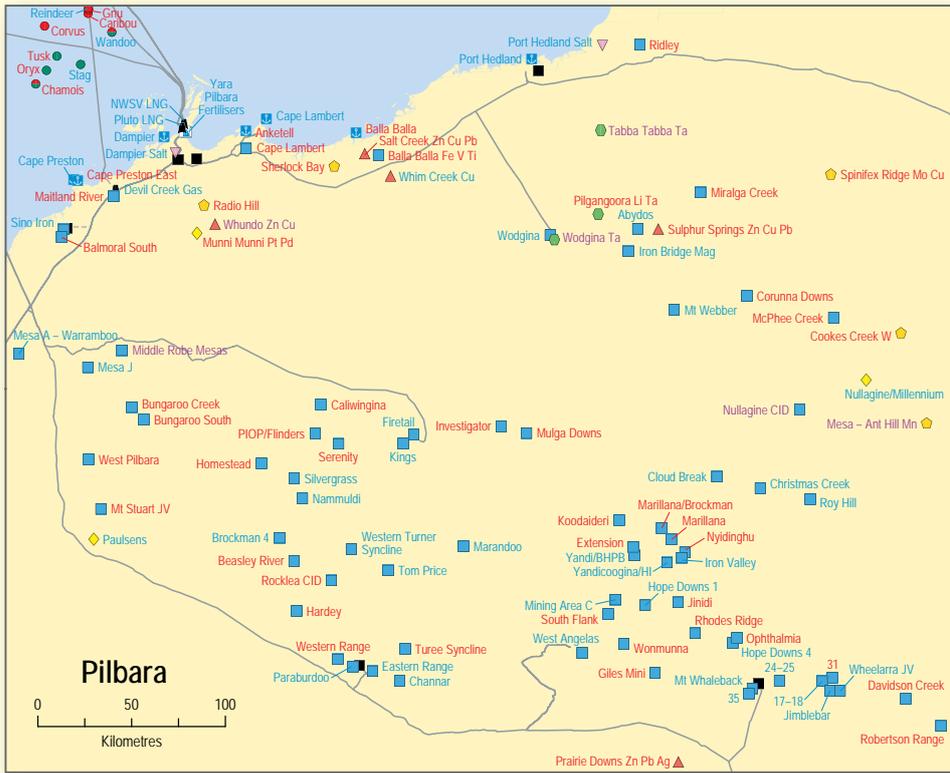
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Mineral symbols		Commodities	
◆ Precious metal	Au (or as shown)	Ag..... Silver	
◆ Steel alloy metal	Ni (or as shown)	Au..... Gold	
◆ Speciality metal	Ti-Zr (or as shown)	Cheft..... Chert	
▲ Base metal		Cu..... Copper	
▲ Iron		Fe..... Iron	
▲ Alumina	All sites are bauxite	Hem..... Hematite	
● Coal and lignite		K..... Potassium	
▽ Industrial mineral		Kln..... Koolinite, Kaolin	
⊠ Processing plant		Li..... Lithium	
Petroleum symbols		LNG..... Liquefied natural gas	
● Gas field		LPG..... Liquefied petroleum gas	
● Oil field		Mag..... Magnetite	
● Oil and gas field		Mica..... Mica	
◆ Significant gas discovery		Mn..... Manganese	
▲ Processing plant		Mo..... Molybdenum	
— Oil / gas pipeline, operating		Ni..... Nickel	
- - - Oil / gas pipeline, proposed		Pb..... Lead	
Infrastructure		Pd..... Palladium	
■ Power plant		Phos..... Phosphate	
⊠ Irrigation / water / desalination		Pt..... Platinum	
⊠ Port		REE..... Rare earth elements	
		Sisd..... Silica sand	
		Ta..... Tantalum	
		Ti..... Titanium	
		Tlc..... Talc	
		V..... Vanadium	
		W..... Tungsten	
		Zn..... Zinc	
		Zr..... Zirconium	

Data for offshore Commonwealth controlled waters is up-to-date as of February 2016. Enquiries for latest information for Commonwealth controlled waters is available from the National Offshore Petroleum Titles Administrator (NOPTA) at <info@noppta.gov.au>

