Western Australian **Mineral and Petroleum** Statistics Digest 2003–04

Department of Industry and Resources

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FOREWORD

Welcome to the Department of Industry and Resources' 2003–04 Statistics Digest. This publication contains the most comprehensive statistical information available on the Western Australian mineral and petroleum industry.

The 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 data 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 in the global economy as a resource exporter, are also covered.

Sales volumes in 2003–04 for Western Australia's resource sector were strong with iron ore, alumina, salt, cobalt and manganese reaching record levels. However, a weaker US dollar forced up the average value of the Australian dollar during the year. With most mineral and petroleum sales denominated in US dollars, the appreciation of the Australian dollar in the past financial year undermined sales values. As a result, the total value of Western Australian petroleum and mineral sales fell by 5 per cent to $26.4 billion in 2003–04.

The significant drag on sales values in Australian dollar terms more than outweighed a year of very solid international price increases for most mineral and petroleum commodities. For example, significant increases in the US dollar gold price were counteracted by the Australian dollar's appreciation, which together with lower sales volumes resulted in a ten per cent decline in the value of gold sales. Similarly, appreciation of the Australian dollar more than offset very high US dollar oil prices, which together with reduced production from mature fields contributed to reduced sales values.

However, booming commodity prices such as that for nickel and record-breaking output levels in many sectors, to some extent helped compensate for the adverse effects of currency movements.

Despite the persistent strength of the Australian dollar, the outlook for mineral and petroleum sales is positive with continued strong demand. Notably, the importance of the mineral and petroleum sector in Western Australia remains uncontested, contributing around three-quarters of exports and around a quarter of gross state product (GSP). Increase in sales in the mineral and petroleum sector has also experienced nominal growth of around eight per cent per annum during the last ten years.

In releasing the Western Australian Mineral and Petroleum Statistics Digest for 2003–04, I would like to express my appreciation to the many individuals and companies which 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 Western Australian Treasury Department.

1. ECONOMY

1.1 Global economic context

The global economy recovered rapidly from the middle of 2003, driven by a return to strong growth in the United States. The rising prominence of China as a key driver of economic activity was also important, in part through its demand for resources as inputs into rapid industrialisation.

The impact of rising US and Chinese growth was to 'kick start' export-led recoveries in Europe and Japan and provide impetus to growth in the economies of the East Asian region. Western Australia's resource sector has been a key beneficiary of global recovery, with rising demand as well as an overall rise in global commodity prices.

Source: OECD

Figure 1

Over the second half of 2004, the global economy saw growth slow modestly from the rapid pace achieved in the second half of 2003 and early 2004.

The slow-down has largely been driven by an easing in growth in the US and Japan. Latin America and Eastern Europe continue to grow strongly, as does East Asia, though there has been some slowing in the smaller economies in the latter region. Augmenting the overall growth picture, the euro area's previously tentative recovery appears to be becoming more broadly based, albeit remaining modest.

Overall, the International Monetary Fund (IMF) expects that global growth in 2004 will hit 5 per cent, its highest rate in almost 30 years. This reflects growth across all regional groups.

Economic Growth 2002–05

	2002	2003	2004	2005
			IMF forecasts	
United States	1.9	3.0	4.3	3.5
Euro Area	0.8	0.5	2.2	2.2
Japan	-0.3	2.5	4.4	2.3
China	8.3	9.3	9.0	7.5
Other East Asia	4.7	3.7	5.6	4.5
World	**3.0**	**3.9**	**5.0**	**4.3**

Source: RBA, IMF September 2004 World Economic Outlook

Figure 2

Looking ahead, the IMF forecasts solid global growth of 4.3 per cent for 2005, with a moderate easing of growth in all major economic regions except Europe, which is expected to maintain current rates of expansion.

United States

The recovery in the US economy since mid-2003 has been driven by a broad-based improvement in business investment and consumption, and this has been supported by highly expansionary monetary and fiscal policy. Following a slow start and intermittent periods of slower growth, employment has responded to stronger economic activity, helping to reinforce growth. In spite of the strong recovery, inflation has remained low.

The US economy continued to grow solidly in the second half of 2004. In the September quarter 2004, gross domestic product (GDP) rose by 1 per cent to be up 4 per cent in the year to September. Strong household consumption and business investment were the key drivers of growth in the quarter as they have been for much of the US recovery since mid-2003.

Household consumption grew by 1.1 per cent in the September quarter, rebounding after a soft June quarter. Over the year, household borrowing and a strong rise in household net wealth, the latter due to higher share prices and housing values over 2003–04, have sustained consumption growth. Rising employment and thus disposable income should help underpin consumer spending over the near term.

Though employment growth was unexpectedly soft following a strong performance in the first five months of 2004, possibly due to the uncertainties provoked by rising oil prices, forward-looking indicators suggest an improved job market. For example, the Institute of Supply Management employment indices for October suggest faster job growth in the non-manufacturing sector, and ongoing growth in manufacturing.

An uncertainty for the outlook for household consumption, as well as other drivers of the US economy, is the extent to which high oil prices will be sustained and thus erode spending capacity at a time when interest rates are rising and household debt is at high levels – in late 2004 there were signs that rising petrol prices had eroded US consumer confidence measures.

The consensus appears to be that world oil prices should drift down over the near term, hopefully reducing the potential for this factor to do too much damage to consumption.

US business investment grew strongly in the September quarter 2004 to be nearly 10 per cent higher than a year ago and economic conditions remain favourable for continued growth. Along with solid consumption, profitability remains high as a share of GDP and corporate borrowing costs remain low, despite the Federal Reserve's 100-basis-point lift in official interest rates since June 2004 (up to November 2004).

Japan

The Japanese economy began to establish the basis for a sustained recovery in the second half of 2003 with a recovery in the manufacturing sector driven principally by export demand from the US and China. Following rises in exports and industrial production which drove improved corporate profitability, employment growth began to rise driving a fall in unemployment. Consequent improvements in consumer confidence and spending meant that the recovery gradually began to spread into the services sector.

Like the US, Japan's economy has slowed from the strong growth it experienced at the start of 2004. In the June quarter 2004, Japanese output was 2.9 per cent higher than a year ago. However, in the September quarter, output remained stable, which brought the annual growth rate back to 2.7 per cent. Exports and capital spending, both recent drivers of Japan's recovery, were weak. This softness is consistent with other indicators such as industrial production, merchandise exports and machinery orders, which slowed in recent months. On the positive side, consumption rose solidly in the September quarter.

Commentators have suggested a number of factors that may have caused the weak September quarter GDP result. These include: the impact of softer US consumer sentiment due to high oil prices on exports to the US; the impact of recent typhoons on the construction sector; and a 'run-up' in ITC stocks.

Though some uncertainty about the strength of the recovery has returned, the outlook for the Japanese economy remains one of continued, but more moderate, growth.

Business conditions reported in the Tankan survey are at 10-year highs, likely reflecting improved levels of consumer spending. Manufacturing appears to be seeing stronger conditions than in services, driven by strong growth in consumer demand for plasma-screen TVs, DVDs and air-conditioners. Consumer demand should continue to be supported by ongoing employment growth and a downward drift in unemployment.

Investment is expected to remain robust, supported by strong growth in profits, which rose by 33 per cent in the year to the June quarter. This return to profitability has allowed significant repair to Japanese corporate balance sheets, such that corporate debt levels have fallen to levels (as a share of Japan's GDP) last seen in the late 1980s.

China

The Chinese economy continues to increase its role as a driver of world economic growth as its demand for inputs of resources and simply transformed manufactures support export growth in economies such as Japan, Australia and East Asia. Concerns had developed through 2003–04 that the economy was growing unsustainably quickly with the potential for excess investment in some sectors and rising inflationary pressures. China's growth over the past year or so has reflected rising exports of manufactures as well as solid domestic demand growth reflecting both household consumption and business investment.

In the second half of 2004, tighter credit restrictions and controls on over-investment appear to have produced a modest slow-down in targeted sectors such as the aluminium, real estate, automotive, construction and steel-making industries. China's aggregate fixed capital investment growth fell from rates of over 50 per cent a year in early 2004 to 28 per cent in the year to September. However, concern that investment had not slowed as much as desired, and unease about rising inflationary pressures have contributed to the Chinese authorities' decision to raise interest rates in late October 2004.

The Chinese economy still appears to have a significant 'head of steam', with industrial production rising at over 16 per cent in the year to September and exports growing by over 30 per cent over the same period. Similarly household consumption growth, underpinned by rising household incomes, remains robust.

Non-Japan East Asia

Growth in East Asia since mid-2003 reflected the boost to demand from increasing US, Chinese and Japanese demand for ITC goods as well as the general lift in demand from stronger global growth. Regional economies with high trade intensities with China have done relatively well.

In the wake of higher exports, domestic demand has also improved, in part driven by stimulatory macroeconomic policies and subsequently, improving labour markets.

Growth in the rest of East Asia slowed in the second half of 2004 but remains solid with strengthening domestic demand underpinned by expansionary macroeconomic policies and firming employment growth. South Korea remains the exception with growth constrained by weak household spending.

The region's export growth has slowed, possibly reflecting the slowing in China, a key market for simply transformed manufactures for the region, and softer US demand. There are also signs that the strong recovery in global ITC demand, which is a key component of the region's exports, has plateaued.

Prospects for domestic demand in the region remain favourable, with still low interest rates despite some tightening of monetary policy, rising capacity utilisation and improving employment growth, which is supporting household disposable incomes. South Korea remains the exception with consumption falling and employment prospects deteriorating.

Sustained high oil prices are an important risk to the region's economies given their intensity of imported oil use.

Europe

The European economies benefitted from the general lift in global trade beginning in mid-2003, but growth remained constrained to the export sector, with only limited response from domestic demand and employment.

Europe's recovery picked up speed in the second half of 2004, though it remains highly dependent on exports and is geographically uneven. France is performing best with strong domestic demand supplementing exports, while the other major economies of Germany, Italy and the Netherlands are experiencing only modest domestic demand.

There are some signs that domestic conditions are improving mildly – consumer and, particularly business, sentiment have improved as has corporate profitability. Mediocre employment growth has however kept a cap on consumer spending growth and is likely to remain a constraint.

The UK economy continues to grow solidly, though it is expected to soften as manufacturing production and merchandise exports have weakened recently. On the positive side, consumer sentiment remains high and labour market conditions are strong.

The Global Outlook

While global growth is expected to remain solid over the near term, there are concerns that Japan, Europe and parts of East Asia remain too heavily dependent on export demand from the US and, in some cases, China, and need to boost domestic demand.

These concerns relate to the risk that US and Chinese growth may be softer than expected. In China's case, this relates to the fear that the authorities may be unable to engineer a soft landing for the economy. In the US case, the concern relates to a worry that medium-term structural problems may interfere with growth in the near term.

Concerns about the underlying health of the US economy reflect a high and rising US current account deficit, which recently breached 5.5 per cent of GDP. In the absence of policy action to lift public saving by reducing the Federal Budget deficit and/or a rise in private sector saving, a fall in the US dollar and/or higher interest rates would be required to assist in correcting this imbalance.

A significant and sustained depreciation of the US dollar in the near term, while assisting the US current account to adjust would also erode the competitiveness of exports from those economies with floating exchange rates which are currently reliant on exports for growth, notably Europe and Japan. Higher US interest rates would compound this effect if the US economy slowed in response and import demand declined.

Western Australian Economic Context

The Western Australian economy performed better than expected in 2003–04, with gross state product (GSP) rising by 7.5 per cent over the year, compared with a 2004–05 Budget forecast of 6.75 per cent.

Economic growth for 2003–04 was driven largely by rapid growth in the domestic economy, with State final demand rising by 8.0 per cent in 2003–04, underpinned by growth in household consumption and business investment. Western Australia's domestic economic growth was the second highest on record.

On the trade side, net exports grew by 0.9 per cent in 2003–04. Imports of goods and services rose by 10.1 per cent after record growth in 2002–03 of 22.6 per cent, driven by strong business investment. Growth in exports of goods and services moderated to 4.5 per cent, down from 10.0 per cent in 2002–03.

1.2 Implications of the appreciating Australian currency

During the past two years, the Australian dollar experienced its strongest appreciation against the US dollar since its float in December 1983. In 2003–04, the local currency gained almost 22 per cent on average compared with the previous year. Measured from its trough in March 2001, the Australian dollar appreciation compared with its peak in February 2004 is close to 60 per cent.

While the Australian dollar particularly strengthened against the US dollar, it also gained significantly against many Asian currencies that are pegged or managed vis-a-vis the US dollar. Consequently, the Australian dollar also gained significantly in trade weighted terms. Figure 3 illustrates the local currency's recent appreciation in an historical context.

Figure 4 however, also provides some historical perspective to the appreciation in 2003. Firstly, the Australian dollar did not exceed the historical average by as much as might be generally perceived. Secondly, the historical appreciation followed a period of an historically weak local currency against the US dollar.

Importantly and unusually, the weakening Australian dollar during 1999 and 2001 also coincided with relatively strong commodity prices. This led to a significant windfall for Australian mineral and petroleum exporters, who both gained competitiveness and increased Australian dollar export earnings from the weak Australian dollar and also benefitted from high prices.

The Australian dollar's close link to commodity prices has historically provided Australian exporters with a 'natural hedge' with the Australian dollar tending to weaken when commodity prices were falling and vice versa. For instance, when commodity prices fall, adding downward pressure on export earnings in US dollars, the falling commodity prices have tended to weaken the Australian dollar, which in turn increase Australian dollar export earnings when converted from US to Australian dollars. As a result, Australian exporters have benefitted from relatively stable Australian dollar commodity prices as compared with the movements in the exchange rate and US dollar commodity prices.

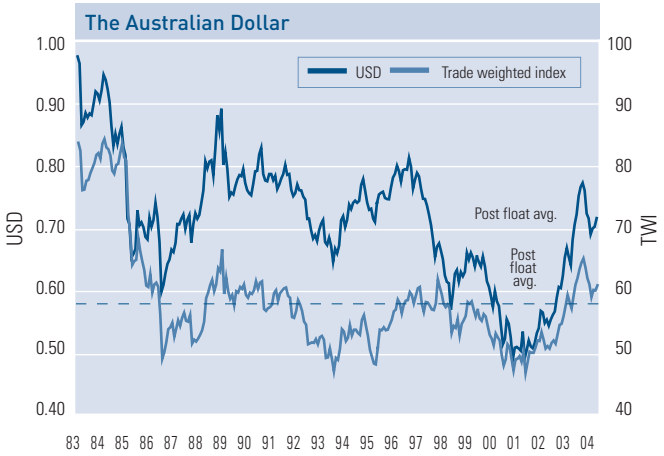
The Figure 4 illustrates both the 'natural hedge' and the recent windfall. The latter is highlighted and shows the divergence between the exchange rate and the US dollar commodity price in 2000 and the associated increase in Australian dollar commodity prices.

Several factors have driven the appreciation. The strong appreciation over the past two years could arguably be seen as a return to normal conditions in terms of the Australian dollar exchange rate better reflecting economic fundamentals subsequent to the US 'dot com' phenomenon, during which the Australian dollar suffered from Australia being viewed as an 'old economy' due to its reliance on commodities.

The fundamentals of the Australian economy have been performing relatively well compared with the rest of the Organisation for Economic Cooperation and Development (OECD). Ironically, in relation to the 'dot-com bubble', Australia's strong performance as reflected by its strong economic growth (and consequently interest rate differentials and expectations about these) is partly driven by the strong performance of commodity markets.

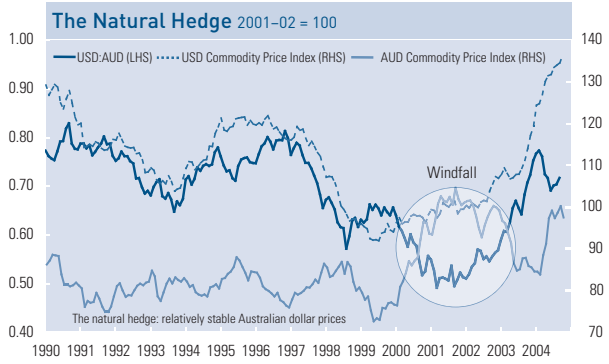
Unrelated to Australia's performance, the US current account and budget deficits have been weighing down on the US dollar's performance particularly when combined with continued uncertainty about US economic recovery and the associated very low US interest rates.

The stronger Australian dollar nevertheless undermines exporters' (price) competitiveness by making our products more expensive in foreign currencies, or, as is more likely for US dollar denominated resource exports, squeeze export earnings. As a result, exporters' sale volumes and particularly export earnings in Australian dollar terms deteriorate. At an aggregate level, the 2003–04 Western Australian resource statistics illustrate some of the impacts of the rise and persistent strength of the Australian dollar.



