

Western Australian
mineral and petroleum
statistics digest 2003



Department of
Industry and Resources

CONTENTS

	Page
FOREWORD	1
RESOURCE SALES AND EXPORTS 2003.....	2
Overview	2
Prices in 2003	4
Outlook	4
Petroleum	5
Iron Ore	9
Alumina	12
Gold	14
Nickel	16
Heavy Mineral Sands	19
Diamonds	21
Base Metals.....	22
Other Minerals.....	23
EXPLORATION AND INVESTMENT	26
Petroleum Exploration.....	26
Mineral Exploration	26
Investment.....	27
TABLES	
1. Quantity and Value of Minerals and Petroleum	28
2. Quantity and Value of Selected Major Commodities.....	30
3. Quantity and Value by Local Government Area.....	32
4. Royalty Receipts 2002 and 2003	38
5. Average Number of Persons Employed in the WA Minerals and Petroleum Industries	40
6. Principal Mineral and Petroleum Producers 2003	44
ABBREVIATIONS, REFERENCES, UNITS AND CONVERSION FACTORS	48
DATA SOURCES.....	49

The Statistics Digest has been compiled in good faith by the Department of Industry and Resources from information and data gathered in the course of the Digest's production. The Department believes information contained in this document is correct and that any opinions and conclusions are reasonably held or made as at the time of compilation. However, the Department does not warrant their accuracy and undertakes no responsibility to any person or organisation in respect of this publication.

LIST OF FIGURES

Figures	Page
1 Average Price Comparison	2
2 Major Commodities by Value 2002 and 2003	2
3 Sales by Commodity	2
4 Exchange Rate US\$/A\$	3
5 Exchange Rate Trade Weighted Index	3
6 Non-rural Commodity Price Index	4
7 Petroleum Exports	5
8 Crude Oil Exports	6
9 TAPIS Crude Oil Price	6
10 Crude Oil and Condensate — Quantity and Value by Quarter	6
11 Crude Oil and Condensate Quantity, WA versus Australia	7
12 Condensate Exports	7
13 Australia's Gas Resources	8
14 Iron Ore Exports	9
15 Iron Ore Price	9
16 Iron Ore — Quantity and Value by Quarter	9
17 Iron Ore Quantity, WA versus Australia	10
18 China's Iron Ore Imports by Source	10
19 Alumina Exports	12
20 Alumina Price	12
21 Alumina — Quantity and Value by Quarter	13
22 Alumina Quantity, WA versus Australia	13
23 Gold Price	14
24 Gold Exports	15
25 Gold Production, WA versus Australia	15
26 Gold — Quantity and Value by Quarter	15
27 Nickel Exports	16
28 Nickel Price	16
29 Nickel — Quantity and Value by Quarter	17
30 Nickel Quantity, WA versus Australia	17
31 Heavy Mineral Sands Exports	19
32 Heavy Mineral Sands — Value by Quarter	19
33 Heavy Mineral Sands Price Index	20
34 Heavy Mineral Sands Value of Production, WA versus Australia	20
35 Selected WA Commodities Relative to World Production	24
36 Mineral Exploration Expenditure, WA versus Australia	26
37 Petroleum Exploration Expenditure, WA versus Australia	26
38 Mining Investment, WA versus Australia	26
39 Tenements in Force Act 1978	27
40 Royalty Receipts by Commodity	39
 MAPS	
Local Government Boundaries	50
Major Mineral and Petroleum Projects in Western Australia	51

FOREWORD



Jim Limerick
Director General

Welcome to the Department of Industry and Resources' 2003 Statistics Digest. This publication contains the most comprehensive statistical information available on the Western Australian mineral and petroleum industry.

This Digest provides detailed quantity and value data, by commodity and industry sector in addition to figures on employment, royalty receipts, exploration, investment and principal producers. Incorporated with this is an analysis explaining the performance of the various mineral and petroleum sectors. Numerous facets of the State's resource sector, including commodity price trends and Western Australia's position as a resource exporter, are also covered.

In 2003, the Western Australian resources sector was characterised by the appreciation of the Australian dollar and strong Chinese demand for metals with an associated impact on commodity prices. On balance, the volume and price changes only partially offset the impact of the stronger local currency. A 20% appreciation of the Australian dollar in 2003 outstripped the combined impact of US dollar price gains and sales volume changes for all major commodities, except LNG and nickel. As a result, the total sales value of Western Australian petroleum and mineral commodities fell by 3% to \$26.6 billion in 2003.

It was, nevertheless, an impressive year for the Western Australian resources sector with iron ore, alumina, nickel, natural gas, salt, cobalt and manganese reaching record production levels. However, petroleum sales decreased in 2003, largely due to reduced crude oil production from mature fields.

For the second consecutive year Western Australia's two largest mineral sectors, iron ore and alumina achieved record production. However, both of these sectors were also examples of the adverse impact of the stronger local currency, as sales values declined despite record production and healthy growth in international prices.

Another key feature for Western Australia's resources sector in 2003 was the range of major new projects brought forward, particularly, in the iron ore sector, to meet strong global demand growth, particularly from China. This highlights the industry's view that it is well positioned to build on its strengths, as a reliable supplier of quality resources at world cost-competitive prices, within close proximity to some of the world's largest and fastest growing markets.

This report provides the statistical information necessary to consider all these issues.

In releasing the Western Australian Mineral and Petroleum Statistics Digest for 2003, I would like to express my appreciation to the many individuals and companies who have contributed to the preparation of this report, including the Australian Bureau of Agricultural and Resource Economics (ABARE), the Australian Bureau of Statistics (ABS) and the Department of Treasury and Finance.

RESOURCE SALES AND EXPORTS 2003

OVERVIEW

In 2003, the resources sector was characterised by two key features, the Australian dollar appreciation and strong Chinese demand for particular metals and the associated impact on commodity prices. On balance, volume and price changes only partially offset the impact of the stronger Australian dollar, with the 20% Australian dollar appreciation outstripping the combined impact of US dollar price gains and sales volume changes for all major commodities, with the exception of LNG and nickel. As a result, the total value of Western Australian petroleum and mineral sales fell a modest 3% to \$26.6 billion in 2003. Despite the decline, the value of many commodities remained close to record levels.

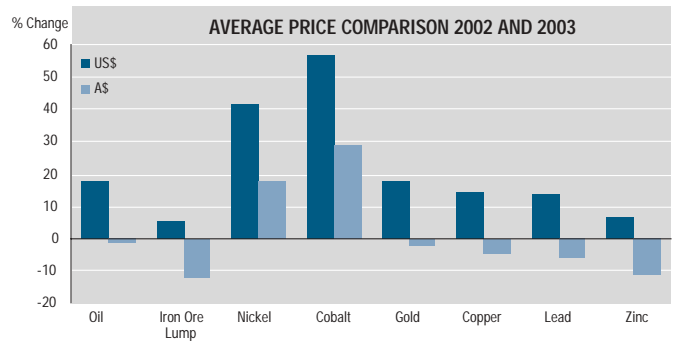
Lowered petroleum sales volumes also contributed to reduced sales values. This was largely attributable to an 8% decline in crude oil sales, due to reduced production from mature fields. The combined impact of the appreciation of the Australian dollar and the decline in crude oil sales was only partly offset by healthy US dollar price gains of 18% in annual average terms and a 4% increase in LNG sales volumes. Accordingly, the total value of petroleum sales eased off its 2002 record levels, falling 5% to \$9.7 billion in 2003. Nevertheless, the petroleum sector remains Western Australia's largest resource sector, accounting for 37% of total sales. Combined, crude oil and LNG accounts for more than 70% of petroleum sales.

The adverse impact of the Australian dollar appreciation was most evident in its effect on iron ore sales. Driven by Chinese demand, iron ore sales increased by 13% to reach a record of 194 Mt. Nevertheless, the value of iron ore sales receded marginally to \$5.0 billion. Iron ore accounts for 19% of sales in the resources sector, the largest individual commodity, followed by crude oil, which accounts for 15% of sales.

The gold price enjoyed a considerable revival increasing by 17% in annual average terms during 2003. However, this was offset by the local currency, combined with a slight decline in the volume of sales, which were down by 1% to 187 t. The overall result was that the value of sales declined by 3% to \$3.4 billion. Gold remains Western Australia's third most valuable individual commodity export, slightly ahead of alumina.

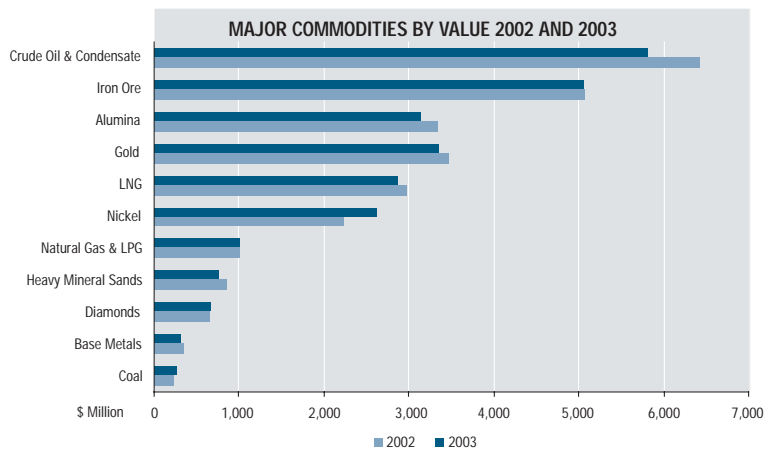
The Western Australian alumina industry also experienced a record year in 2003, with sales volumes increasing 2% to a record level of 11.2 Mt. However, similar to iron ore the record volume of alumina sales was transformed into a 6% decline to \$3.1 billion in sales. This was due to an average price increase of 12% in US dollar terms being insufficient to offset the Australian dollar's appreciation. Alumina accounts for 12% of sales values in the resources sector.

The star performer in 2003 was nickel, which defied the general trend and grew by 16% in value terms to a record \$2.6 billion. This was largely attributable to the nickel price almost doubling in US dollar terms. In volume terms, nickel sales increased by 3% to 187 737 t.



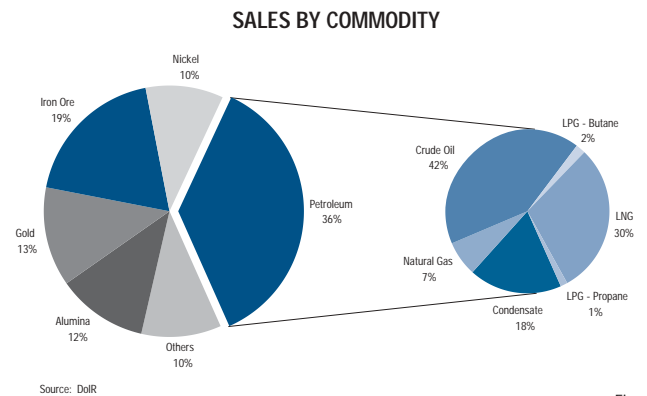
Source: WA Treasury Corporation, CME, Kitco, TEX report, Metal Prices

Figure 1



Source: DoIR

Figure 2



Source: DoIR

Figure 3

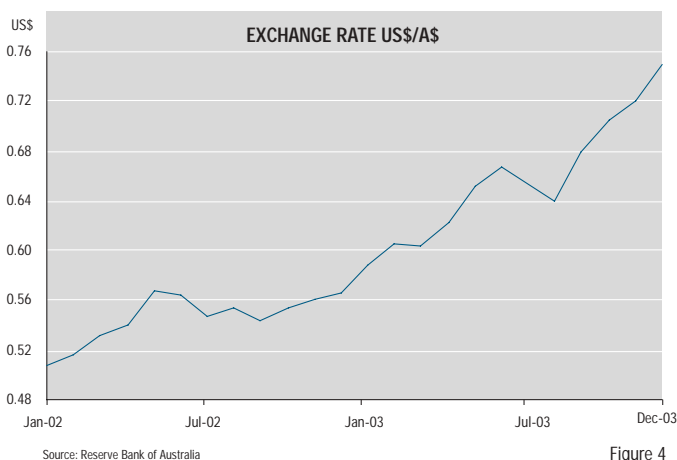


Figure 4

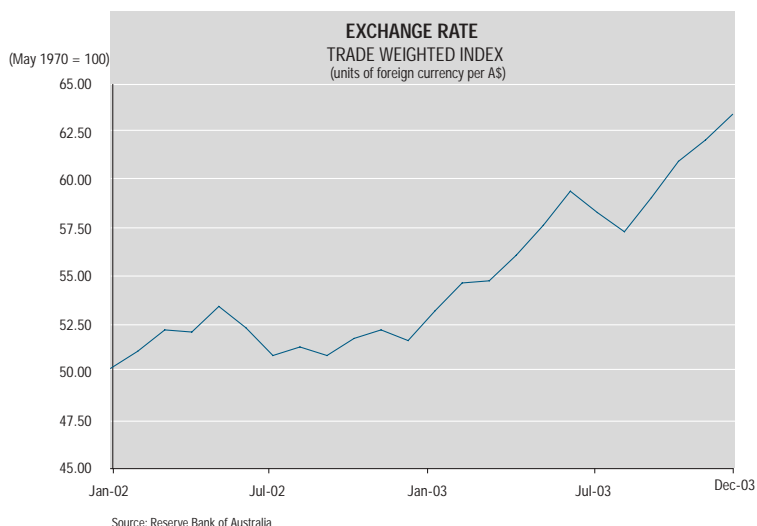


Figure 5

Two other key features of 2003 were booming freight rates and constraints in mining and infrastructure capacity to meet demand for key resources. The latter, manifested in a range of major project developments being brought forward, particularly in the iron ore sector, to meet strong demand growth, especially from China.

Despite the adverse developments in 2003 arising from a strong Australian dollar, the outlook remains positive with continued strong demand flowing through to prices. It is also noteworthy that the relative importance of the resources sector in Western Australia remains uncontested, contributing around three-quarters of exports and around a quarter of gross State product. Sales growth of the petroleum and minerals sector has also experienced nominal growth of around 8% per annum over the last ten years.

RESERVE BANK OF AUSTRALIA (RBA) COMMODITY PRICE INDEX

The Reserve Bank of Australia Commodity Price Index is based on the price of 19 major commodities exported by Australia. These commodities collectively account for around two-thirds of total commodity exports. The index is apportioned into three sections – rural, non-rural, and base metals.

The non-rural index comprises base metals (which consist of aluminium, copper, nickel, zinc and lead), gold, coking coal, steaming coal, iron ore, alumina and LNG. The index is compiled monthly and is expressed in US dollars, Australian dollars and Special Drawing Rights (SDR).

The RBA's index, expressed in US dollar terms is useful because most commodities are traded in world markets in US dollars. However, such an index is subject to changes in the US dollar exchange rate (as it is based on spot prices). In this respect, the SDR index is a better indication of underlying supply and demand for commodities than the US dollar index.

SDR is a unit of account used by the International Monetary Fund (IMF). Its value is based on a basket of currencies comprising the euro, Japanese yen, English pound and US dollar. Weights are assigned to each of these currencies to reflect their relative importance in world terms. The RBA expresses the SDR component of its index in US dollar terms, with commodity prices derived from the London Metal Exchange and Bloomberg and converted to monthly averages of daily data.

Alternatively, the Australian dollar index is useful for gauging the domestic currency price received by Australian commodity exporters as it reflects the interrelation between world commodity prices and the Australian exchange rate. For example, if prices in foreign currency terms remain unchanged but the Australian dollar depreciates, this will be recorded as a favourable upward shift in the index, which would not be evident in either the SDR or US dollar index.

The RBA index is a fixed-weight Laspeyres index, using 2001–02 as the base year and excludes crude oil. The index is re-based every five years in order to make long-run reliable comparisons, unlike the national accounts that are re-based annually to track short-run movements. Base-period weights indicate the relative importance given to individual commodities. They are based on gross exports thus explaining the omission of crude oil (for which Australia is a net importer) and correspond to the export value of each commodity as a share of total exports. These weights change over time to reflect changes in the composition of commodity exports. Movements in the index from one period to the next reflect underlying price movements and do not take into account changes in volumes.

PRICES IN 2003

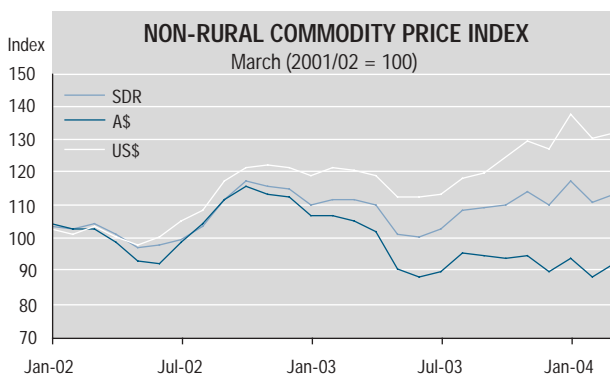
In 2003, the Australian dollar appreciated around 20% against the US dollar in annual average terms and it was around 30% stronger against the US dollar in year-ended terms, reaching levels not seen since early 1997. Although the appreciation of the Australian dollar is partly driven by the imbalances in the global economy, as manifested by the US current account deficit and the general depreciation of the US dollar, the Australian dollar also appreciated against a range of other currencies. In trade-weighted terms, the Australian dollar appreciated more than 10% in average terms and ended the year around 20% above its level at the beginning of the year.

After a weak first beginning, commodity markets sprang to life in the second half of 2003, as the world economy began to pick-up and strong demand growth from China continued to drive demand for minerals. On average, the Reserve Bank of Australia's (RBA) US dollar, non-rural commodity price index grew 7% over 2003, to end the year 12% higher. However, due to the solid appreciation of the Australian dollar, the RBA's non-rural commodity price index retreated 11% on average in Australian dollar terms during 2003.

Oil prices, which are not included in the RBA's commodity price index, also grew a healthy 18% in average terms in 2003 with geo-political uncertainty, low stocks and supply discipline lending support to prices. However, the Australian dollar appreciation led to the average price declining marginally in Australian dollar terms.

In 2003, metals such as copper, lead and nickel were among the commodities experiencing the strongest growth in prices, during the year. Yet, in Australian dollar terms, prices receded in annual average terms, by around 5%. Price growth picked up in the second part of the year and in year-ended terms, base metal prices ended in positive territory, up just over 1% in Australian dollar terms.

Influenced by the activity in commodity trade, spot-ocean freight prices have also increased significantly. According to Australian Mineral Economics (AME), spot rates for the two key vessel categories that deliver dry bulk commodities, such as coal and iron ore, tripled in 2003. The surge in shipping rates has been a result of global demand for resources underpinned by China's demand for coal and iron ore to produce steel for its construction programs.



Source: Reserve Bank of Australia

Figure 6

OUTLOOK

The first quarter of 2004 has seen continued US dollar price growth of key resource commodities, while the Australian dollar appears to be stabilising or even receding. As a result, the RBA commodity index grew 7% in average US dollar terms, while it stagnated in Australian dollar terms, while the base metal index performed more strongly in average Australian dollar terms, increasing 9%. If this development continues, the outlook for 2004 is very positive for the Australian resources sector.

Demand is likely to continue to grow significantly over the remainder of 2004 with continued strong growth in China, albeit the Chinese authorities are targeting an economic growth rate of around 7% in 2004 compared with 9% in 2003. Any modest slowdown in China is likely to be partly offset by increased growth in the US, where economic recovery now appears to be on track. Similarly, the rest of Asia, including Japan, appears also to be likely to experience robust growth, partly assisted by demand from China and the US. Europe is also expected to recover, albeit at a slower pace, as US demand for European exports continues to grow. As a consequence, 2004 should be the first year with synchronised Organisation of Economic Co-operation and Development (OECD) growth for a decade.

On the supply side, the global resources sector is generally expected to struggle to meet growth in demand and a range of significant mine developments are still a couple of years from getting their output to market.

Western Australia saw a range of significant expansion projects during 2003, which should significantly enhance the capacity to meet rising global demand for resources. As a result, the volume of Western Australian mineral and petroleum production is expected to perform robustly.

In the light of expected demand and supply developments, commodity prices are generally forecast to continue to perform strongly in US dollar terms. Possible exceptions to this are oil and gold prices. Oil prices benefited significantly from the Iraq war and have maintained relatively high levels due to supply discipline and supply disruptions. However, the Australian Bureau of Agricultural and Resource Economics (ABARE) expects oil prices to ease due to production increases in 2004. This is dependent on several OPEC members adhering to their announced intentions to increase output. This increase is supposed to include Iraq in its attempts to foster an economic recovery. So far though, oil prices have remained buoyant.

Gold has similarly enjoyed exceptional price increases reflecting its role as an investment asset, due partly to circumstances in foreign exchange markets and subdued equity and low interest rates. ABARE forecasts gold prices to be weaker in 2004 depending on a gradual strengthening of the world economy and developments in interest rates and hedging.

It appears that the financial markets expect that the Australian dollar has had its run against the US dollar with most forecasters expecting the Australian dollar, in average terms, to remain between US\$0.70 and US\$0.75 in 2004. Explaining this, while strong commodity prices are expected to support a relatively

strong Australian dollar, domestic growth and interest differentials vis a vis the US are expected to narrow. It is therefore unlikely that Australian exporters will see their earnings being decimated by exchange rate movements in 2004, if nothing else simply because most of the upward adjustment occurred in 2003. As a result, Western Australian export performance in value terms should improve in 2004 compared to 2003, subject to other developments.

A range of risks to the outlook for 2004 remains, but the risks appear to be diminishing. The main short-term risk appears to be that the signs of US recovery are false, with flow-on impacts on the rest of the global economy. This, however, appears increasingly unlikely with concerns most recently arising that the recovery will spur earlier than expected US interest rate rises. Indeed, if the US recovery is robust and rates rise earlier than otherwise expected, this is likely to benefit Australian exporters through the foreign exchange markets. There is also some concern that the Chinese economy is overheating. So far, in response to these concerns, China is aiming at a lower but still relatively high growth rate of 7% in 2004.

In the commodity markets, there is a risk for some commodities that growth will be dampened as high prices (incl. freight rates) induce substitution and shift demand to domestic sources where these are available.

PETROLEUM

World oil prices in 2003 averaged US\$30 per barrel and were around 18% higher compared to the previous financial year. Oil prices peaked in February 2003 at US\$34/bbl (average of Brent, Tapis and West Texas Intermediate (WTI) prices over the course of the month), reflecting concerns over a disruption in oil supplies as a result of the war with Iraq. The quick coalition victory caused prices to ease slightly, averaging US\$27/bbl for the June quarter. However, a slow recovery in Iraq's exports, coupled with low OECD oil stocks caused prices to remain relatively high. Oil prices in the closing months of the year strengthened, reaching a December 2003 monthly average of US\$31/bbl. This was mainly attributed to an increase in demand from a continued recovery in the world economy and the onset of the northern hemisphere

winter. The OPEC announcement to reduce oil production levels by 4% or one million barrels (MMbbl) to 23.5 MMbbl/d saw prices rally to US\$34/bbl in February 2004.

In 2003, the value of the Australian dollar averaged US65 cents, an increase of 20% compared to US54 cents in 2002. As a result of the appreciation in the Australian dollar, the average oil price in Australian dollar terms was down 1% in 2003.

In 2003, due to the strong Australian dollar and a decline in production sales, the value of Western Australian petroleum sales was down by 5% to \$9.7 billion. However, petroleum remains the largest resource sector in Western Australia. In 2003, the petroleum industry accounted for 36% of the State's total value of mineral and petroleum sales. Crude oil was the principal contributor and accounted for 42% of total petroleum sales value, followed by liquefied natural gas (LNG) (30%), condensate (18%), natural gas (7%), liquefied petroleum gas (LPG)-butane (2%) and LPG-propane (1%).

Crude oil was the most valuable petroleum product and recorded the largest fall in sales value in 2003. Compared with 2002, in 2003 the value of crude oil fell by \$464 million to \$4.0 billion. The main contributors to the fall in sales value was an 8% decline in production and a strong Australian dollar, which in local terms translated to a 1% fall in oil prices.

Condensate and LPG also recorded falls in both volume and value of sales. The value of condensate fell 9% or \$163 million to \$1.8 billion in 2003, while LPG sales value fell by \$38 million to \$326 million. This was largely due to significant production falls from the Goodwyn field and a strong Australian dollar.

LNG and natural gas went against the trend of falling production levels to record an increase in sales volumes of 4% and 5% respectively. However, the sales value for LNG increased by a lower rate reflecting the appreciation of the Australian dollar, which inhibited the benefits from an 18% increase in oil prices.

Unaffected by exchange rates, natural gas for domestic consumption was able to reap the benefits of a 5% increase in sales volume due to a significant increase in output from the North Rankin field. Compared to 2002, the value of sales in 2003 increased by 6% or \$40 million to \$390 million.

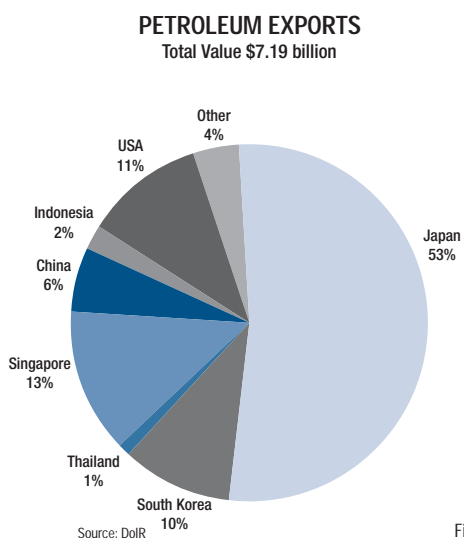
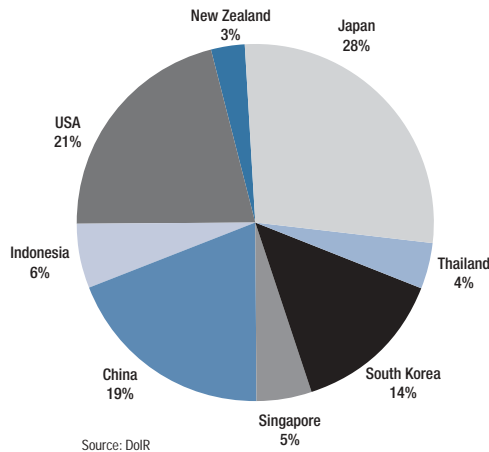


Figure 7

Crude Oil

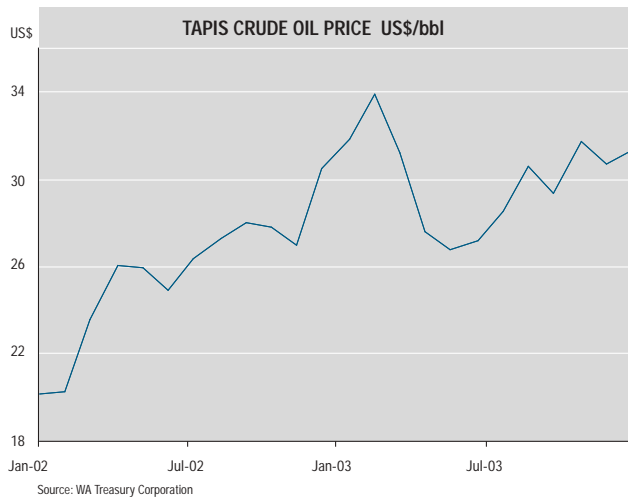
In 2003, a number of new fields commenced production, such as Woollybutt, Hovea and Eremia. In addition, the Harriet area fields experienced a 27% increase in volume of crude oil sales, partly due to a number of new fields within the Harriet area commencing production, such as Victoria, South Plato, Pedirka and Gibson and new wells in the Simpson field. However, the additional output from the new fields did not ameliorate falls in production levels from several mature fields. Hence in 2003, the volume of crude oil sales dropped by 8% to 89 MMbbl. Production decreases were most notable in the Griffin, Buffalo and Cossack-Wanaea fields and from oil fields in the Thevenard Island area such as Saladin and Roller-Skate. Nevertheless, crude oil remains the most valuable proportion of Western Australia's petroleum resource sales. In 2003, the sales value of crude oil was \$4.0 billion.