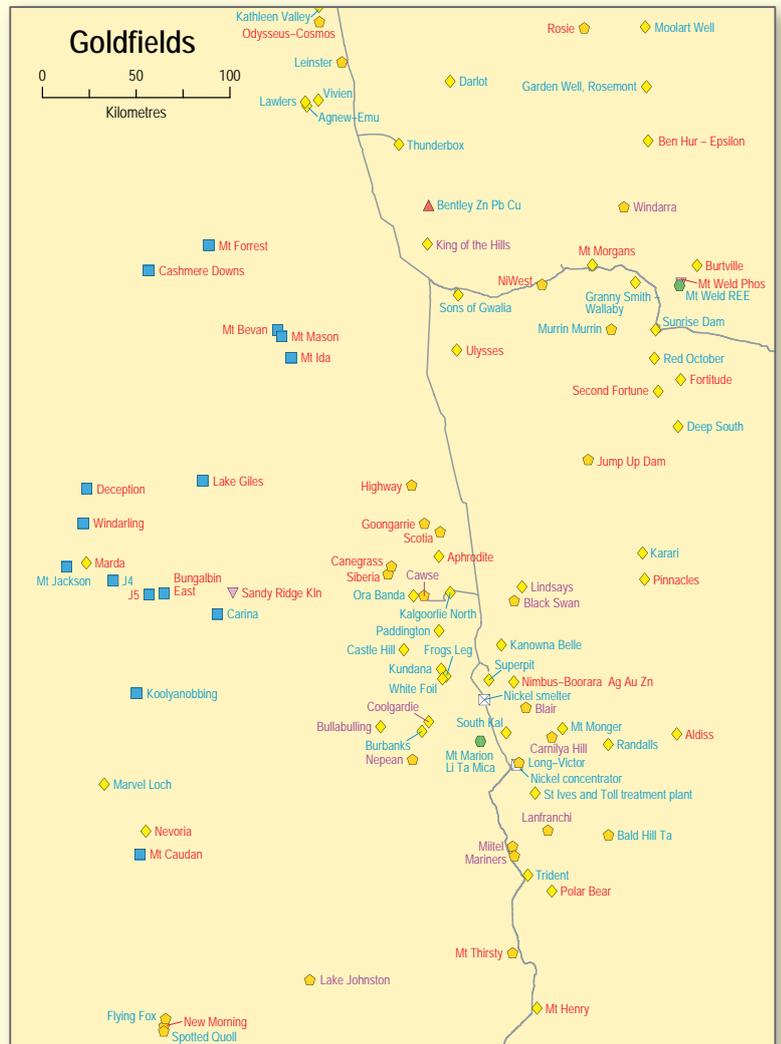


Project labels:

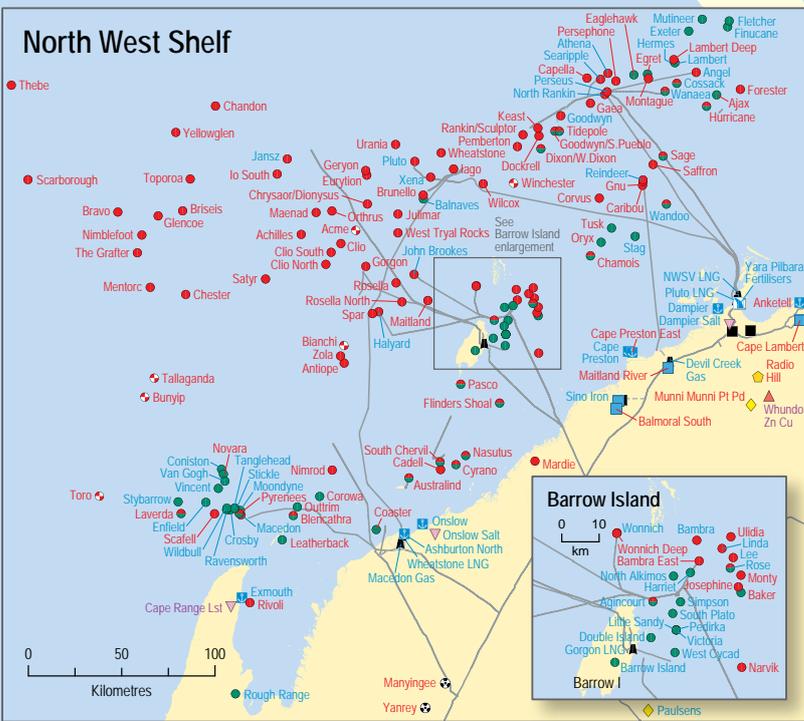
Projects operating or currently under development with an actual or anticipated value of production greater than A\$10 Million are shown in blue

Proposed or potential projects with a capital expenditure greater than A\$20 Million are shown in red

Projects under care and maintenance are shown in purple



North West Shelf



Major Resource Projects June 2016

Project labels:

Projects operating or currently under development with an actual or anticipated value of production greater than A\$10 Million are shown in blue

Proposed or potential projects with a capital expenditure greater than A\$20 Million are shown in red

Projects under care and maintenance are shown in purple



Commodities

- Ag..... Silver
- Au..... Gold
- Co..... Cobalt
- Cu..... Copper
- Dmd..... Diamond
- Fe..... Iron
- Fl..... Fluorite
- Gp..... Gypsum
- Gr..... Graphite
- Grt..... Garnet
- K..... Potassium
- Kln..... Kaolin
- Li..... Lithium
- LNG..... Liquefied natural gas
- Lst..... Limestone
- Mag..... Magnetite
- Mn..... Manganese
- Nb..... Niobium
- Ni..... Nickel
- Pb..... Lead
- Pd..... Palladium
- PGE..... Platinum group elements
- Pt..... Platinum
- REE..... Rare earth elements
- Ta..... Tantalum
- Ti..... Titanium
- V..... Vanadium
- W..... Tungsten
- Zn..... Zinc
- Zr..... Zirconium

Mineral symbols

- ☆ Precious mineral
- ◇ Precious metal
- ◇ Au (or as shown)
- ◇ Steel alloy metal
- ◇ Ni (or as shown)
- ◇ Speciality metal
- ◇ Ti-Zr (or as shown)
- ▲ Base metal
- Iron
- Alumina
- All sites are bauxite
- Coal and lignite
- ⊕ Uranium
- ▽ Industrial mineral
- ⊠ Processing plant

Petroleum symbols

- Gas field
- Oil field
- Oil and gas field
- Significant gas discovery
- Significant oil and gas discovery
- ▲ Processing plant
- Oil / gas pipeline, operating
- - - Oil / gas pipeline, proposed

Infrastructure

- Power plant
- ⊠ Irrigation / water / desalination
- ⊠ Port

Data for offshore Commonwealth controlled waters is up-to-date as of February 2016. Enquiries for latest information for Commonwealth controlled waters is available from the National Offshore Petroleum Titles Administrator (NOPTA) at <info@nopla.gov.au>