Source: Reserve Bank of Australia

Figure 3



Source: Reserve Bank of Australia

Figure 4

Indeed, Western Australia could be expected to suffer significantly from the strong local currency, due to its high reliance on exports, particularly as resource exports are denominated in US dollars. Relatively high input prices (to the extent that these are in Australian dollars) and relative low export prices (when converted from US dollars to Australian dollars) would be expected to squeeze exporters' margins which could in turn limit discretionary expenditure and possibly investment. This would particularly be the case if growth in physical output were limited by infrastructure bottlenecks.

In addition, it is likely that a swiftly rising exchange rate would have surprised some firms, which, in turn, would have had real impacts even if the actual exchange rate were not 'surprisingly' high. When firms' margins are squeezed, a range of adjustments are likely to follow, resulting in additional costs and output, employment and investment are as a result likely to diminish.

So far, however, the State's exports are performing relatively well and so has business investment. Although the growth of business investment is moderating, this appears to be a cyclical phenomenon subsequent to the very high average investment growth of 17.2 per cent in 2003–04. One reason for this, as referred to above, is that the strong Australian dollar partly reflects the strong performance in the resource markets with strong price growth driven by strong demand growth, particularly from China. It is also likely to be a result of the long-term nature of mineral and petroleum sector investments and low marginal costs of producing additional output, which may make a range of resource sector investments less sensitive to short-term exchange rate movements.

Similarly, in many cases, the short-term exchange rate impact on resource companies would largely affect share prices, with returns to the local economy in the form of wages and intermediate demands being largely unaffected unless sale volumes collapse.

This highlights the incongruous 'old-economy-label' associated with the highly competitive and capital- and knowledge-intensive Western Australian resource sector.

Further mitigating the impact of the strong local currency are savings on US dollar denominated expenses, such as US dollar denominated debt and capital imports purchased in US dollars (as is much mining equipment). Many companies will also experience currency gains from hedging insofar that the hedge has been written at a lower value of the Australian dollar than currently is the case (the flip side to the exchange rate losses experienced during the Australian dollar depreciation of 2000 and 2001). In the extreme case, for a multi-national firm that operates in US dollars, the loss resulting from conversion to Australian dollars is more of an accounting issue. Finally, a range of resource-importing nations has experienced increased US dollar purchasing power, due to their currencies' appreciation. This should have benefitted exporters either in terms of price negotiations or sale volumes.

Exchange rates are particularly awkward to forecast and a range of features of the current global economic conditions makes it even more difficult. The value of the Australian currency is currently relatively high compared to the US and detracts from local gains in US dollar commodity price increases. The immediate outlook is for continued strength in the Australian dollar, but the most significant risk to the outlook is arguably the nature of the adjustment to the US current account and budget deficit. If this leads to an excessive depreciation of the US dollar, e.g. due to currency speculation, floating currencies such as the Australian dollar could appreciate well in excess of what fundamental economic conditions would justify. This would not only impact upon Western Australia directly, but also indirectly through its impact on global growth as it would threaten the export-driven recovery of Europe and some Asian countries.

Tenements in Force 1978 Act

	1996–97		1997–98		1998–99		1999–2000		2000–01		2001–02		2002–03		2003–04	
	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha	Number	000 ha
Prospecting Licences	8,212	1,100	7,525	992	6,242	809	5,827	745	5,512	711	4,964	634	4,566	575	4,561	568
Exploration Licences	4,718	38,279	4,505	35,993	3,463	23,732	3,394	20,687	3,162	18,152	2,899	18,556	2,855	21,123	2,917	20,896
Mining Leases	5,180	2,047	6,690	2,031	7,555*	2,263	4,865	1,829	4,841	1,803	4,820	1,774	4,770	1,762	4,713	1,716
Other	1,537	89	1,584	205			2,001	468	3,625	2,840	3,618	3,002	3,629	3,299	3,590	3,115
Mineral Claims & Other 1904 Act	310	34	309	34	307	34	194	22	186	21	186	22	186	22	186	22
Total	**19,647**	**41,515**	**19,029**	**39,255**	**17,567**	**26,838**	**16,280**	**23,751**	**17,326**	**23,829**	**16,487**	**23,988**	**16,006**	**26,781**	**15,967**	**26,317**

* Includes Other

Figure 5

Source: DoIR

2. EXPLORATION AND INVESTMENT

2.1 Mineral Exploration

Overview

Western Australia continues to attract the major proportion of mineral exploration expenditure in Australia (59 per cent), a reflection of the State's real and perceived prospectivity. During 2003–04, mineral exploration expenditure (excluding petroleum) figures for Western Australia rose by 10 per cent ($42.2 million) to $465.8 million, which is the second year in succession where mineral exploration expenditure has risen by 10–11 per cent in Western Australia. However, mineral exploration is still well below the peak level of 1996–97, when $825 million (in 2003–04 dollar terms) was spent.

Recent quarterly data shows mineral exploration expenditure continuing to rise, with exploration expenditure in mid-2004 significantly above the disastrous levels of mid-2002.

The Western Australian trend is consistent with the Australian trend. The 2003–04 level of mineral exploration expenditure within Australia was $786.7 million, which was seven per cent ($54.2 million) higher than during 2002–03. However, mineral exploration expenditure in Australia is still well below the peak level of 1996–97, when $1.37 billion (in 2003–04 dollar terms) was spent.

In terms of drilling, activity in Australia declined markedly following the peak of mineral exploration drilling in 1996–97 and at the low point in 2001–02 had declined by 55 per cent (7.120 million metres) from its peak. However, mineral exploration drilling has started to recover during the last two years and in 2003–04, mineral exploration drilling in Australia rose by 10.7 per cent (0.554 million metres) to a total of 5.711 million metres, with the estimated mineral exploration drilling in Western Australia following the same trend.

Unfortunately, the recovery in exploration expenditure in Australia and Western Australia has not been as strong as the world-wide recovery, with Australia and Western Australia having lost market share in the expanded pool of exploration capital. During the last decade, the proportion of the world's non-ferrous mineral exploration expenditure in Australia has dropped from 23 per cent to 15 per cent of the total, whereas that of Western Australia has dropped from 13 per cent to nine per cent.

The situation is starkly illustrated in a survey of 1138 global mining companies' exploration budgets prepared by the Canada-based Metals Economic Group, Australia. This showed that Australia, once the global leader in mineral exploration, is now outpaced by Latin America, Canada, Africa and countries classified in the 'Rest of the World' category. This result continues a trend that has seen Australia slip dramatically from the world's second-largest explorer in the period 1994–2001, to fourth place today.

The comparison with the situation in Canada is striking, with the proportion of world-wide mineral exploration expenditure spent in Canada recovering strongly after the mid-1990s whereas the proportion has continued to fall in Australia and Western Australia. This clearly illustrates what can be achieved with the combination of high-profile discoveries, ongoing exploration success, and favourable government regimes (including fiscal incentives to exploration).

In an additional effort to increase exploration expenditure, Regional Standard Heritage Agreements were endorsed in 2003–04 between Native Title Representative Bodies, the Chamber of Minerals and Energy and the Association of Mining and Exploration Companies, to set out rules for Aboriginal Heritage surveys in respect to exploration in all Western Australian regions, other than the Kimberley. The new policy has been showing some interesting trends. In the three months to January 2004, 425 objections to using the expedited procedure under the *Native Title Act 1993* were recorded. For the three months ending June 2004, only 36 objections were recorded.

Mineral exploration expenditure by commodity

Western Australia still accounts for the major proportion of the exploration dollars expended in Australia for many of the major commodities — iron ore (99 per cent), nickel–cobalt (84 per cent), gold (70 per cent), diamond (65 per cent), heavy mineral sands (44 per cent), silver–lead–zinc (13 per cent), and copper (6 per cent).

Within Western Australia, $277 million was expended on gold exploration, which was only marginally up (plus four per cent or $11 million) from the $266 million spent in 2002–03. The level of gold exploration expenditure has barely recovered and is still at the recessionary levels of the early 1990s and 2001–02 and is still 48 per cent lower (down $255 million) from the peak level of $531 million (in 2003–04 dollar terms) in 1996–97. Gold nevertheless remains the main focus of mineral exploration, accounting for about 60 per cent of all exploration expenditure.

Other commodities, in their order of importance as exploration targets in Western Australia, are nickel–cobalt (Ni–Co) 15 per cent, iron ore (14 per cent), diamond (four per cent), heavy mineral sands (two per cent), copper–lead–zinc–silver (one per cent), and 'others' totalling four per cent. 'Others' include all industrial minerals, construction materials, platinum group elements, tantalite, rare earth elements and coal–lignite.

Commodities that attracted increased exploration expenditure in Western Australia during 2003–04 were iron ore, Ni–Co, heavy mineral sands and gold, whereas exploration expenditure directed at copper–lead–zinc–silver and uranium was unchanged. Commodities that attracted decreased exploration expenditure in Western Australia during 2003–04 were diamond and 'others'.

Exploration for Ni–Co recovered strongly during 2003–04, rising by 31 per cent ($17 million) to $71 million. Exploration expenditure for Ni–Co has risen strongly over the last two years and there was even talk of a 'nickel boom', with a shortage of skilled personnel and available drill rigs, but a comparison with the longer-term trends shows that Ni–Co exploration is still well below other boom periods of around 1980–81 and 1997–98. Data from the Australian Bureau of Statistics (ABS) for the earlier years is for base metals generally (as an undifferentiated group), but these booms were undoubtedly dominated by exploration for Ni–Co. The recovery during 2002–03 and 2003–04 was principally led by junior companies exploring for and developing nickel sulphide deposits (particularly in the Kambalda area) and by BHP Billiton (BHPB) completing the feasibility study of the Ravensthorpe lateritic nickel project.

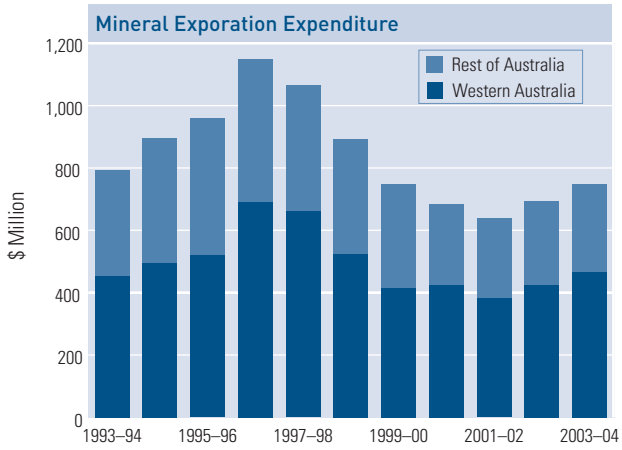
Iron ore exploration expenditure in Western Australia is now at the highest level ever recorded, and, during 2003–04, iron ore exploration expenditure jumped dramatically by 65 per cent ($24.9 million) to $63.1 million. This was driven by strong customer demand for iron ore, particularly from China, with the major producers in the Pilbara able to respond fairly rapidly by expanding the operations at existing projects. In addition, the Fortescue Metals Group (FMG) emerged as a new force in the Pilbara iron ore industry, and there was renewed interest in exploration for magnetite deposits in primary banded iron formations on the Yilgarn Craton.

Diamond exploration in Western Australia is now at the lowest level for at least 25 years, with diamond exploration expenditure decreasing by a further five per cent during 2003–04, falling by $0.9 million to only $16.9 million for the year. The fall was primarily due to reduced resource–reserve drilling at Argyle, the Ellendale project at the production phase and limited diamond exploration elsewhere in the State. Diamond exploration expenditure has been subdued for many years, has declined gradually over the last decade and is now far below the peak level of $134 million in 1981–82 (in 2003–04 dollar terms), reflecting the general lack of exploration success in Western Australia. Unfortunately, the success of Kimberley Diamond at Ellendale has had only a limited impact on other companies' ability to raise capital specifically for diamond exploration in Western Australia.

Exploration expenditure for heavy minerals in Western Australia recovered strongly during 2003–04, rising by 34 per cent ($2.4 million) to $10.6 million for 2003–04. After the switch in the 1990s by mineral sand explorers to the Murray Basin in Australia's eastern states, exploration in Western Australia had stabilised at around $8 million – $11 million per year (in 2003–04 dollar terms). As a result of that refocusing, Western Australia's share of the Australian exploration expenditure for heavy minerals has fallen from around 70 per cent of the total in the mid-1990s to only 28 per cent in 2002–03, but recovered during 2003–04 to 44 per cent of the total. The main greenfield exploration project is Coburn (south of Shark Bay), which is at the bankable, feasibility study stage.

Exploration expenditure directed at copper–lead–zinc–silver and uranium in Western Australia was unchanged, at $3.9 million and less than $1 million respectively.

Exploration expenditure directed into 'other' minerals in Western Australia fell by 14 per cent ($3.1 million) to $18.5 million in 2003–04.



Source: ABS

Figure 6

2.2 Petroleum Exploration

Petroleum exploration expenditure in both Australia and Western Australia was at very strong levels during 2003–04, with Western Australia experiencing near-record expenditure during the June 2004 quarter, albeit after a weak March 2004 quarter. But nationally, petroleum exploration expenditure in Australia actually fell during 2003–04, five per cent ($51 million) from $995 million in 2002–03 to $944 million in 2003–04.

However in Western Australia petroleum exploration expenditure rose during 2003–04 to the second-highest on record, rising by 12 per cent ($72.2 million) from $598.3 million in 2002–03 to $670.5 million in 2003–04. Most of Western Australia's petroleum exploration occurs in adjacent Commonwealth waters.

Most other states experienced declines in petroleum exploration expenditure, with Tasmania the only other state to show an increase for the year. As a result, the proportion of Australian petroleum exploration spent in Western Australia rose sharply, from 60.1 per cent in 2002–03 to a record 71 per cent in 2003–04.

Petroleum exploration onshore in Australia (and Western Australia) remains very subdued and now represents only 19 per cent of the total petroleum exploration expenditure, declining from about 29 per cent a decade ago. This reinforces the need for initiatives to encourage onshore petroleum exploration.

Drilling activity in Western Australia in 2003–04 was concentrated in the Carnarvon and Perth basins with some activity in the Browse Basin. All drilling activity took place in offshore areas with the exception of Perth Basin, which solely comprised onshore drilling.

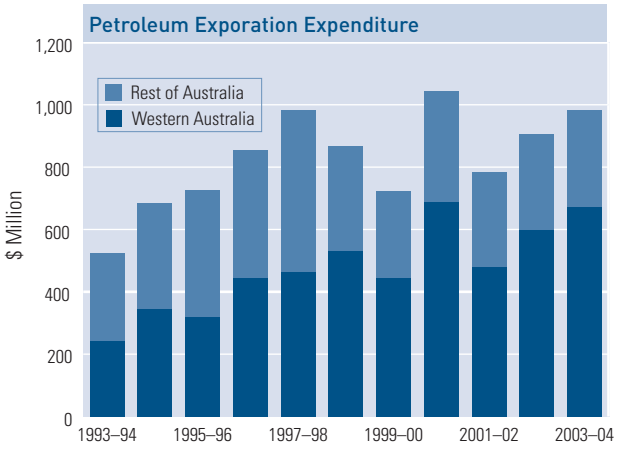
Industry expectations for petroleum exploration activity in the second half of 2004 were for modest increases relative to 2003–04.

2003–04 Drilling by Basin

	New Field Wildcat	Extension	Development	Total
Carnarvon	28	18	15	61
Perth (All Onshore)	6	5	3	14
Canning	0	0	0	0
Bonaparte	0	0	0	0
Browse	1	1	0	2
Total	**35**	**24**	**18**	**77**

Source: DoIR

Figure 7



Source: ABS

Figure 8

2.3 Investment

The ABS private capital expenditure data for 2003–04 showed that Australia's investment in current prices in the mining sector rose by 5.9 per cent, from $8.8 billion in 2002–03 to $9.3 billion in 2003–04. During the same period, Western Australia's mining investment increased from $3.9 billion to $5.0 billion in current prices. Western Australia's share of national mining investment rose to 54 per cent.

Total capital investment in Western Australia amounted to $8.9 billion in 2003–04, with mining investment accounting for 56 per cent of this total. This compares to a 55 per cent share of total capital investment in 2002–03.

As noted in more detail in previous editions of this publication, the ABS industry classification for mining used above is based on the Australian and New Zealand Standard Industry Classification (ANZSIC). This mining classification excludes a number of industry sectors involved in downstream processing of resources, which are instead included by the ABS in the manufacturing sector classification. Arguably, investments carried out in the downstream resource processing sectors in a particular year could be combined with the ABS mining sector classification to gain a fuller picture of investment in the resource sector.

Along these lines and looking into the future, the Department of Industry and Resources (DoIR) currently estimates that there are over $40 billion of resource sector projects under way or planned in Western Australia. Major projects under development in 2003–04 included:

Burrup Peninsula Ammonia Plant - Burrup Fertilisers is developing an ammonia plant at the King Bay–Hearson Cove industrial area on the Burrup Peninsula, near Karratha. Around 760 000 t/a of liquid ammonia will be produced and exported to India and other world markets for the manufacture of fertilisers. Construction commenced on 30 April 2003 and production is planned to start in the third quarter of 2005.