CRUDE OIL EXPORTS
Total Value \$2.26 billion



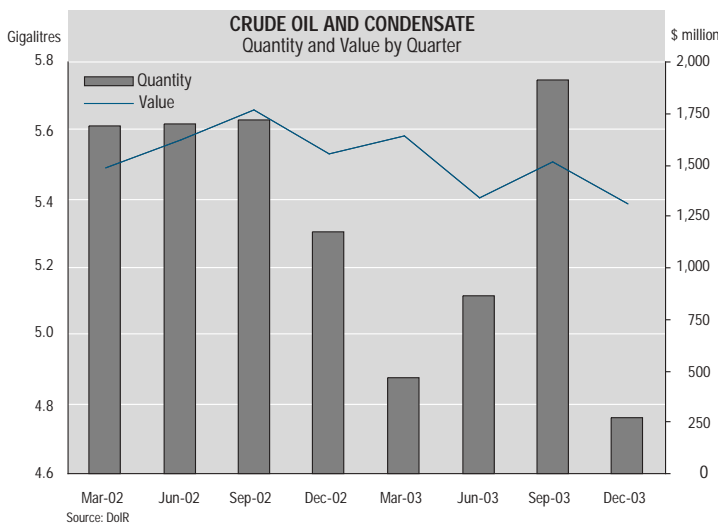
Source: DoIR

Figure 8



Source: WA Treasury Corporation

Figure 9



Source: DoIR

Figure 10

Although a number of significant oil discoveries have been made, it is anticipated that oil production in the short to medium term will continue to decline. This decline will continue until new oil fields come online alleviating the fall in production from mature oil fields. New oil fields expected to boost output from Western Australia include Santos' Mutineer-Exeter oil field development, located in the Carnarvon Basin, which is expected to commence production in April 2005. Also expected to come on-stream in the latter part of 2005 is Roc Oil's Cliff Head oil field located in the Perth Basin, 11 km offshore southwest of Dongara.

This highlights the key role exploration plays in maintaining a sustainable Western Australian petroleum industry. Recent statistics released by the Australian Bureau of Statistics (ABS) for 2003 indicate that petroleum exploration expenditure in Western Australia has recovered from the dramatic fall experienced in 2002. In 2003, petroleum exploration expenditure in Western Australia was the highest on record, increasing by 55% or \$252 million to \$709 million.

In 2003, 74% of Western Australia's petroleum products were exported, compared to 71% in 2002. During 2003, \$2.3 billion or 56% of Western Australia's crude oil was exported. The major export markets for crude oil included Japan, accounting for 28% of the total value of exports, USA (21%), China (19%) and South Korea (14%). Compared to 2002, crude oil exports to China have more than tripled, mainly at the expense of South Korea.

In a global context, strengthening world oil demand, OPEC's output restraint policy, low OECD oil stocks and continued uncertainty about future oil supplies from Iraq have all placed upward pressure on oil prices. World oil prices in 2003 averaged US\$30/bbl and were around 18% higher compared to the previous financial year.

The demand for oil has strengthened, particularly from China and the USA as economic recovery in these regions accelerated late in 2003. In 2003, oil consumption in China increased by 10% to 5.46 MMbbl/d now making it the world's second-largest oil consumer. It is expected that China will be the main driver of growth in oil consumption in 2004. According to ABARE, Chinese oil consumption in 2004 is forecast to increase by 6% to 5.8 MMbbl/d. In 2003, the USA consumed 20.0 MMbbl/d, making it the world's largest oil consumer. ABARE expects oil consumption in the USA to increase by 1% in 2004.

On the supply side, ABARE forecasts non-OPEC oil production to increase by 3% (1.5 MMbbl/d) to 50.5 MMbbl/d in 2004. The major contributor to the increase in forecast production is anticipated to be Russia. However, in February, OPEC decided to reduce its oil production quota by 4% (1 MMbbl/d) to 23.5 MMbbl/d from 1 April 2004. This production level excludes oil production from Iraq whose ability to increase oil exports to pre-war levels have continued to be hampered by domestic security concerns.

It is anticipated that with low OECD oil stocks, uncertainty about future oil supplies from Iraq and the reliance of the world economy on OPEC oil, oil prices are expected to remain high in the short term.

Condensate

Condensate is Western Australia's third most valuable petroleum product after crude oil and LNG. However, sales volumes for condensate fell 7% from last year's record high of 43 MMbbl to 40 MMbbl in 2003. This was largely due to a 28% (6 MMbbl) fall in production from the Goodwyn field. However this was at least partly ameliorated by strong increases in production for Echo-Yodel and North Rankin, which resulted in a net decline of 3 MMbbl for the State's condensate output.

Sales values for condensate in Western Australia decreased by 8% to \$1.8 billion despite high oil prices. The fall in sales values culminated from a decline in production levels and a 20% appreciation of the Australian dollar against the US dollar.

Woodside Energy Ltd is Western Australia's largest condensate producer, accounting for 95% of condensate production in 2003. Woodside also operates four of the top-five condensate fields in Western Australia, namely Goodwyn, Echo-Yodel, North Rankin and Athena. Although Goodwyn remains Western Australia's largest producer of condensate, generating 15 MMbbl in 2003, production levels have significantly decreased, dropping by 28% compared to 2002. Production levels for Goodwyn have halved since the year 2000. Echo-Yodel and North Rankin both contributed 26% or 10 MMbbl, making them equally the State's second-largest condensate producer and were responsible for the strong recovery in quantity levels in the June 2003 quarter.

Western Australia remains the nation's primary producer of crude oil and condensate, accounting for 68% of production, an increase of 7 percentage points compared to 2002. However, as a nation, crude oil and condensate output for 2003 has decreased by 17% from 227 MMbbl in 2002 to 189 MMbbl in 2003.

In 2003, condensate exports totalled \$1.7 billion or 93% of all the State's condensate sales. This represented an increase of 2% on the previous year's exports of \$1.6 billion. Singapore remains the largest market accounting for 49% of the State's total condensate exports, an increase of 13 percentage points compared to 2002. Exports to Taiwan fell by 74% from \$339 million in 2002 to \$87 million in 2003, now accounting for only 5% of the total exports. Other major export markets were South Korea (21%) and the USA (13%).

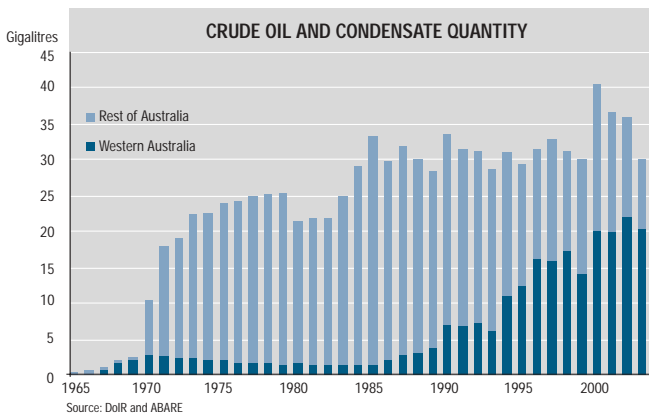


Figure 11

Liquefied natural gas (LNG)

LNG is Western Australia's second most valuable petroleum product after crude oil. In 2003, LNG accounted for 30% of total petroleum sales. In contrast to crude oil and condensate, LNG sales volumes were up by 4% to 7.9 Mt, partly as a result of increased production levels from the Echo-Yodel, North Rankin and Cossack fields.

The value of LNG sales was also up by 3% to \$2.9 billion. This was not enough to prevent the overall value of Western Australia's petroleum sales falling by 5% in 2003 to \$9.7 billion. Although production volumes were up, due to the appreciation of the Australian dollar and the contractual arrangements that characterise the State's LNG sales, the value of the LNG shipments did not fully benefit from the higher oil prices.

LNG exports amounted to \$2.9 billion, surpassing crude oil to become the State's most valuable petroleum export. Japan continues to dominate as an LNG export destination, importing 93% of the State's LNG. The North West Shelf (NWS) project began LNG exports to Japan in 1989 under a long-term contract. In July 2003, the NWS project reached a key milestone by delivering its 1500th LNG cargo to customers Osaka Gas and Kansai Electric. Other LNG export destinations include the US, South Korea and Spain.

During the year, the NWS project shipped a record 139 LNG cargoes. This comprised both contract supplies and spot cargoes. It is anticipated the number of shipments will again rise in 2004 due to the delivery of the Venture's 9th LNG ship (*Northwest Swan*) in 2004. In 2003, the NWS Venture signed three new long-term contracts with Shizuoka Gas Company, Tohoku Electric Power Company and Korea Gas Corporation (which have received spot cargoes in the past). In addition, a Heads of Agreement was signed with two existing Japanese customers Chubu Electric Power Company and Kansai Electric Power Company for the 15-year supply of LNG starting in 2009. The 15-year contract with Chubu Electronic represents the last uncommitted LNG production from the fourth production train due to be completed mid-2004.

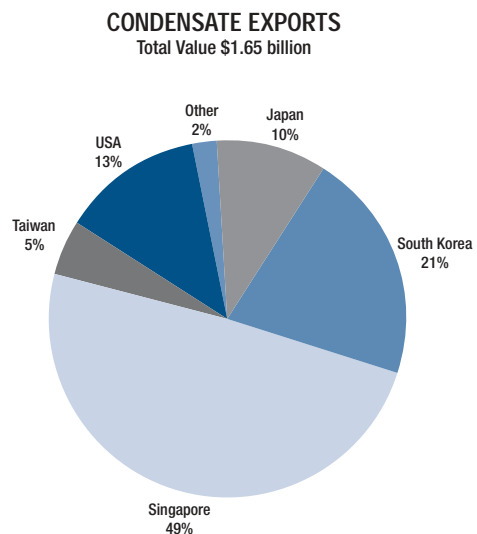


Figure 12

In addition to contract sales, three spot cargo sales have also taken place around the world in 2003. In the first half of the year, two LNG cargos totalling 250 000 cubic metres (m³) were delivered to Tokyo Electric Power Company in Japan. In August 2003, the NWS LNG sellers signed an agreement for the supply of 135 000 m³ of LNG. BP will deliver the cargo to a receiving terminal in Spain. The NWS Venture consists of the following six equal participants: Woodside Energy (operator), BHP Billiton Petroleum (NWS), BP Developments Australia, ChevronTexaco Australia, Japan Australia LNG (MIMI) and Shell Development (Australia).

Whilst the NWS gas project is currently the only LNG project in Western Australia, an additional LNG facility is being considered in the form of the Gorgon gas project. This centres on the development of an LNG facility on Barrow Island, which will supply LNG for distribution to markets abroad. In 2003, the State Government granted in-principle approval for the restricted use of Barrow Island as part of the \$11-billion Gorgon gas project. The agreement is a major milestone in Western Australia's economic development. The Gorgon gas area (comprising the Gorgon field, West Tryal Rocks, Spar, Chrysaor and Dionysus fields) contains certified gas reserves of 12.9 trillion cubic feet (Tcf). The proponents of the project, the Gorgon Joint Venture, comprise ChevronTexaco (4/7th interest), Shell (2/7th interest) and ExxonMobil (1/7th interest).

Development of the Gorgon gas field advanced further in 2003 when the State Government granted in-principle approval for the restricted use of Barrow Island for an LNG facility to supply LNG for export. Currently under consideration is a single 5 Mt/a liquefaction train and associated infrastructure. Natural gas feedstock for the LNG facility will initially be supplied from North Gorgon via a 26-inch, 70-km subsea trunkline. Feedstock for future liquefaction expansions or domestic sales may be supplied from the Chrysaor, Dionysus, West Tryal Rocks and Spar fields.

A development decision regarding the Gorgon LNG project is subject to market commitments. The joint venture is targeting markets in China, South Korea and North America and they are continuing to pursue the closure of sales agreements with China and the US by the end of 2004 prior to a final investment decision.

An increased demand for diversified energy supplies from the US has presented new market opportunities for Western Australian gas producers. A number of delegations attended talks and an LNG Summit in the US during 2003 aimed at securing long-term LNG contracts with the USA.

The \$2.5-billion expansion of the NWS Venture's gas-processing facilities, which commenced in 2001, continued during 2003 and is at the pre-commissioning phase. Completion is scheduled for mid-2004. It is expected that the new plant will add up to 4.2 Mt of annual LNG production in addition to the existing annual 7.5 Mt of production. Contingent on future market conditions, the NWS Venture may consider constructing a fifth LNG train to meet growing Asian energy markets, now that LNG production from the fourth train is fully committed. The NWS Venture received environmental approval for a fifth LNG train in 1998 and a decision to proceed with a \$1.6 billion fifth train is expected at the end of 2004.

Associated with the NWS project is construction of an \$800 million second sub-sea trunkline linking the offshore production facilities to the onshore gas plant on the Burrup Peninsula. Commissioning of the new trunkline commenced in February 2004. The 130-km, 42-inch diameter trunkline will increase the NWS offshore gas production transportation capacity to the Burrup Peninsula from 46.7 MMm³/d to 110.7 MMm³/d. The new trunkline will meet increased demand from existing and new customers as well as the additional developments proposed on the Burrup Peninsula.

Currently, there are five gas-to-liquids (GTL) projects proposed for the Burrup Peninsula, including an ammonia plant that will produce around 760 kt/a of liquid ammonia for export to India and other world markets for the manufacture of fertilisers. Construction of the \$630-million ammonia plant commenced in April 2003 and is scheduled to start production in the third-quarter of 2005. The plant, located at the King Bay – Hearson Cove industrial area on the Burrup Peninsula, will have 82 terajoules per day (TJ/d) of natural gas supplied by the Harriet Joint Venture.

The remaining four GTL projects are still under consideration. Amongst the most significant in terms of potential gas consumption is the Sasol Chevron's proposed synthetic diesel plant. The project involves the production of diesel fuel from natural gas. It is anticipated that 20 Tcf of gas will be utilised over the 25-year design life of the project. Initial production levels are about 50 000 bbl/d with future expansions targeted to 200 000 bbl/d.

Natural gas

Outside of gas used as feedstock for LNG production, all natural gas produced is for domestic industrial and household consumption. Natural gas sales for domestic purposes increased 6% from \$650 million in 2002 to \$690 million in 2003. The increase in production levels was partly responsible for the increase in natural gas sales. In 2003, natural gas production increased by 5% to 8.1 billion cubic metres (Bcm). Figures for 2003 also show the quantity of natural gas produced for domestic consumption has more than doubled since 1992.

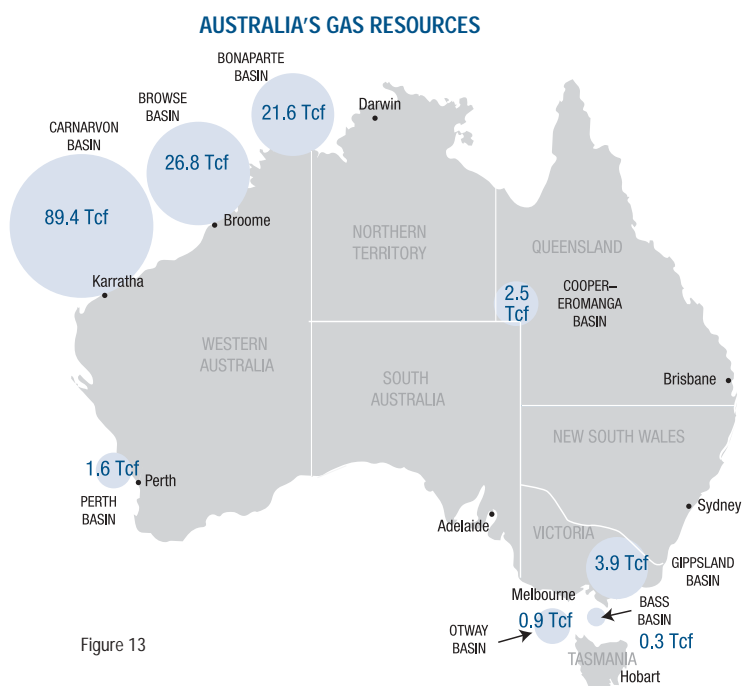


Figure 13

In 2003, the top-five natural gas producers for domestic consumption were North Rankin producing 3.3 Bcm, followed by Goodwyn producing 1.4 Bcm, Harriet (0.9 Bcm), East Spar (0.9 Bcm) and Echo–Yodel (0.6 Bcm). Production from these fields account for 90% of the State's total natural gas production for domestic consumption.

As at the end of 2003, the gas reserves for Australia were:

- Bonaparte Basin 21.6 Tcf (Western Australian portion 1.7 Tcf, Northern Territory portion 19.9 Tcf)
- Browse Basin 26.8 Tcf
- Carnarvon Basin 89.4 Tcf
- Perth Basin 1.6 Tcf
- Otway Basin 0.9 Tcf
- Bass Basin 0.3 Tcf
- Gippsland Basin 3.9 Tcf
- Cooper–Eromanga Basin 2.5 Tcf.

Using the data above, Western Australia contains 81% of the nation's total gas reserves. In addition, according to data sourced from ABARE Australian Mineral Statistics quarterlies, Western Australia produces 61% of the nation's natural gas.

Reserves for Western Australia are calculated on the basis of a 50% probability of recovery level as well as unbooked resources. These refer to resources that may or may not eventually prove viable. They are resources that have not at present been delineated, audited or appraised by an independent third party. Reserve figures for the rest of Australia are calculated on a 50% probability only.

Liquefied petroleum gas (LPG)

LPG production sales (including butane and propane) amounted to 745 kt, a reduction of 9% compared to 816 kt in 2002. The decline is attributed to significant reductions in production levels most notable in Goodwyn and Wanaea.

The share of LPG sales in the State's total petroleum sales fell slightly from 4% in 2002 to 3% in 2003. The majority of LPG produced in the State is for export. Therefore, the appreciation of the Australian dollar resulted in the value of sales decreasing in 2003 by 10% to \$326 million. Japan remains the primary export destination for Western Australia's LPG.

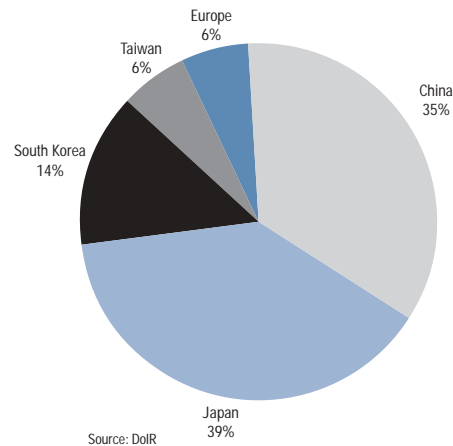
IRON ORE

According to AME, world iron ore production totalled a record of 1 176 Mt in 2003. Demand for iron ore was driven principally by a booming Chinese economy. For the second consecutive year Chinese crude steel production increased by over 20%, according to ABARE. As a result, Chinese iron ore imports surged 33%, or 37 Mt to a record total of 148 Mt and China surpassed Japan as the world's largest importer of iron ore.

Contrasting booming demand growth, supply only increased by 5%, as iron ore producers increased efficiency and brought forward project expansions. Iron ore production expanded almost 10% in Australia, 7% in Brazil and 5% in India. According to ABARE, seaborne trade in iron ore reached 519 Mt in 2003 with Australia and Brazil accounting for over 70% of this trade.

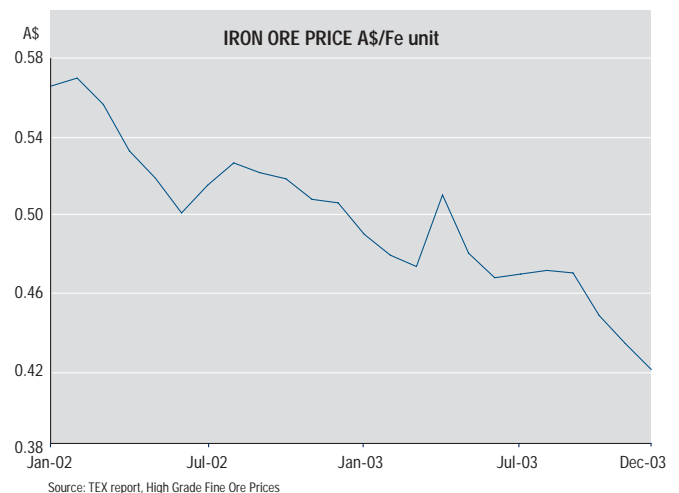
IRON ORE EXPORTS

Total Value \$4.87 billion



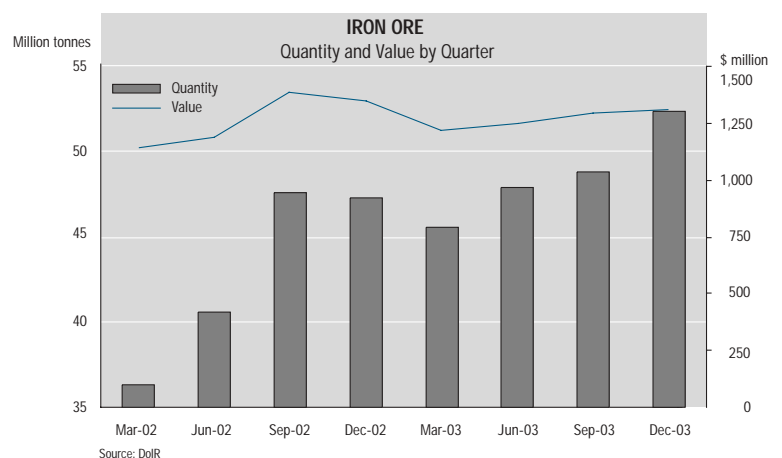
Source: DoIR

Figure 14



Source: TEX report, High Grade Fine Ore Prices

Figure 15



Source: DoIR

Figure 16

Western Australian Iron Ore Sales

Western Australian iron ore sales recorded double digit growth for the second consecutive year in volume terms, growing 13% to reach a new record of 194.7 Mt in 2003. Chinese demand was the principal driver for this increase. Sales values, however, remained flat, at \$5.1 billion. This was due to the strong gains in the value of the Australian dollar, which overshadowed moderate growth in US dollar iron ore prices of 5–6%.

Booming trade, mainly to the Chinese mainland, resulted in very strong growth in ocean freight rates. Coupled with the US dollar depreciation, this put a dampener on an otherwise buoyant year for iron ore producers, which have been focused on meeting expanding demand by the development of mines and expanding infrastructure.

Demand from China has significantly altered Western Australia's export profile. China now accounts for 35% of Western Australia's \$4.9 billion iron ore exports compared with 28% in 2002 and is now a close second to Japan, which consumes 39% of Western Australian exports, down from 42% in 2002. Other major importers of Western Australian iron ore are South Korea (14%), Taiwan (6%) and Europe (6%).

Western Australia is one of the world's major iron ore producers, representing 17% of global iron ore production in 2003. Western Australia's iron ore industry is highly export-oriented and accounts for around 37% of global iron ore seaborne trade. Not surprisingly, iron ore is Western Australia's second-largest commodity sector accounting for nearly 19% of the State's total mineral and petroleum sales in 2003. Western Australia also accounts for more than 97% of Australia's iron ore production.

Australia is the largest supplier of iron ore to China, accounting for 39% of the market in 2003, followed by Brazil (26%), India (22%) and South Africa (7%). Although Australia's share of the Chinese market increased slightly in 2003, its share of the Chinese market is significantly below the 47% achieved in 2000.

Historically, Western Australia's high share of the Chinese iron ore market has been attributed to competitive transport costs due to its proximity to East Asian markets. Furthermore, the State's competitiveness in the Chinese market has now been further enhanced by continuing efficiency gains achieved by Western Australian iron ore producers.

Western Australian Iron Ore Developments

The boom in Chinese iron ore demand has resulted in a range of infrastructure and mine developments being fast-tracked.

Iron ore majors Rio Tinto and BHP Billiton (BHPB) control the vast majority of iron ore output in Western Australia. Both companies fast-tracked significant capacity expansions in 2003.

Rio Tinto's Hamersley Iron (Hamersley) and Robe River Mining (Robe), in which Rio Tinto holds 53% interest significantly expanded operations in 2003:

- Hamersley is completing its 4 Mt/a expansion of the Yandicoogina mine to 24 Mt/a of pisolite iron ore. An additional, \$1.25-billion expansion of the mine and Dampier Port was announced in December 2003, which will increase Yandicoogina's production capacity by a further 12 Mt/a to 36 Mt/a. Dampier Port's capacity will also be boosted with progressive commissioning during 2005.
- Robe also undertook expansions in 2003. In December 2003, a \$142-million expansion of Robe's West Angelas mine was approved. West Angelas currently has an operating capacity of 20 Mt/a and the expansion will see an additional 5 Mt/a added by mid-2005, subject to government approvals and heritage clearance. In addition, Robe is considering an expansion of its Cape Lambert port facilities, to 69 Mt/a. West Angelas' ore is shipped through Cape Lambert.
- Rio Tinto is also seeking increased integration of its iron ore activities in Western Australia. The merger of Hamersley and Robe River rail systems into a single operation, through the Pilbara Rail Company, has enhanced flexibility in rail haulage and potential use of Dampier and Cape Lambert facilities. As a result of this cooperation, Hamersley began shipping iron ore from Robe River's Cape Lambert port facilities in early October 2003.
- In March 2004, BHPB signed a 25-year US\$5.9 billion iron ore export deal with China. The deal means that BHPB will

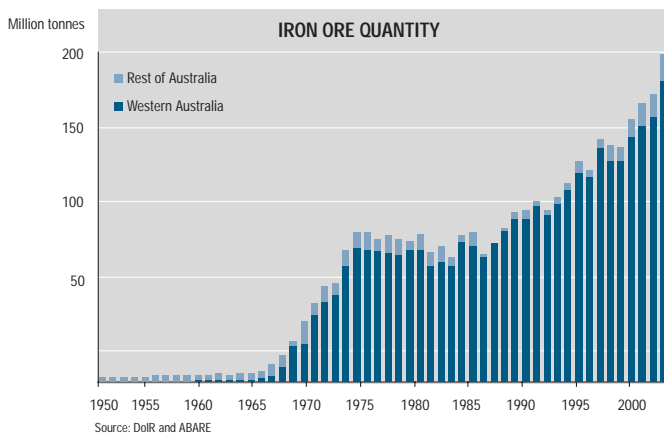


Figure 17

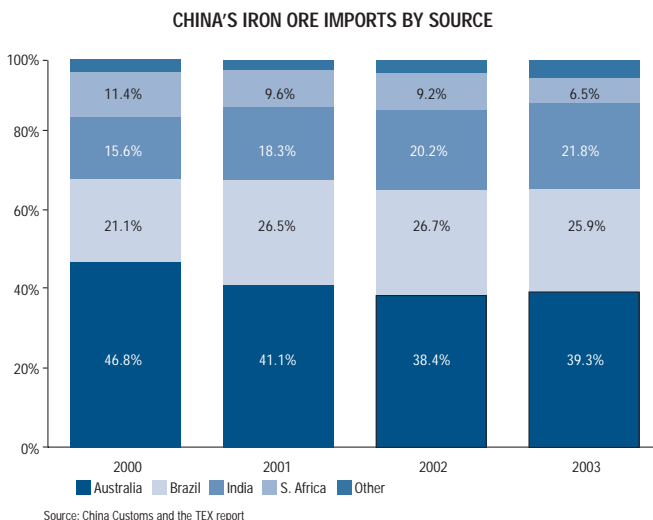


Figure 18

export a further 12 Mt/a of iron ore to Chinese steel mills. The agreement establishes the Wheelara Joint Venture with four Chinese steel mills taking a 40% equity in a sub-lease of the Jimblebar mine near Newman. Later in April 2004, Rio Tinto reached a new 10-year supply agreement with Shanghai Baosteel Group Corporation (Baosteel), which will take its total supply to Baosteel up to around 20 Mt/a. This agreement, which will have effect from 2006, followed the opening of the Eastern Ridge mine owned by Hamersley Iron (54%) and Baosteel (46%).