Kwinana - HIsmelt Commercial Iron Making Plant - HIsmelt Corporation, in a joint venture with Nucor (25 per cent), Mitsubishi (10 per cent) and Shougang (5 per cent), is developing a commercial-scale HIsmelt process plant at Kwinana, near Perth. The first stage of the plant will produce 800 000 t/a of pig iron from iron ore fines, coal and fluxes. Construction commenced in January 2003, with commissioning expected in the first half of 2005.

Telfer - Gold Mine (Expansion) - Feasibility studies for the Telfer expansion have identified a large low-grade resource in excess of 500 Mt and containing more than 26 Moz of gold. Newcrest commenced construction of the mine extension in late 2002 and commissioning was scheduled in the second half of 2004 with full capacity to be reached by 2005. When production commences, it is estimated to average 800 000 oz/a of gold and 30 000 t/a of copper during a 24-year period. Newcrest Mining is building a new 17 Mt/a processing plant as part of the project. A major component of the project is a 440-km gas pipeline from Port Hedland to the mine site.

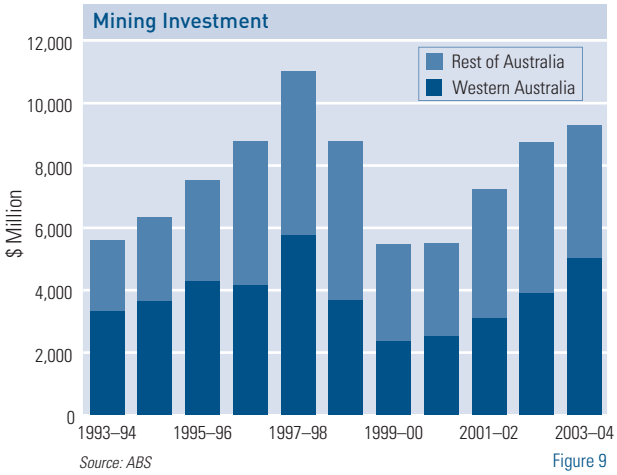
North West Shelf - Project Expansion - 4th LNG Train, Second Trunkline - Proposals by the NWSV partners for additional LNG Trains 4 and 5, and a second trunkline and expansion of the Domgas plant, received environmental approval in 1998 and 1999. The LNG expansion is based on growing Asian energy markets. First gas began flowing through the trunkline in February 2004 and in September 2004, Train 4 commenced production.

Major projects under consideration at the end of 2003–04 included:

Burrup Peninsula - Ammonia Urea Plant - Plenty River Corporation and Thiess have signed a Cooperation Agreement to develop the A$900-million ammonia and urea plant and have been given access to the site on the Burrup Peninsula set aside for an ammonia–urea project. The plant would be world scale and produce around 1.2 Mt/a of granular urea and 100 000 t/a of ammonia. Urea is widely used as a fertiliser, while ammonia is used in fertilisers, explosives and as a chemical feedstock.

Gorgon (Carnarvon Offshore Basin) - Gas and Condensate Field - The Gorgon Joint Venture is considering an LNG (up to 10 Mt/a) and domestic gas development at Barrow Island, based on gas from the Gorgon field. The Western Australian Cabinet after evaluation of environmental, social, economic and strategic aspects has approved the restricted industrial use of Barrow Island, in principle. Gas reserves have been enhanced by positive results from an exploration program in the West Gorgon area. Development decisions by the Gorgon Joint Venturers will be subject to market commitments. The joint venture has applied for environmental approvals so it is in a position to start construction in late 2005.

Burrup Peninsula – Dimethyl–Ether Project - Japan DME Ltd, a joint venture of Japanese companies comprising Mitsubishi Gas Chemical Company, Itochu Corporation, Mitsubishi Heavy Industries and JGC Corporation, plans to develop a world-scale dimethyl-ether (DME) plant on the Burrup Peninsula near Karratha. DME is used as an aerosol propellant and is a likely future environmentally clean fuel for the power generation and transportation industries. The proposed plant will produce methanol for conversion into 1.7 Mt/a of DME, from around 220 TJ/d natural gas. Detailed feasibility studies are underway. The project was granted Major Project Facilitation status by the Federal Government. Environmental consultant, Parsons Brinckerhoff (Aust) Pty Ltd, has commenced work on obtaining environmental approval for the project. A commitment to proceed was expected by the end of 2004. Current planning is for the plant to be operating by end of 2007.



Source: ABS

Figure 9

An alternative indicator of resource sector investment is that published in the Delta Electricity – Access Economics Investment Monitor. As at September 2004, the Monitor indicated that there were $39 billion worth of projects listed as "under construction, committed, under consideration or possible" in the mining sector. This mining classification is similar to the ABS approach to classifying the sector and excludes some downstream processing projects classifying them instead as manufacturing. It also excludes some resource investment-related infrastructure spending and classifies this among, for example, the transport and electricity, gas and water sectors. Inclusion of such downstream and infrastructure spending would push investment in resource-related projects significantly above the $40 billion DoIR estimate. However, offsetting this, the DoIR estimate tends to be more conservative, not counting some projects listed by Delta–Access as 'possible'.

New Approvals Process

In a continual effort to enhance the State investment environment, a new Project Approvals Coordination Unit (PACU) in DoIR was established to oversee the implementation of scoping agreements/ frameworks across government. Scoping is a term used by agencies for mapping out the pathway of a project within government to secure all necessary approvals. It is a means of effectively coordinating a great number of approvals from across all agencies. The guidelines for project scoping were developed in response to the recommendations of the Keating Review and serve to accelerate the rigorous approval processes that new industrial and resource projects must undertake.

The aim is to streamline project approvals with up-front identification of significant issues, approvals required, agency responsibilities and timelines, leading to an agreement with proponents about how the project approvals will be managed within government. Under the new scoping framework:

- Proponents identify key issues early, to avoid the introduction of new issues later in the process;
- Agencies advise proponents of all the approvals required, based on issues identified;
- Proponents and agencies agree to a timetable for all approvals; and
- Approval agencies agree on a process timeline that includes parallel processing of approvals, and which recognises the responsibilities of both agencies and developers.

Mining Laws Overhauled

In a further enhancement of the resource investment environment, the biggest overhaul of the State's mining laws in more than 25 years took place in October 2004 with Parliament passing the government's amendments to the State's *Mining Act 1978*. The landmark reforms incorporated recommendations from the government-commissioned Technical Taskforce on Native Title, the Bowler Inquiry into Greenfields Exploration in Western Australia and the Keating Review of the Project Development Approvals System.

One of the most important reforms of the laws is the introduction of a process to clear the backlog of mining lease applications. The new system is designed to ensure that mining leases can only be applied for when a mineral resource has been discovered and that exploration is carried out on an exploration title. This will allow for the backlog of about 5000 mining applications to be progressed. It is anticipated that during the next two to three years, backlogs will be reduced with a return to normal operating levels.

Mining leases will now only be issued when mining is proposed, rather than for exploration, which was a key recommendation of each of the reviews. The next stage is to get the regulations drafted that support the amendments with the third stage being implementation. It is anticipated that the amendments will come into effect in March 2005.

3. RESOURCE FOCUS 2003–04

3.1 Overview

In 2003–04, the resource sector continued to be characterised by two key features, the Australian dollar appreciation and its persistent strength and strong Chinese demand for particular metals and the associated impact on commodity prices. On balance, the impact of the 22 per cent appreciation of the Australian dollar outstripped the combined effect of US dollar price gains and sale volume changes. As a result, the total value of Western Australian petroleum and mineral sales fell by a modest five per cent to $26.4 billion in 2003–04. Despite the decline, the value of many commodities remained close to record levels.

With the exception of liquefied natural gas (LNG), lower petroleum sale volumes also contributed to the reduced sales' values, partly attributable to reduced production from mature fields. In addition, the appreciation of the Australian dollar more than offset the average US dollar oil price increase during the past financial year. Accordingly, the total value of petroleum sales fell by 12 per cent to $9.2 billion in 2003–04.

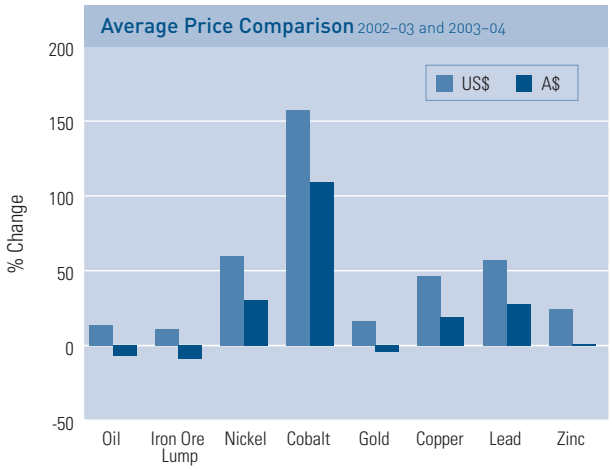
Driven by Chinese demand, iron ore sales reached record volumes for a fifth consecutive year, increasing by seven per cent to 202 Mt, pushing sale values to a new record of $5.3 billion. However, similar to most other commodities, the Australian dollar appreciation more the offset average US dollar price increases.

The Australian dollar's appreciation also outweighed a 17 per cent increase in the average US dollar gold price. Together with a six per cent lower sales volume, this contributed to a ten per cent decline in the value of gold sales, to $3.1 billion. The value of alumina sales was also $3.1 billion, with healthy US dollar price growth largely offsetting the impact of the stronger local currency. In volume terms, alumina production set yet another record, edging up to 11.2 Mt.

Booming nickel prices sheltered the value of nickel sales against both currency movements as well as a six per cent decline in volumes that receded to 181000t. As a result, the value of nickel sales increased by 21 per cent in 2003–04, to a record $3.0 billion.

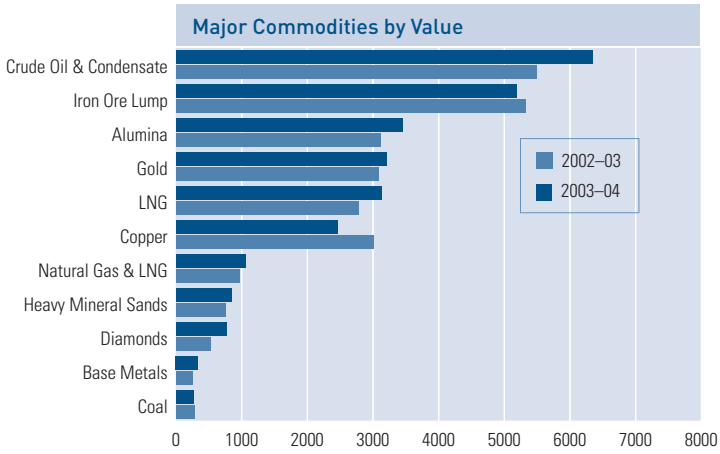
Diamond sales quantities, on the other hand, fell a significant 16 per cent, while values in Australian dollar terms suffered due to the Australian dollar appreciation. As a result, the value of diamond sales fell a third to $0.5 billion.

A range of other minor (in terms of share of Western Australia's total mineral sales) mineral commodities also achieved record volumes including salt, cobalt, manganese and rutile. While cobalt and manganese enjoyed favourable price developments and hence achieved strong increases in sale values, unfavourable Australian dollar prices detracted from the result for salt and rutile.



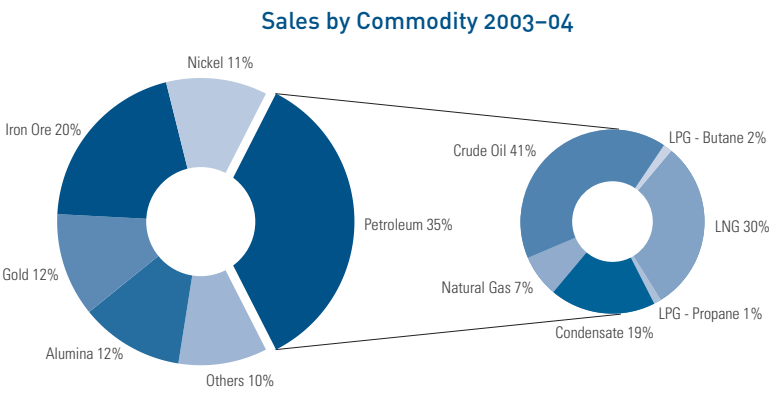
Source: LME, Kitco, TEX report, Metal Prices

Figure 10



Source: LME, Kitco, TEX report, Metal Prices

Figure 11



Source: DoIR

Figure 12

Despite the persistent strength of the Australian dollar, the outlook for mineral and petroleum sales is positive with continued strong demand flowing through to prices. With expansion projects to increase mining and infrastructure capacity also an important feature of 2003–04, Western Australia is expected to be well placed to take advantage of the continued positive environment.

It is also noteworthy that the relative importance of the resource sector in Western Australia remains uncontested, contributing around three-quarters of exports and around a quarter of gross state product. Sales growth of the mineral and petroleum sector has also experienced nominal growth of around eight per cent per annum over the last ten years.

3.2 Commodity Prices

In 2003–04, the Australian dollar appreciated 22 per cent against the US dollar in annual average terms. 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 15 per cent.

After a weak beginning, commodity markets sprang to life in the second half of 2003–04, as the world economy began to improve 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 14 per cent in 2003–04, to end the year 24 per cent higher. However, due to the local currency's appreciation by a similar amount, the RBA's non-rural commodity price index on average only increased a weak two per cent in Australian dollar terms during the past financial year.

The appreciation of the Australian dollar outweighed the impact of geopolitical uncertainty, low stocks and supply discipline on the US dollar oil price. As a result, the price of oil, which is not included in the RBA's commodity price index, receded in Australian dollar terms during 2003–04.

Base metals, such as copper, lead and nickel continued to experience strong price growth in US dollar terms, with the RBA's base metal price index increasing by a third in 2003–04. Yet, in Australian dollar terms, the same price index increased on average by only eight per cent in annual average terms. Price growth improved in the second part of the year and as a result, in year-ended (quarterly) terms, base metal prices grew by a strong 25 per cent 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.

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.

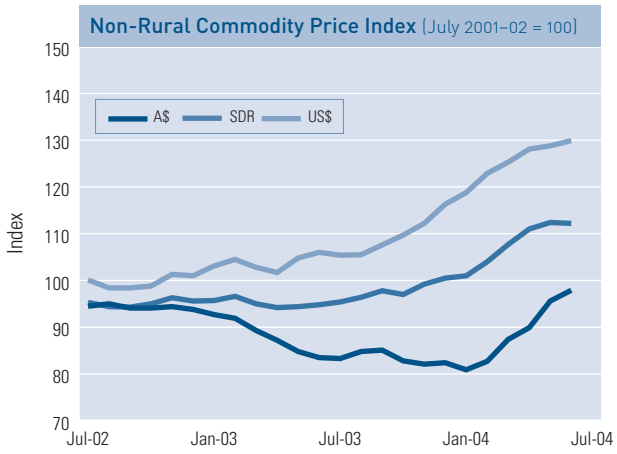
Alternatively, the Australian dollar index is useful for gauging the domestic currency price received by Australian commodity exporters as it reflects the interrelation between world commodity prices and the Australian exchange rate. For example, if prices in foreign currency terms remain unchanged but 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 Laspeyre's 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.

3.3 Outlook

As a whole, resource commodity prices continue to be buoyant, but different factors support individual metals and resources. Global economic growth appears to be positive for the remainder of 2004–05 and some time into 2005–06 with continued strong growth in China and synchronised growth across the Organisation of Economic Cooperation and Development (OECD) for the first time in a decade. But removing oil and gold from the equation, economic fundamentals supporting metal commodities require careful scrutiny. The Metals Industry Indicators for example, released by the US Geological Survey (USGS) in November 2004, have shown a continuing downturn in both the group's leading indicator of metals prices and US metals demand. Also, at the beginning of November the OECD released its composite leading indicator of future industrial production growth, which displayed a continuation of the trend highlighted by the USGS analysis.

Important therefore is the recovery of the US, which appears on track, although the US twin current account and budget deficit and potential impact on the global economy arguably remain a significant risk to any outlook. The key elements of the current account and budget deficits are the associated downwards pressure on the US dollar, which continues to be propped up by massive US dollar investments by Asian Central Banks. If this imbalance unravels in an uncontrollable manner, a fast depreciation of the US dollar could halt the export-driven growth in Europe and Asia. Alternatively, US interest rates could be driven up significantly to ensure continued financing of its current account deficit, with impacts on domestic growth and associated imports which again poses a significant negative impact on export-orientated economies elsewhere.