- In May 2004, Rio Tinto announced that current, approved expansion plans would take its managed iron ore capacity to 180 Mt/a.

BHPB undertook major expansions in 2003 that significantly expanded its capacity to meet the surging global demand for iron ore:

- The \$1-billion Mining Area C (MAC) mine and Products and Capacity Expansion (PACE) project was fast-tracked in 2003. MAC will reach a capacity of 15 Mt/a in 2004, while PACE was completed in February 2004 complementing MAC and earlier Mount Whaleback and Yandi mining expansions. Initially, these developments were planned to be finalised in 2011. The PACE project included a new stockpile area and upgraded berth handling capacity to accommodate 250 kt ships at the Finucane Island port facility. As a result BHPB's Pilbara iron ore capacity is now 100 Mt/a.
- BHPB is progressing the Iron Ore Rapid Growth project, which will increase MAC's output to 23 Mt/a and is expected to add 10 Mt/a by mid-2004. This will increase capacity at Nelson Point to 85 Mt/a.
- In addition, BHPB expects to complete a feasibility study over the next 12 to 15 months to further expand its Pilbara capacity towards 150 Mt/a.

In addition, two possible major new developments which have been mooted for some time include:

- The Fortescue Metals Group (FMG) which is conducting a feasibility study into a new iron ore operation in Western Australia's Pilbara region based on the Mt Nicholas, Tongololo and Mindy Mindy prospects at Mt Nicholas and Mount Leeuwin. The project involves a \$575-million mine development and a \$1.3-billion infrastructure fund to develop rail and port facilities. FMG currently envisages construction to begin in 2005 and the first ore shipments in 2007. FMG has secured memorandums of intent for 28 Mt/a iron ore sales in long-term sales agreements. In February 2004, FMG announced a memorandum of understanding (MOU) with Baosteel for a 25-year sales commitment for 3 Mt/a, which would take the tonnage under MOU sales agreements to almost 80% of the envisaged production of 40 Mt/a.
- Hancock Prospecting- and Anglo American-controlled South African Kumba Resources continue negotiations about developing the \$1.05 billion Hope Downs Iron Ore project. A conclusion in negotiations would see the development of a 400 Mt reserve 75 km northwest of Newman with an annual production of around 25 Mt/a. The project is currently based

on a stand-alone \$300-million rail facility to Port Hedland. However, negotiations with BHPB's Mount Newman Joint Venture also continues with regard to gaining third-party access to BHPB's Newman railway. The current joint venture, Hope Downs Management Services, has potential buyers for 90% of production.

Elsewhere in the State, a range of smaller iron ore projects is being progressed, including:

- Portman has expanded production at its Koolyanobbing mine to 5 Mt/a in early 2004 through its Mount Jackson and Windarling tenements, and also made additional infrastructure expansions. Shipments from Koolyanobbing were 4.7 Mt in 2003. An upgrade of its reserves in February 2004 should see production levels increase further in 2005. In March 2004, Portman and its joint venture partner stated that construction of the stage two seawall at Cockatoo Island would begin immediately. Due to operational problems, production has been 50–75 kt per month and the project produced 0.6 Mt in 2003. However, production should increase significantly to 100–130 kt per month from August 2004 following completion of the seawall.
- Mount Gibson Iron (MGI) made its first shipment from its Tallering Peak mine in February 2004 and is expected to increase shipments to 1.65 Mt/a in 2004. Also in February 2004, MGI announced a supply agreement with Asia Iron Holdings (Asia Iron) to supply up to 10 Mt/a of magnetite concentrate by December 2008 to feed four new Asian iron pellet plants. The first plant is expected to be commissioned in late 2005. Asia Iron also intends to establish a similar plant in Geraldton, Western Australia. Subject to environmental approvals, MGI's Mount Gibson haematite production (Extension Hill and Iron Hill deposits) is expected to begin shipments in mid-2005 with a production capacity of 1.5 Mt/a. Magnetite mining of around 5 Mt/a is expected to be at least five years away. MGI is awaiting results from preliminary drilling to decide whether it will progress its Koolanooka South haematite project (in the order of 2 Mt/a).
- Midwest Corporation (Midwest) expects to begin iron ore shipments from its Koolanooka and Blue Hills tenements in late 2004. Total shipments are expected to be 3.4 Mt/a through the port of Geraldton. In addition, Midwest is pursuing development of its Weld Range tenement to develop a 10 Mt/a operation. Development of this project is first expected to begin in a couple of years. Midwest's fourth project is an iron ore pellet project at Koolanooka for which a joint venture partner is being sought. Koolanooka has proved reserves of about 400 Mt of magnetite ore.
- Aztec Resources (AZR) is continuing drilling on Koolan Island in Yampi Sound north of Derby. Koolan is adjacent to Portman's Cockatoo Island project. The project has inferred resources of 24.9 Mt and production could begin in 2005, pending a bankable feasibility study being completed by the end of 2004.

In terms of iron ore processing, the construction of Rio Tinto's \$430 million Hismelt plant at Kwinana, a joint venture with Nucor (25%), Mitsubishi (10%) and Shougang (5%), began in March 2003. When finished, the plant's annual capacity will initially be 0.8 Mt/a pig iron and will increase to 1.64 Mt/a by 2006. The plant is scheduled to be commissioned by late 2004 with around 65 full-time employees. During the construction phase approximately 230 people will be employed. The Hismelt plant will fulfil Hamersley Iron's secondary processing obligations under the *Iron Ore (Yandicoogina) Agreement Act 1996*.

The Australian-developed Hismelt technology is the world's most advanced method of direct pig iron smelting through conversion of iron ore to liquid pig iron by the injection of non-coking coal and fine iron ore into a molten bath. A technology transfer deal in the form of a Hismelt Process Licence with Chinese Laiwu Steel Group was signed in August 2003. Laiwu Steel plans to replicate the 0.8 Mt/a Western Australian Hismelt Plant at Laiwu City, Shandong Province, China.

The State Government's \$225 million port enhancement program of which the \$100 million Geraldton Port expansion is the major part will enable the port to service fully laden Handymax vessels at a maximum draft of 12.8m, primarily for Mount Gibson Iron's iron ore exports. The project commenced in 2002-03 and the dredging and facilities upgrade is nearing completion.

Iron Ore Outlook

With the development of greenfield iron ore mines and associated infrastructure, coupled with proximity to the East Asian markets, Western Australia's iron ore industry appears to be well placed to further consolidate its position as one of the leading global players in the international iron ore market.

On the demand side, while China's economic growth is expected to slow in 2004, growth is forecast to remain relatively strong. A similar picture is expected for its steel industry. Outside China, demand is expected to pick up in the OECD as US-led recovery gains pace. As a result, global demand for iron ore will continue to grow significantly over the next couple of years. The major short-term risk appears to be a stronger than expected slow-down in China in the event of the Chinese economy overheating.

Reflecting partially this more positive outlook, iron ore producers gained an average price increase of 18.62% for the Japanese financial year 2004-05 (beginning in April 2004). The outcome was identical to the price rise agreed between the world's largest ore producer, Brazilian CVRD, and Arcelor, the world's largest steel producer.

Despite the favourable market conditions, Western Australian iron ore producers face fierce competition. The world's largest iron ore producer, CVRD, is aggressively pushing for a larger share of the Chinese and Japanese markets, seeking long-term supply agreements and strategic alliances. CVRD and Mitsui and Co entered a strategic alliance in 2002 and Mitsui is now represented on the CVRD board. In addition, both India and South Africa are also likely to expand output.

ALUMINA EXPORTS

Total Value \$2.85 billion

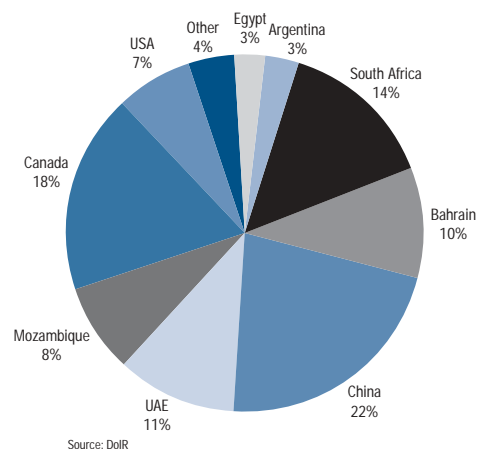


Figure 19

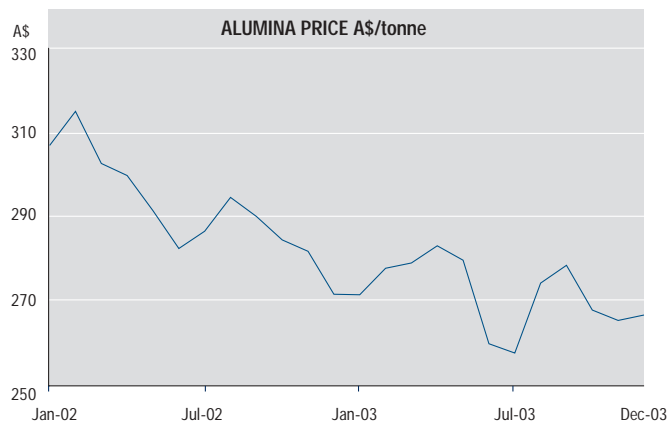


Figure 20

ALUMINA

The global alumina market tightened in 2003. Strong demand for aluminium, including the re-emergence of Chinese aluminium production created an alumina supply deficit. Spot prices almost doubled in 2003 spurred by Chinese demand, as alumina producers could not keep up with an increase of Chinese aluminium production.

Most alumina is sold on a contractual basis, with around a fifth of production renegotiated every year. Therefore, the extent to which many exporters benefit from favourable prices will depend on the timing and type of contract. Consequently, Western Australian alumina sales prices increased significantly less than spot prices, by a robust 12% in US dollar terms. However, due to the significant strengthening of the Australian dollar, prices received by local producers fell 7% in the local currency terms during 2004.

Western Australian Alumina Sales

With Western Australian alumina sales already at high levels, the State's sales grew marginally to 11.2 Mt. However, reflecting currency movements, the aggregate sales value of this tonnage in Australian dollar terms fell almost 6% in 2003, to \$3.1 billion.

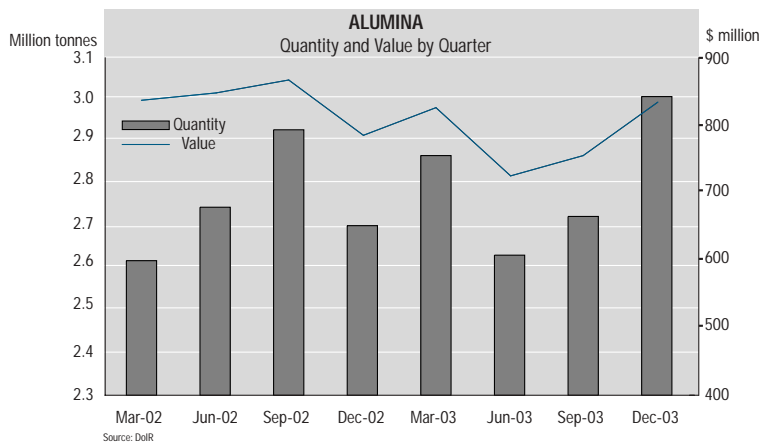


Figure 21

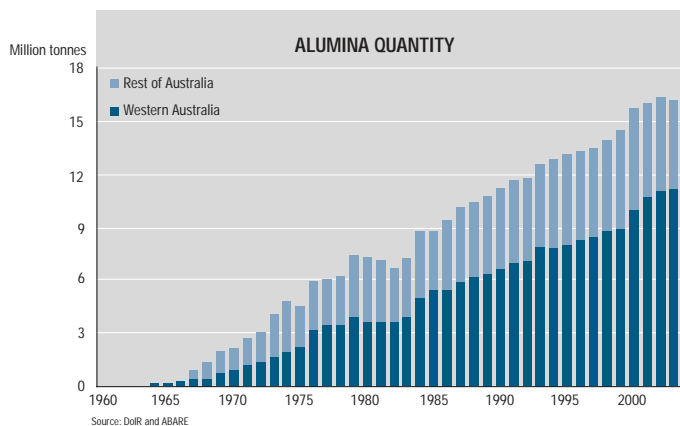


Figure 22

Also reflecting foreign currency movements, Western Australia's exports fell from \$3.0 billion in 2002 to \$2.9 billion in 2003. China remained the State's largest export destination accounting for 21% of exports or \$601 million. China now accounts for 20% of global alumina consumption. During the last year, Canada has overtaken the US to become the second most important export destination, accounting for 18% of the State's alumina exports. Exports to the US have seen a dramatic fall and now only accounts for only 7% (\$191 million) of exports. Other significant export destinations were South Africa (14%), United Arab Emirates (11%), Bahrain (10%) and Mozambique (8%).

According to the US Aluminium Association, the global production of bauxite is around 70 Mt/a of bauxite residue, which is processed into alumina. Australia is the largest bauxite producer and alumina refiner in the world, producing almost a third of global alumina production. Western Australian alumina production accounted for 70% of Australian production in 2003 compared to 67% in 2002.

Western Australian Alumina Developments

The alumina industry is Western Australia's fourth-largest sector in terms of sales (after iron ore, crude oil and gold), accounting for 12% of total mineral and petroleum sales.

Western Australia's four alumina refineries, located within close proximity to the bauxite mines comprise:

- Alcoa's Pinjarra Refinery, which is the State's largest and the world's second-largest producer of alumina accounting for around 7% of the world market. In early February 2004, the Western Australian Government approved Alcoa's \$440 million efficiency upgrade of the Pinjarra Refinery. The upgrade will increase the production of alumina from 3.4 Mt/a to 4.2 Mt/a, reduce production costs and boost annual export revenues by around \$160 million. The refinery is already Alcoa's lowest cost refinery.
- Worsley Alumina (Worsley) is Western Australia's second-largest refinery with annual production of 3.25 Mt/a. Worsley is a joint venture between BHP Billiton (86%), Kobe Alumina Associates (Australia) (10%) and Nissho-Iwai Alumina (4%). Worsley is investigating a \$225-million expansion of output to 3.5 Mt/a over the next two years and the scope for incremental expansion of annual production to exceed 4 Mt/a.
- The remaining two refineries are Alcoa's Wagerup and Kwinana refineries with production capacities of 2.3 Mt/a and 2.0 Mt/a, respectively.

Alumina Outlook

The outlook for alumina is solid with limited additional global capacity becoming available in the short term and demand expected to increase from anticipated global economic recovery in 2004.

More than 90% of the world's alumina is used for aluminium production. The demand for aluminium is likely to gather further momentum in 2004. ABARE estimates that world aluminium consumption increased almost 9% in 2003 and will increase by a further 5% in 2004. The primary source of demand continues to be China, but additional smelting capacity is also being built in India, Mozambique, Norway, Russia and the United Arab Emirates. In addition, aluminium consumption is forecast to increase with the economic recovery in the OECD.

Tempering global alumina demand is the understanding that China is attempting to curb perceived aluminium oversupply by closing up to 1.3 Mt/a capacity (based on the outdated Soderberg anode technology). There is also a risk that Chinese smelter output be dampened by strongly rising alumina prices. A more likely scenario, however, would appear to be that higher cost smelters, in countries whose currencies have experienced a US dollar appreciation, would continue to lose market share to China.

On the supply side, there is little scope to increase alumina production from existing facilities, which are already operating close to capacity. Simultaneously, the global production capacity is expected to remain fairly flat until mid-2005. There are relatively few new major projects underway and the lead-in time is expected to be around four years. In addition, stocks provide little buffer, as these have declined considerably and represented only around six weeks of consumption by the end of 2003.

Alumina prices should increase further in 2004 due to higher demand, increased aluminium smelter capacity and limited scope for alumina expansion. Alumina prices should increase in 2004. As a result, ABARE forecasts alumina spot prices to rise around 21% in 2004 (on top of 2003's strong gains) with additional

upside if alumina production is insufficient to meet the planned increases in aluminium production. With spot price developments increasingly flowing through to contract prices and Western Australia's proximity to the Asian market, the State's alumina industry would appear to face a solid year.

GOLD

Gold prices reached their highest level in 14 years attaining over US\$400 per ounce in November 2003. Since then prices have remained slightly above the US\$400-mark (monthly average). Major factors supporting gold prices in 2003 included weakness in the US dollar, sustained geo-political risks, low interest rates, weak equity markets, the Central Bank Gold Agreement and producer de-hedging.

Western Australian Gold Sales

In 2003, Western Australian gold sales declined by 1% to 6 Moz or 187 t. The combined impact of marginally reduced sales and the appreciation of the Australian dollar resulted in the value of Western Australia's gold sales receding by 3% to \$3.4 billion.

Gold exports were \$3.4 billion. The United Kingdom significantly increased its share of Western Australian gold exports accounting for 47%. India and South Korea are the two other major export destinations, accounting for 21% and 13% of Western Australian gold exports, respectively.

The slowdown in Western Australia's gold production combined with an increase in gold output in the rest of Australia saw the State's share fall to two-thirds of Australia's total gold production. This is its lowest share since the early 1980s. However, 2004 is expected to see a reversal of this trend with a range of significant projects coming into production.

The European Central Bank Gold Sales Agreement (ECB-GSA) In March 2004, 14 European countries' central banks and the European Central Bank agreed to limit gold sales to 2 500 t over the next five years beginning in September 2004 with annual sales not exceeding 500 t (around two and a half month's of world production).

The new agreement differs from the previous ECB-GSA reached in September 1999 in the following ways:

- the new ECB-GSA expanded the annual sales allowance by 100 t and the total allowance by 500 t;
- the Bank of England did not sign the ECB-GSA, stating that it has no plans to sell gold; and
- the Bank of Greece is a new signatory.

Currently, only the Bank of Switzerland has confirmed an intention to sell gold, in the order of 130 t. In contrast, over the previous agreement period six central banks (Austria, Germany, Holland, Portugal, Switzerland and the UK) sold a total of 1 994 t gold.

As of December 2003, total world gold holdings in the official sector (central banks) were around 31 964.3 t. This equates to around 12.5 years of total world mine production.

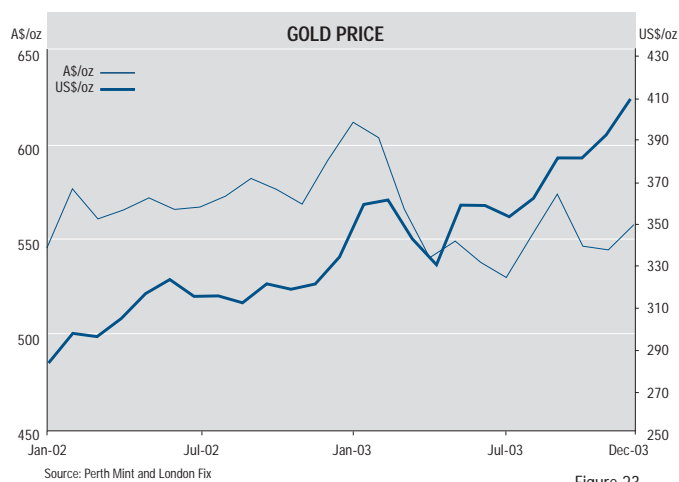


Figure 23

The small net decrease in sales volumes covered significant reductions and increases by individual mines. Notably, production decreases were recorded at Granny Smith, Jundee-Nimary and others, including production being stopped or halted at a range of mines, most significantly at Bounty. This was however, almost offset with increased sales from a range of mines, including Thunderbox and the Super Pit.

Western Australian Gold Developments

Western Australia's ten largest projects produced 110 t of gold and accounted for 59% of the State's total gold production in 2003. These projects comprised:

- Super Pit (Kalgoorlie Consolidated Gold Mines (KCGM)) – 26.2 t
- St Ives (Gold Fields) – 16.3 t
- Granny Smith (Placer Dome) – 14.9 t
- Sunrise Dam (AngloGold) – 10.7 t
- Plutonic (Barrick Gold Corp) – 10.4 t
- Jundee-Nimary (Newmont) – 10.0 t
- Paddington (Placer Dome) – 9.4 t
- Kanowna Belle (Placer Dome) – 8.2 t
- Bronzewing (Newmont) – 6.6 t
- Thunderbox (LionOre) – 6.4 t

Whilst Western Australia's gold output declined in 2003, a range of substantial new gold projects bode well for a return to increased production in the near future.

Newcrest Mining is expected to resurrect its \$1.2-billion Telfer gold (and copper) mine development with commissioning in the third quarter of 2004 and underground operations to follow in December 2005. In March 2004, construction of the Telfer project was 79% complete. The Telfer project is estimated to have reserves of 18 M oz and production is expected to average 800 000 oz or around 25 t/a. This would rival the production of Australia's largest gold mine, the Super Pit that accounted for 14% of Western Australian gold sales in 2003. The expected life of Telfer is 24 years.

GOLD EXPORT DATA UPDATE 2003

The Australia Bureau of Statistics (ABS) released trade data in 2003 (Catalogue No 5432.065) that indicated a significant rise in Western Australian gold exports. However, this apparent increase in gold exports from Western Australia in 2003 has been due to the recent restructuring of Australia's gold refining industry.

In October 2002, AGR Matthey was formed. This is a partnership between Johnson Matthey (Aust) in Victoria, WA Mint (The Perth Mint) and the Australian Gold Alliance. As a result of the merger, all Australian gold is now refined in Western Australia. The Victorian refinery still refines silver and jewellery products.

Gold export data published by the ABS from Western Australia must therefore be interpreted with some caution. It includes gold produced in other States and Territories, which is refined and exported from Western Australia. This export figure is therefore larger than Western Australia's level of gold production.

The ABS unpublished international trade statistics estimate that gold exports from Western Australia in 2003 amounted to approximately \$5.74 billion.

Assuming all Western Australia produced gold was exported (\$3.36 billion) the remaining \$2.38 billion can be attributed to gold refined and exported from Western Australia but produced from mining operations in other States and Territories.

Gold produced in overseas mining operations namely Papua New Guinea and Asia plus imported scrap is also refined in Australia and exported. Wherever possible to identify such gold is excluded from the aforementioned ABS export data and is included separately in a separate ABS series Australian Harmonised Export Commodity Classification (AHECC) 9805.

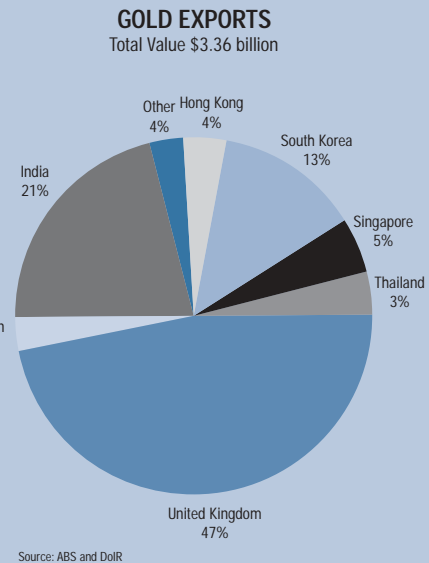


Figure 24

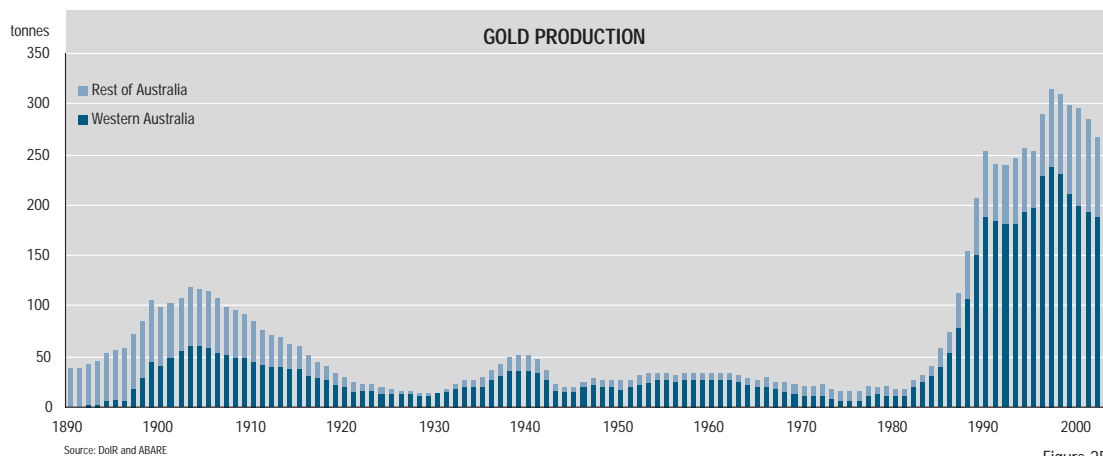


Figure 25

The Boddington Gold Mine remained on care and maintenance in 2003, but negotiations continue between the Boddington Gold Mine joint venture partners, Newmont (44.4%), AngloGold (33.3%) and Newcrest (22.2%) with regard to the \$600 million Boddington Expansion Project. Currently, production is expected to begin in 2005. If progressed, the project is forecast to produce in excess of 500 000 oz per annum with a life exceeding 15 years.