Source: Reserve Bank of Australia

Figure 13

With some indicators pointing to a slow-down in economic growth at the end of the first quarter of 2005, what this means for metals demand is that demand growth rates across the OECD area (encompassing the main Western metal-consuming countries) may slow in 2005. China is not included within this group and with industrial growth slowing modestly around the world, the prospects for Chinese economic and metal demand growth over the next year hold the key to whether metal prices continue to be supported at high levels. Normally, substantial falls in metals prices would be expected over the next few months as industrial production growth slows. However, if Chinese demand continues to grow strongly, an unusual cycle is predicted, with prices holding up in the face of slower growth elsewhere.

On the supply side, the global resource 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.

4. 2003–04 RESOURCE INDUSTRY ANALYSIS

4.1 Petroleum

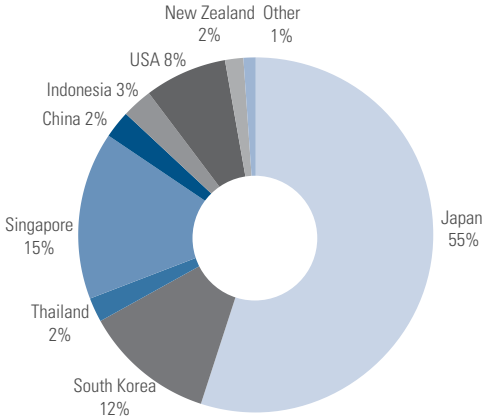
World oil prices in 2003–04 averaged US$32.77/bbl, up 14 per cent on the previous financial year. Key factors supporting oil prices are strong demand, supply disruptions and geopolitical disturbances. On the demand side, the US economic recovery and rapid growth in oil consumption of newly industrialised countries, particularly China, have supported strong growth in the need for oil. Further pressuring prices upwards have been production cuts by OPEC producers, strikes in Venezuela and Nigeria, the continuing sabotage of Iraq's oil supply infrastructure, natural disasters and other geopolitical risks. These conditions have generated considerable concerns about disruptions to oil supply and served to encourage speculative activity in the market.

Although oil prices in terms of the US dollar rose significantly in 2003–04, the average oil price in Australian currency was down seven per cent compared to 2002–03 due to a 22 per cent appreciation in the Australian dollar.

As a result of the surging Australian dollar, which outweighed healthy petroleum prices and reduced volumes from mature fields, the value of Western Australia's petroleum sales declined compared with 2002–03, falling by 12 per cent to $9.222 billion. In volume terms, crude oil sales fell five per cent, condensate 11 per cent, while liquefied natural gas (LNG) remained the same.

The decline of sales has reduced the share of the petroleum industry in Western Australia's total value of mineral and petroleum sales from 38 per cent in 2002–03 to 35 per cent in 2003–04. Despite this, petroleum remains as Western Australia's largest resource sector. Crude oil was the principal contributor to total petroleum sales, accounting for 41 per cent of total petroleum sales value, followed by LNG (30 per cent) and condensate (19 per cent). Together these commodities account for nearly 90 per cent of the State's petroleum sales. The rest was accounted for by natural gas (seven per cent) and LPG (three per cent).

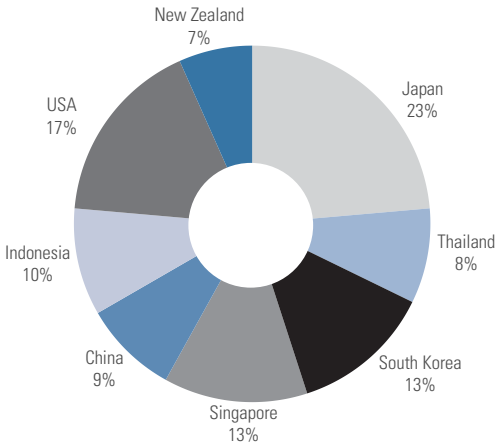
Petroleum Exports
Total Value $6.64 billion



Source: DoIR

Figure 14

Crude Oil Exports
Total Value $1.85 billion



Source: DoIR

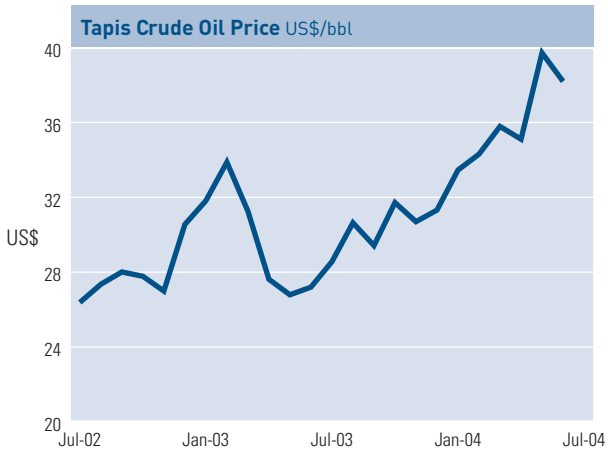
Figure 15

Crude oil

In 2003–04, the sales value of crude oil was $3.76 billion. Compared with 2002–03, the value of crude oil fell by $501 million in 2003–04. The main contributors to the fall in sales value were a seven per cent decline in production and a strong Australian dollar. The latter translated to a seven per cent fall in Australian dollar oil prices.

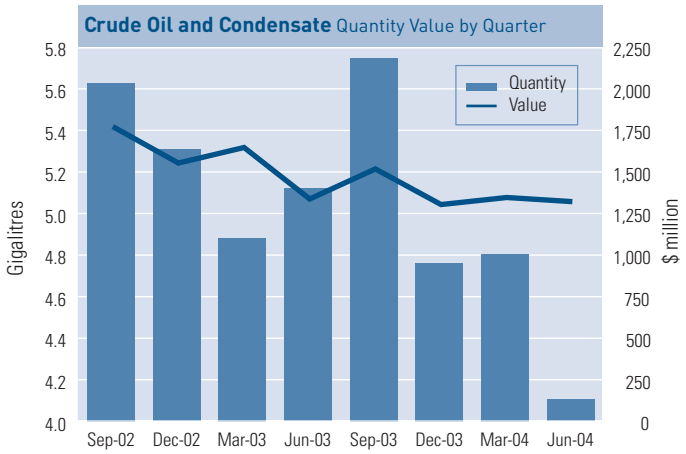
In 2003–04 Western Australia produced 83.4 MMbbl crude oil, down seven per cent on the previous financial year. Total gross reduction (which does not take into account output increases in some fields) in oil output was 16.8 MMbbl. Production decreases were most notable in several mature fields such as the Buffalo (which was decommissioned in December 2004), Chinook–Scindian, Griffin and Wanaea fields. Compared with 2002–03, in 2003–04 oil production was down 59 per cent in Buffalo, down 47 per cent in Chinook–Scindian, down 39 per cent in Griffin and down 11 per cent in Wanaea. Together these fields accounted for more than 50 per cent (9.1 MMbbl) of total gross decrease in oil production.

Falls in oil production levels were partially ameliorated by output increases from a number of new fields such as Woollybutt, Hovea, Jingemia, Gudrun, Hoover and North Pedirka. Total increase in oil output was 10.5 MMbbl. The Woollybutt and Hovea fields are the most important contributors to the additional output. In 2003–04, production from the Woollybutt and Hovea fields increased by 339 per cent and 198 per cent respectively. The two fields accounted for 85 per cent of total additional output. Nevertheless, output increases were not sufficient to offset production falls, resulting in a net oil production decrease of 6.4 MMbbl.



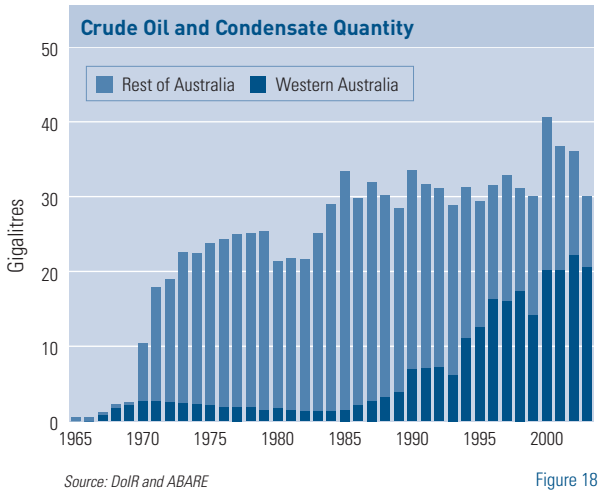
Source: WA Treasury Corporation

Figure 16



Source: DoIR

Figure 17



Source: DoIR and ABARE

Figure 18

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, approximately 20 km south of Dongara, Western Australia.

This highlights the key role exploration plays in maintaining a sustainable Western Australian petroleum industry. Recent statistics released by the ABS for 2003–04 indicate that petroleum exploration expenditure in Western Australia has continued to recover from the dramatic fall experienced in 2001–02. In 2003–04, petroleum exploration expenditure in Western Australia increased by 12 per cent or $72.2 million to $670.5 million.

In 2003–04, $1.85 billion (or half) of Western Australia's crude oil was exported. Although Japan remains the largest overseas market for Western Australia's crude oil, its share in the State's total oil exports has fallen significantly to 24 per cent, compared with 33 per cent in 2002–03. Other major export markets include the US which accounts for 17 per cent of oil exports from Western Australia, Singapore (13 per cent), South Korea (13 per cent), Indonesia (10 per cent), China (nine per cent) and Thailand (eight per cent). Together these countries accounted for more than 90 per cent of the State's total oil exports. Compared with 2002–03, crude oil exports to the US, South Korea and China fell while exports to Singapore, Indonesia and Thailand increased significantly.

Condensate

Sales volumes of condensate in Western Australia fell by 11 per cent to 38.9 MMbbl in 2003–04. This was largely due to production decreases in the Goodwyn and Echo–Yodel fields. The production of condensate in the two fields fell by 17 per cent and 19 per cent respectively, in 2003–04. The combined reduction in production from Goodwyn and Echo–Yodel was 5.4 MMbbl, accounting for about 80 per cent of the State's total falls in condensate production.

The lower sale volumes, combined with a stronger Australian currency which more than negated oil price increases, saw sale values of condensate in Western Australia fall by 16 per cent to $1.73 billion in 2003–04.

Condensate is a by-product from offshore gas fields. Woodside Energy Ltd is Western Australia's largest condensate producer. The top-four condensate fields operated by Woodside, namely Goodwyn, Echo–Yodel, Perseus and North Rankin, produced 36.2 MMbbl condensate in 2003–04, accounting for over 93 per cent of the State's total. New fields, which commenced producing condensate in 2003–04, include Linda, Hoover, North Pedirka, Gudrun and Monet. Although Goodwyn remains Western Australia's largest producer of condensate, generating 14.7 MMbbl in 2003–04, production levels have significantly decreased, dropping by 17 per cent compared with the previous financial year.

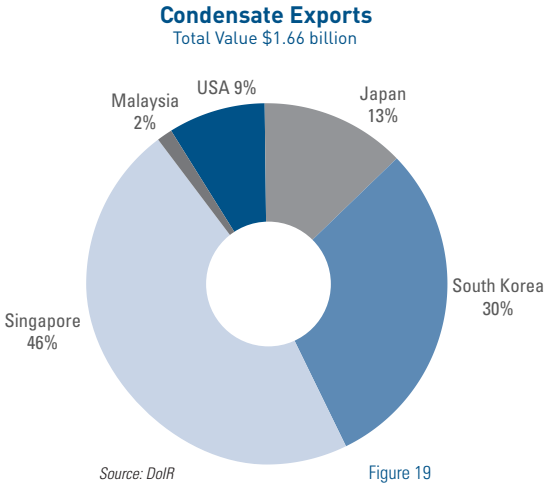


Figure 19

Approximately 96 per cent of Western Australia's total condensate sales in 2003–04 was exported, totalling $1.66 billion. The major destinations for the State's condensate exports were Singapore with a share of 46 per cent, South Korea (30 per cent), Japan (13 per cent) and the US (nine per cent). Compared with 2002–03, in value terms, condensate exports to Japan and South Korea have increased significantly by 68 per cent and 83 per cent respectively, mainly at the expense of Taiwan and the US.

Liquefied natural gas (LNG)

LNG is Western Australia's second most valuable petroleum product after crude oil, accounting for 30 per cent of the State's total petroleum sales in 2003–04. Compared with 2002–03, LNG sales volumes increased slightly by 0.3 per cent, which is the only petroleum product recording a positive volume change in the year. However, as a result of an appreciating Australian currency, sales values for LNG fell by 11 per cent to $2.78 billion.

All of Western Australia's LNG is exported. Valued at $2.78 billion, LNG is the State's most valuable petroleum export in 2003–04. Japan remains the dominant overseas market for LNG, accounting for 95 per cent of the State's total LNG exports. Other LNG export destinations include South Korea (two per cent), the US (one per cent) and Spain (one per cent).

LNG is produced by the North West Shelf Venture (NWSV) gas project. Based on extensive gas and condensate reserves discovered in the early 1970s just over 130 km off the Pilbara coast of Western Australia, the NWSV project began LNG exports to Japan in 1989 under long-term contracts. Japanese power utilities have been the principal purchasers. In July 2003, the NWSV project reached a key milestone by delivering its 1500th LNG cargo to customers Osaka Gas and Kansai Electric Power. The NWSV also began supplying LNG to South Korea under a mid-term, seven-year contract that started in late 2003. In addition to contract sales, 'spot' cargo sales have also taken place around the world.

2004 marks 15 years of LNG supply from Western Australia. Formalising a heads of agreement signed in September 2003, a new LNG sale and purchase agreement between the NWSV LNG sellers and Kansai Electric Power, which is Japan's second-largest power company and one of the original customers when LNG shipments began in 1989, was signed in July 2004. The agreement is for the supply and purchase of 0.5 Mt/a of LNG between 2009 and 2014 and 0.925 Mt/a of LNG between 2015 and 2023.

The $2.7-billion expansion of the NWSV's gas-processing facilities, which commenced in 2001, continued during 2003–04. As of 30 June, the construction phase was all but finished with insulation of pipe and vessels being the major work still taking place and commissioning was nearly 90 per cent completed. In July 2004, gas began flowing into the new LNG fourth train where it will be liquefied for export. In September 2004, the train successfully commenced production. The train is expected to reach full capacity of 4.2 Mt/a of LNG by early next year in addition to the existing annual 7.5 Mt of production.

Contingent on future market conditions, the NWSV may consider constructing a fifth LNG train to meet growing Asian energy markets and preliminary site works for Train 5 have been completed. A decision to proceed with a $1.6-billion fifth train is expected in the first quarter of 2005. A fifth LNG train would add 4.2 Mt/a of output with first production in the fourth quarter of 2008.

Whilst the NWSV 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 September 2003, the State Government granted in-principle approval for the restricted use of Barrow Island as part of the $11-billion Gorgon gas project, conditional on the Gorgon partners meeting State and Commonwealth environmental safeguards. The agreement is a major milestone in Western Australia's economic development.

The Gorgon Joint Venture, comprising ChevronTexaco (4/7th interest), Shell (2/7th interest) and ExxonMobil (1/7th interest), plans to build an initial 5 Mt/a LNG plant on Barrow Island at an upfront cost of $6 billion. 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 Gorgon Joint Venture is targeting markets in China, South Korea and North America. Massive new demand for diversified and clean energy in South Korea, China and the US has presented new opportunities for Western Australian LNG producers. In October 2003, the Gorgon Joint Venture Participants and China National Offshore Oil Corporation (CNOOC) signed a non-binding agreement based on CNOOC acquiring a 12.5 per cent stake in the field's reserves while contracting the delivery of up to 100 Mt of LNG over 25 years.

Natural gas

Outside of gas used as feedstock for LNG production, all remaining natural gas produced in Western Australia is for domestic industrial and household consumption. In 2003–04, natural gas sales for domestic purposes accounted for seven per cent of the State's total petroleum sales. Compared with 2002–03, despite a slight one per cent drop in quantity sold, the value of natural gas sales increased by three per cent to $681 million in 2003–04.

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

Reserves for Western Australia are calculated on the basis of a 50 per cent 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 per cent probability only.

Liquified petroleum gas (LPG)

In 2003–04, sales volumes of LPG (including butane and propane) fell by 14 per cent to 695 kt compared to 2002–03. As a result of the combination of falling sale volumes and appreciating Australian currency, sales values of LPG were down 28 per cent on the previous financial year to $282 million.

All LPG produced in the State is for export to Japan.

Australia's Gas Resources

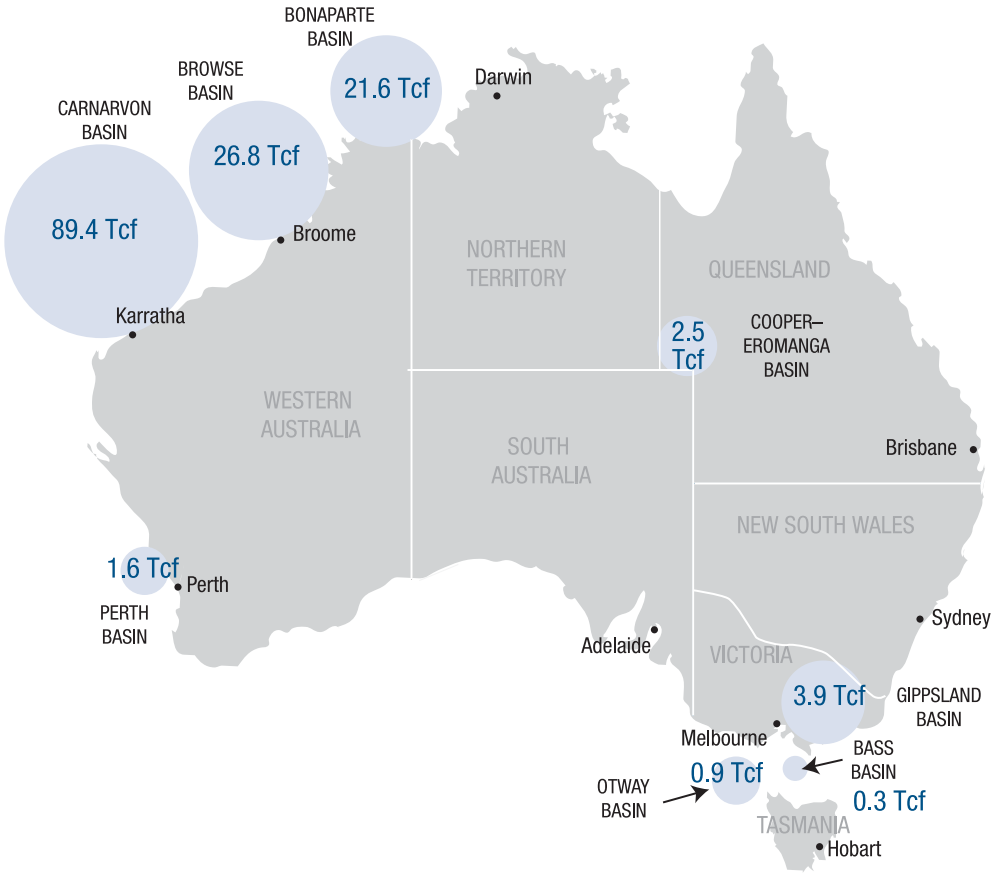


Figure 20

4.2 Iron Ore

In 2003–04, the Western Australian iron ore industry expanded greatly and the State's prominence in the global iron ore industry continued to gather momentum. This is based on the State's large reserves of high-grade iron ore, the industry's ability to produce metallurgically acceptable fines and lump ores, its close proximity to Asia and sophisticated infrastructure.

The State's iron ore industry plays a pivotal role in the export-driven economy, with the industry contributing $5.3 billion or around 20 per cent of the total value of mineral and petroleum sales. Driven by Chinese demand, iron ore sales reached record volumes for a fifth consecutive year, increasing by seven per cent to 202 Mt. All of the State's iron ore producers made a significant contribution to this impressive performance. However, similar to most other commodities, the Australian dollar appreciation more than offset average US dollar price increases.

Western Australian iron ore companies are swiftly moving to meet the demand for low alumina fine ore with sophisticated ore processing facilities and large capital investment in the development of greenfield deposits. The success of the State's iron ore industry rests critically on reliability, competitiveness and quality control in a demanding trading environment.

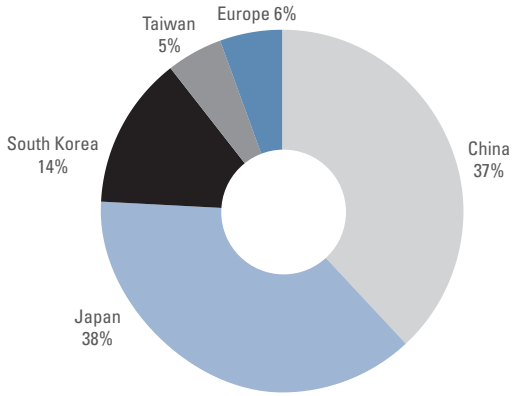
Furthermore, the State's iron ore industry continues to improve its competitiveness in mining practices, technological innovation and management processes. The continued fine-tuning of these sectors will be critical to the success of the industry in the years ahead.

The Western Australian iron ore industry is principally based in the Pilbara region of the State where the major large-scale developments and expansions are focused. However, production and potential is not confined to the Pilbara. The Yilgarn region has also witnessed the emergence of smaller operations and contains areas of development currently being evaluated. Furthermore, Yampi Sound, in the West Kimberley region, was the source of some of the initial iron ore developments in the State on Koolan and Cockatoo Islands. Mining continues to this day in this region on a limited scale.

Currently, there are five iron ore producers, three in the Pilbara region (comprising Hamersley Iron, Robe River and BHP Billiton Iron Ore), two in the Yilgarn, and one in the Kimberley region (comprising Portman Mining Limited and Mount Gibson Iron Limited). Portman operates two mine sites, one at Koolyanobbing in the Yilgarn, 400 km east of Perth, and the other on Cockatoo Island in the Kimberley region, in the north of the State. Mount Gibson Iron commenced shipping from its Tallering Peak mine site in February 2004.

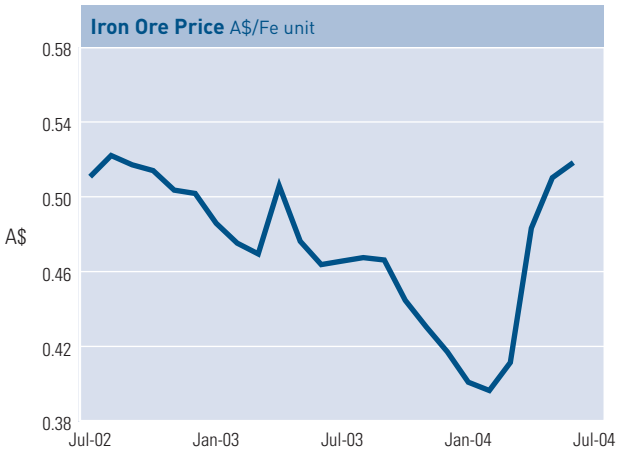
Hamersley Iron, a 100 per cent owned subsidiary of Rio Tinto, produced close to 70 Mt of iron ore in 2003–04, an increase of 6.4 per cent from the 65.8 Mt produced in 2002–03. Production came from the company's operations at Marandoo, Tom Price, Paraburdoo, Channar and the Brockman No. 2 mine. The output from these mines is blended to produce saleable lump and fine ore

Iron Ore Exports
Total Value $5.15 billion



Source: DoIR

Figure 21



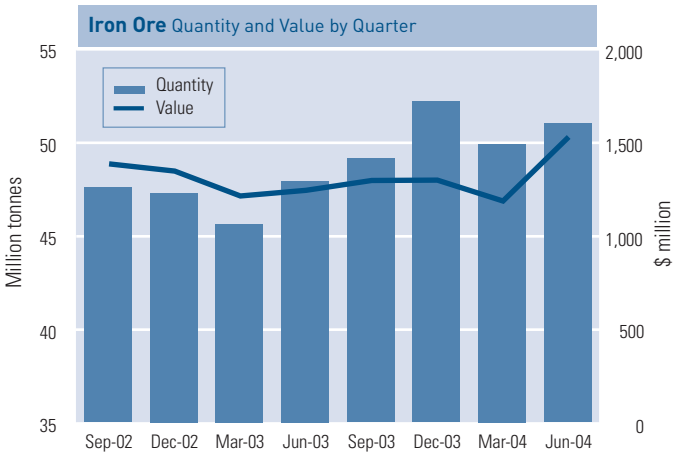
Source: Tex Report, High Grade Fine Ore Prices

Figure 22

products, while the company's Yandicoogina operation produces a fine ore pisolitic product.

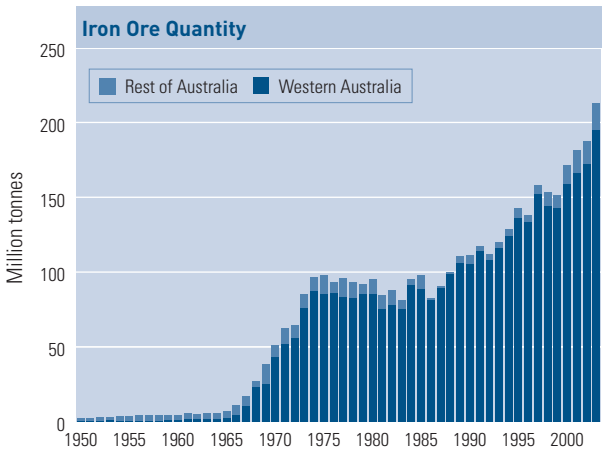
Robe River produced 42 Mt of iron ore in 2003–04, 11.4 per cent higher than the 37.7 Mt produced in 2002–03.

During 2003–04, the Rio Tinto Group continued to invest considerable capital in the upgrade of rail and port capacity to meet new developments in its iron ore operations in the Pilbara. In April 2004, construction was completed of the Eastern Range deposit near Paraburdoo in which Hamersley Iron has a 54 per cent equity and Shanghai–Baosteel 46 per cent. The Eastern Range mine will supply Shanghai–Baosteel, one of China's largest steel mills, with an estimated 200 Mt of iron ore during a 20-year period.



Source: DoIR

Figure 23



Source: DoIR and ABARE

Figure 24

Furthermore, in early 2004, Rio Tinto signed a Heads of Agreement with the same company for an additional iron ore supply contract, commencing in 2006. This deal involves the shipment of 7 Mt/a of products from its Hamersley operations and the Robe River Joint Venture.

The new sale arrangements mean that from 2006–07, Hamersley Iron will be committed to long-term sale agreements of iron ore totalling around 70 Mt to Chinese steel mills through joint ventures or long-term contracts. Robe River, in which Rio has a 53 per cent shareholding, will provide 15 Mt/a of this tonnage under long-term contracts to China.

The merger of Hamersley Iron and Robe River rail systems into a joint operation, through the Pilbara Rail Company has also added significant flexibility in rail haulage and the potential use of Dampier and Cape Lambert port facilities. The company has also upgraded port facilities at Dampier and Cape Lambert and Hamersley has commenced shipping iron ore through Robe River's port at Cape Lambert. Other arrangements are being finalised through the establishment of the joint entity Pilbara Iron to operate and maintain rail, port and power infrastructure of the two companies.

Iron ore production from Tom Price, Paraburdoo–Channar and Marandoo operations is forecast to be steady, with replacement of existing Paraburdoo pits from the joint venture development between Hamersley Iron and Baosteel in the Eastern Ranges, east of Paraburdoo, and potentially the Western Ranges in due course.

Hamersley Iron's Yandicoogina pisolite operation continues to expand since its commissioning in 1999. Expansions will lift capacity from 24 Mt/a to 36 Mt/a by mid-2005. Plans are proposed to further increase capacity above 50 Mt/a.

Construction of Rio Tinto's A$200-million HIsmelt facility at Kwinana which was started in early 2003, is expected to be commissioned early in 2005.

Over the years, considerable discussion has been directed to third party access to privately owned rail and port infrastructure of iron ore companies operating in the Pilbara. With iron ore mines located between 200 km and 460 km from the ports, efficiently using the rail network is crucial to the economic success of the iron ore companies. The heavy-duty Pilbara rail networks are acknowledged as being the most sophisticated and efficient operations in the world.

The other major producer in the Pilbara, BHP Billiton (BHPB) also continued to evaluate different expansion options in order to significantly expand its operations to meet world demand. The company's major operations comprise Newman, Marillana Creek, Mining Area C (MAC), Goldsworthy, Yandi and Jimblebar.

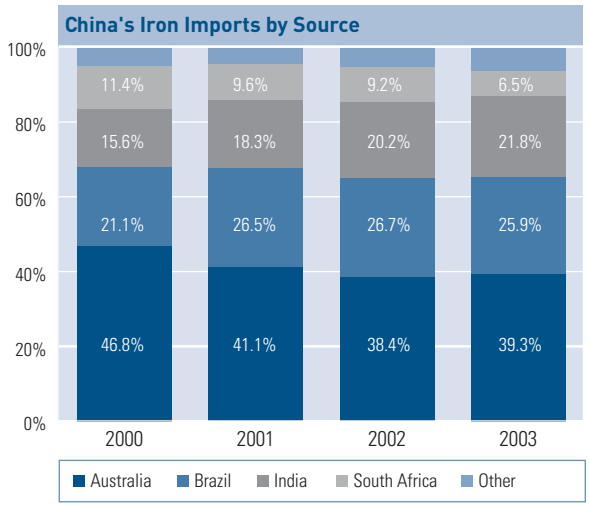
In February 2004, BHPB indicated that it would evaluate the possibility of increasing iron ore output to 145 Mt/a to specifically feed the rapidly expanding steel industry in China. This announcement was made after the company said it would spend A$145 million to lift capacity to 110 Mt/a by the end of 2004, up from the initial 100 Mt/a. As part of its growing iron ore trading links with China, BHPB announced in March 2004 that it had secured a record 25-year US$9-billion export deal to ship 12 Mt/a of iron ore to Chinese steel mills. The agreement saw the establishment of the Wheelara Joint Venture, with four Chinese mills collectively taking a 40 per cent interest in a sub-lease of the Jimblebar mine located near Newman. BHPB will have a 51 per cent equity and the Japanese joint venture partners nine per cent.

During 2003–04, Portman Ltd produced 5.2 Mt of iron ore at its mining operations at Koolyanobbing, 400 km east of Perth in the Yilgarn region. The operation has been expanded, by developing the Windarling and Mount Jackson deposits 100 km north of Koolyanobbing. This allows the operation to increase production and sustain it at around 5 to 6 Mt/a for an extended period, with the ability to blend the range of ore qualities to allow full exploitation of the resource base within market-acceptable quality limits. In addition, in October 2004, the company indicated it was committing $55 million to further expand production at its Koolyanobbing operation to around 8 Mt/a with full capacity expected to be attained in late 2006. This expansion announcement follows an upgrading of reserves at Koolyanobbing that has extended the life of the mine by 13 years, with additional upside potential from exploration.

Furthermore, the Portman–Henry Walker Eltin Joint Venture on Cockatoo Island in the north of the State (the Kimberley Region), has switched from a dumps reprocessing operation to redevelopment of the old Cockatoo mine site below sea level. A tonnage of 4 Mt/a has been delineated, and it is proposed to exploit at a rate of 1 Mt/a.

A new producer in the State's iron ore shipments industry is Mount Gibson Iron Limited (MGI) which commenced shipments of hematite at Tallering Peak, 130 km northeast of Geraldton early in 2004. Ore is transported 55 km by road to a rail load-out facility at Mullewa and then is transported by rail to a 150 000 t capacity storage shed at Geraldton Port. The first ore was shipped through the Geraldton Port on 23 February 2004. The current production output of 1.8 Mt/a will be increased to 2.2 Mt/a by the end of 2004–05. The life of the mine is expected to be eight to ten years, dependent on the results of further drilling. All ore has been sold forward for the life of the Tallering Peak mine, with about 50 per cent going to two trading companies, Stemcore (S.E.A.) Pty Ltd and Sinom (Hong Kong) Ltd, and 50 per cent to two end users, Glencore International AG and Prosperity Minerals (Asia) Limited.

MGI is also considering other production options, including development plans principally founded on the exploitation of the primary banded iron formations at Mount Gibson involving concentration and pelletising. This option is based on a defined resource of around 200 Mt of low-grade magnetite at Mount Gibson, and potentially significantly more within nine deposits in the immediate area. Overall, MGI's development plans are to occur in three stages. The first stage commenced with mining at Tallering Peak. The final two stages will occur at Extension Hill at Mount Gibson and will include the development of a 1.8 Mt/a hematite operation, and production of 5 Mt/a of magnetite concentrate, planned for shipment to pelletising facilities in China.



Sources: China Customs and The TEX Report

Figure 25

In other developments, Fortescue Metals Group (FMG), a new entrant into the State's iron ore sector, is conducting a pre feasibility study into a new iron ore development in the Pilbara based on prospects centred around Mount Nicholas, and Christmas Creek in the Chichester Ranges. In late 2004, negotiations between the State Government, FMG and The Pilbara Infrastructure (TPI – a subsidiary of FMG) were completed for a State Agreement that will facilitate new $1.4-billion multi-user railway and port facilities in the Pilbara. Under the agreement, TPI proposes to construct a 520 km multi-user railway from iron ore deposits in the eastern and central Pilbara to Port Hedland and to develop new multi-user facilities at the port.

There are a number of other new developments at various stages of evaluation and being proposed to meet the China boom, including Hope Downs, Fortescue, Koolanooka, Weld Range, Mt Karana, Koolan Island and Southdown.