The Laverton Exploration Joint Venture between Metex Resources and Placer Dome's Granny Smith Mines had its Notice of Intent for the Whisper trial pit approved in April 2004. The trial pit development is proceeding smoothly with mining and processing on track for the first quarter of 2004. Whisper is part of the Chatterbox resources that also include Innuendo, Rumour and Garden Well. The trial pit will be used

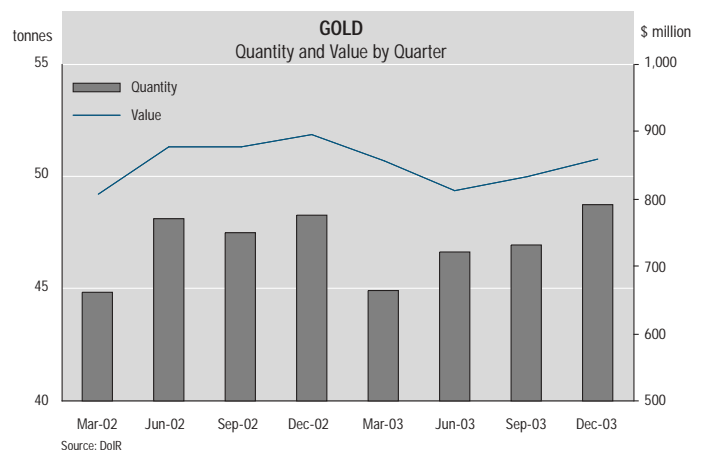


Figure 26

to complete a feasibility study for the larger resource. The joint venture's total resources are expected to be around 1.2 M oz. The joint venture is expecting low ore treatment costs by taking advantage of the existing Granny Smith mill where Placer Dome is also progressing expansions.

In addition, to these three major expansions a range of new projects and/or expansions are underway. For example, AngloGold is progressing an \$87-million expansion of the Sunrise Dam mine, while a range of junior gold miners announced commencement of mining or new gold finds. These include the Frog's Leg joint venture at Kalgoorlie between Mines and Resources Australia (51%) and Dioro Explorations (49%), which commenced mining in March 2004 with initial production expected in July this year. The joint venture expects to recover a resource in excess of 100 000 oz.

Gold Outlook

The gold price during 2004 is highly susceptible to developments in the global economy, particularly the US. A range of uncertainties exists largely with regard to the demand for gold. From an investment perspective, there is a positive outlook for substitutes, particularly if US interest rates are likely to increase and there is also a positive outlook for equities. This should place a downward pressure on the gold price. ABARE forecasts the gold price to average around US\$410 oz in 2004, but trend down as a rising US interest rate environment is affirmed.

If and when gold prices fall, increasing consumption, particularly from Asia in the context of appreciating Asian currencies could moderate the decline. In the short term, a range of factors may nevertheless support prices, including continued low US interest rates, exchange rate variability, and increased access to investment in gold through new security products.

On the supply side, the extension of the European Central Bank Gold Sales Agreement to maintain an upper limit on gold reserve sales will moderate the impact of European central bank sell-offs. Asian central banks may also increase purchases. Continued strong local currencies in Australia and South Africa could also discourage production. However, ABARE forecasts global gold production to increase by around 3% to 2 690 t in 2004.

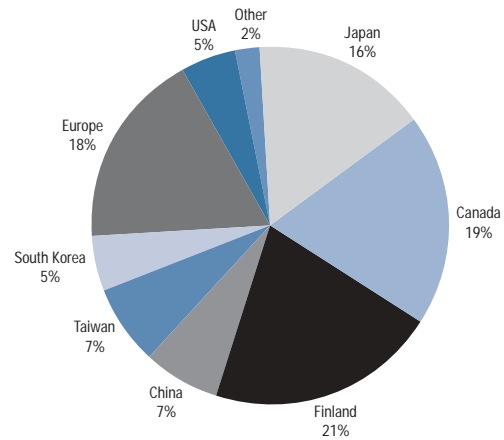
NICKEL

Chinese demand has driven world consumption of nickel, assisted by growth in South Korea and Finland. This is largely due to expanding stainless steel production. ABARE estimates that China's consumption of nickel contributed 60% to global nickel consumption growth in 2003. In absolute terms, ABARE estimates that China consumed 123 kt of nickel in 2003, plus an additional 140 kt of nickel contained in stainless steel imports. This implies that China accounted for around 22% of global nickel consumption in 2003.

Nickel supply did not respond to the surge in demand. Production upheavals, such as the three-month strike at Inco's Sudbury operations, which ended in September 2003, also contributed to a relatively slow response in mine output. On balance, growth in consumption significantly outpaced production and the market

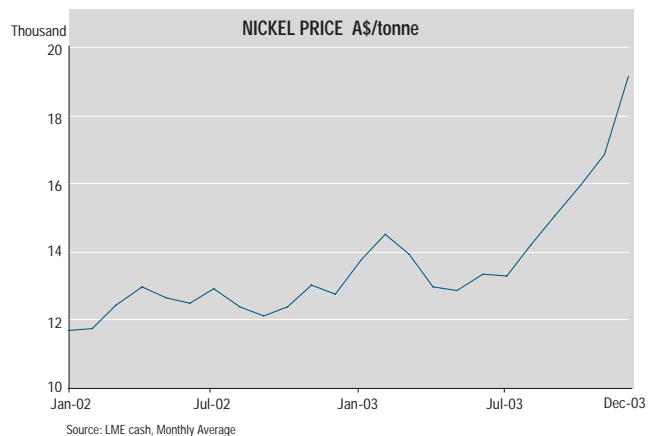
NICKEL EXPORTS

Total Value \$2.53 billion



Source: DoIR

Figure 27



Source: LME cash, Monthly Average

Figure 28

was only kept in balance by significant de-stocking in 2003. The deficit was closed by stockpile sales particularly from Norilsk, which paid back collateralised loans by selling some 60 kt of nickel. Norilsk is the world's largest nickel producer and in 2003 its sales increased 91 kt or 42% to 309 kt. Most of the stockpile sales took place in early 2003.

As a result of the emerging supply deficit, nickel prices grew strongly in 2003, almost doubling in US dollar-terms from around \$8 000/t in January 2003 to exceed \$15 000/t in January 2004. Nickel prices have since been corrected down after reaching a 15-year high in early 2004, spurred on by speculative capital buying.

Western Australian Nickel Sales

In Western Australia, producers experienced a price increase of almost 42% in US dollar terms during 2003. This made nickel the absolute star performer in value terms, as the US dollar price increase more than offset the dramatic impact of the appreciation of the local currency that decimated Australian dollar sales values for most other commodities. As a result, the value of nickel sales grew strongly, by 16% to a record \$2.6 billion. Nickel sales volumes also increased to a new record of 187 737 t. Western Australia remains Australia's only producer of nickel.

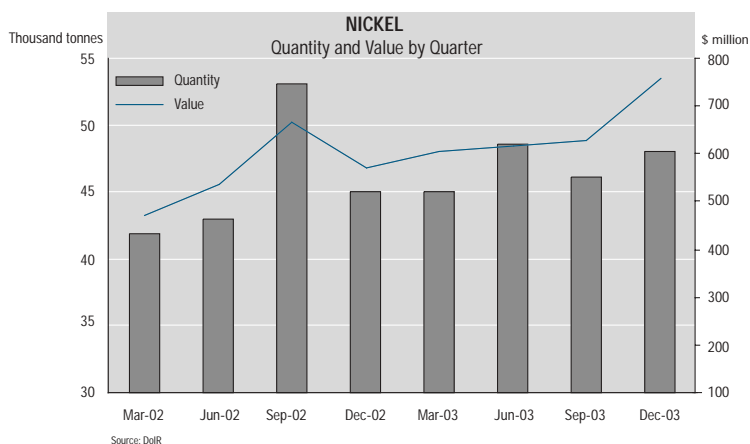


Figure 29

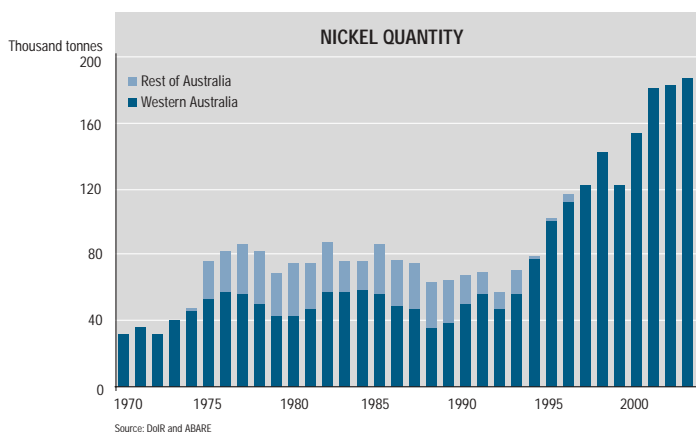


Figure 30

Accordingly, Western Australian nickel exports continued to rise, reaching \$2.5 billion, up by 18% from 2002. Most of the increase was attributable to Canadian and Chinese imports that increased their share of Western Australian nickel exports by 11 and 7 percentage points, respectively. Finland continues to account for most exports (21%), followed by Canada (19%), Europe (other than Finland; 18%), Japan (16%), China (7%), Taiwan (7%).

Western Australian Nickel Developments

While the Western Australian nickel sector arguably has become more diverse in recent years with a number of smaller nickel miners emerging, the sector remains heavily concentrated with the largest five miners contributing close to 90% of nickel sales:

- Western Mining Corporation (Mount Keith and Leinster) – 92 t
- Minarra Resources (Murrin Murrin) – 32 t
- Jubilee Mines (Cosmos) – 15 t
- Mincor Resources (Miitel) – 13 t
- MPI Nickel (Black Swan) – 11 t

Production at WMC Resources (WMC) increased significantly in 2003 reflecting record production from Mount Keith and increased output at Leinster. This was a result of a program to improve

recovery, which has increased recovery from 60% to 71% at Mount Keith over the last five years. A similar program for Leinster was initiated in 2003. The majority of WMC's underground expansion at Leinster is expected to be finalised by the end of 2005, with capital expenditure of \$70 million in 2004. WMC announced in April 2004 that it is looking for alternative nickel supplies, as the Leinster–Harmony open pit were to be depleted and lower grade stockpiles and ore from Mount Keith would be processed in 2004. In response, throughput will be increased elsewhere and WMC is also aiming at beginning production at the 11 Mile Well south of Leinster in 2004. WMC also finalised a scoping study for the large Yakabindie deposit and is to progress a feasibility study aiming at production around the end of the decade.

In terms of concentration and refining, WMC's supplies from independent operators will increase for WMC's Kambalda concentrator. The Kalgoorlie smelter increased its production by 8% to 99 152 t in 2003, while production at the Kwinana refinery fell 6% to 61 417 t due to boiler repairs. A de-bottlenecking program should lift Kwinana's capacity to 70 kt in 2004, although production is expected to be somewhat less at 62 kt in 2004. Increased in-matte production comes after WMC increased its long-term supply agreements with China's largest domestic nickel producer, Jinchuan Group (Jinchuan). In mid-2003, the companies signed a six-year, 90 kt nickel in-matte supply agreement worth \$1 billion.

Western Australia's second-largest producer, Minara Resources' (previously Anaconda Nickel) Murrin Murrin nickel laterite project continues to operate significantly under capacity. However, a \$100-million capital program is nearing completion which is expected to increase Murrin Murrin capacity to 40 kt/a by mid-2004. Further de-bottlenecking is subsequently predicted to increase capacity to 42 500 t/a. In the medium term, a fifth autoclave is also being considered, which would take Murrin Murrin's capacity to 50 kt/a.

Western Australia's fourth-largest nickel miner, Mincor Resources, is expected to almost double its production adding around 10 kt/a of nickel from a range of developments in the Kambalda area over the next year or so. The company's \$13-million North Miitel project is expected to be complete in July 2004 and add around 3 kt/a of nickel to production. In addition, Mincor announced the establishment of two additional nickel mines in 2003. These comprise the \$11-million development of the Redross project which is scheduled for production of around 4 000 t/a of nickel metal concentrate in September 2004 and the Mariners Nickel Mine which is expected to begin operations in October 2004 at around 3 500 t/a. In addition, Mincor announced a tripling of its exploration budget in early 2004. Mincor supplies WMC's Kambalda concentrator.

In other developments MPI Nickel approved the Black Swan Disseminated (BSD) nickel project in December 2003 and production is expected to begin in 2004 starting at 2 500 t/a of nickel concentrate by mid-2004. In addition, Mining Project Investors Mines (MPM) is progressing an evaluation of the Honey Well project. Honey Well is one of the world's largest undeveloped

nickel sulphide deposits. MPI Nickel is jointly owned by MPM (80%) and the OM Group (OMG) (20%) and output is trucked to OMG's Cawse facilities and exported to OMG's Finnish operations.

In addition, to these major projects a range of smaller nickel sulphide operations have toll treatment and concentrate purchase agreements in place with WMC, trucking ore to be concentrated at WMC's Kambalda operations. These include:

- Australian Mines which re-opened the Blair mine in March 2004 and aims at a production of 1 700 t over the first six months subsequently ramping up to twice the amount.
- Independence Group (IGO), which currently produces nickel from its Long Nickel and Gibb South mines in the order of 4 kt/a. Production at Victor is expected to begin in mid-2004. IGO's Victor and Victor South developments could increase IGO's production capacity by 4 kt/a to 8kt/a (including Victor South).
- Reliance Mining producing remnant ore from the Hunt deposit with additional sulphide ore coming from the new Beta Hunt deposit, which is to expand production up to 4 kt/a over 2004.
- Tectonic Resources which operate the RAV8 mine at Ravensthorpe.
- View Resources, which commenced mining at the Carnilya Hill Mine near Kambalda in November 2003 and delivered the first ore to WMC in January 2004. Mining also commenced at Zone 29 of its Carnilya Hill Tenements in January 2004 with nickel production expected in May 2004.

In addition, to these minor operations, the Western Australian nickel industry is set to become significantly more diverse, as the buoyant nickel demand and prices encourages a range of new nickel projects.

Most significantly is BHPB's \$1.4-billion Ravensthorpe nickel project, which is expected to produce around 45 kt/a. Construction is expected to begin in late 2004 with Ravensthorpe nickel expected to reach the market in late 2007. The mine life is currently expected to be 25 years. The Western Australian Government is to contribute about \$48 million to common-user infrastructure in the region. Globally, the development could see BHPB become the world's third-largest nickel producer ahead of WMC and Ravensthorpe. Locally, Ravensthorpe will rival Murrin Murrin as Western Australia's second-largest nickel mine. Both operations are based on nickel laterite deposits, and Heron Resources is also pursuing a laterite operation in Kalgoorlie.

While most current Western Australian production is based on nickel sulphide deposits, most of Western Australia's nickel resources are laterite. However operational problems for laterite processing have plagued Western Australia's three initial laterite operations Bulong, Cawse and Murrin Murrin. Indeed, the companies have ceased operations in their original form:

- The Bulong laterite nickel operations went into voluntary administration in 2003 with LionOre acquiring the refinery and infrastructure, which it does not intend to use for laterite but to expand its sulphide operations in Western Australia, possibly using its Activox technology. Heron Resources

purchased the Bulong tenements and is aiming at establishing a 40 kt/a nickel laterite operation. Further processing of an intermediate nickel product could take place through the Murrin Murrin and Cawse nickel treatment facilities.

- The Cawse operation was placed in receivership in 2001 and was subsequently purchased by US-owned OMG. OMG closed the refinery in 2002 but has since shipped output from its Cawse mine to its Finland refinery. Similar to MPI's Black Swan nickel sulphide, Breakaway Resources' nickel sulphide stockpile at Spargoville has been processed at Cawse. As a part of the scoping study for Honey Well, joint venture partners MPM and OMG are considering the addition of a low pressure, oxidation leach system to OMG's Cawse nickel refinery in Western Australia, employing the sulphide autoclave process used at OMG's Finnish Kokkola operations.

In other events, LionOre is in the process of establishing itself as a major nickel producer in Western Australia with its Emily Anne mine and the Maggie Hay project. The latter is expected to begin production in the second half of 2004 and could see LionOre increasing its nickel production to more than 10 kt/a by the end of the year.

Another medium-sized nickel project is the \$60 million Sally Malay nickel (plus copper and cobalt) project in the East Kimberley. The operation is expected to be commissioned in August 2004 with first shipment to China later in the year and production subsequently ramping up to around 8 kt/a. The project has a whole-of-life sales agreement with two Chinese companies.

In addition, to these projects, the buoyant nickel demand and prices have resulted in a significant number of nickel sulphide projects being progressed by a range of nickel juniors, including Breakaway Resources, Discovery Nickel, Titan Resources and Western Areas.

As per the developments in the iron ore industry, Fox Resources became the third Western Australian nickel company to sign supply agreements with China. The \$135-million, three-year agreement is to supply the Jinchuan province with 35–40 kt of concentrate. Fox Resources' Radio Hill operations are to begin operations in 2004 with the first shipment to China, through Dampier, scheduled for July 2004.

Nickel Outlook

The outlook for nickel over the coming year is very positive with high price levels likely to be maintained. On the demand side, economic growth in China is anticipated to remain strong, though growing at a slower rate. Growth in Chinese steel production is likely to result in increased nickel consumption.

On the supply side, global stocks have declined and there is little additional production coming online in the short term. Any additional supply is likely to come only from brownfield expansions and increased efficiency of existing mines. For example, in addition to BHPB's Western Australian Ravensthorpe nickel project, only a few nickel projects are likely to come online, but not until around 2007. These comprise Inco's Goro (55 kt) and

Voisey's Bay (50 kt) projects, with production beginning in late 2006 and 2007, respectively. Norilsk Nickel and Jinchuan Nickel are also expected to expand. In the longer term, Falconbridge is investigating the addition of 55 kt refining capacity to its New Caledonian operations and Highland Pacific's Ramu project could contribute 33 kt additional refining capacity in Papua New Guinea.

Consequently, the upward trend for nickel prices is likely to continue. Solid prices are expected to continue until 2007 – after which global production is predicted to exceed consumption for the first time since 2002.

HEAVY MINERAL SANDS

In 2003, although gaining marginally in US dollar terms, heavy mineral prices decreased significantly in local prices due to the appreciation of the Australian dollar. Focusing on specific mineral sands products, unit sales prices for both ilmenite and rutile declined 19% in Australian dollar terms, while zircon declined by 15%. In addition to the negative impact of the Australian dollar, prices were also under pressure due to continued excess supply of some titanium dioxide feed stocks.

Western Australian Sales of Heavy Mineral Sands

The total value of Western Australian heavy mineral sand sales declined by 12% to \$754 million in 2003. Reflecting the moderate prices and reduced production of some heavy mineral sands, sales now account for less than 3% of total Western Australian resources sales. Nevertheless, heavy mineral sands remains the State's sixth-largest resources sector and Western Australia increased its share of Australian heavy mineral sands production to over 90%.

Total exports of heavy mineral sands amounted to \$580 million. The USA remains the most significant export destination accounting for 20% of Western Australian heavy mineral sands exports, followed by the Netherlands (12%), the United Kingdom (9%) and China (9%). In total, Asia accounts for 36% of total exports.

The sales value of Western Australia's most valuable mineral sand, synthetic rutile (upgraded ilmenite) fell 11% to \$315 million, partly attributable to a 5% drop in sales volumes. Ilmenite sales values also fell, by 16%, although volumes increased slightly, while rutile and leucoxene sales values fell around 20%. Rutile sales volumes were also slightly down, but leucoxene volumes increased almost 7%.

Zircon fared somewhat better with the total sales value falling 7% to \$230 million. The relatively small decline was attributable to the less adverse price performance and improved sales volumes which were up in excess of 7% to 396 805 t.

Western Australian Heavy Mineral Sands Developments

The majority of Western Australia's heavy mineral sands industry is located in the State's southwest region. Western Australian production is confined to a small number of companies, Iluka Resources, Nissho Iwai's RZM Cable Sands Group, the TiWest Joint Venture, (co-owned by Ticom and Kerr McGee Chemical

HEAVY MINERAL SANDS EXPORTS

Total Value \$580.10 million

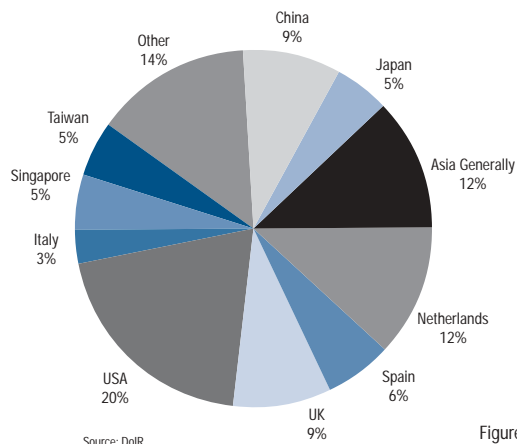


Figure 31

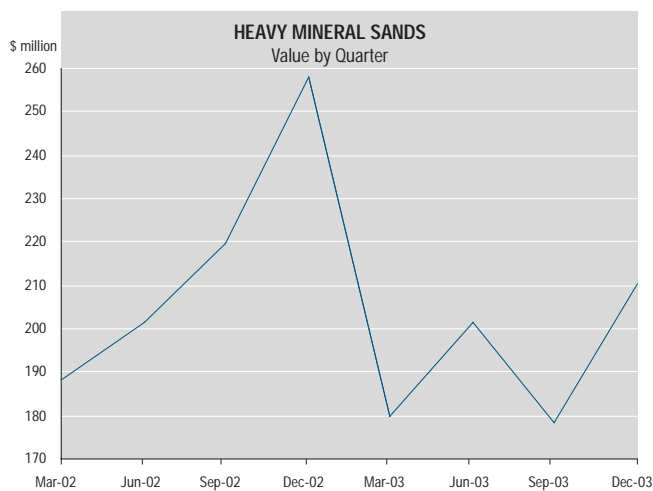


Figure 32

Corporation) and Doral Minerals Sands.

In 2003, zircon and synthetic rutile sales by Iluka Resources, the world's largest zircon and the second-largest titanium minerals producer, reached record levels largely due to increased production in Western Australia. Nevertheless, Iluka's Western Australia reserves, particularly in the mid-west of the State, are set to gradually be depleted resulting in a deteriorating grade. Iluka has also suffered operational problems at its Yoganup operations and kiln shutdowns. Despite the depletion of Iluka's Western Australian resources, additional mineral sands production may emanate from mineral sands production at Mining Area C (for which Iluka receives a royalty payment), which has a capacity of 23 Mt/a.

The Australian heavy mineral sands industry was further consolidated with the merger of BeMax Resources, Nissho Iwai's RZM Cable Sands Group and Sons of Gwalia. Shareholders approved the merger in early 2004 and as a result the mineral sands assets will be unified under BeMax with Cristal Australia (27%), Nissho Iwai (20%), Sons of Gwalia (15%), Imperial One (6%) and other existing BeMax shareholders (31%) as major shareholders. The resulting entity will be Australia's third-largest titanium dioxide feedstock producer, accounting for 11% of world ilmenite output and almost

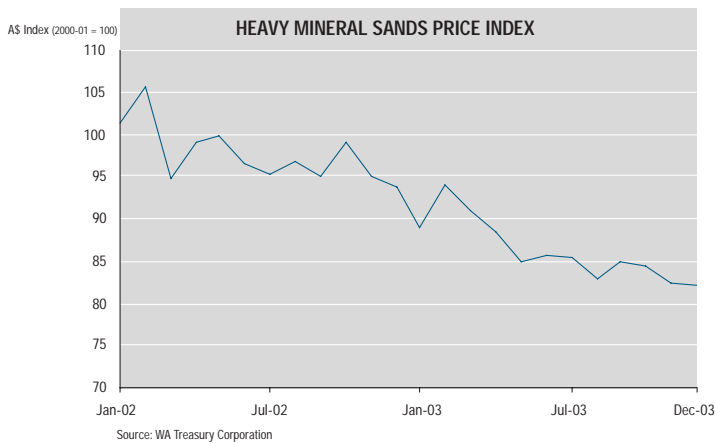


Figure 33

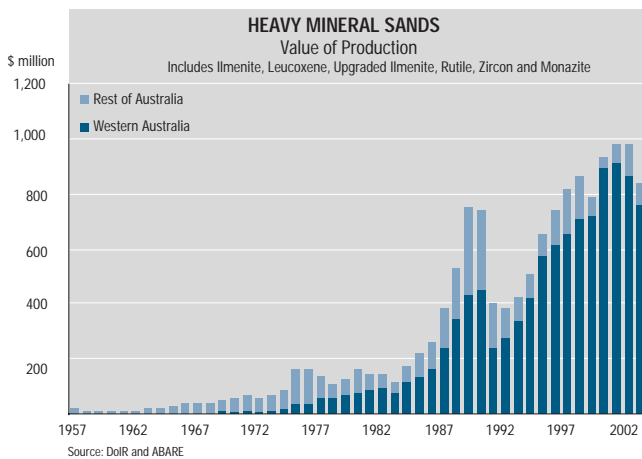


Figure 34

4% of world titanium dioxide output.

In terms of additional heavy mineral sands projects final conditions for mining by Cable Sands at the Ludlow State Forest were detailed in December 2003. Subject to a public review process, production could begin later in 2004. The Ludlow ore body consists of approximately 7 Mt that will produce about 0.8 Mt/a for three to four years of concentrate comprising mainly ilmenite, zircon and leucoxene. The deposit is located 3 km from Cable Sands Jangardup mine next to D'Entrecasteaux National Park.

In other developments, Gunson Resources is currently developing its Coburn deposit, which is located at Shark Bay. A bankable feasibility study for the project is expected to be finalised shortly. The zircon-rich Coburn project has an inferred resource estimate of 690 Mt, with zircon constituting 22% of heavy minerals. The project's capital cost is estimated at \$62 million, with potential production from early 2006.

Mineral Sands Outlook

The outlook for heavy mineral sands is improving, based on expected recovery of economic growth in the OECD and continued growth in demand from China and India.

This is particularly the case for zircon, which has already achieved significant US dollar price increases in 2004. Strong zircon demand from China has chiefly been responsible for zircon's resilience, with the country's building boom increasing demand for ceramic tiles. With limited supply growth in the short-term, the gap between demand and supply in the zircon market is anticipated to widen. As Western Australia is the world's largest zircon producer, this places local zircon producers in an excellent position to reap the benefits. However, there is some scope for additional zircon production to come on-stream possibly moderating price gains.

In terms of titanium-based mineral sands, there is a range of major international projects, which could possibly be progressed in 2004, such as WMC's corridor project in Mozambique and Rio Tinto's Madagascar project. With additional capacity coming online and a more competitive environment for products made from titanium minerals, price growth for ilmenite is likely to be subdued.

DIAMONDS

The global diamond market experienced healthy growth during 2003. Demand for rough diamonds was strong and demand for polished diamonds recovered in the second half of 2003 from the adverse effects of the Severe Acute Respiratory Syndrome (SARS) and the Iraq War. Both of these factors negatively impacted on demand in the first half of 2003. However, reflecting strong global demand diamond prices experienced solid gains in the second half of 2003.

Growth in the Western Australian diamond industry was moderate in 2003 with sales increasing by 3% to 35.5 Mct. The Australian dollar value of diamond sales however, grew modestly, at 2% and amounted to \$663 million in 2003.

Rio Tinto's Argyle mine accounted for most of the growth in diamond sales. The Argyle project is the world's largest supplier of diamonds and its output of industrial-grade stones accounts for almost all of Australia's diamond production and around a fifth of world production. In 2003, Argyle's production of 30.9 Mct was down by 7.8% on its 2002 production level of 33.5 Mct. Sales however, thanks to stockpiles, increased 3% in 2003, to 35.4 Mct. The increase in the quantity of diamonds sold was the result of continued strong marketing efforts and healthy demand.

Currently, the Argyle open pit operation is expected to continue until 2007, although a feasibility study investigates underground mining options. This could extend the mine's life to 2020. A decision regarding an underground mine development is expected in 2005.

Diamond production at Western Australia's only other diamond mine is experiencing strong growth. Kimberley Diamond Corporation's Ellendale 9, the first stage of Kimberley Diamond's Ellendale mine, was reaching full production in early 2004. A new ore-body adjacent to Ellendale 9 with resources of around 0.6 Mct was announced in December 2003 and the total resources of Ellendale 9 is now expected to be 1.6 Mct. In addition, the quality of stones at Ellendale is higher than initially expected.

Kimberley Diamond expects to continue expanding and predicts that it will be the world's fifth-largest diamond producer by 2006. Currently, Ellendale's total resources are estimated to be 4.15 Mct and is expected to produce around 60 000 ct/a in 2004 with an expected mine life of about 30 years at its current processing capacity.

Striker Resources NL has committed to trial mining at the Seppelt 2 kimberlite pipe in Western Australia's Kimberley region after bulk sampling was completed and a parcel of 3 566 ct was valued. The company was expected to make a decision about committing to mining by mid-2004. Exploration also continues at Seppelt 5. Nationally, Striker also continues its exploration joint ventures with Rio Tinto and Striker has obtained a 100% interest in the Arnhem Land Diamond Project land from De Beers and is expected to begin exploration in 2004.

In other developments, Flinders Diamonds also continues exploration in the Pilbara (Hamersley), Kimberley (Skelton Flat) and Twin Swaps area, east of Wiluna.

Diamond Outlook

With the diamond industry being particularly sensitive to global economic conditions, the outlook for diamonds should be solid for 2004 and beyond. This should be assisted by relatively little additional supply expected to come online in the near future.

Demand for rough diamonds is expected to continue to grow at a healthy rate in 2004, particularly as economic growth is picking up in the OECD, especially in the USA and Japan. The USA accounts for around half of world demand and consequently with what appears to be a healthy recovery of the US economy, bodes well for diamond demand. Similarly, an end to the deflation in the Japanese economy could also see Japanese demand beginning to recover to pre-recession levels. This would improve the market, as Japanese diamond consumption rivalled that of the USA prior to the stagnation of the Japanese economy. The tentative signs of an end to Japan's recession are therefore promising.

Strong economic growth in China, India and elsewhere in Asia could also increase demand since these countries have an increasing number of consumers with sufficient disposable incomes.

On the supply side, there is evidence that De Beers and the Russian diamond monopoly, Alrosa, have continued to sell down their stocks in 2003. In 2002, rough diamond production was 8.0 Mct whereas sales amounted to 9.0 Mct. Combined with stocks increasingly being sold down and no major new production coming on line, prices for rough diamonds should continue to experience solid growth in the short to medium term.

According to a prediction at the World Diamond Conference in Perth last year it has widely been reported that De Beers expects the global demand for diamonds to increase in the order of 50% by 2012. Even after Rio Tinto's Diavik mine comes online, this would leave a supply shortfall equivalent to the entire production of De Beers. This could lead to real price increases in the order of 20% to 40%. Price increases during 2003 may therefore be the beginning of a decade of healthy price growth for diamonds.

BASE METALS

On average, in the last couple of years, copper, zinc and lead have not been subjected to market conditions as favourable as that for nickel or alumina. Despite signs of improvement, particularly in copper and lead prices, the Australian dollar appreciation significantly detracted from international price growth in 2003.

As a result, the total value of Western Australian copper, lead and zinc sales fell in 2003 by 14% to \$302 million. This was despite US dollar price increases of 14% for copper and lead and 6% for zinc. Compounding the adverse effect of the Australian dollar appreciation, production volumes also fell, by 20% for lead and zinc and 8% for copper.

Copper

In volume and value terms, Western Australian copper sales decreased from record levels in 2002, to 59 098 t/a worth \$140 million in 2003.

Western Australia's second-largest copper mine, Nifty (around 24 kt/a), was sold by Straits Resources to the Indian Aditya Birla Group (ABG) in 2003. ABG stated that it intended to scale up production. Nifty produced around 22 kt/a of copper prior to production being scaled back as a part of the sales process. The other major copper operation is Newmont's Golden Grove project which produces around 25 kt/a. These two major producers account for around 80% of Western Australian copper production.

In 2004, a couple of additional projects were scheduled to come on line. Newcrest's Telfer project is expected to begin production later this year with an additional 30 kt/a of copper when in full operation. Strait Resources also aims at restart production from Whim Creek in the last quarter of 2004. Annual production from Whim Creek is expected to be 51 kt during a 4-year period. Copper production from Whim Creek first started in 1888 and continued until 1964.

Globally the copper market was in deficit for most of 2003. Significantly Chinese copper purchases increased 10% in 2003. In addition to market purchases, China also consumed copper from the Chinese Government's State Reserve Bureau's stockpile which had built up in 2002.

China has been the world's largest consumer of copper since 2002 and accounts for almost 20% of global demand. Much of the economic growth in China relates to its construction, telecommunications and electronics industries, which consume a lot of copper. While copper consumption in China was up almost 30% in the first quarter of 2004, compared to a year earlier, some analysts expect Chinese demand to flatten over the course of 2004. However, any significant slowdown in Chinese demand may be offset by synchronised growth in the OECD and economic recovery in the US and Japan has been forecast to result in double-digit copper demand growth in these countries. Also, consumption in Japan increased 4% in 2003 but is forecast to increase almost 20% in 2004. Together, Japan and the US accounts for more than a fifth of world copper demand.

The outlook for copper is therefore expected to further improve. ABARE forecasts continued strong prices over the next couple of years, with prices expected to increase almost 40% in 2004 and only tapering off slightly during the following years. This is a result of an emerging production deficit, which has already caused some de-stocking.

Nevertheless, there is some uncertainty about the extent to which increased capacity utilisation, brownfield expansions and further stockpile sales by the China Reserve Bureau and Codelco will moderate price growth as market conditions improve. Codelco has already tendered about half of its 200 kt stockpile and Phelps Dodge has announced additional production of 91 kt of copper both in 2004 and 2005. Production problems at Escondia, Grasberg and Ok Tedi should, however, offset other supply increases in the short term.

Zinc

Although zinc prices gained momentum in the second half of 2003, average growth in US dollar terms during the year was a moderate 6%. As a consequence, Australian dollar prices fell by almost 12%. This contributed the majority of the decline in the value of Western Australian zinc sales in 2003.

Western Australian zinc sales declined 43 678 t to 175 125 t and were worth \$137 million. The decline in volume partly reflects that cessation of output from the Lennard Shelf project. Mining was suspended and placed on care and maintenance as a part of Western Metals' sale of the mine to Teck Cominco.

Western Metals went into voluntary administration in July 2003, partly as a result of falling zinc prices. Lennard Shelf was the world's sixth-largest zinc mine and if deciding to resume operation, Teck Cominco has announced it would increase its zinc concentrate production capacity by around 170 kt. However, this depends on zinc prices, exchange rate movements and the outcome of a \$2-million development program. Teck Cominco has also on-sold a 50% interest in the Lennard Shelf project to another Canadian diversified resources company, Noranda (Falconbridge's majority shareholder). Noranda will be required to invest approximately \$26 million in exploration, operating, capital expenditures or other advances in Lennard Shelf.

Golden Grove is Western Australia's other major zinc project. In 2003, the mine produced 54,000 t and sold in the order of 47,000 t and worth in the order of \$36 million.

Recently, zinc prices have risen to their highest levels since 2000. This has been driven by forecast demand growth from China and the USA coupled with limited expected supply growth. Similar to the situation for copper, despite several mine and smelter closures, there is scope to increase capacity utilisation which will moderate price increases. Nevertheless, in 2003 global stockpiles fell significantly and Deutsche Bank predicts a supply deficit of between 250 kt and 300 kt in 2004 attributable to increasing demand and production declines. ABARE forecast US dollar price increases in the order of 25% in 2004 and project an additional price increase of 6% in 2005.

Lead

With double the price gains, the global lead market fared somewhat better than the zinc market during 2003. Australian dollar prices, nevertheless, still suffered a 6% decline. The volume of Western Australian lead sales suffered a similar fate to zinc, with the Lennard Shelf project also having been a dominant Western Australian lead producer. As a result, Western Australian lead sales fell by 13 906 t to 56 491 t in 2003. In value terms, lead sales also fell significantly, to \$25 million, compared to \$33 million in 2002.

Improvement in lead prices has helped stimulate interest in development of a new lead mine near Wiluna by Magellan Metals. Subsequent to environmental approvals, it was announced in May 2004 that the high-grade, low-cost Magellan lead project will be progressed in two stages with construction beginning in the second quarter of 2004. Production is expected to begin in the first quarter of 2005 and to build up to 70 kt of lead in concentrate. A second phase is envisaged to begin with the establishment of a refinery in 2006 and a further increase in production, to 90 kt/a of lead metal, in 2007.

OTHER MINERALS

Coal

In 2003, Western Australian coal sales decreased by 3.8% to 6.0 Mt, while the value of sales remained unchanged at \$266 million. This was largely due to lower off-take requirements by Western Power. All of the State's coal supply is sold domestically to Western Power or large local energy users, largely in the mineral-processing sector.

The Griffin Group is progressing plans for its Bluewaters coal-fired power station in conjunction with the proposed Coolangatta industrial estate in Collie. Griffin plans to finalise construction of the Bluewaters power station by late 2006. Griffin also announced plans for the expansion of the Ewington mine at Collie with reserves of 80 Mt and opening up the Chicken Creek 3 deposit to supplement supply from the Muja mine which is 100% dedicated to the Muja power station.

In terms of electricity generation, Western Power is seeking 1000 MW of extra electricity from independent power producers by 2012. The Griffin Group has linked up with Japanese industrial giant Mitsui and Co to tender for the right to build a 300 MW base-load power station for Western Power. Competing coal producer Wesfarmers, owner of the State's largest coal producer, Premier Coal, has also joined with Japanese partner, wholesale electric power company, J-Power to tender for the same bid.

Salt

In 2003, Western Australian salt sales continued to increase, growing by 6%, to 9.8 Mt. However, a drop in received prices resulted in a deterioration of the value of sales, which fell in excess of 21% to \$197 million.

Western Australia is the nation's sole producer of salt. Dampier Salt's operations are the State's chief producer and the world's largest producer of seaborne salt (Dampier Salt is also Australia's largest producer and exporter of natural gypsum). Dampier Salt is majority-owned by Rio Tinto (65%), Marubeni Corporation (20.5%), Nissho-Iwai Corporation (10.1%) and Itochu Corporation (4.5%). It has operations at Dampier, Lake McLeod and Port Hedland. The major export destinations for Dampier Salt are Japan, South Korea and Taiwan. It also exports to other regions of Asia, the Middle East, North America and Africa. Early in the year, Dampier Salt shipped its 100th million tonnes of salt.

Onslow Salt, majority-owned by Akzo Nobel, is Western Australia's second-largest salt producer. All of Onslow Salt's production is exported with major markets being Japan, South Korea and Indonesia. The product is primarily used in the production of chemicals, glass and plastics.

A potential new entrant into Western Australia's salt industry is Straits Resources, which in 2004 is undertaking a feasibility study, in combination with an EPA assessment and approval processes in regard to the Exmouth Gulf Solar Salt project. At this stage, the company envisages a 3 Mt/a project with capital expenditure in the order of \$100 million focusing on increasing salt demand in Asia. If a mooted staged expansion process takes the project to 10 Mt/a, this would make the project one of the world's largest.

Salt is primarily used as a feedstock for the production of chemicals and plastic. In the context of growing demand from Asia and expected economic recovery of the OECD, demand for salt is likely to continue to grow in the order of 2% per annum globally. With growth being higher in the faster growing Asian markets, Western Australian salt producers should therefore be well placed, due to their proximity to the Asian markets, particularly in the context of rising freight rates for low value bulk commodities.

Tin, Tantalum and Lithium

In 2003, Western Australian tin, tantalum and lithium sales declined 9% to \$202 million, as the sector was negatively impacted upon by the rising local currency.

Tantalum-Lithium

The tantalum market has been subdued since spot prices of tantalum exceeding US\$200/lb were attained in 2000 during the tech-boom. Unlike other commodities, no central market exists for tantalum products. Tantalum products also vary significantly subject to the tantalum content of the ore. Prices are set in the context of long-term supply contracts and it is difficult to obtain robust price information. Currently, it is understood that prices remain low due to the overcapacity created by the price spike in 2000. Prices now are between US\$20 to US\$40/lb. This compares with long-term price contracts between US\$40 and US\$55/lb in 2000.

Western Australia has the world's largest tantalum mines with Sons of Gwalia's (SGW's) Greenbushes and Wodgina operations. SGW is the world's largest producer of tantalum concentrate providing 50% of global supply from the two mines that hold around 70% of global reserves.

SGW is also one of three dominant global producers of spodumene (lithium concentrate), accounting for approximately 60% of the world's supply. Its Greenbushes lithium operations contain the largest and highest-grade lithium mineral resource in the world.

Subsequent to significant expansion projects initiated in response to the price spike in 2000, tantalite projects in both Western Australia and globally have been placed on hold subject to improving prices. For instance, the underground mine development at the Greenbushes Cornwall pit was suspended, awaiting an upturn in the market.

Tantalum production is also sourced from Haddington Resources' Bald Hill project. However, it experienced production problems and is only producing at half of its capacity. Haddington Resources operates Bald Hill under a licence agreement with SGW, which purchases all concentrate. It is also continuing exploration of its extensive range of tantalum prospects, including those through its wholly owned Australian tantalum entity.

Western Australia's third tantalum producer, Tantalum Australia, kept its Dalgara operation on care and maintenance in 2003, due to the low tantalum prices. Nevertheless, the company signed two long-term sales contracts worth a total of \$54 million with a possible extension of these contracts to \$123 million. The company also progressed its Solid Oxygen-ion Conducting Membrane process (SOM) with Boston University. The process offers cost and quality advantages in the refining of rare metals. A feasibility study for a pilot plant in Western Australia is scheduled to begin in April 2004.

Demand for tantalum is likely to improve with a synchronised recovery of the OECD, particularly in the USA. Due to tantalum's non-corrosiveness and quality as a conductor, tantalum is mainly used in the electronics industry, e.g. in capacitors for mobile phones and computers. It is also used in hi-tech alloys and medical applications. In addition, new technologies using tantalum are emerging.

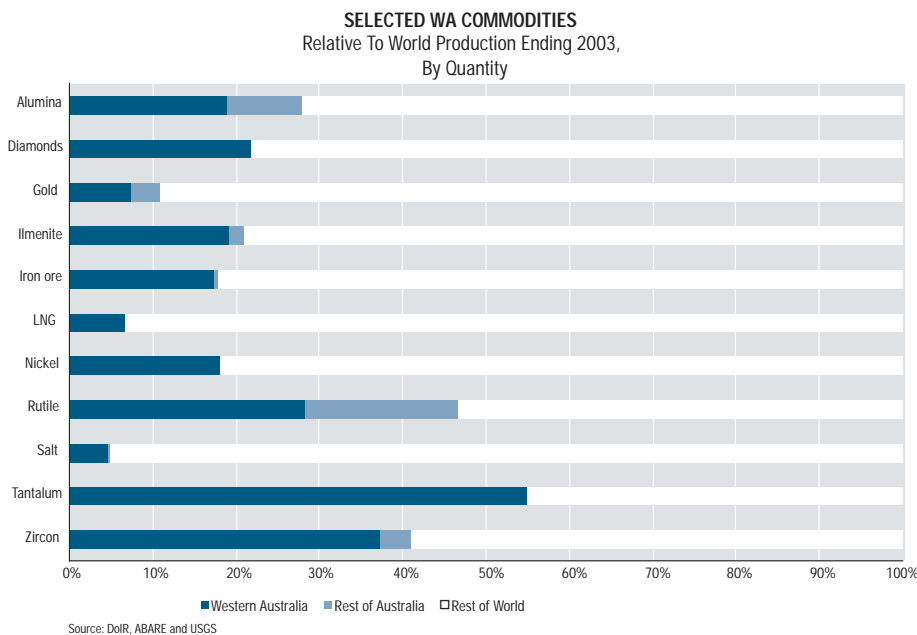


Figure 35

On the supply side, however, high stocks and overcapacity are likely to moderate price. It is understood that the tantalum industry approached the US Defence National Stockpile Center in 2003 to delay stockpile sales until 2004 due to excess commercial stocks. Analysts also estimate that current producers have capacity to meet annual demand growth of 20% per annum until 2005. In addition, a range of projects, currently on hold due to the price slump, could re-emerge if prices increase significantly.

As for lithium demand, it is expected to continue to grow at a moderate pace with strong growth in the secondary batteries sector offsetting reduced consumption in the aluminium industry.

Tin

In 2003, Western Australian tin export prices remained flat with US dollar price increases being offset by the appreciation of the Australian dollar. In volume terms, tin sales fell by 14% to 653 t. As a result, tin sales values were down 16% to \$4.3 million by the end of 2003 compared with 2002. In Western Australia, tin is only produced as a by-product of tantalum mining.

In 2004, tin is expected to continue to perform strongly. In the first quarter of 2004, tin prices recovered significantly in Australian dollar terms, up by 24%. Low stocks and continued strong demand influence the outlook. Tin stocks held by exchanges more than halved during 2003 and have continued the decline in 2004. The buoyant tin prices are expected to elicit a supply response that is expected to moderate price growth later in the year.

Sons of Gwalia is also Western Australia's largest tin producer and its Greenbushes operation also produces kaolin.

The Chinese construction sector has driven consumption growth and is likely to continue to provide impetus to the market in 2004. Similar to other metals, synchronised world economic recovery should offset any slowdown in Chinese growth. Another factor contributing to growth in tin consumption is increasing environmental requirements, resulting in lead-free soldering processes, e.g. in the electronic industries such as semi-conductors, the lead-free processes involve increasing the tin content.

Cobalt

Cobalt prices boomed in 2003 with price increases even exceeding those of nickel. In US\$-terms cobalt prices grew 57% on average during the year resulting in an Australian dollar gain of almost 29%. However, prices only gathered momentum from October 2003. This was driven by strong demand, particularly from China, which increased its consumption by around 30% in 2003.

Reflecting the buoyant demand and strong prices, Western Australian cobalt sales increased by 9% to 5 119 t and the value of these sales grew in excess of 17% to \$140 million in 2003. This is a solid result, particularly in the context of the moderate prices for most of the year.

There is little sign that these conditions will turn around swiftly. In the first quarter of 2004 cobalt prices grew by around 150% in both US dollar and Australian dollar terms. Similarly to nickel, stocks are

low and decreasing. Supply, on the other hand, is likely to respond slowly. While there is some risk of substitution due to the high prices, the use of other materials is limited due to their generally inferior performance. Additionally, demand is likely to increase from the lithium-ion battery sector and gas-to-liquids catalyst technology. As a consequence, conditions for cobalt are likely to remain very robust similarly to nickel, during the next two years.

Manganese

The boom in global steel production strongly assisted by the Chinese demand has been driving the market for manganese. China consumes around 90% of the world's manganese and in 2003, Chinese manganese imports increased to 2.9 Mt, compared to 2 Mt in 2002.

In 2003, Western Australia's manganese sales increased marginally by 2% to 587 836 t. While the volume remains high in historical terms, it suggests a slight slowdown with sales of 619 356 t for the 2002-03 financial year. Despite the healthy volume and solid price gains, the value of sales fell in Australian dollar terms by almost 14% to \$65 million, largely reflecting the appreciation of the Australian dollar.

Consolidated Minerals' (CSM's) Woodie Woodie operation in the Pilbara is Western Australia's sole manganese producer. The major export destinations for CSM's manganese ore are China and the Ukraine. In response to buoyant prices and strong Chinese demand CSM is undertaking a \$7 million expansion to increase production capacity to 800 kt. Following a successful exploration program, Woodie Woodie's life is expected to be 10 years.

In 2003, it is estimated that Australia has overtaken Brazil and is now the third-largest producer of manganese after South Africa and Gabon. With increased shipping freight rates, Western Australia may benefit from closeness to the Asian markets.

Continued strong demand is likely to drive developments in 2004 and magnesium sales are expected to hold up in 2004. Prices can also be expected to pickup further. The Tex Report predicts continued strong Chinese manganese import growth with imports of 3.5 Mt in 2004. The rate of growth in steel production shows little sign of slowing down, particularly in China. With both alloy and iron ore prices experiencing strong growth, this is likely to flow through to manganese ore and in December 2003 CSM negotiated a 10% increase for January and February 2004 shipments with a further 23% increase for March 2004 shipments.

EXPLORATION AND INVESTMENT

PETROLEUM EXPLORATION

The outstanding news in Western Australia for 2003 was that petroleum exploration expenditure rose by 55% to a new record high of \$709 million. In addition, Australian petroleum exploration expenditure topped \$1 billion for the third time in history, with such levels previously reached in 1998 and 2001.

The perceived and recognised petroleum prospectivity of Western Australia has increased since the mid-1980s, with Western Australia steadily attracting both more exploration (in absolute dollar terms) and a greater share of Australian petroleum exploration expenditure. Petroleum exploration expenditure in Western Australia has lifted from a level of about only \$100 million to the 2003 level of activity of over \$700 million. At the same time, Western Australia's proportion of the Australian petroleum exploration activity has increased from only 27% (1987) to the current level of 69%, matching the record first set in 2000.

Petroleum exploration activity is very much focused offshore in Australia (and Western Australia), with 80% of all expenditure directed to offshore Australian waters. In addition, the sector is characterised by a high proportion spent on drilling, with 65–70% of all petroleum exploration expenditure related to drilling. These levels are consistent with previous years.

MINERAL EXPLORATION

Australian and Western Australian mineral exploration expenditure was still at very depressed levels during 2003, but was showing signs of an upward trend late in the year. Mineral exploration expenditure in Western Australia during 2003 was however slightly higher than during 2002, having risen by 9.5% (\$37 million) to \$433 million. However this was after five years of decline, and mineral exploration was still 38% lower (down \$268 million) from its peak level in 1997 (in dollars-of-the-day terms).

Western Australia has continued to attract around 59% of the total mineral exploration expenditure in Australia, but this is still well down from the peak level of 65% in 1998. The short-term increase in mineral exploration expenditure in late 2003 is attributed to the renewed activity of brownfields nickel exploration and companies beginning to explore following recent capital raisings. However, gold exploration expenditure, the backbone of the Western Australian exploration industry, remained depressed during calendar 2003, with essentially unchanged expenditure. Exploration expenditure by commodity (as a percentage of the total) was: gold (65%), nickel-cobalt (13%), iron ore (6%), diamonds (4%), copper-lead-zinc (2%), heavy mineral sands (1%), and with 'others' at 9%.

Drilling is still at very depressed levels and has not shown any sign of a recovery during late 2003.

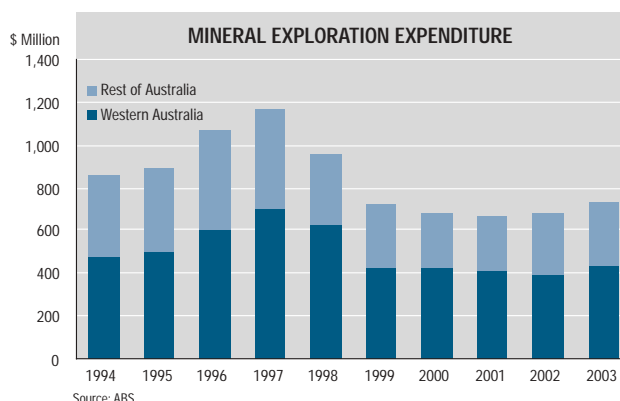


Figure 36

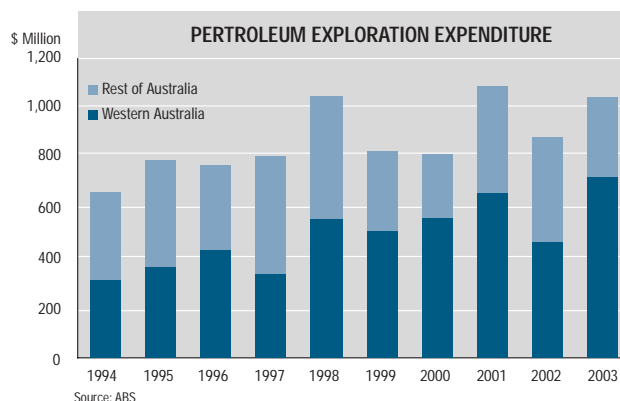


Figure 37

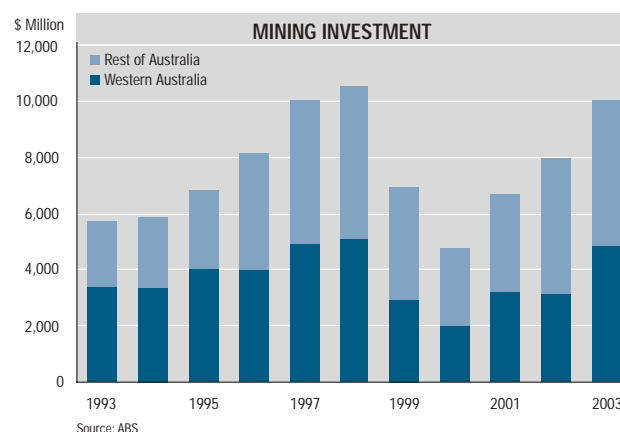


Figure 38

INVESTMENT

The ABS capital expenditure data for 2003 showed that Australia's investment in the mining sector increased 25% from \$8.0 billion in 2002 to \$10.1 billion in 2003. During the same period Western Australia's mining investment increased from \$3.2 billion to \$4.9 billion. Western Australia's share of national mining investment rose to 48%. Total capital investment in Western Australia amounted to \$8.6 billion in 2003, with mining investment representing 57% of this total. This compares to a 50% share of total capital investment in 2002.

Delta Electricity and Access Economics Investment Monitor takes a longer term perspective by accounting for projects under construction, those committed and those that are merely under consideration or possible. Summary data for the entire project database showed Western Australia with \$37.2 billion worth of mining, petroleum and metals industry projects in 2003. However, this figure may be higher as the database lists some expenditure for certain projects as unavailable.

By including electricity and gas-generating projects, such as the Western Power project for a gas-fired power plant to replace Kwinana B, summary data for Western Australia increases to \$48 million.

The Western Australian value of projects compares to the Australian sum of mining, petroleum and metals projects totalling \$68.2 billion. Similarly, this national figure also increases to \$104.5 billion when accounting for electricity and gas-generating projects, such as BHP Billiton's (BHPB's) Peak Downs coal-fired plant in Queensland.