The continued vigour of the steel industries in China, South Korea and Taiwan linked to a stable major supply base of Japan will underpin significant increases in Western Australia's iron ore sales well into the next decade. Against a backdrop of enormous industrial growth forecast in China and other countries in Asia, the State's iron ore industry is poised for a long-term future at high production rates. It is therefore, an industry diversifying into new mines and into a changing product mix with the major iron ore companies continuing to improve product quality and infrastructure.

4.3 Gold

Sale volumes for the State's gold industry suffered a decline of six per cent in 2003–04 to 5.7 Moz (177 t). In volume terms, gold production was the lowest since 1989–90. Wet weather particularly in the first half of 2004 with rainstorms hitting operations in March caused many plants to cut back operations. Mills also treated fewer tonnes and lower grade ores in some instances. These factors combined to cut into Western Australia's gold production.

As an example, Placer Dome's Kalgoorlie West operation suffered a reduction in ore sources due to changes in production scheduling and high sulphur content in ore lowered production at Kanowna Belle. Similarly, Barrick Gold's Plutonic operation was affected by difficult ground conditions while Sons of Gwalia's Tarmoola plant treated lower grade stockpiles following closure of its Tarmoola pit. Plant closures at Bronzewing and Paraburdoo also contributed to the production downturn.

Western Australia's 10 largest projects produced 3.5 Moz or 110.4 t of gold and accounted for 62 per cent of the State's total gold production in 2003–04. These projects comprised:

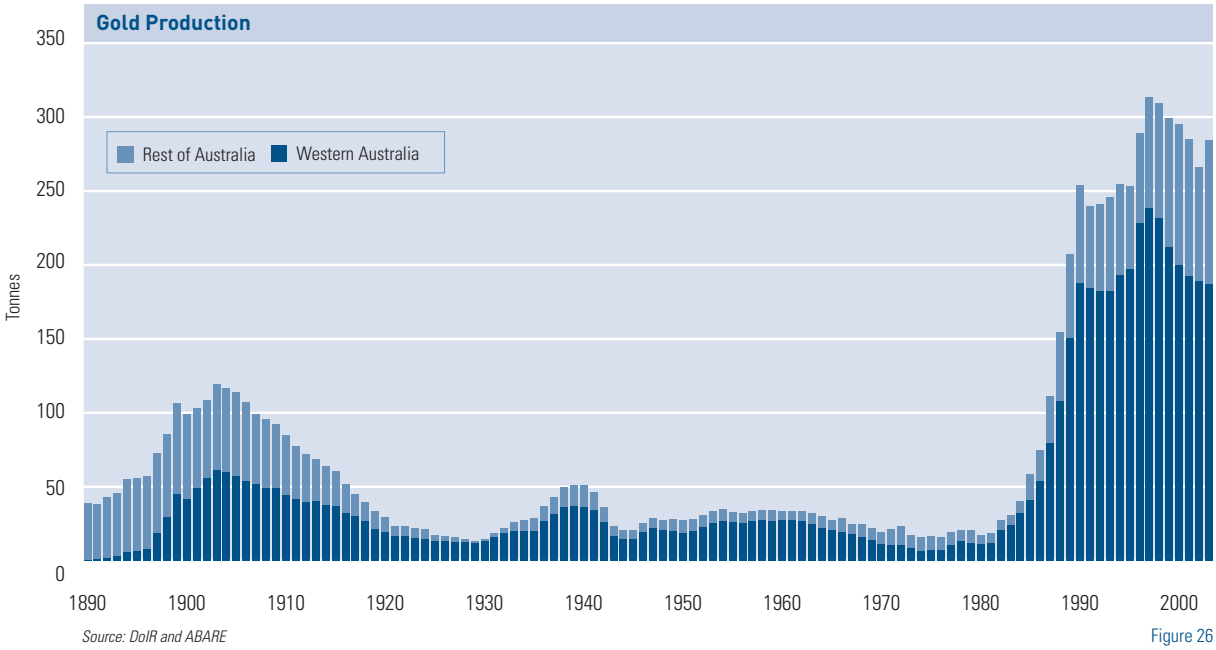
- Super Pit (KCGM -Newmont and Barrick Gold) – 864 613 oz (26.9 t)
- St Ives (Gold Fields) – 540 667 oz (16.8 t)
- Sunrise Dam (AngloGold Ashanti Limited) – 353 502 oz (11.0 t)
- Plutonic (Barrick Gold) – 350 159 oz (10.9 t)
- Jundee–Nimary (Newmont) – 286 330 oz (8.9 t)
- Paddington (Placer Dome) – 280 754 oz (8.7 t)
- Granny Smith (Placer Dome) – 250 011 oz (7.8 t)
- Kanowna Belle (Placer Dome) – 242 812 oz (7.6 t)
- Agnew (Gold Fields) – 205 626 oz (6.4 t)
- Hill 50 – Mount Magnet (Harmony Gold) – 174 783 oz (5.4 t)

Ownership of these 10 projects is split amongst the world's six top gold companies.

In 2003–04, international gold prices performed relatively well again, averaging US$389/oz. This represented a 16 per cent increase compared with 2002–03. However, the value of the Australian dollar against the US dollar appreciated by more than 22 per cent in 2003–04. This meant that the average local gold price denominated in Australian dollars in 2003–04 dropped by around five per cent. This result was compounded by the cut in Western Australia's gold production and the value of Western Australian gold sales falling by 10 per cent to $3.11 billion.

So far, weakness in the US dollar has been the key factor driving up the price of gold to a 16-year high in late November 2004. In fact, the price of gold has not increased by nearly as much in currencies other than the US dollar. Large budget and trade deficits in the US are causing the frailty in that country's currency and if these macro conditions persist, further weakness in the US dollar is likely and particularly against Asian currencies if China revalues the yuan. Such developments bode well in supporting the gold price but outside of these issues, 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 were to increase and the outlook for equities is also encouraging. This can place downward pressure on gold prices. Positively though, gold's safe haven status might also support the gold price in the short term due to the historically high oil prices and continued geopolitical uncertainty. If and when gold prices fall, increasing consumption, particularly from Asia in the context of appreciating Asian currencies could moderate the decline.



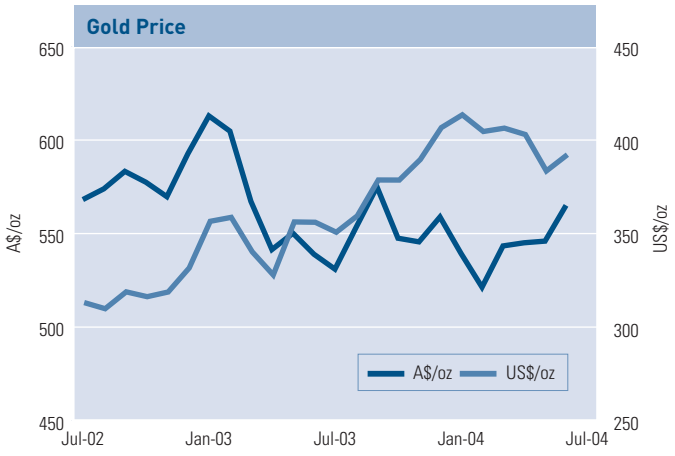
Source: DoIR and ABARE

Figure 26

On the supply side, the extension of the European Central Bank Gold Sales Agreement is moderating the impact of European Central Bank sell-offs. In addition, Asian Central Banks may increase their purchases while strong local currencies in Australia and South Africa can act to discourage production.

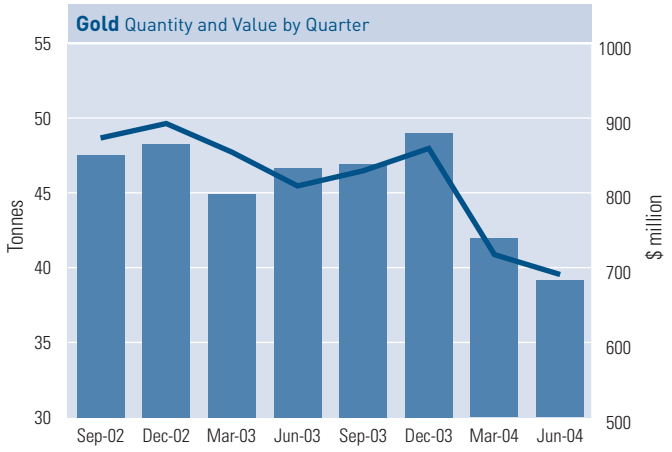
ABARE forecasts Australian gold production to increase by 12 per cent in 2004–05 to 292 t and expects most of the increase to occur from the redeveloped Western Australian Telfer mine which in November commenced processing gold and copper. The long-awaited Telfer project is expected, over the course of 20 years, to annually produce around 800 000 oz of gold and 30 000 t of copper.

Western Australia accounts for around two-thirds of Australian gold production. However, ABARE also forecasts a 7 per cent fall in export volumes for 2004– 05.



Source: The Perth Mint and London Fix

Figure 27



Source: DoIR

Figure 28

Gold Export update 2003–04

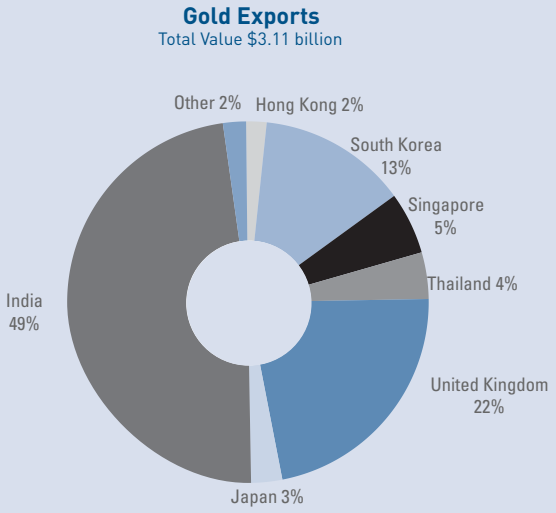
The Australian Bureau of Statistics (ABS) released trade data that indicated a significant rise in Western Australian gold exports. However, this apparent increase in gold exports from Western Australia has been due to the recent restructuring of Australia's gold refining industry.

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 as well as overseas operations, namely Papua New Guinea and Asia, which is refined and exported from Western Australia. This export figure is therefore larger than Western Australia's level of gold production.

The ABS estimates that gold exports from Western Australia in 2003–04 amounted to approximately $5.55 billion. Approximately 56 per cent or $3.11 billion was gold produced in Western Australia. The remaining 44 per cent (approximately $2.44 billion) can be attributed to gold refined and exported from Western Australia but produced from mining operations in other States and Territories and overseas.

Overseas imported gold also includes scrap which is refined in Western Australia and exported.



Source: ABS and DoIR

Figure 29

4.4 Alumina

Alumina production set yet another record, with sales edging up to 11.2 Mt in 2003–04. Western Australian alumina output has increased annually since 1980.

Prices received by local alumina producers averaged US$199/t in 2003–04. This represented a 22 per cent increase compared to the average annual price in 2002–03. However, despite this recovery in the alumina market, with solid US dollar price growth, the value of alumina sales in local currency terms decreased by four per cent to $3.085 billion. This was due to the impact of the appreciating Australian dollar.

The alumina industry is Western Australia's fourth-largest sector in terms of sales (after iron ore, crude oil and gold), accounting for 12 per cent of the total value of mineral and petroleum sales. The industry in this State comprises four alumina refineries operated by Alcoa and Worsley Alumina, located within close proximity to bauxite mines.

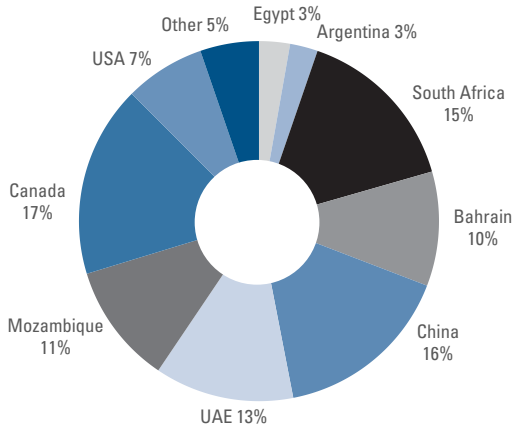
Alcoa's Pinjarra refinery is the State's largest and the world's second-largest producer of alumina accounting for around seven per cent of the world market. This refinery has been operating since 1972 with bauxite feedstock brought into the refinery by conveyor from Alcoa's Huntly mine and alumina exported through the Kwinana and Bunbury shipping terminals. 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. This is already Alcoa's lowest cost refinery and it is expected that the upgrade will come fully on-stream by the end of 2005.

Alcoa is also considering expansion of its Wagerup refinery. The Wagerup refinery has been in operation since 1984. It sources its bauxite by conveyor from the Willowdale mine, with a current alumina production capacity of 2.4 Mt/a and exports through the Bunbury shipping terminal. Alcoa's expansion plans for Wagerup encompass construction of a third production train to expand output to more than 4 Mt/a. This will require assessment at the level of the Environmental Review and Management Program.

Alcoa's oldest refinery is its Kwinana operation, which commenced in 1963. It has a production capacity of 2 Mt/a and ships alumina out of the Kwinana shipping facilities. Alcoa's first mine, at Jarrahdale, likewise began operations in 1963 and for 35 years, until its closure in 1998, supplied bauxite to the Kwinana refinery. The Huntly mine, established in the early 1970s to supply the Pinjarra refinery, now also supplies the ore (by rail) for Kwinana. Expanded capacity of the Huntly mine makes it the largest bauxite mine in the world.

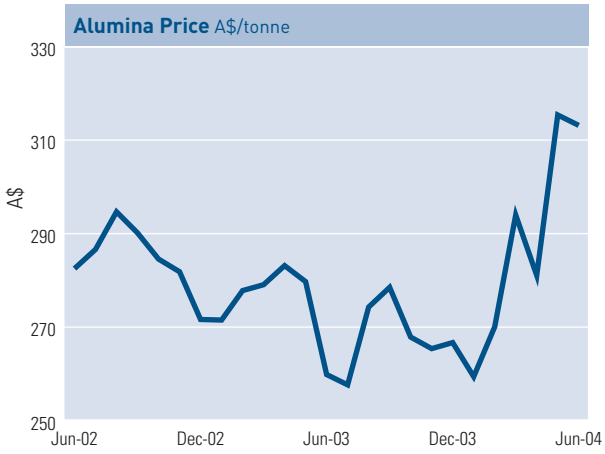
BHPB's Worsley Alumina refinery is Western Australia's second-largest refinery with annual production of 3.25 Mt/a. It was commissioned in 1984 and sources its feedstock by a 52-km overland conveyor from its Boddington bauxite mine. Alumina from

Alumina Exports
Total Value $2.8 billion



Source: DoIR

Figure 30

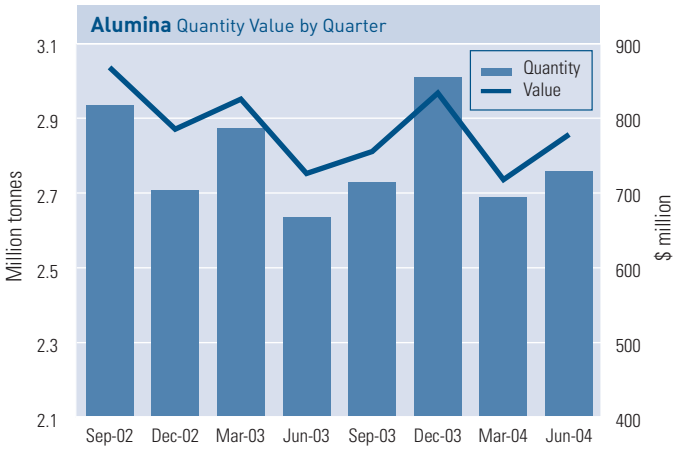


Source: ABS

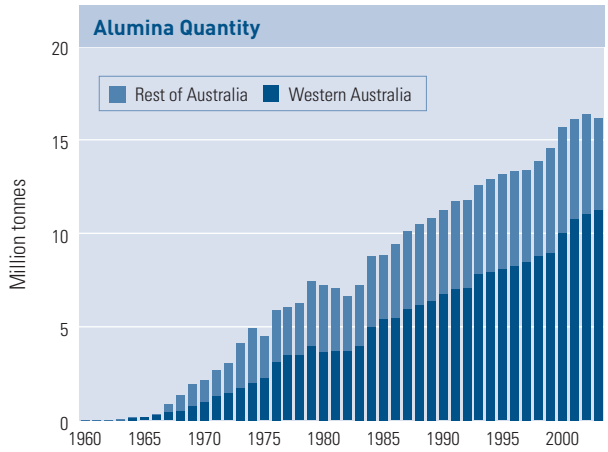
Figure 31

Worsley is exported through the Bunbury shipping terminal. The Worsley refinery is also undergoing a capacity expansion of 250 000 t/a to enable output to increase to 3.5 Mt/a over the next two years. This expansion program will expand the refinery's capacity to the maximum provided for by Worsley's current environmental approval. BHPB is also studying the possibility for incrementally expanding annual production at Worsley to more than 4 Mt/a.