As noted in more detail in previous editions of this publication, the ABS mining investment data should be interpreted with caution as it is based on the Australian and New Zealand Standard Industrial Classification (ANZIC) and does not fully reflect all the investments made in the industry during the year. Downstream processing in particular is generally grouped with the manufacturing sectors.

Highlights of major resources projects that were under development in Western Australia during 2003 include:

- The Telfer gold mine expansion – Newcrest Mining Limited is investing \$1.2 billion to develop a large low-grade resource in excess of 500 Mt containing over 26 million ounces of gold. Newcrest commenced construction of the mine extension in late 2002, with commissioning scheduled in the third quarter of 2004 and full capacity to be reached by 2005.
- Mining Area C – BHPB commenced mining in May 2003 with the first iron ore shipment being made in August 2003. Mining Area C produces Marra Mamba lump and fines products similar to the West Angelas products and has a production capacity of 15 Mt/a.
- Koolyanobbing, Northern Expansion, Iron Ore Mine – Portman's Board gave the go ahead for the \$20 million mine expansion within the Northern Tenements, comprising Windarling and Mount Jackson deposits in late 2003. Portman is proceeding with mine and infrastructure developments, such as haul roads and a camp.
- Lake Johnston (Emily Ann and Maggie Hays) Nickel Mine (Sulphide ore) – LionOre Mining is investing \$28 million in developing the Maggie Hays deposit as an integrated development with its nearby Emily Ann mine near Lake Johnston. Construction at Maggie Hays commenced with the box-cut being completed in April 2003, while the main decline and ventilation portals are currently under development.
- North West Shelf LNG Train 4 – The North West Shelf Gas partners are developing the \$2.4-billion fourth LNG train and associated trunkline. The project is currently at the pre-commissioning phase. Substantial progress has been made in the construction of Train 4 and the laying of the second trunkline has commenced. The trunkline is scheduled to be completed in mid-2004 to coincide with the completion of Train 4.
- Burrup Peninsula ammonia plant – Burrup Fertilisers Pty Ltd is constructing an ammonia plant at the King Bay–Hearson Cove industrial area on the Burrup Peninsula, near Karratha. This \$630-million investment will be converting natural gas to ammonia for export to fertiliser manufacturers in India and the rest of the world.

Tenements in Force 1978 Act

	1997–98		1998–99		1999–00		2000–01		2001–02		2002–03	
	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha
Prospecting Licences	7,525	992	6,242	809	5,827	745	5,512	711	4,964	634	4,566	575
Exploration Licences	4,505	35,993	3,463	23,732	3,394	20,687	3,162	18,152	2,899	18,556	2,855	21,123
Mining Leases	6,690	2,031	7,555*	2,263	4,865	1,829	4,841	1,803	4,820	1,774	4,770	1,762
Other	1,584	205			2,001	468	3,625	2,840	3,618	3,002	3,629	3,299
Mineral Claims & Other 1904 Act	309	34	307	34	194	22	186	21	186	22	186	22
Total	19,029	39,255	17,567	26,838	16,280	23,751	17,326	23,829	16,487	23,988	16,006	26,781

* Includes Other

Source: DoIR

Figure 39

TABLE 1 QUANTITY AND VALUE OF MINERALS AND PETROLEUM					
COMMODITY	UNIT	2002		2003	
		QUANTITY	VALUE	QUANTITY	VALUE
ALUMINA	t	11,000,041 (r)	3,339,247,705 (r)	11,228,615	3,140,479,497
BASE METALS					
Copper Metal	t	64,287 (r)	145,489,840 (r)	59,098	140,285,105
Lead Metal	t	70,397	32,690,023	56,491	24,621,925
Zinc Metal	t	218,803	173,064,117	175,125	137,237,186
TOTAL BASE METALS			351,243,980 (r)		302,144,216
CHROMITE	t	22,668	3,952,594 (r)	67,271	16,050,607
CLAYS					
Attapulgite	t	11,926	1,245,433	11,187	1,168,258
Clay Shale	t	18,517 (r)	185,170 (r)	10,825	96,912
Fire Clay	t	2,470	55,104	16,113	480,240
Kaolin	t	377	36,155	1,891	158,266
Saponite	t	1,191	75,940	577	49,749
TOTAL CLAYS			1,597,802 (r)		1,953,425
COAL	t	6,262,538	266,402,673	6,026,581	266,405,945
CONSTRUCTION MATERIALS					
Aggregate	t	589,339	5,726,287	479,468	3,712,516
Gravel	t	350,885 (r)	1,349,499 (r)	166,480	1,063,952
Rock	t	352,261	3,543,190	295,464	2,690,594
Sand	t	1,682,388 (r)	7,831,502 (r)	1,631,578	7,937,455
Sandstone	t	868	47,740	0	0
TOTAL CONSTRUCTION MATERIALS			18,498,218 (r)		15,404,516
DIAMONDS		34,371,491 (r)	650,344,132 (r)	35,486,604	663,071,954
DIMENSION STONE					
Granite	t	639	171,900	1,169	334,255
Marble	t	515	183,099	464	160,461
Other	t	435	226,690	0	0
TOTAL DIMENSION STONE			581,689		494,716
GEM & SEMI-PRECIOUS STONES	kg	540,965 (r)	546,807 (r)	269,305	219,320
GOLD	kg	188,859 (r)	3,460,872,364 (r)	187,284 (e)	3,361,196,329
GYPSUM	t	1,505,817 (r)	25,320,815 (r)	1,570,660	25,312,796
HEAVY MINERAL SANDS					
Garnet	t	101,846	n/a	127,975	n/a
Ilmenite	t	852,550 (r)	131,259,688 (r)	862,391	110,463,583
Upgraded Ilmenite (a)	t	586,993	353,672,268 (r)	556,253	315,484,558
Leucoxene	t	43,750	21,205,504	46,736	17,324,237
Rutile	t	125,411	102,663,206	123,675	80,315,881
Staurolite	t	2,120	330,906	2,129	279,802
Zircon	t	369,920 (r)	246,741,492 (r)	396,805	229,897,862
TOTAL HEAVY MINERAL SANDS			855,873,064 (r)		753,765,923
INDUSTRIAL PEGMATITE MINERALS					
Feldspar	t	61,828	3,082,424	21,963	986,583
IRON ORE					
Domestic	t	6,599,275	192,414,071	8,004,155	189,790,259
Exported	t	165,167,541 (r)	4,872,202,224 (r)	186,678,315	4,870,441,253
TOTAL IRON ORE		171,766,816 (r)	5,064,616,295 (r)	194,682,470	5,060,231,512

COMMODITY	UNIT	2002		2003	
		QUANTITY	VALUE	QUANTITY	VALUE
LIMESAND-LIMESTONE-DOLOMITE					
Dolomite	t	17,599 (r)	327,033 (r)	7,585	65,984
Limesand-Limestone	t	3,943,000 (r)	16,636,737 (r)	5,409,469	28,388,181
TOTAL LIMESAND-LIMESTONE-DOLOMITE			16,963,770 (r)		28,454,165
MANGANESE ORE	t	578,388	75,626,451	587,836	65,180,987
NICKEL INDUSTRY					
Cobalt By-Product	t	2,068 (r)	53,657,040 (r)	1,741	47,652,355
Cobalt Metal	t	2,116 (r)	51,122,414	3,005	79,296,234
Cobalt Sulphide	t	514	14,166,005	374	12,586,611
TOTAL COBALT			118,945,459 (r)		139,535,200
Nickel Concentrate	t	1,234,067 (r)	1,841,344,135 (r)	1,376,907	2,086,103,982
Nickel Metal	t	32,012	401,212,339	38,213	521,380,522
Palladium By-Product	kg	811	16,146,791	477	4,002,358
Platinum By-Product	kg	122	2,945,218	133	4,306,903
TOTAL NICKEL INDUSTRY			2,380,593,942 (r)		2,755,328,965
PETROLEUM					
Condensate	kl	6,878,561	1,928,575,845 (r)	6,393,743	1,765,463,476
Crude Oil	kl	15,288,416 (r)	4,502,719,059 (r)	14,119,334	4,038,742,091
LNG	Btu 10 ⁶	383,356,512 (r)	2,974,400,068 (r)	408,272,004	2,874,614,163
LPG - Butane	t	458,153	197,559,482	425,199	182,825,510
LPG - Propane	t	357,413	165,884,336	319,970	142,721,362
Natural Gas	'000m ³	7,749,597 (r)	650,203,389 (r)	8,112,617	690,454,885
TOTAL PETROLEUM			10,419,342,179 (r)		9,694,821,487
PIGMENTS					
Red Oxide	t	2,282 (r)	577,289 (r)	643	195,683
SALT	t	9,171,463	250,526,627	9,752,885	197,008,925
SILICA-SILICA SAND					
Silica	t	99,232	992,320	96,431	964,298
Silica Sand	t	576,223 (r)	5,904,603 (r)	567,937	6,669,844
TOTAL SILICA-SILICA SAND			6,896,923 (r)		7,634,142
SILVER	kg	98,896	24,917,841	64,434	15,349,693
SPONGOLITE	t	12,693	1,817,362	9,919	1,258,601
TALC	t	132,211	11,775,309	142,736	13,291,592
TIN-TANTALUM-LITHIUM					
Spodumene	t	79,085	n/a	124,410	n/a
Tantalite	t	990	n/a	973	n/a
Tin Metal	t	763	4,967,874	653	4,184,604
TOTAL TIN-TANTALUM-LITHIUM			222,610,433 (r)		202,174,629
VANADIUM	t	5,614	30,929,289	693,512	4,665,521
TOTAL VALUE			27,484,757,977 (r)		26,593,081,729

Note: Quantities used in this table only apply to Minerals and Petroleum covered by the Mining Act 1978, the Petroleum Act 1967, the Petroleum (Submerged Lands) Act 1982 and relevant State Agreement Acts.

(a) Also known as synthetic rutile

(e) Estimate

(r) Revised from previous edition

n/a Breakdown of garnet, spodumene and tantalite values not available

	Unit	1994		1995		1996		1997	
		Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M
ALUMINA	Mt	7.93	1,684.58	8.07	1,757.36	8.25	1,967.81	8.48	2,084.71
BASE METALS									
Copper Metal	kt	35.11	68.13	24.31	73.29	23.07	51.28	28.32	62.46
Lead Metal	kt	20.29	7.32	15.64	8.25	17.08	9.90	23.20	9.91
Zinc Metal	kt	123.62	85.14	126.34	87.73	106.86	71.28	117.20	118.10
TOTAL BASE METALS			160.59		169.27		132.46		190.47
COAL	Mt	5.03	234.02	6.06	280.66	5.81	268.38	5.69	260.53
COBALT	kt	0.66	35.84	0.82	56.37	0.94	63.52	1.27	84.58
DIAMONDS	M ct	27.72	470.34	23.45	480.15	47.43	442.01	40.42	421.19
GOLD	tonnes	192.98	3,265.93	189.48	3,163.66	221.18	3,528.64	238.34	3,414.61
HEAVY MINERAL SANDS									
Ilmenite	Mt	1.08	93.52	1.00	96.27	1.08	114.29	1.23	133.59
Rutile	kt	87.16	44.46	124.87	68.14	110.65	79.17	111.78	78.53
Upgraded Ilmenite (Synthetic Rutile)	kt	453.00	208.47	535.00	254.58	522.00	258.23	581.00	292.86
Zircon	kt	444.26	99.00	458.44	152.54	372.70	197.54	292.79	160.34
Other HMS			6.62		8.07		25.26		22.86
TOTAL HEAVY MINERAL SANDS			452.07		579.60		674.49		688.18
IRON ORE	Mt	124.26	2,630.61	135.97	2,980.69	133.65	2,924.48	151.72	3,633.34
MANGANESE ORE	kt	202.52	22.74	227.90	28.42	296.81	32.67	176.99	22.15
NICKEL	kt	77.00	630.13	101.36	1,094.17	108.38	1,033.88	122.99	1,136.00
PETROLEUM									
Condensate	Gl	2.34	331.19	3.83	564.91	4.97	773.72	6.44	1,103.31
Crude oil	Gl	8.75	1,299.75	8.68	1,384.83	11.26	1,958.82	9.54	1,719.80
LNG	Btu 10 ¹²	335.16	1,431.96	375.34	1,827.78	377.82	1,789.40	377.11	2,037.60
LPG - Butane	kt	0	0	19.42	4.73	158.96	37.44	320.43	93.17
LPG - Propane	kt	0	0	14.14	3.44	150.84	36.93	253.82	73.83
Natural Gas	Gm ³	4.92	441.96	5.83	421.92	6.62	494.68	7.33	571.51
TOTAL PETROLEUM			3,504.86		4,207.61		5,090.99		5,599.22
SALT	Mt	6.86	153.49	7.29	155.81	7.21	143.61	8.12	172.12
OTHER			113.83		126.44		144.19		101.69
TOTAL			13,359.03		15,080.21		16,447.13		17,808.79

1998		1999		2000		2001		2002		2003	
Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M	Quantity	Value \$M
8.75	2,429.70	8.93	2,311.38	10.00	3,187.47	10.75	3,766.55	11.00	3,339.25	11.23	3,140.48
28.24	57.13	26.23	46.25	34.04	82.61	50.24	120.71	64.29	145.49	59.10	140.28
39.52	15.09	55.28	17.23	73.08	25.76	91.38	44.90	70.40	32.69	56.49	24.62
149.33	127.85	222.54	219.59	257.72	290.11	210.84	208.72	218.80	173.06	175.13	137.24
	200.07		283.07		398.48		374.33		351.24		302.14
5.61	249.35	6.23	268.02	6.20	257.84	6.20	258.21	6.26	266.40	6.03	266.41
1.22	58.77	1.01	37.68	3.59	157.66	4.26	146.27	4.70	118.95	5.12	139.54
52.27	642.39	51.64	640.06	42.30	713.68	21.68	499.53	34.37	650.34	35.49	663.07
231.43	3,477.73	211.55	2,939.98	199.04	3,078.65	192.20	3,236.20	188.86	3,460.87	187.28	3,361.20
1.29	150.85	1.24	152.95	1.30	185.47	0.83	137.32	0.85	131.26	0.86	110.46
96.93	76.45	113.40	82.26	122.15	100.58	112.93	99.01	125.41	102.66	123.68	80.32
529.48	289.79	522.93	288.01	617.53	377.50	646.46	418.66	586.99	353.67	556.25	316.86
277.35	154.37	322.94	139.14	347.93	172.11	353.17	230.00	369.92	246.74	396.81	229.90
	26.13		26.13		27.27		24.23		21.54		17.60
	697.59		688.49		862.93		909.22		855.87		753.77
143.75	4,103.92	143.01	3,517.17	158.87	4,365.19	162.25	5,245.93	171.77	5,064.62	194.68	5,060.23
79.43	8.13	108.16	13.20	259.53	33.61	498.60	76.09	578.39	75.63	587.84	65.18
143.08	1,039.12	121.89	1,084.96	153.51	2,243.28	181.17	2,074.48	183.00	2,242.55	187.74	2,607.48
6.41	887.06	5.57	1,013.30	6.20	1,946.37	6.02	1,787.91	6.88	1,928.58	6.40	1,765.46
10.98	1,497.55	8.49	1,559.29	13.74	4,472.42	14.06	4,246.65	15.29	4,502.72	14.12	4,038.74
387.96	2,044.37	387.38	1,934.44	385.61	2,986.97	389.57	3,482.87	394.11	2,791.22	408.27	2,874.62
384.54	86.31	390.08	116.55	450.57	225.36	475.25	217.54	458.15	197.56	425.20	182.82
263.82	55.87	260.44	81.77	364.53	183.36	385.83	185.08	357.41	165.88	319.97	142.72
6.33	527.96	6.60	569.33	6.93	607.64	7.67	642.08	7.75	650.20	8.11	690.46
	5,099.12		5,274.68		10,422.12		10,562.13		10,236.16		9,694.82
8.48	210.17	9.02	212.74	7.71	197.32	8.58	249.24	9.17	250.53	9.75	197.01
	206.14		192.81		297.01		379.55		389.16		341.75
	18,422.20		17,464.24		26,215.24		27,777.73		27,301.57		26,593.08

TABLE 3 CALENDAR YEAR 2003 QUANTITY AND VALUE BY LOCAL GOVERNMENT AREA					
COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUE	Ref (p.48)
ALUMINA	Boddington	3,308,185		935,713,779	
	Murray	5,582,599		1,554,057,051	
	Waroona	2,337,831		650,708,667	
TOTAL ALUMINA		11,228,615		3,140,479,497	(c), (d)
BASE METALS			Cu tonnes		
Copper By-Product	Coolgardie		2,000	4,741,683	
	Dundas		341	890,446	
	Kalgoorlie-Boulder		288	776,041	
	Ravensthorpe		151	436,941	
	Wiluna		561	1,540,358	
	Total			3,342	8,385,469
Copper Concentrates	Yalgoo	142,082	30,626	68,989,947	(a)
Copper Cathode	East Pilbara		25,130	62,909,689	(a)
	Total Copper	142,082	59,098	140,285,105	(a), (b)
Lead			Pb tonnes		
	Derby-West Kimberley	73,408	53,495	23,009,983	
	Yalgoo	11,475	2,996	1,611,942	
	Total	84,883	56,491	24,621,925	(a)
Zinc			Zn tonnes		
	Derby-West Kimberley	270,599	128,096	100,891,144	
	Yalgoo	116,229	47,029	36,346,042	
Total	386,828	175,125	137,237,186	(a)	
TOTAL BASE METALS				302,144,216	
CHROMITE			Cr₂O₃ tonnes		
Chromite Ore	Meekatharra	162,012	67,271	16,050,607	(a)
CLAY					
Attapulгите	Mullewa	11,187		1,168,258	
Clay Shale	Collie	10,825		96,912	
Fire Clay	Broome	1,080		29,250	
	Chittering	15,033		450,990	
	Total	16,113		480,240	
Kaolin	Bridgetown-Greenbushes	1,891		158,266	
Saponite	Coorow	577		49,749	
TOTAL CLAY		40,593		1,953,425	(e)
COAL	Collie	6,026,581		266,405,945	(f)
CONSTRUCTION MATERIALS					
Aggregate	Ashburton	1,325		6,625	
	Broome	71,176		1,671,063	
	East Pilbara	13,115		65,577	
	Port Hedland Town	83,439		417,189	
	Roebourne	214,842		1,074,207	
	Wyndham-East Kimberley	4,020		20,105	
	Wyndham-East Kimberley	91,550		457,750	
	Total	479,468		3,712,516	
Gravel	Broome	10,974		180,173	
	Coolgardie	68,837		344,053	
	Coorow	11,140		27,850	
	Kalamunda	65,648		459,536	
	Kalgoorlie-Boulder	5,675		28,375	
	Wyndham-East Kimberley	4,207		23,965	
	Total	166,480		1,063,952	

COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUE	Ref (p.48)
Rock	Broome	10,282		260,554	
	Derby-West Kimberley	755		33,985	
	East Pilbara	250,242		1,251,210	
	Port Hedland Town	34,095		1,144,400	
	Wyndham-East Kimberley	90		445	
	Total	295,464		2,690,594	
Sand	Broome	68,807		506,538	
	Cockburn	44,984		224,920	
	Coolgardie	90,493		438,441	
	Coorow	3,946		9,794	
	Dandaragan	1,345		6,725	
	Derby-West Kimberley	9,213		97,976	
	Esperance	3,702		18,510	
	Kalgoorlie-Boulder	1,360		6,800	
	Marble Bar	49,665		248,320	
	Meekatharra	36,688		184,881	
	Menzies	19,236		96,183	
	Northam	117,013		590,980	
	Port Hedland Town	59,209		296,043	
	Roebourne	71,166		390,627	
	Swan	1,180		8,900	
	Wanneroo	1,047,553		4,781,399	
Wyndham-East Kimberley	2,769		14,176		
Yilgarn	3,249		16,242		
	Total	1,631,578		7,937,455	
TOTAL CONSTRUCTION MATERIAL		2,572,990		15,404,516	(e)
			carats		
DIAMONDS	Derby-West Kimberley		56,712	13,767,657	
	Wyndham-East Kimberley		35,429,892	649,304,297	
TOTAL DIAMONDS			35,486,604	663,071,954	(a)
DIMENSION STONE					
Granite	Roebourne	264		14,390	
	Cue	22		9,960	
	Dundas	883		309,905	
	Total	1,169		334,255	
Marble	Ashburton	464		160,461	
TOTAL DIMENSION STONE		1,632		494,716	(e)
GEM & SEMI-PRECIOUS STONES					
			kg		
Agate	Marble Bar	36,681		21,402	
Amethyst	Upper Gascoyne	235		1,052	
Chalcedony/Mookaite	Carnarvon	395		9,950	
Chrysoprase	Leonora	10,000		5,000	
	Menzies	35		7,000	
	Total	10,035		12,000	
Jasper	Meekatharra	17,474		10,666	
Tourmaline	Upper Gascoyne	1,362		14,994	
	Yalgoo	3		12,615	
	Total	1,365		27,609	
Variscite	Carnarvon	203,120		136,641	
TOTAL GEM & SEMI-PRECIOUS STONES		269,305		219,320	(d)

TABLE 3		CALENDAR YEAR QUANTITY AND VALUE BY LOCAL GOVERNMENT AREA			
COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUE	Ref (p.48)
GOLD			Au kg		
	Boddington		8,653.009	155,566,137	
	Coolgardie		18,819.621	336,987,226	
	Cue		5,239.317	93,933,367	
	Dundas		4,690.559	84,402,146	
	Halls Creek		16.701	318,803	
	Kalgoorlie-Boulder		41,602.575	746,265,995	
	Laverton		16,280.428	291,575,184	
	Leonora		39,999.513	717,744,031	
	Meekatharra		12,769.686	228,548,344	
	Menzies		8,834.021	159,457,675	
	Mt Magnet		4,726.534	84,315,742	
	Sandstone		1,249.889	22,354,189	
	Sundry Producers		545.105	9,612,181	
	Wiluna		13,327.368	239,799,780	
Yalgoo		4,399.757	79,348,984		
Yilgarn		6,129.893	110,966,547		
TOTAL GOLD			187,283.976	3,361,196,329	(g)
GYPSUM	Carnarvon	1,353,203		21,758,152	
	Corrigin	1,159		16,226	
	Dalwallinu	63,627		1,076,642	
	Dandaragan	43,287		1,433,723	
	Dundas	33,405		284,059	
	Esperance	4,270		39,872	
	Irwin	2,500		35,000	
	Kent	21,945		288,535	
	Koorda	125		2,500	
	Lake Grace	10,411		101,855	
	Merredin	3,450		43,500	
	Nungarin	16,277		112,028	
	Perenjori	695		7,641	
	Ravensthorpe	5,985		30,000	
	Wyalkatchem	10,221		81,763	
Yilgarn	100		1,300		
TOTAL GYPSUM		1,570,660		25,312,796	(f)
HEAVY MINERAL SANDS					
Garnet Sand	Northampton	127,975		n/a	
Ilmenite			TiO ₂ tonnes		
	Bunbury City	260,558	143,307	31,946,300	
	Capel	260,237	140,528	34,460,715	
	Carnamah	140,760	83,406	14,362,659	
	Dandaragan	104,669	56,521	15,889,144	
	Dardanup	96,167	52,892	13,804,765	
Total		862,391	476,654	110,463,583	
Synthetic Rutile			TiO ₂ tonnes		
	Capel	204,228	187,890	118,861,827	
	Carnamah	166,080	152,794	95,579,512	
	Dandaragan	185,946	171,070	101,043,219	
Total		556,253	511,753	315,484,558	
Leucoxene			TiO ₂ tonnes		
	Bunbury City	4,815	4,429	2,526,366	
	Capel	13,650	12,558	5,847,254	
	Dandaragan	22,813	18,169	6,231,673	
	Dardanup	5,458	5,022	2,718,944	
Total		46,736	40,178	17,324,237	

COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUE	Ref (p.48)
			TiO ₂ tonnes		
Rutile	Bunbury City	2,790	2,623	2,008,669	
	Carnamah	94,952	89,254	60,534,717	
	Dandaragan	25,933	24,897	17,772,495	
	Total	123,675	116,774	80,315,881	
Staurolite	Dandaragan	2,129		279,802	
			ZrO ₂ tonnes		
Zircon	Bunbury City	13,340	8,670	7,948,382	
	Dardanup	13,584	8,830	6,425,230	
	Carnamah	245,565	159,617	143,959,190	
	Capel	56,507	36,730	33,040,634	
	Dandaragan	67,809	44,076	38,524,426	
	Total	396,805	257,922	229,897,862	
TOTAL HEAVY MINERAL SANDS				753,765,923	(a)
INDUSTRIAL PEGMATITE MINERALS					
Feldspar	Marble Bar	21,465		976,789	
	Mukinbudin	498		9,794	
	Total	21,963		986,583	(e)
IRON ORE					
Domestic Ore	East Pilbara	8,004,155		189,790,259	
Exported Ore	Ashburton	75,958,752		1,930,560,733	
	Derby-West Kimberley	544,685		15,164,689	
	East Pilbara	105,870,544		2,806,711,000	
	Yilgarn	4,304,334		118,004,831	
Total	186,678,315		4,870,441,253		
TOTAL IRON ORE				5,060,231,512	(a)
LIMESAND-LIMESTONE-DOLOMITE					
Dolomite	Lake Grace	6,262		42,698	
	Yilgarn	1,323		23,286	
	Total	7,585		65,984	
Limesand-Limestone	Broome	3,902		46,824	
	Carnamah	10,381		24,685	
	Cockburn	2,102,645		5,743,858	
	Coorow	6,630		19,890	
	Dandaragan	24,836		168,780	
	Dundas	182,990		9,960,136	
	Exmouth	92,749		746,184	
	Gingin	40,579		932,739	
	Irwin	147,134		398,643	
	Kununurra	400		6,000	
	Kwinana	57,229		171,689	
	Leonora	2,297,741		4,595,482	
	Manjimup	1,620		24,300	
	Shark Bay	1,957		273,942	
	Wanneroo	401,262		5,200,201	
	Wiluna	37,414		74,828	
Total	5,409,469		28,388,181		
TOTAL LIMESAND-LIMESTONE-DOLOMITE				28,454,165	(e)
			Mn tonnes		
MANGANESE ORE	East Pilbara	587,836	280,154	65,180,987	(a)

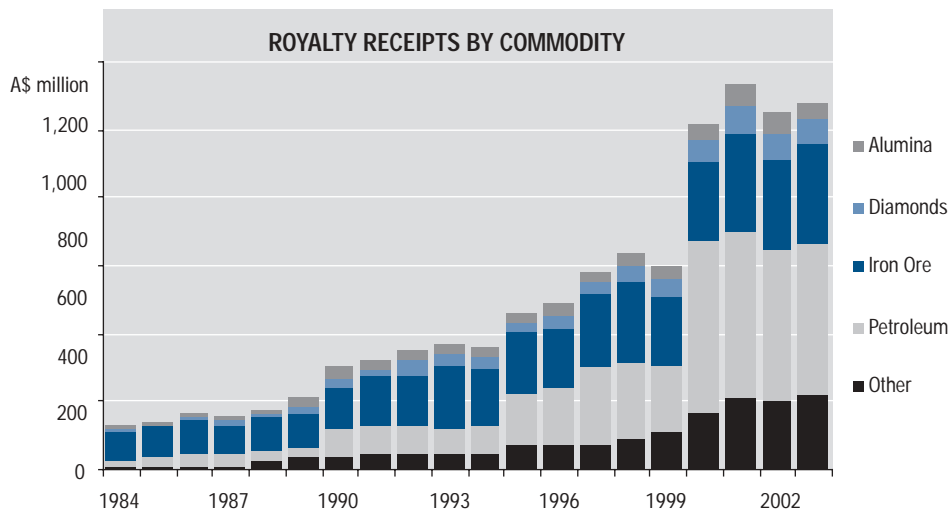
TABLE 3		CALENDAR YEAR QUANTITY AND VALUE BY LOCAL GOVERNMENT AREA			
COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUE	Ref (p.48)
NICKEL INDUSTRY			Co tonnes		
Cobalt By-Product	Coolgardie		909	24,021,924	
	Dundas		123	3,611,236	
	Kalgoorlie-Boulder		184	5,928,635	
	Laverton		153	4,993,787	
	Ravensthorpe		50	1,397,858	
	Wiluna		322	7,698,915	
	Total			1,741	47,652,355
Cobalt Metal	Coolgardie		391	13,959,059	
	Kalgoorlie-Boulder		454	6,751,985	
	Laverton		2,160	58,585,190	
	Total		3,005	79,296,234	
Cobalt Sulphide	Kalgoorlie-Boulder		374	12,586,611	
TOTAL COBALT			5,119	139,535,200	(a), (b)
			Ni tonnes		
Nickel Concentrates	Coolgardie	403,499	12,877	170,209,105	
	Dundas	43,670	6,358	90,289,581	
	Kalgoorlie-Boulder	170,603	20,891	288,432,517	
	Leonora	346,903	41,806	581,059,101	
	Ravensthorpe	87,537	3,022	49,766,433	
	Wiluna	324,695	64,570	906,347,245	
	Total		1,376,907	149,524	2,086,103,982
			Ni tonnes		
Nickel Metal	Laverton		32,125	436,925,016	
	Kalgoorlie-Boulder		6,088	84,455,506	
	Total		38,213	521,380,522	(i)
TOTAL NICKEL				2,607,484,504	(i)
			Pd kg		
Palladium By-Product	Coolgardie		477	4,002,358	(b)
			Pt kg		
Platinum By-Product	Coolgardie		133	4,306,903	(b)
TOTAL NICKEL INDUSTRY				2,755,328,965	
PETROLEUM			Kilolitres		
Condensate	Ashburton	303,815		68,606,512	
	Carnamah	130		6,697	
	Irwin	1,272		295,565	
	Roebourne	6,088,526		1,696,554,702	
	Total		6,393,743		1,765,463,476
			Kilolitres		
Crude Oil	Ashburton	3,383,464		945,619,505	
	Derby-West Kimberley	14,392		2,371,763	
	Irwin	277,811		69,314,899	
	Roebourne	10,443,667		3,021,435,924	
	Total		14,119,334		4,038,742,091
			Btu 10 ⁶		
LNG	Roebourne	408,272,004		2,874,614,163	
			Tonnes		
LPG - Butane	Roebourne	425,199		182,825,510	
			Tonnes		
LPG - Propane	Roebourne	319,970		142,721,362	

COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUES	Ref (p.48)
		'000 m ³			
Natural Gas	Ashburton	1,236,360		87,547,732	
	Carnamah	43,891		4,760,360	
	Irwin	132,871		14,077,247	
	Roebourne	6,699,495		584,069,546	
	Total	8,112,617		690,454,885	
TOTAL PETROLEUM PRODUCTS				9,694,821,487	(d)
PIGMENTS					
Red Oxide	Cue	643		195,683	(a)
SALT					
	Ashburton	1,361,583		26,548,000	(a)
	Carnarvon	1,042,853		20,122,373	(a)
	Esperance	11,828		570,977	(h)
	Port Hedland Town	2,446,160		49,812,106	(a)
	Roebourne	3,685,954		71,628,488	(a)
	Shark Bay	1,087,151		22,019,097	(a)
	Wyalkatchem	151		14,331	(h)
	Yilgarn	117,205		6,293,553	(h)
TOTAL SALT		9,752,885		197,008,925	
SILICA-SILICA SAND					
Silica	Moora	96,431		964,298	
Silica Sand	Albany	153,179		2,963,592	
	Coolgardie	99,958		244,897	
	Swan	314,800		3,461,355	
	Total	567,937		6,669,844	
TOTAL SILICA-SILICA SAND				7,634,142	(a)
SILVER BY-PRODUCT					
	Coolgardie		Ag kg		
			127	25,818	(a), (j)
	Derby-West Kimberley		280	63,663	(a), (b)
	Statewide		27,811	6,209,235	
	Yalgoo		36,217	9,050,977	(a), (j)
TOTAL SILVER			64,434	15,349,693	
SPONGOLITE					
	Plantagenet	9,919		1,258,601	(h)
TALC					
	Meekatharra	21,453		3,285,709	
	Three Springs	121,283		10,005,883	
TOTAL TALC		142,736		13,291,592	(f)
TIN-TANTALUM-LITHIUM					
Spodumene	Bridgetown-Greenbushes	124,410	Li ₂ O tonnes		
			7,330	n/a	
Tantalite	Bridgetown-Greenbushes	894	Ta ₂ O ₅ kg		
	Coolgardie	80		n/a	
	Total	973		n/a	
Tin	Bridgetown-Greenbushes		Sn Tonnes		
			653	4,184,604	
TOTAL TIN-TANTALUM-LITHIUM				202,174,629	(a)
VANADIUM					
	Mt Magnet		V ₂ O ₅ tonnes		
			694	4,665,521	(f)
TOTAL VALUE				26,593,081,729	

TABLE 4 ROYALTY RECEIPTS 2002 AND 2003				
COMMODITY	2002 Total A\$	2003 Total A\$	2003 Growth	
			A\$	%
ALUMINA	57,229,192	51,081,238	-6,147,954	(11)
BASE METALS				
Copper	4,994,097	4,804,046	-190,051	(4)
Lead	1,699,051	1,618,765	-80,286	(5)
Zinc	8,710,570	8,036,022	-674,548	(8)
TOTAL BASE METALS	15,403,718	14,458,833	-944,885	(6)
CHROMITE	59,472	626,696	567,224	954
CLAYS	92,456	58,484	-33,972	(37)
COAL	16,154,724	13,677,342	-2,477,382	(15)
CONSTRUCTION MATERIALS				
Aggregate	193,795	117,262	-76,533	(40)
Gravel	112,559	35,052	-77,507	(69)
Rock	80,622	89,887	9,265	12
Sand	495,356	434,753	-60,603	(12)
Sandstone	150	284	134	100
TOTAL CONSTRUCTION MATERIALS	882,482	677,238	-205,244	(23)
DIAMONDS	77,106,520	72,794,517	-4,312,003	(6)
DIMENSION STONE	896	807	-89	(10)
GEM AND SEMI-PRECIOUS STONES	33,116	23,190	-9,926	(30)
GOLD	81,952,569	83,599,622	1,647,053	2
GYPSUM	423,660	602,333	178,673	42
HEAVY MINERAL SANDS				
Garnet	478,264	771,222	292,958	61
Ilmenite	8,622,901	7,996,304	-626,597	(7)
Leucosene	769,988	652,735	-117,253	(15)
Rutile	4,465,756	5,330,870	865,114	19
Staurolite	17,966	13,486	-4,480	100
Zircon	11,310,818	11,606,980	296,162	3
TOTAL HEAVY MINERAL SANDS	25,665,693	26,371,597	705,904	3
INDUSTRIAL PEGMATITE MINERALS				
Feldspar	133,759	101,435	-32,324	(24)
IRON ORE	272,499,984	290,647,904	18,147,920	7
LIMESAND-LIMESTONE-DOLOMITE				
Dolomite	5,570	2,214	-3,356	(60)
Limesand-Limestone	1,472,379	2,274,361	801,982	55
TOTAL LIMESAND-LIMESTONE-DOLOMITE	1,477,949	2,276,575	798,626	54
MANGANESE	3,226,856	3,795,357	568,501	18
NICKEL INDUSTRY				
Cobalt	2,098,585	4,112,011	2,013,426	96
Nickel	46,654,437	63,881,419	17,226,982	37
Palladium by-product	541,236	135,265	-405,971	(75)
Platinum by-product	97,161	104,613	7,452	8
Rhodium by-product	1,546	0	-1,546	(100)
TOTAL NICKEL INDUSTRY	49,392,965	68,233,308	18,840,343	38
PETROLEUM				
Condensate	100,008,091	102,785,974	2,777,883	3
Liquified Natural Gas	125,578,265	138,988,327	13,410,062	11
LPG - Butane	9,838,950	11,538,592	1,699,642	17
LPG - Propane	8,239,666	8,968,288	728,622	9
Natural gas	33,465,536	37,022,026	3,556,490	11
Crude Oil	161,366,777	142,043,651	-19,323,126	(12)
TOTAL PETROLEUM	438,497,285	441,346,858	2,849,573	1

COMMODITY	2002	2003	2003 Growth	
	Total \$A	Total \$A	A\$	%
PIGMENTS				
Red oxide	103,387	21,889	-81,498	
SALT	1,961,366	2,321,168	359,802	18
SILICA SAND	314,292	308,666	-5,626	(2)
SILVER	577,205	530,415	-46,790	(8)
SPONGOLITE	65,154	84,865	19,711	30
TALC	75,166	70,563	-4,603	(6)
TIN-TANTALUM-LITHIUM				
Spodumene	1,002,951	964,959	-37,992	(4)
Tantalite	4,992,273	5,486,403	494,130	10
Tin	130,818	122,823	-7,995	(6)
TOTAL TIN-TANTALUM-LITHIUM	6,126,042	6,574,185	448,143	7
VANADIUM	38,434	176,951	138,517	100
TOTAL REVENUE	1,049,494,342	1,080,462,036	30,967,694	3

Note: All royalty receipts above are only those paid into the State's Consolidated Revenue Fund during the period. It does not include royalty receipts collected on behalf of the Commonwealth.



Source: DoIR

Figure 40

TABLE 5 AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS AND PETROLEUM INDUSTRIES

MINERAL/Company	Operating Site	2002	2003
ALUMINA			
Alcoa of Australia Ltd	Huntly	740	839
	Kwinana Alumina Refinery	1,514	1,492
	Pinjarra Refinery	1,434	1,400
	Wagerup Alumina Refinery	1,002	966
	Willowdale	349	345
Australian Fused Materials Pty Ltd	Rockingham Fused Alumina Plant	169	215
Worsley Alumina Pty Ltd	Worsley - includes Mount Saddleback	214	236
	Worsley Refinery	1,211	1,522
TOTAL - ALUMINA		6,633	7,015
BASE METALS			
Barmingo Pty Ltd	Elizabeth Hill	5	1
Normandy Mining Ltd	Scuddles	300	359
Straits Resources Ltd	Nifty	488	315
Western Metals Ltd	Pillara	502	425
TOTAL BASE METALS		1,295	1,100
COAL			
Griffin Coal Mining Co. Pty Ltd	Muja	292	308
Wesfarmers Coal Ltd	Premier/WCL	357	333
TOTAL COAL		649	641
DIAMONDS			
Argyle Diamond Mines Pty Ltd	Lake Argyle	1,077	995
Kimberley Diamond Company NL	Ellendale	24	99
TOTAL DIAMONDS		1,101	1,094
GOLD			
Agincourt Resources Limited	Wiluna	261	187
Agnew Gold Mining Co Pty Ltd	Agnew-Emu	1,263	892
AGR Matthey	Perth Mint	88	112
AngloGold Australia Ltd	Sunrise Dam	675	758
Barra Resources Ltd	First Hit	20	0
Barmingo Pty Ltd	Lights of Israel Underground	0	42
Barrick Gold Corporation	Darlot	131	126
	Lawlers	218	270
	Plutonic	542	623
Worsley Alumina Pty Ltd	Boddington	86	46
Coolgardie Mining Company Pty Ltd	Coolgardie	50	151
Croesus Mining NL	Central Norseman	206	229
	Davyhurst	114	93
	Binduli	27	0
	Hannan South	33	30
Equigold NL	Kirkalocka	56	116
Gindalbie Gold NL	Minjar	63	70
Harmony Gold (Australia) Pty Ltd	Big Bell	440	180
Hill 50 Gold NL	Hill 50, Mt Magnet	392	396
Jervois Mining Limited	Bullabulling	0	9
Kalgoorlie Consolidated Gold Mines Pty Ltd	Golden Mile - Superpit	1,238	1,352
King Solomon Mines Limited	Gullewa	36	0
Lakewood Mill Pty Ltd	Lakewood	10	0
Legend Mining Limited	Gidgee	113	91
LionOre Australia Pty Ltd	Thunderbox	147	168
Lynas Gold NL	Mt Olympus	45	55
Mines and Resources Australia Pty Ltd	White Foil	158	94

MINERAL/Company	Operating Site	2002	2003
Newcrest Australia Ltd	Telfer	373	1,007
Newfield Central Pty Ltd	Newfield Central	0	10
New Hampton Goldfields NL	Jubilee	90	0
Newmont Yandal Operations Ltd	Jundee, Nimary	446	445
	Bronzewing, Mt McClure	481	347
Perilya Daisy-Milano Pty Ltd	Daisy-Milano	21	25
Placer Dome Inc	Granny Smith	463	455
Placer Dome Asia Pacific Limited	Kanowna Belle	373	514
	Kundana	248	0
	Paddington	310	544
Resolute Ltd	Chalice	5	0
	Higginsville	11	0
Sons of Gwalia NL	Carosue Dam	269	381
	Marvel Loch	485	514
	Sons of Gwalia	205	453
	Tarmoola	275	0
South Kal Mines Pty Ltd	New Celebration	276	468
St. Barbara Mines Ltd	Bluebird	307	113
St Ives Gold Mining Company Pty Limited	Kambalda-St Ives	1,444	1,358
Troy Resources Ltd	Bulchina-Mt Klemptz	52	55
Viceroy Australia Pty Ltd	Bounty	68	0
Other		39	22
TOTAL GOLD		12,653	12,801
HEAVY MINERAL SANDS			
BHP Titanium Minerals Pty Ltd	Beenup	33	17
Cable Sands Pty Ltd	Bunbury	316	296
Doral Mineral Sands Pty Ltd	Dardanup	103	136
GMA Garnet Pty Ltd	Narngulu Garnet Plant	32	32
	Port Gregory	17	20
Hanwah Advanced Ceramics Australia Pty Ltd	Rockingham Zirconia Plant	28	23
Iluka Resources Limited	Capel	481	482
	Eneabba	295	317
	Narngulu Synthetic Rutile Plants	431	362
TiWest Pty Ltd	Chandala-Muchea	183	212
	Cooljarloo	251	327
TOTAL HEAVY MINERAL SANDS		2,170	2,224
IRON ORE			
BHP Iron Ore (Goldsworthy) Ltd	Finucane Island	414	214
	Yarrie	188	220
BHP Iron Ore (Jimblebar) Ltd	Jimblebar	141	146
BHP Iron Ore Ltd	Mining Area C	161	254
	Mt Newman Railway	571	618
	Mt Whaleback	1,015	1,237
	Nelson Point	876	601
	Mt Newman Orebody 25	103	115
	Port Hedland HBI Plant	796	1,230
	Port Hedland Harbour Tunnel	0	332
	Yandi	297	379

TABLE 5 AVERAGE NUMBER OF PERSONS EMPLOYED IN THE WA MINERALS AND PETROLEUM INDUSTRIES			
MINERAL/Company	Operating Site	2002	2003
Hamersley Iron Pty Ltd	Brockman No. 2 Detritals Group	58	142
	Dampier Port Operations	773	736
	Eastern Range	0	118
	Hlsmelt - Kwinana	322	449
	Marandoo	191	200
	Paraburdoo	634	672
	Hamersley Railway	96	0
	Tom Price	1,030	1,070
	Yandicoogina	249	385
	Koolyanobbing Iron Pty Ltd	Cockatoo Island	46
Koolyanobbing		134	197
Pilbara Railway Company	Hamersley, Robe River and West Angelas Rail	0	450
Robe River Mining Co. Pty Ltd	Cape Lambert	544	647
	Pannawonica Deepdale	358	419
	Robe River Railway	20	0
	West Angelas Rail	10	0
	West Angelas Port Facility	111	0
	West Angelas Plant	151	266
TOTAL IRON ORE		9,289	11,184
NICKEL			
Fox Resources Ltd	Radio Hill	52	0
Goldfields Mine Management Pty Ltd	Kambalda	0	115
Lightning Nickel Pty Ltd	Long Nickel	16	92
LionOre Australia (Nickel) Ltd	Emily Ann	147	170
Mincor Resources NL	Miitel	0	135
	Wannaway	0	56
MPI Mines Ltd	Black Swan	268	201
Murrin Murrin Operations	Murrin Murrin	591	683
OMG Cawse Pty Ltd	Cawse	215	203
Preston Resources Ltd	Bulong	323	321
Reliance Operations Limited	Beta-Hunt	0	7
Sir Samuel Mines NL	Cosmos	86	96
Tectonic Resources NL	RAV 8	59	73
Western Mining Corporation Ltd	Kalgoorlie Nickel Smelter	676	888
	Kambalda Group	266	197
	Kwinana Refinery	308	347
	Leinster	821	1,097
	Mt Keith	871	1,033
TOTAL NICKEL		4,699	5,714
PETROLEUM PRODUCTS			
Apache Energy Ltd	Agincourt, Campbell, Double Island, East Spar, Endymion, Gibson, Gipsy, Harriet, Hoover, Little Sandy, North Pedirka, Pedirka, Rosette, Simpson, Sinbad, South Plato, Stag, Tanami, Victoria, Wonnich	230	187
ARC Energy NL	Dongara, Hovea-Eremia, Mt Horner, Woodada	13	18
BHP Billiton Petroleum (North West Shelf) Pty Ltd	Griffin, Chinook-Scindian	44	46
ChevronTexaco. Australia Pty Ltd	Barrow Island, Cowle, Crest, Roller, Skate, Saladin, Yammaderry	119	125
Eni Australia Limited	Woollybutt	0	65

MINERAL/Company	Operating Site	2002	2003
Kimberley Oil NL	Lloyd	4	4
Mobil Exploration & Producing Australia Pty Ltd	Wandoo	38	30
Nexen Petroleum Australia Pty Ltd	Buffalo	20	40
Origin Energy Resources Ltd	Beharra Springs, Tubridgi, Jingemia	10	23
Woodside Energy Ltd	Athena, Cossack, Echo-Yodel, Goodwyn, Hermes, Lambert, Legendre, North Rankin, Wanaea	703	623
TOTAL PETROLEUM PRODUCTS		1,181	1,161
SALT			
Dampier Salt Ltd	Port Hedland	88	96
	Dampier	249	234
	Lake MacLeod	170	157
Onslow Solar Salt Pty Ltd	Onslow	75	96
Shark Bay Salt JV	Useless Loop	66	65
WA Salt Supply Koolyanobbing Pty Ltd	Lake Deborah East	10	10
TOTAL SALT		658	658
TOTAL CLAYS		73	65
TOTAL CONSTRUCTION MATERIALS		416	302
TOTAL DIMENSION STONE		93	105
TOTAL INDUSTRIAL PEGMATITE MINERALS		29	21
TOTAL LIMESTONE - LIMESAND		124	111
TOTAL MANGANESE ORE		108	128
TOTAL PHOSPHATE		177	148
TOTAL SILICA - SILICA SAND		207	197
TOTAL TALC		97	89
TOTAL TIN - TANTALUM - LITHIUM		505	450
TOTAL VANADIUM		96	26
ALL OTHER MATERIALS		250	418
TOTAL		42,479	45,553

(Source: AXTAT Reporting System, Mining Operations Division Reporting System, Safety, Health and Environment Division for Minerals Data and Petroleum Producers for Petroleum Data. Figures are as provided by the various operating companies to the Department.

TABLE 6

PRINCIPAL MINERAL AND PETROLEUM PRODUCERS

effective 1 May 2004

BASE METALS*Copper*

Newmont Australia,
PO Box 1123,
West Perth WA 6872,
(08) 9366 3232,
Golden Grove.
www.newmont.com

Straits Resources Ltd,
Level 1, 35 Ventnor Avenue,
West Perth WA 6005,
(08) 9480 0500,
Nifty,
www.straits.com.au

WMC Resources Ltd,
191 Great Eastern Highway,
Belmont WA 6104,
(08) 9479 0500,
Kambalda,
www.wmc.com.au

Lead-Zinc

Newmont Australia,
PO Box 1123,
West Perth WA 6872,
(08) 9366 3232,
Golden Grove.
www.newmont.com

Western Metals Ltd,
263 Adelaide Terrace,
Perth WA 6000,
(08) 9221 2555,
Lennard Shelf,
www.westernmetals.com.au

BAUXITE-ALUMINA*Alumina*

Alcoa World Alumina Australia,
181-205 Davy Street,
Booragoon WA 6154,
(08) 9316 5111,
Del Park, Willowdale, Huntly,
www.alcoa.com.au

Worsley Alumina Pty Ltd,
PO Box 344,
Collie WA 6225,
(08) 9734 8311,
Boddington,
www.wapl.com.au

CHROMITE*Chromite Ore*

Pilbara Chromite Pty Ltd,
62 Colin Street,
West Perth WA 6005,
(08) 9321 3633,
Coobina,
www.consminerals.com.au

CLAY*Attapulgitite*

Hudson Resources Ltd,
James Street, Narngulu,
Geraldton WA 6530,
(08) 9923 3604,
Lake Nerramayne,
www.hudsonresources.com

Clay Shale

The Griffin Coal Mining Company Pty Limited,
28 The Esplanade,
Perth WA 6000,
(08) 9261 2800,
Collie
www.griffincoal.com.au

Fire Clay

Broome Brick Company Pty Ltd,
PO Box 323,
Broome WA 6725
(08) 9192 1385
Broome

Kaolin

Sons of Gwalia Ltd,
16 Parliament Place,
West Perth WA 6005,
(08) 9263 5555,
Greenbushes,
www.sog.com.au

Saponite

Watheroo Minerals Pty Ltd,
PO Box 353,
Dunsborough, WA 6281,
(08) 9756 6121,
Watheroo Clays,
www.bentoniteproductswa.com.au

COAL

The Griffin Coal Mining Company Pty Limited,
28 The Esplanade,
Perth WA 6000,
(08) 9261 2800,
Collie
www.griffincoal.com.au

Wesfarmers Premier Coal Ltd,
Premier Road,
Collie WA 6225,
(08) 9780 2222
Collie
www.wesfarmers.com.au

CONSTRUCTION MATERIALS*Aggregate*

The Readymix Group (WA),
75 Canning Highway,
Victoria Park WA 6100,
(08) 9212 2000,
Boodarie, Burrup-Dampier,
www.readymix.com.au

Gravel

Boral Resources (WA) Ltd,
63-69 Abernethy Road,
Belmont WA 6104,
(08) 9333 3400,
Grosmont,
www.boral.com.au

WA Limestone Co.,
41 Spearwood Avenue,
Bibra Lake WA 6163,
(08) 9434 2299,
Pickering Brook

Sand

Boral Resources (WA) Ltd,
63-69 Abernethy Road,
Belmont WA 6104,
(08) 9333 3400,
Grosmont,
www.boral.com.au

Rocla Quarry Products,
180 Fauntleroy Avenue,
Redcliffe WA 6104,
(08) 9475 2555,
Gnangarra,
www.rocla.com.au

The Readymix Group (WA),
75 Canning Highway,
Victoria Park WA 6100,
(08) 9212 2000,
Various sites,
www.readymix.com.au

Tuma Holdings Pty Ltd,
T/as Action Sand Supplies
42 Noel Road,
Gooseberry Hill WA 6076,
(08) 9275 1100
Mobile: 0408 923 801
The Lakes, Mundaring

DIAMONDS

Argyle Diamonds Australia
2 Kings Park Road,
West Perth WA 6005,
(08) 9482 1166,
Argyle,
www.argylediamonds.com.au

Kimberley Diamond Company
12 Walker Avenue,
West Perth WA 6005,
(08) 9321 5887,
Ellendale,
www.kimberleydiamondco.com.au

DIMENSION STONE*Granite*

Allied Granites Pty Ltd,
4 Koojan Avenue,
South Guildford WA 6055,
Fraser Range Granite.

FELDSPAR

Unimin Australia Ltd,
26 Tomlinson Road,
Welshpool WA 6106,
(08) 9362 1411,
Pippingarra, Mukinbudin,
www.unimin.com.au

GOLD

Agincourt Resources Limited
1st Floor
16 Ord Street
West Perth WA 6005
(08) 9216 5800
Wiluna
www.agincourtresources.com.au

Legend Mining Limited,
Suite 1 46 Ord Street,
West Perth WA 6005,
08 9322 3700
Gidgee,
www.legendmining.com.au

Agnew Gold Mining Co Pty Ltd,
PMB 10,
Leinster WA 6437,
(08) 9088 3834,
Agnew,
www.goldfields.co.za

AngloGold Australia Ltd,
Level 13, St Martin's Tower,
44 St Georges Terrace,
Perth WA 6000,
(08) 9425 4600,
Sunrise Dam,
www.anglogold.com

Barrick Gold of Australia Limited,
2 Mill Street,
Perth WA 6000,
(08) 9212 5777,
Darlot, Lawlers, Plutonic,
www.barrick.com

Coolgardie Mining Company Pty Ltd,
PMB 3,
Coolgardie WA 6439,
(08) 9022 0222,
Three Mile.

Croesus Mining NL,
39 Porter Street,
Kalgoorlie WA 6430,
(08) 9091 2222,
Binduli, Central Norseman, Davyhurst,
www.croesus.com.au

Equigold NL,
1st Floor, 7 Sleat Road,
Applecross WA 6153,
(08) 9316 3661,
Kirkalocka,
www.equigold.com.au

Gindalbie Gold NL,
PO Box 512,
West Perth WA 6872,
(08) 9480 8700
Minjar.
www.gindalbie.com.au

Harmony Gold (Australia) Pty Ltd,
10 Ord Street,
West Perth WA 6005,
(08) 9211 3100,
Big Bell, Hill 50–Mt Magnet, South Kal Mines
- New Celebration,
www.harmony.co.za

Jervois Mining Limited,
PO Box 64,
Coolgardie WA 6429,
(08) 9024 2114
Bullabulling
www.jervoismining.com.au

**Kalgoorlie Consolidated Gold Mines
Pty Ltd,**
Private Bag 27,
Kalgoorlie WA 6433,
(08) 9022 1100,
Golden Mile,
www.kalgold.com.au

LionOre Australia Pty Ltd,
PO Box 205,
Leinster WA 6437,
(08) 9088 3400,
Thunderbox,
www.lionore.com

Mines and Resources Australia Pty Ltd,
Level 1, 12 St Georges Terrace
Perth WA 6000,
(08) 9202 1100,
White Foil

Newfield Central Pty Ltd,
PO Box 1094,
Kalgoorlie WA 6430
(08) 9021 7234,
Mobile: 041 999 1713
Newfield Central.