Expansions in Western Australian alumina production, both underway and those being considered, are very much based on an upbeat prognosis on China and demand for aluminium. Other Asian countries are also benefitting from China's appetite for aluminium and even Japan is displaying relatively strong growth. The issue of hidden aluminium stocks across Eastern Europe and China has also largely dissipated. Such factors have combined to result in severe short-term tightness in the alumina market with reported delays in securing supplies and alumina spot prices in October 2004 up at



Source: DoIR Figure 32



Source: DoIR and ABARE Figure 33

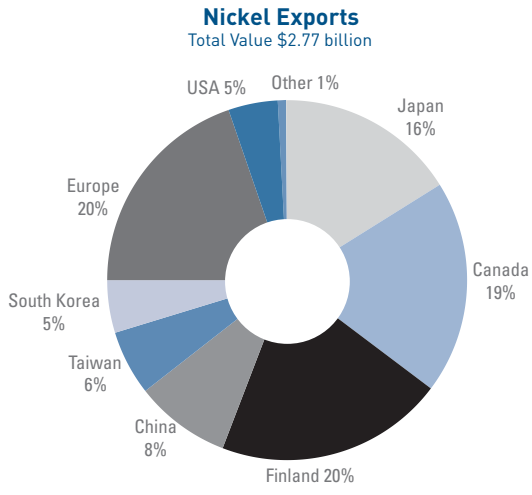
US$420/t which is equivalent to around 22 per cent of the LME aluminium price. Overall, for 2004, global aluminium consumption is estimated to total 30 Mt and for 2005 global consumption is forecast to increase to 31 Mt. This incorporates the analysts' view that in 2005 global demand growth rate will ease to 3.2 per cent. However, when coupling this with a forecast that in 2005 primary producers will only achieve 30.4 Mt, what looked like a balanced outlook for 2005 turns into a forecast deficit of 0.6 Mt. Accordingly this augurs well in terms of price forecasts for the local alumina industry.

The positive outlook for alumina is of course based on the strength of the aluminium market which was also demonstrated during October 2004 when the LME cash price for aluminium peaked at US$1894/t (US¢85.9/lb). This was a nine-year record and analysts point to it being challenged again in early 2005 with expected substantial supply deficits enduring until the third quarter of 2005. Only in 2006 is the situation expected to turn around, with a prognosis of a six per cent rise in supply overtaking four per cent growth in consumption. This outlook is couched within a prospect that Chinese domestic demand will slow down, in relative terms (reinforced by Beijing's belated hike in the official benchmark interest rate). Forecasts of primary aluminium demand have therefore been trimmed for both China and its major suppliers of semi-fabricated imports. However, this effect is not expected to be extraordinary with much of China's consumption being channelled into export goods.

4.5 Nickel

Nickel sales reached a fifth consecutive record in 2003–04 with a sales value of $3.011 billion, an increase of more than 21 per cent. The result was driven by a buoyant global nickel market that saw prices received by exporters climb 30 per cent in Australian dollar terms. Nickel sales' volumes, however, declined by six per cent to 180 519 tonnes in the same period. This was partly a result of expansion by nickel miners, which resulted in temporary reductions in production. Western Mining Corporation's (WMC) Mount Keith mine, for instance, only returned to full production in the September quarter 2004 after a major cutback process to access new ore. In addition, lower quality stockpiles and bad weather disrupted production, contributing to lower sale volumes.

Accordingly, Western Australian nickel exports continued to rise, reaching $2.8 billion, up by 17 per cent from 2002–03. Chinese imports accounted for 56 per cent of the increase in export values. South Korea's share of Western Australia's nickel exports also increased, to five per cent, while Taiwan's receded to six per cent. Finland continues to account for most exports (20 per cent), followed by Canada (19 per cent), Europe (other than Finland; 20 per cent) and Japan (16 per cent). Western Australia remains Australia's only nickel mining State.



Source: DoIR Figure 34

Despite the increasing number of nickel miners and emerging projects, the Western Australian nickel industry remained heavily concentrated with the largest five miners contributing close to 86 per cent of all nickel sales' volumes. The chief supplier remains WMC with its Mount Keith, Leinster, Kambalda and Kwinana operations. It produced more than 91 000 t in 2003–04 while processing lower grade ore. As a result of the associated lower concentrate supply, smelting was reduced and a planned maintenance shutdown of the Kalgoorlie smelter for 2005 was pulled forward to 2004. In addition, the Kwinana refinery was due for a three-yearly maintenance shutdown.

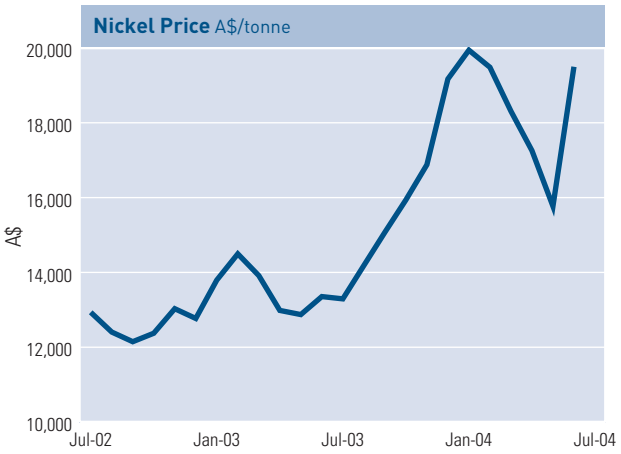
Minarra Resources (Murrin Murrin) produced 28 261 t of nickel in 2003–04 which was down on the previous year due to the impact of flooding in February and a planned shutdown to complete the capital program and maintenance problems in the hydrogen sulphide plant. A $100-million capital program was completed in June/July 2004.

The third-largest producer was Jubilee Mines (Cosmos) which at 14 420 t was also down on the previous year, due to developments in moving from open-pit to underground mining.

Other major producers include Mincor Resources (Miitel–Wannaway) and MPI Mines (Black Swan). Production at Miitel and Wannaway was impacted upon by various operational constraints. The Wannaway mine operated at a reduced production rate as mining moved to a remnant phase, though strong nickel prices extended the mine life of Wannaway which was originally due to close in December 2003. Operational problems also impacted on production from Black Swan.

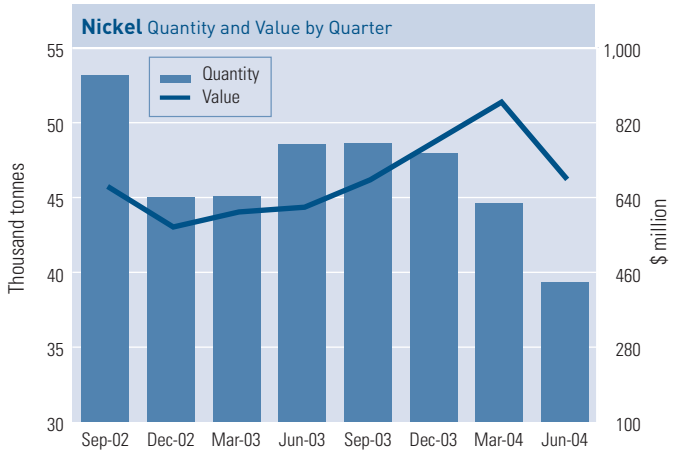
The combination of Western Australia's large nickel reserves and the buoyant nickel price has catalysed a range of new development activities. Among the most significant is BHPB's $1.4-billion Ravensthorpe nickel laterite project that is envisaged to ship 45 500 t/a of Ni–Co hydroxide. Construction was expected to begin in late 2004 with Ravensthorpe nickel expected to reach the market in late 2007 and full production in the second half of 2008. 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. Locally, Ravensthorpe will rival Murrin Murrin as Western Australia's second-largest nickel mine.

LionOre is also in the process of establishing itself as a major nickel producer in Western Australia as it seeks to integrate its Lake Johnston Emily Anne mine and the Maggie Hay project, which could see the Lake Johnston operations produce 11 000 t of nickel in the medium term compared with current sales of 7961 t. In addition, LionOre is seeking to acquire MPI Nickel subsequent to approval of a demerger of MPI Mines, which will see its gold assets being spun-off in a new entity, Leviathan Resources.



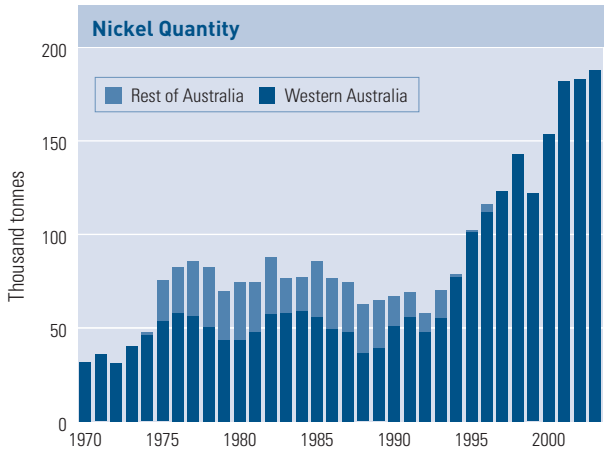
Source: LME Cash, Monthly Average

Figure 35



Source: DoIR

Figure 36



Source: DoIR and ABARE

Figure 37

The Sally Malay nickel (plus copper and cobalt) project in the East Kimberley began mining in September 2003 with ore processed in August and the first shipment to China in September 2004. Production is to subsequently ramp-up to around 8000 t/a with a whole-of-life sales agreement with two Chinese companies. In addition, a Sally Malay (75 per cent) and Donegal Resources (25 per cent) JV acquired WMC's Lanfranchi mine with production of a total nickel reserve of 25 600 t to begin by around the beginning of 2005.

A range of other nickel sulphide minors have toll treatment and concentrate purchase agreements in place with WMC, trucking ore to be concentrated at WMC's Kambalda operation, including:

- Australian Mines re-opened the Blair mine in March 2004 and according to company reports produced around 1500 t in the first six months of operation.
- Independence Group currently produces nickel from its Long Nickel and Gibb South with sales in the order of 3964 t in 2003–04, but is expected to expand considerably with further developments at its Gibb and Victor developments.
- Reliance Mining produced from remnant ore in the Hunt deposit with additional sulphide ore coming from the new Beta Hunt deposit that was recommissioned in July 2004. Sales reached 889 t in 2003–04 with scope to expand in 2004–05.
- Tectonic Resources operates the RAV8 mine at Ravensthorpe.
- View Resources 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 projects, 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 (off-take agreement with LionOre), 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 and its first shipment was made in August 2004 after beginning production in July. Annual production is expected to be around 3000 t.

While current Western Australian production is chiefly based on nickel sulphide deposits, most of Western Australia's nickel resources are laterite. However, operational problems in laterite processing have plagued Western Australia's three initial laterite operations Bulong, Cawse and Murrin Murrin. Indeed, two of these companies have ceased operation 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 with the aim of establishing a 50 000 t/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. It closed the refinery in 2002 but has since shipped output from the Cawse mine to its Finland refinery. OMG's nickel (sulphide) sales were 6276 t in 2003–04. 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 Honeymoon Well, joint venture partners MPM and OMG are considering the addition of a low pressure, oxidation leach system to OMG's Cawse nickel refinery, employing the sulphide autoclave process used at OMG's Finnish Kokkola operations.

Together with Murrin Murrin operation, the Ravensthorpe and Heron's laterite project could see a revitalised nickel laterite industry particularly in the light of Western Australia's large laterite resources.

Like other base metals, nickel prices experienced a correction in the second half of 2003–04 as a result of further tightening measures in China to slow inflationary pressures resulting from the country's overheating economy and associated commodity shortages. For instance, steel manufacturers are now required to provide 40 per cent (instead of 25 per cent) of equity for fixed asset borrowing and nickel demand is largely associated with expanding stainless steel production.

However, subject to the expected continued high level of growth in China, the outlook for nickel remains strong. Stocks are at historically low levels and additional capacity is only coming into production slowly with no major developments until 2006-07. Any additional supply is likely to come only from brownfield expansions and increased efficiency of existing mines. Western Australia's expanding nickel sector is therefore likely to be well placed to take advantage of this environment.

ABARE forecasts US dollar nickel prices to increase marginally over the coming year, and continued growth of Australian nickel exports both in volume and value terms. Western Australia is likely to continue to account for all of Australia's nickel mining in 2004–05. Solid prices are likely to continue until 2007, after which global production is predicted to exceed consumption for the first time since 2002.

4.6 Mineral Sands

In 2003–04, the total value of Western Australian heavy mineral sands sales (comprising the titanium group, zircon and garnet) amounted to $759 million. This was 10 per cent down on the value of sales in 2002–03.

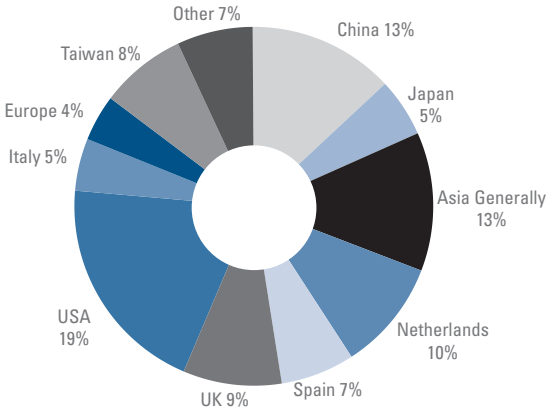
The total value of titanium feedstock mineral sands (ilmenite, rutile, synthetic rutile or upgraded ilmenite and leucoxene) amounted to $501 million in 2003–04. This was 15 per cent down on sales value in 2002–03. This was largely due to decreases in the sales value of ilmenite and synthetic rutile. The sales quantity for ilmenite decreased 18 per cent to 789 000 t in 2003–04 while synthetic rutile sales were slightly down by one per cent to 305 000 t. Furthermore, received prices for titanium feedstock minerals like rutile and ilmenite were down by around 17 per cent in 2003–04 compared with the previous year. This has been due to oversupply and more competitive market conditions, which was exacerbated by the entry of some new suppliers. Whilst the price fall for ilmenite was influenced by the strength of the Australian dollar compared with its US counterpart, the price in US dollar terms also fell slightly. However, the price fall for synthetic rutile is complicated by the presence of contracts denominated in Australian dollars.

Western Australia's rutile sales increased by 13 per cent in quantity terms to 128 000 t in 2003–04, but fell in value terms by five per cent to $78 million. This was chiefly due to the effect of the Australian dollar appreciation as rutile prices have gone against the general downward trend due to restricted supply and increased demand from the welding industry. Rutile prices are expected to show moderate increases in 2005 – as indeed they already have in the second half of 2004. This is due to continuing tight supply, which thus far is not totally being impacted upon by additional production from new projects.

Closely associated with the mining of titanium minerals is zircon. This mineral has widespread industrial applications including its usage in ceramics for glazes on tiles and in television picture tubes. The volume of zircon sales increased eight per cent in 2003–04 to 446 000 t. Unlike most titanium minerals, prices for zircon have increased in the past two to three years. However Western Australian producers have been unable to fully capitalise on this due to the strength of the Australian dollar. Overall, the value of zircon sales out of Western Australia during 2003–04 increased only marginally, by 0.5 per cent to $257 million.

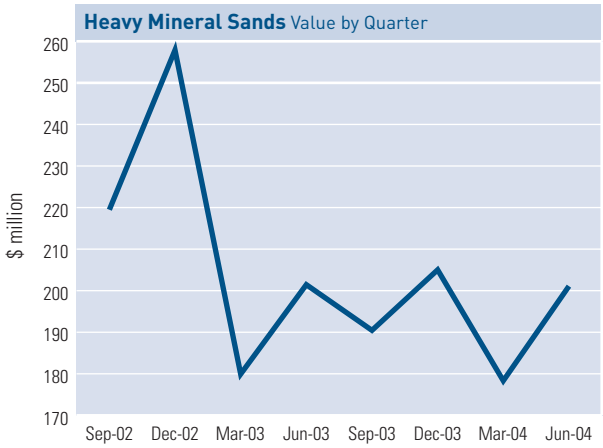
Although most zircon is exported, a substantial quantity is supplied to the domestic market including three local Western Australian producers involved in value-adding processing activities. These comprise Australian Fused Materials and Millennium Inorganic Chemicals in Kwinana plus Imdex in Jandakot.