Newmont Australia,
PO Box 1123,
West Perth WA 6872,
(08) 9366 3232,
Bronzewing-Mt McClure, Jundee-Nimary,
www.newmont.com

Placer (Granny Smith) Pty Ltd,
PO Box 33,
Laverton WA 6440,
(08) 9088 2217
Granny Smith,
www.placerdome.com

Placer Dome Asia Pacific Limited,
PO Box 1662,
Kalgoorlie WA 6433,
(08) 9080 6111,
Kanowna Belle,
www.placerdome.com

Placer Dome Asia Pacific Limited,
PO Box 622,
Kalgoorlie WA 6433,
(08) 9080 6400,
East Kundana, Kundana, Paddington,
www.placerdome.com

Sipa Resources Limited
Level 2, 87 Collin Street,
West Perth WA 6005,
(08) 9481 6259,
Paraburdoo,
www.sipa.com.au

Sons of Gwalia Ltd,
16 Parliament Place,
West Perth WA 6005,
(08) 9263 5555,
Carosue Dam, Cornishman,
Marvel Loch–Southern Cross,
Sons of Gwalia, Tarmoola,
www.sog.com.au

St Barbara Mines Ltd,
Level 2, 16 Ord Street,
West Perth WA, 6005
(08) 9476 5555,
Bluebird.
www.stbarbara.com.au

St Ives Gold Mining Co Pty Ltd,
POB 359
Kambalda WA 6442,
(08) 9088 1111,
Kambalda–St Ives,
www.goldfields.co.za

Troy Resources NL,
44 Ord Street,
West Perth WA 6005,
(08) 9481 1277,
Bulchina,
www.try.com.au

GYPSUM

Cockburn Cement Ltd,
Lot 242 Russell Road East
East Munster WA 6166,
(08) 9411 1000,
Lake Hillman.

CSR Limited,
19 Sheffield Road,
Welshpool WA 6106,
(08) 9365 1666,
Jurien Bay North.

Dampier Salt Ltd,
Level 24-152 St Georges Terrace,
Perth WA 6000,
(08) 9327 2257,
Lake MacLeod,
www.dampiersalt.com.au

Gypsum Industries,
PO Box 952,
Canning Bridge WA 6153,
(08) 9364 4951,
Lake Cowcowing.
www.aglime.com.au

Lake Hillman Mining Pty Ltd,
PO Box 1,
Kalannie WA 6468,
(08) 9666 2045,
Lake Hillman

HEAVY MINERAL SANDS

Garnet Sand

GMA Garnet Pty Ltd,
PO Box 188,
Geraldton WA 6531,
(08) 9923 3644,
Port Gregory,
www.gmagarnet.com

TABLE 6

PRINCIPAL MINERAL AND PETROLEUM PRODUCERS

effective 1 May 2004

Ilmenite, Leucoxene, Rutile and Zircon

Cable Sands (WA) Pty Ltd,
PO Box 133,
Bunbury WA 6230,
(08) 9721 0200,
Jangardup, Sandalwood, Yarloop,
www.cablesands.com.au

Doral Mineral Sands

Lot 7 Harris Road
PICTON WA 6229
(08) 9725 4899
www.doral.com.au

Iluka Resources Ltd,

Level 23, 140 St Georges Terrace,
Perth WA 6000,
(08) 9360 4700
Capel, Eneabba, Yoganup, Stratham,
www.iluka.com

TiWest Pty Ltd,

1 Brodie-Hall Drive,
Bentley WA 6102,
(08) 9365 1333,
Cooljarloo,
www.tiwest.com.au

IRON ORE**BHP Billiton Iron Ore (Goldsworthy) Ltd,**

200 St Georges Terrace,
Perth WA 6000,
(08) 9320 4444,
Nimingarra-Yarrie,
www.bhpbilliton.com

BHP Billiton Iron Ore Ltd,

200 St Georges Terrace,
Perth WA 6000,
(08) 9320 4444,
Jimblebar, Newman, Yandicoogina,
www.bhpbilliton.com

Channar Mining Pty Ltd,

152 St Georges Terrace,
Perth WA 6000,
(08) 9327 2327,
Channar.

Hamersley Iron Pty Ltd,

152 St Georges Terrace,
Perth WA 6000,
(08) 9327 2327,
Marandoo, Paraburdoo, Tom Price,
Yandicoogina,
www.hamersleyiron.com

Mt Gibson Iron Limited,

1st Floor,
7 Havelock Street,
West Perth WA 6005,
(08) 9485 2355,
Talling Peak
www.mtgibsoniron.com.au

Portman Iron Ore Ltd,

Level 11, 1 William Street,
Perth WA 6000,
(08) 9426 3388,
Cockatoo Island, Koolyanobbing,
www.portman.com.au

Robe River Iron Associates,

Level 15, 1 William St,
Perth WA 6000,
(08) 9217 4747
Pannawonica, West Angelas
www.roberiver.com.au

LIMESAND-LIMESTONE**Cockburn Cement Ltd,**

Lot 242, Russell Road East
East Munster WA 6166,
(08) 9411 1000,
Cockburn, Dongara, Wanneroo
www.cockburncement.com.au

Limestone Resources Australia Pty Ltd,

Parkland Road, Cnr Hasler Street,
Osborne Park WA, 6017,
(08) 9443 4244,
Wanneroo, Moore River, Carabooda

Loongana Lime Pty Ltd,

PO Box 808,
Kalgoorlie WA 6430,
(08) 9021 8055,
Loongana.

WA Limestone Co.,

41 Spearwood Avenue,
Bibra Lake WA 6163,
(08) 9434 2299,
Postans.

Gypsum Industries of Australia,

PO Box 952,
Canning Bridge WA 6153,
(08) 9364 4951,
Dongara-Denison, Cervantes, Lancelin, Jurien.

MANGANESE**Pilbara Manganese Pty Ltd,**

62 Colin Street,
West Perth WA 6005,
(08) 9321 3633,
Woodie Woodie,
www.consminerals.com.au

NICKEL**Fox Resources Ltd,**

702 Murray Street,
West Perth WA 6005,
(08) 9420 7300,
Radio Hill
www.foxresources.com.au

Minara Resources Ltd,

Level 4, 30 The Esplanade,
Perth WA 6000,
(08) 9212 8400,
Murrin Murrin,
www.minara.com.au

Independence Group NL,

PO Box 893,
South Perth WA 6951,
(08) 9367 2755,
Long Nickel,
www.independencgroup.com.au

LionOre (Australia) Nickel Ltd,

Level 2, 10 Ord Street,
West Perth WA 6005,
(08) 9481 5656,
Emily Ann,
www.lionore.com

Mincor Resources NL,

Level 1, 1 Havelock Street,
West Perth 6005,
(08) 9321 7125,
Miitel, Wannaway,
www.mincor.com.au

MPI Mines Ltd,

Level 8, 10-16 Queen Street,
Melbourne Vic 3000,
(03) 9628 2214,
Black Swan,
www.mpimines.com.au

OMG Cawse Pty Ltd,

Cawse Nickel Operations,
Locked Bag 32,
Kalgoorlie WA 6433,
(08) 9024 8800,
Cawse.
www.omgi.com

Sally Malay Mining Ltd,

Level 22, Allendale Square,
77 St Georges Terrace,
Perth WA 6000,
(08) 9225 0999,
Sally Malay
www.sallymalay.com

Sir Samuel Mines NL,

24 Outram Street,
West Perth WA 6005,
(08) 9213 1588,
Cosmos,
www.jubileemines.com.au

Tectonic Resources NL,

Suite 4, 100 Hay Street,
Subiaco WA 6008,
(08) 9388 3872,
RAV8,
www.tectonicres.com.au

View Resources Ltd,

Level 1, Scott House,
46-50 Kings Park Road,
West Perth WA 6005,
(08) 9 226 4611,
Carnilya Hill
www.viewresources.com.au

WMC Resources Ltd,

191 Great Eastern Highway,
Belmont WA 6104,
(08) 9479 0500
Kambalda, Leinster, Mt Keith,
www.wmc.com

PALLADIUM

WMC Resources Ltd,
191 Great Eastern Highway,
Belmont WA 6104,
(08) 9479 0500,
Kambalda,
www.wmc.com

PETROLEUM

Apache Energy Ltd,
Level 3, 256 St Georges Terrace,
Perth WA 6000,
(08) 9422 7222,
Agincourt, Campbell, Double Island, East Spar,
Endymion, Gibson, Gipsy, Harriet, Hoover,
Little Sandy, North Gipsy, North Pedirka,
Pedirka, Rosette, Simpson, Sinbad,
South Plato, Stag, Tanami, Victoria, Wonnich,
www.apachecorp.com

ARC Energy Ltd,
Level 4, 679 Murray St,
West Perth WA 6005,
(08) 9486 7333,
Dongara, Hovea-Eremia, Woodada,
Mt Horner
www.arcenergy.com.au

**BHP Billiton Petroleum (North West Shelf)
Pty Ltd,**
Level 42, Central Park,
152-158 St Georges Terrace,
Perth WA 6000,
(08) 9278 4888,
Chinook-Scindian, Griffin,
www.bhpbilliton.com

ChevronTexaco Australia Pty Ltd,
Level 24, QV1 Building,
250 St Georges Terrace,
Perth WA 6000,
(08) 9216 4000,
Barrow Island, Cowle, Crest,
Roller-Skate, Saladin, Yammaderry,
www.chevrontexaco.com

ENI Australia Limited,
Level 3, 40 Kings Park Road,
West Perth WA 6005,
(08) 9320 1111,
Woollybutt.

Kimberley Oil NL,
Suite 12B, 573 Canning Highway,
Alfred Cove WA 6154,
(08) 9330 8876,
Blina, Boundary, Lloyd,
Sundown, West Terrace

**Mobil Exploration & Producing Australia
Pty Ltd**
Level 7, 30 The Esplanade,
Perth WA 6000,
(08) 9480 0300,
Wandoo,
www.wandoo.com.au

Nexen Petroleum Australia Pty Limited,
Level 18, 44 St Georges Terrace,
Perth WA 6000,
(08) 9218 8911,
Buffalo,
www.nexeninc.com

Origin Energy Resources Ltd,
34 Collins Street,
West Perth WA 6005,
(09) 9324 6111,
Beharra Springs, Tubridgi,
www.originenergy.com.au

Woodside Energy Ltd,
240 St Georges Terrace,
Perth WA 6000,
(08) 9348 4000,
Athena, Cossack, Echo-Yodel, Goodwyn,
Hermes, Lambert, Laminaria, Legendre,
North Rankin, Perseus, Wanaea,
www.woodside.com.au

PLATINUM

WMC Resources Ltd,
191 Great Eastern Highway,
Belmont WA 6104,
(08) 9479 0500,
Kambalda,
www.wmc.com.au

SALT

Dampier Salt Pty Ltd,
37 Belmont Avenue
Belmont WA 6104
(08) 9270 9270,
Dampier, Lake MacLeod, Port Hedland,
www.dampiersalt.com.au

Onslow Salt Pty Ltd,
PO Box 23,
Onslow WA 6710,
(08) 9184 9000,
Onslow Salt,
www.onslowsalt.com

Shark Bay Salt Joint Venture,
22 Mount Street,
Perth WA 6000,
(08) 9420 4320,
Useless Loop

WA Salt Supply Ltd,
Cockburn Road,
Hamilton Hill WA 6163,
(08) 9335 9911,
Lake Deborah East, Pink Lake,
www.wasalt.com.au

SILICA-SILICA SAND

Silica

Simcoa Operations Pty Ltd,
PO Box 1389,
Bunbury WA 6231,
(08) 9780 6666,
Dalaroo,
www.simcoa.com.au

Silica Sand

Rocla Quarry Products,
180 Fauntleroy Avenue,
Kewdale WA 6105,
(08) 9475 2555
Gnangarra,
www.rocla.com.au

TT Sand Pty Ltd,
PO Box 1664,
Fremantle WA 6959,
(08) 9319 1371,
Mindijup.

SPONGOLITE

Supersorb Minerals NL,
55 Collie Street,
Albany WA 6330,
(08) 9842 1955,
Woogenellup,
www.supersorb.com.au

TALC

Luzenac Australia Pty Ltd,
GPO Box A42,
Perth WA 6837
(08) 9327 2844,
Three Springs,
www.luzenac.com

Unimin Australia Ltd,
26 Tomlinson Road,
Welshpool WA 6106,
(08) 9362 1411,
Mt Seabrook.

TIN-TANTALUM-LITHIUM

Spodumene

Sons of Gwalia Ltd,
16 Parliament Place,
West Perth WA 6005,
(08) 9263 5555,
Greenbushes, Wodgina,
www.sog.com.au

Tantalite-Tin

Sons of Gwalia Ltd,
16 Parliament Place,
West Perth WA 6005,
(08) 9263 5555,
Greenbushes, Wodgina,
www.sog.com.au

Haddington Resources Ltd,
PO Box 1909,
West Perth WA 6872,
(08) 9226 1550,
Bald Hill,
haddington.com.au

ABBREVIATIONS, REFERENCES, UNITS & CONVERSION FACTORS

As the document makes use of abbreviations and references, an explanation of each has been included below. A conversion table, relating the units by which various commodities are measured, has also been provided.

ABBREVIATIONS

A\$	Australian Dollar	HBI	Hot Briquetted Iron
ABARE	Australian Bureau of Agricultural and Resource Economics	IMF	International Monetary Fund
ABS	Australian Bureau of Statistics	km	kilometres
AFR	Australian Financial Review	km ²	square kilometres
ANZ	Australia New Zealand bank	LME	London Metal Exchange
bbl	barrels of oil	Mbbl	thousand barrels of oil
Bcm	billion cubic metres	MMbbl	million barrels of oil
BMR	Bureau of Mineral Resources	Mt	million tonnes
cons	concentrates	Mt/a	million tonnes per annum
CSO	Central Selling Organisation	n/a	not applicable
ct	carat	RBA	Reserve Bank of Australia
DRI	Direct Reduced Iron	SARS	Severe Acute Respiratory Syndrome
ECB	European Central Bank	t	tonnes
f.o.b.	free-on-board	t/a	tonnes per annum
f.o.t.	free-on-truck	Tcf	trillion cubic feet
GDP	Gross Domestic Product	US\$	United States Dollar
		WTI	West Texas Intermediate

REFERENCES TABLE 3

(a)	Estimated f.o.b. value
(b)	Metallic by-product of nickel mining
(c)	Value based on the average Australian value of alumina as published by the ABS
(d)	Delivered/shipped value
(e)	Value at works
(f)	Estimated ex-mine value
(g)	London PM Gold Fix price as supplied by WA Treasury Corporation
(h)	Estimated f.o.t. value
(i)	Estimated f.o.b. value based on the current price of nickel-containing products
(j)	By-products of gold mining
(r)	Revised from previous edition

UNITS AND CONVERSION FACTORS

	Metric Unit	Symbol	Imperial Unit	
Mass	1 gram	(g)	= 0.032151 troy (fine) ounce (oz)	
	1 kilogram	(kg)	= 2.204624 pounds (lbs)	
	1 tonne	(t)	= 1.10231 United States short ton [1 US short ton = 2,000 lbs]	
	1 tonne	(t)	= 0.98421 United Kingdom long ton [1 UK long ton = 2,240 lbs]	
	1 tonne LNG	(t)	= 52,000,000 (Btu)	
Volume	1 kilolitre	(kl)	= 6.28981 barrels (bbls)	
	1 cubic metre	(m ³)	= 35.3147 cubic feet (ft ³) [1 kilolitre (kl) = 1 cubic metre (m ³)]	
Energy	1 kilojoule	(kj)	= 0.94781 British Thermal Units (Btu)	
Energy Content	Coal	19.7 GJ/t		kilo (k) 10 ³
	Condensate	32.0 MJ/L		mega (M) 10 ⁶
	Crude oil	37.0 MJ/L		giga (G) 10 ⁹
	LNG	25.0 MJ/L		tera (T) 10 ¹²
	Natural gas	38.2 MJ/m ³		peta (P) 10 ¹⁵
	LPG-butane	28.7 MJ/L (1tonne LPG-butane = 1,720 litres)		
	LPG-propane	25.4 MJ/L (1tonne LPG-propane = 1,960 litres)		

DATA SOURCES

DATA SOURCES

Quantities for minerals and petroleum in this publication are collected by the Department's Royalty Branch and are based on information provided by the producers in royalty and production returns. The quantities specified relate to either mine production or sales as listed below for each commodity.

Mine Production

Clays

Coal

Construction Materials

Dimension Stone

Gold

Gypsum

Limesand -Limestone -Dolomite

Silica - Silica Sand

Talc

Diamonds

Gem and Semi-Precious Stones

Heavy Mineral Sands

Industrial Pegmatite Minerals

Iron Ore

Manganese

Nickel Industry (Nickel, Cobalt, Platinum and Palladium)

Petroleum

Pigments

Salt

Silver

Spongolite

Tin -Tantalum - Lithium

Vanadium

Sales

Alumina

Base Metals (Copper, Lead and Zinc)

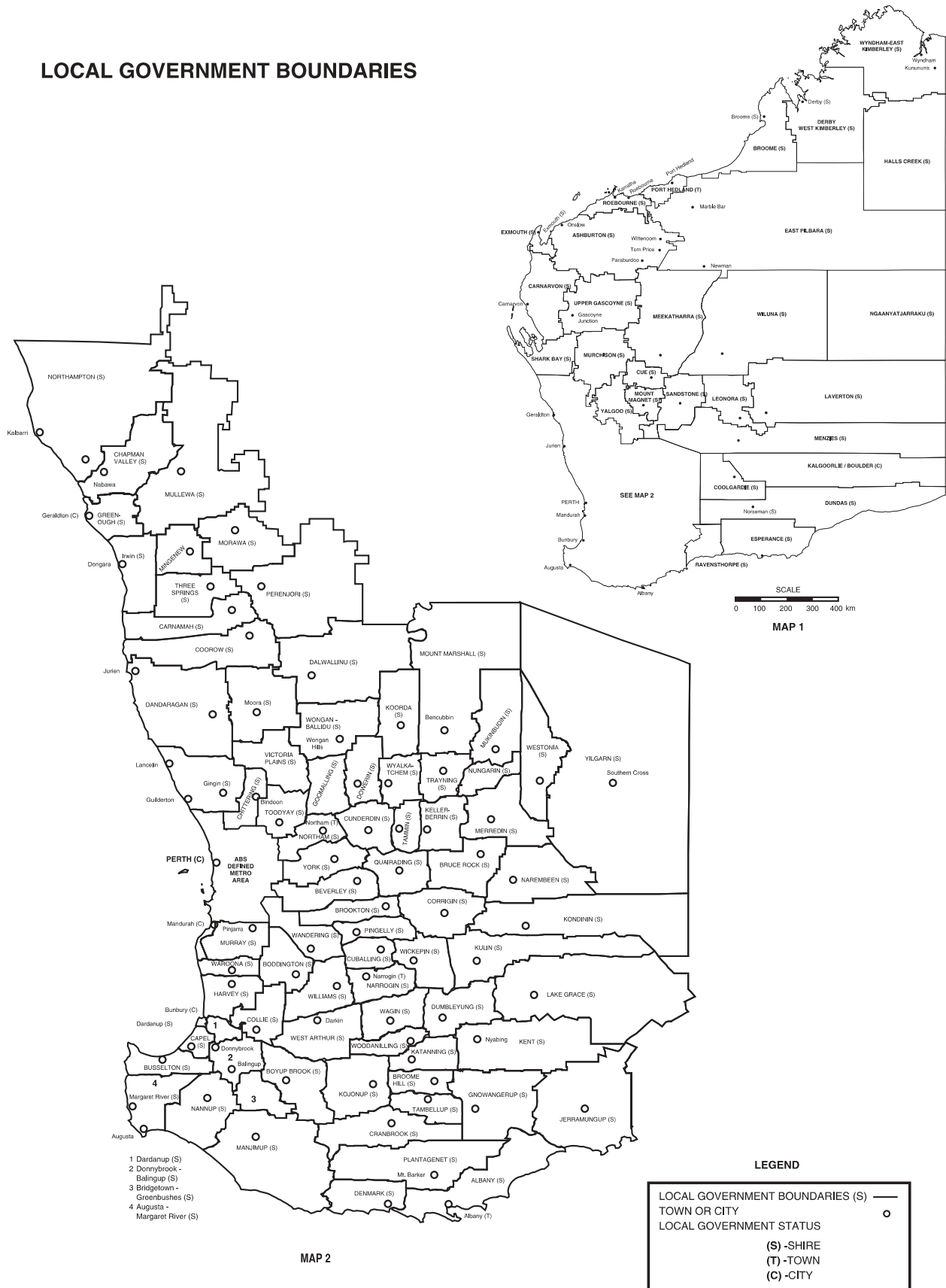
Chromite

CLASSIFICATION OF COUNTRIES

Euro area ¹ / European Union		Non-Japan Asia		Newly Industrialised Asia
<i>Austria</i>	<i>Italy</i>	Afghanistan	Nepal	Hong Kong
<i>Belgium</i>	Latvia	Bangladesh	Pakistan	Republic of Korea
Cyprus	Lithuania	Bhutan	Papua New Guinea	Singapore
Czech Republic	<i>Luxembourg</i>	Brunei Darussalam	Philippines	Taiwan
Denmark	Malta	Cambodia	Samoa	
Estonia	<i>Netherlands</i>	China	Solomon Islands	
<i>Finland</i>	Poland	Fiji	Sri Lanka	
<i>France</i>	<i>Portugal</i>	India	Thailand	
<i>Germany</i>	Slovakia	Indonesia	Tonga	
<i>Greece</i>	Slovenia	Kiribati	Vanuatu	
Hungary	<i>Spain</i>	Lao PD Republic	Vietnam	
<i>Ireland</i>	Sweden	Malaysia	Newly industrialised Asia	
	United Kingdom	Maldives	Mongolia	
		Myanmar		

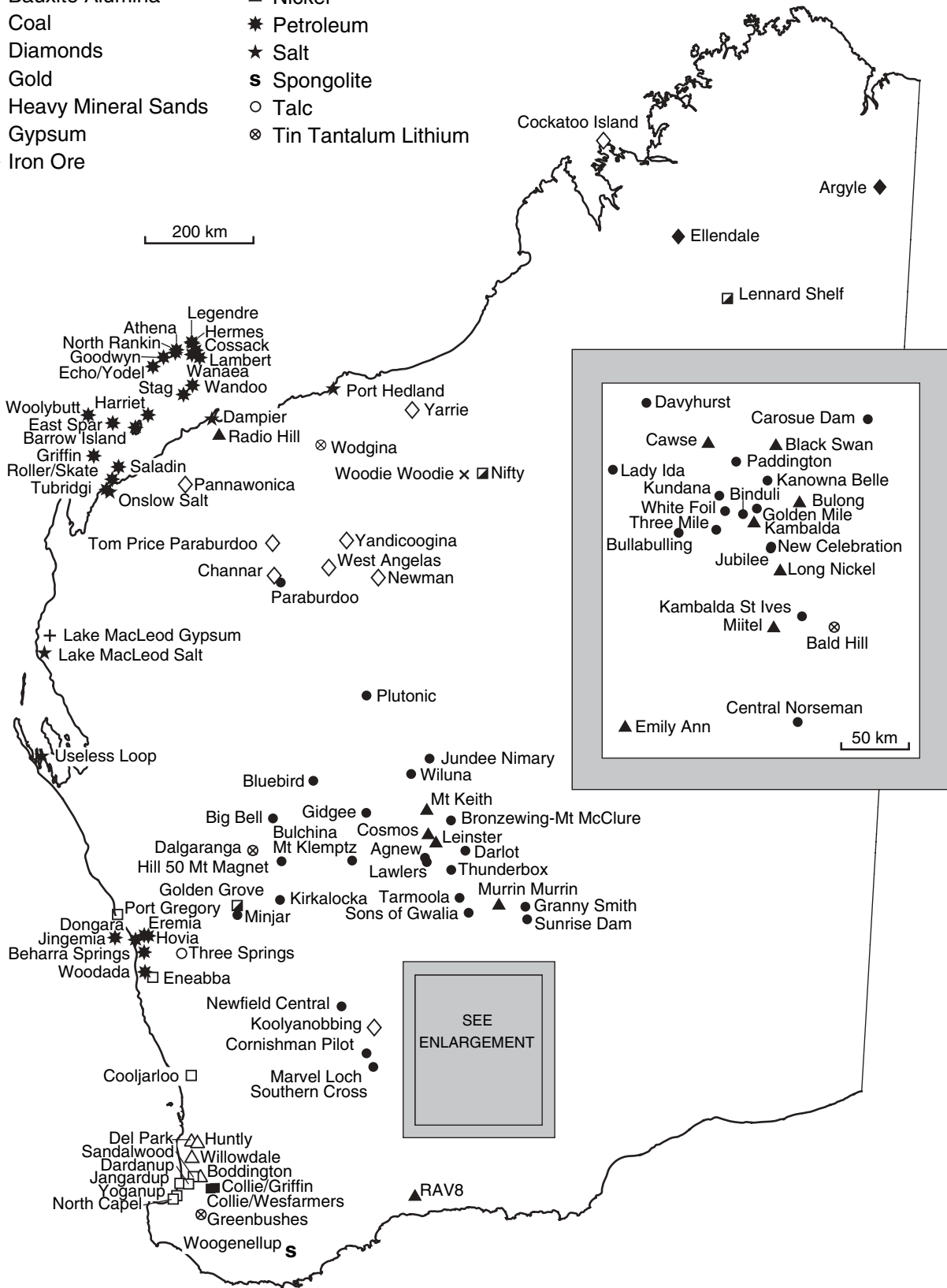
¹Italics indicate countries that are members of the euro area.

LOCAL GOVERNMENT BOUNDARIES



MAJOR MINERAL AND PETROLEUM PROJECTS IN WESTERN AUSTRALIA

- | | |
|-----------------------|------------------------|
| ▣ Base metals | × Manganese |
| △ Bauxite Alumina | ▲ Nickel |
| ■ Coal | ★ Petroleum |
| ◆ Diamonds | ☆ Salt |
| ● Gold | Ⓢ Spongolite |
| □ Heavy Mineral Sands | ○ Talc |
| + Gypsum | ⊗ Tin Tantalum Lithium |
| ◇ Iron Ore | |





Department of
Industry and Resources

This publication is available on our website

www.doir.wa.gov.au

For further information on the mineral and petroleum resources of Western Australia to complement this publication please refer to:

Western Australia Mineral Exploration and Development
Western Australia Atlas of Mineral Deposits and Petroleum Fields 2003
Western Australian Oil and Gas Review 2004
Western Australian Iron Ore Industry 2003
A Guide to Petroleum Exploration and Production in Western Australia
Prospect magazine

Head office:

Mineral House
100 Plain Street
EAST PERTH WA 6004

Telephone: +61 8 9222 3333

Facsimile: +61 8 9222 5460

Email: enquiries@doir.wa.gov.au

For specific data enquiries please email: jill.gregory@doir.wa.gov.au