Heavy Mineral Sands Exports
Total Value $623.08 million



Source: DoIR

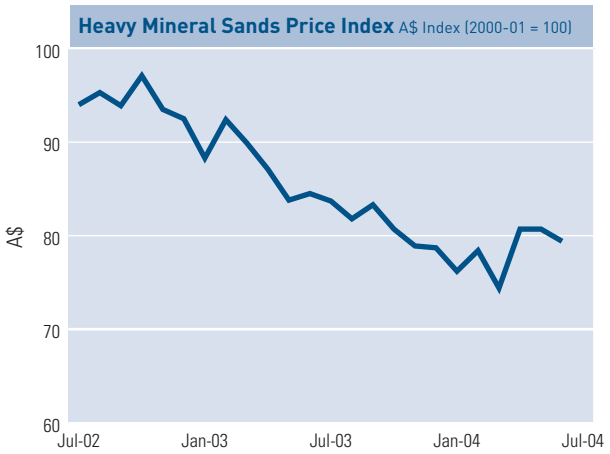
Figure 38



Source: DoIR

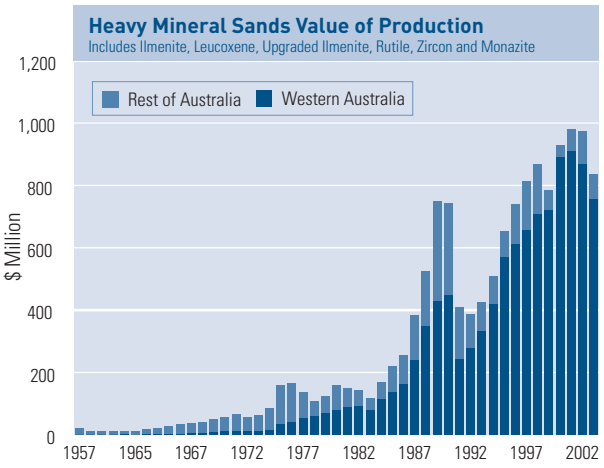
Figure 39

The majority of Western Australia's heavy mineral sands industry is located in the State's southwest region. Western Australian production is now confined to a small number of companies, focused around the Eneabba and Capel regions. These comprise Iluka Resources, BeMax (Cable Sands), the Tiwest Joint Venture and Doral Mineral Sands. Deposits north of Perth provide ilmenite of a 'high-titania altered variety' suitable for synthetic rutile production and the chloride route for titanium dioxide (TiO_2) pigment production. South of Perth, deposits are ilmenite-dominant and contain grades suitable for both the sulphate route (53-56 per cent TiO_2) and the chloride route (>57 per cent TiO_2).



Source: WA Treasury Corporation

Figure 40



Source: DoIR and ABARE

Figure 41

Iluka Resources operates from two locations, Capel 200 km south of Perth, which was Iluka's first mining and processing site when the company's operations began in the late 1950s and Eneabba, approximately 260 km north of Perth. Production facilities in the Capel area include three mine sites, two dry separation plants, a synthetic rutile processing plant and an administration complex. The Eneabba operation contains one of the world's major zircon and rutile deposits and is also the principal source of ilmenite for Iluka's processing plants at Narngulu, which is the processing centre for Iluka's operations in the mid-west and is located on the outskirts of Geraldton, 410 km north of Perth. Titanium minerals and zircon from Iluka's mid-west mining operations are processed at Narngulu before export through the Geraldton Port.

Significantly, in early 2004 the industry was consolidated with the merger of BeMax Resources, Nissho Iwai's RZM Cable Sands Group and Sons of Gwalia. As a result, the mineral sands assets were unified under BeMax with Cristal Australia (27 per cent), Nissho Iwai (20 per cent), Sons of Gwalia (15 per cent), Imperial One (six per cent) and other existing BeMax shareholders (31 per cent) as major shareholders. The resulting entity makes it Australia's third-largest titanium dioxide feedstock producer, accounting for 11 per cent of world ilmenite output and almost four per cent of world titanium dioxide output.

BeMax's operations in Western Australia include the Bunbury dry minerals separation plant which has a capacity in excess of 700 000 t/a and recently commissioned Tutunup mine in the southwest. The Bunbury separation plant produces a range of mineral sands products including ilmenite, zircon, rutile and leucoxene. Feedstock treated in the plant has been sourced from the Jangardup and Tutunup mines along with concentrates from storage at Waroona and Murray Basin Titanium's mine at Wemen, south east of Mildura in the Murray Basin. Active rehabilitation is underway at the exhausted Jangardup, Yarloop and Sandalwood mines. New developments are planned at Jangardup South and Gwindinup.

The TiWest Joint Venture, (co-owned by Ticor and Kerr McGee Chemical Corporation) operates a large scale mine at Cooljarloo, 180 km north of Perth and a synthetic rutile plant at Chandala, about 60 km north of Perth. Some synthetic rutile is exported while another portion is used as feedstock into Tiwest's titanium dioxide pigment plant in Kwinana. There is also a stand-alone mineral sands chemical plant operated by Millennium Inorganic Chemicals located at Kemerton, 20 km north of Bunbury. The company manufactures titanium dioxide pigment by the chlorination, purification and oxidation of synthetic rutile obtained from local producers.

Western Australia's fourth mineral sands producer is Doral Mineral Sands. Doral has a mineral sands mining operation near Dardanup which treats the titanium-based minerals at a processing plant in Picton.

In other developments, Gunson Resources is developing its Coburn deposit, which is located at Shark Bay. A bankable feasibility study for the project was expected to be finalised in December 2004. The zircon-rich Coburn project has an inferred resource estimate of 690 Mt, with zircon constituting 22 per cent of heavy minerals.

4.7 Diamonds

International diamond market conditions were buoyant in 2004, but Western Australia's diamond industry experienced a substantial fall in sales during 2003–04 with a significant 16 per cent drop to 32 Mct. In addition, the appreciation of the Australian dollar caused severe erosion of any price gains. As a result, the value of diamond sales fell by 33 per cent to $520 billion.

Rio Tinto's Argyle mine accounts for the bulk of diamond sales from Western Australia. The Argyle project is the world's largest supplier of diamonds and its output of industrial-grade diamonds accounts for almost all of Australia's diamond production and around a fifth of world production. In 2003–04, Argyle's production of 24.3 Mct was down by 24 per cent on its 2002–03 production level of 31.9 Mct.

Currently, the Argyle open pit operation is expected to continue until 2007, and a feasibility study is underway investigating 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 also continued at Western Australia's only other diamond mine, Kimberley Diamond Company's Ellendale mine near Derby. In 2003–04, the company's diamond sales amounted to 48 000 ct, slightly down on the 52 000 ct sold in 2002–03. However, during the September quarter of 2004 the company recovered a record 24 323 ct and sold a record 33 956 ct for $412.3 million.

Ellendale 9, the first stage of Kimberley Diamond's Ellendale mine, reached full production in 2004. The operation at Ellendale 9 comprises the recently commissioned 2.2 Mt/a East Plant, the existing 600 000 t/a West Plant and the Pipe 9 mining operations and infrastructure.

Kimberley Diamond expects to continue expanding and predicts that it will be amongst the world's top-five diamond producers within the next three years. In December 2004, the Kimberley Diamond Company approved a new mining and processing operation at Ellendale Pipe 4, which will push the operation's processing capacity up to 7.2 Mt/a. This new long-term production rate is expected to start in 2006 and will enable production to increase to 700 000 ct/a.

The search for marine diamonds resumed with Bonaparte Diamond Mines listing on the Australian Stock Exchange in October 2004. Using offshore diamond dredging equipment, the company plans to sample a large area of the seabed in a region known as the Lacrosse Scour Basin north of Wyndham near the mouth of the Ord River. The theory is that diamonds deposited onshore in the volcanoes that produced the Argyle deposit and other mines like Ellendale, have gradually been eroded and washed into the sea off the northwest coast of Western Australia.

4.8 Base Metals

The overall value of Western Australia's base metals production (copper, lead and zinc) fell sharply in 2003–04 to $246 million from $344 million in 2002–03. The fall was principally due to reduced production and the strengthening of the Australian dollar. Copper was the only base metal commodity in 2003–04 to experience an increase in its value of sales. In 2003–04, copper accounted for 63 per cent of total base metal sales, while zinc accounted for 32 per cent and lead for the remaining five per cent.

Copper

Western Australia produces three copper products; copper cathode, copper concentrates and copper by-product from gold and nickel projects. The volume of copper by product and copper cathode produced during 2003–04 was down 12 per cent to 25 024 t. The volume of copper concentrate produced during 2003–04 also fell by 11 per cent.

Overall, the volume of copper produced decreased by 11 per cent to 52 792 t in 2003–04 compared with 59 447 t in 2002–03. However, for Western Australian producers, the actual value of copper sold performed well, with the value of sales rising 11 per cent in 2003–04 to $154 million from $139 million in the previous year. Two factors were principally responsible for this favourable sales outcome. Firstly, the international copper price performed very well in 2003–04. In 2003–04, the average LME price of copper (US$2333/t or US$1.06/lb) was 46 per cent higher compared to 2002–03. Secondly, a 36 per cent reduction in treatment costs for the copper concentrates increased returns to local producers.

The reduction in treatment costs was driven by both supply and demand factors. Supply was restricted due to several copper producers either closing mines such as BHP's Tintaya operation, on standby since January 2002, or reduced production from Escondida and Phelps Dodge. Smelter demand was high due to strong consumption particularly from China. It is anticipated that as copper prices remain firm and operations resume full-scale production, the treatment costs associated with copper concentrates will start to increase.

Zinc

The LME price of zinc in 2003–04 increased by 24 per cent, averaging US$961/t compared with US$775/t in 2002–03. Zinc prices have increased during 2003–04 principally due to strong Chinese demand and relatively good OECD economic growth. However, the quantity of zinc produced in Western Australia fell nearly 48 per cent to 107 892 t in 2003–04 compared with 206 451 t in 2002–03. This was the fourth consecutive annual fall in tonnage. The value of zinc also fell substantially by 53 per cent from $173 million in 2002–03 to $81 million in 2003–04.

Until recently, zinc was mined at two operations in Western Australia, at Newmont's Golden Grove operation and Western Metals' Lennard Shelf operations. The Lennard Shelf lead–zinc mine ceased operating in early 2004 and has been placed on care and maintenance. Prior to Lennard Shelf stopping production, the operation was the world's sixth-largest zinc mine producing concentrates of high-grade zinc with low impurities. Zinc prices have risen in 2003–04 due mainly to robust Chinese demand and stronger industrial production growth in the OECD countries.

In October 2003, Teck Cominco of Vancouver, British Columbia, agreed to buy the Lennard Shelf zinc-mining assets from the receiver of Western Metals and to evaluate the redevelopment potential.

Lead

Lead and zinc are usually found together in deposits, therefore it is not uncommon that the same operation produces lead as a co-product of zinc. After being in the doldrums for several years, in 2003–04, lead prices underwent a remarkable recovery, increasing by 57 per cent to an average of US$700/t or US¢32/lb. Fundamentals behind this reflected strong demand for electrical battery storage and under-investment in mine production.

Since lead from the Golden Grove and Lennard Shelf operation is produced in association with zinc, the reduced level of zinc production also caused a reduction in the level of lead output. In 2003–04, total lead volumes were down 41 745 t or close to a massive 60 per cent. This was principally due to the closure of the Lennard Shelf zinc–lead mine in early 2004.

Western Australia should however see a resurgence in lead output with the establishment of the Magellan lead mine, 30 km east of Wiluna. This mine is expected to come on-stream in the first quarter of 2005. The Magellan lead mine represents the State's first stand-alone lead mine in more than 30 years when the Wheal Ellen North mine at Northampton ceased production in 1973. The Magellan project is being developed by Canadian miner Ivernia and is based on reserves totalling 16.2 Mt grading 6.2 per cent lead based on a price of US$700/t. For the first 18–24 months Magellan will produce lead concentrates, which will be exported to smelters overseas until the refinery is built. Fruition of ultimate plans could see lead metal production rates of 70 000 to 90 000 t/a.

4.9 Other Minerals

Coal

All of Western Australia's coal supplies are sold domestically to Western Power or large local energy users, mainly in the mineral-processing sector. In 2003–04, Western Australian coal sales decreased by five per cent to 6 Mt while the value of sales remained almost static at $274 million.

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 per cent dedicated to the Muja power station.

Cobalt

In US dollar terms, cobalt prices skyrocketed by 158 per cent during 2003–04 to record an average of US$46 335/t (US$21/lb) with price increases even far exceeding those for nickel. This resulted in the average price of cobalt in Australian dollar terms growing by 109 per cent. Price increases have been driven by strong demand, particularly from China.

Reflecting buoyant demand and strong prices, Western Australian cobalt sales increased by a staggering 87 per cent in 2003–04 to $232 million despite sales tonnage increasing only 12 per cent to 5495 t. The value of cobalt sales in 2003–04 meant that the cobalt sector has now jumped to take position as the second most valuable 'other minerals' sector after coal.

There are some question marks over how long such high prices for cobalt can be sustained. Cobalt prices appeared to stabilise at around the mid to high US$50 000 mark during July to October 2004 but in November fell sharply to around US$38 000. The impetus of economic growth behind the demand for metals such as cobalt appeared to have slowed and there is no question that the growth rates experienced in cobalt prices during 2003–04 are unlikely to be repeated in the coming year.

The main issue remains the supply response and whether the narrowing of the gap between supply and demand actually leads to surplus markets and further price drops. Analysts point out that as for most metals, the deficits may remain in place through the first half of 2005 with perhaps a final surge in prices taking place over that period.

Salt

Western Australia accounts for approximately 97 per cent of the nation's salt production and is the country's predominant exporter of salt. In 2003–04, Western Australian salt sales continued to increase, growing by three per cent to 9.9 Mt. However, a drop in received prices and appreciation in the Australian dollar resulted in a deterioration of the value of sales, which fell in excess of 21 per cent to $180 million.

Dampier Salt's operations are the State's chief producer and the world's largest exporter of solar salt (Dampier Salt is also Australia's largest producer and exporter of natural gypsum). Dampier Salt is majority-owned by Rio Tinto (65 per cent), Marubeni Corporation (20.5 per cent), Nissho Iwai Corporation (10.1 per cent) and Itochu Corporation (4.5 per cent). 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 is undertaking a feasibility study has initiated the EPA assessment and approval processes in regard to the Exmouth Gulf Solar Salt project. The company proposes to produce up to 10 Mt/a of salt which would make the project one of the world's largest. Capital expenditure for this project has been estimated to be in the order of $120 million.

Salt is primarily used as a feedstock for the production of chemicals and plastic. In the context of growing demand from Asia, demand for salt is likely to continue to increase. Western Australian salt producers are therefore 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 2003–04, Western Australian tin, tantalum and lithium sales declined 26 per cent to $162 million, as the sector was negatively affected by the rising local currency and a fall in the sales quantity of tantalite and tin.

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 average around US$30/lb.

Western Australia has the world's largest tantalum mines with Sons of Gwalia's (SOG) Greenbushes and Wodgina operations. SOG is the world's largest producer of tantalum concentrate providing 50 per cent of global supply from the two mines that hold around 70 per cent of global reserves. Tantalum production is also sourced from Haddington Resources' Bald Hill project in Western Australia's Eastern Goldfields. Haddington Resources operates Bald Hill under a licence agreement with SOG, which purchases all concentrate under a take-or-pay licence agreement that runs through to 31 March 2006. This agreement gives Haddington the exclusive rights to develop the Bald Hill and Cattlin Creek tantalite deposits.

In August 2004, SOG went into voluntary administration, mainly the result of hedging and technical problems with the gold aspects of the company's operation. Whilst this created some uncertainty in the global tantalum market, in December 2004 it was announced that new supply arrangements had been locked in until September 2005 with SOG advising Haddington Resources that it will be required to supply 150 000 lb (more than 168 t) of the mineral between January and September of 2005. It was also announced that the administrators of SOG are to spend $18 million expanding SOG's Greenbushes and Wodgina mines in addition to signing off on a new contract with Bayer subsidiary HCStarck to supply 800 000 lbs (363 t) of tantalum a year between 2006 and 2008.

All of the tantalum Haddington produces is currently sourced from tenements currently held by SOG. However, the company holds extensive tantalum exploration project areas in its own right. In December it announced it was raising $1.6 million in a rights issue to finance new tantalum exploration with the aim of establishing its own independent mine. Exploration targets include 185 km^2 at Bald Hill, 650 km^2 in the Pilbara and tenements at Shoebridge in the Northern Territory. It is initially proposed to drill a total of 120 RC holes on Haddington's tenements, which are adjacent to the SOG leases. The proximity of these targets to the current Bald Hill operations ensures that ore can easily be transported for treatment to the Bald Hill located treatment plant.

SOG is also one of three dominant global producers of spodumene (lithium concentrate), accounting for approximately 60 per cent 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.

Western Australia's third tantalum producer, Tantalum Australia, kept its Dalgaranga operation on care and maintenance due to the low tantalum prices.

High stocks and overcapacity are likely to moderate price. It is understood that the tantalum industry approached the US Defence National Stockpile Centre in 2003 to delay stockpile sales until 2004 due to excess commercial stocks. Analysts also estimate that current producers have the capacity to meet annual demand growth of 20 per cent 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.

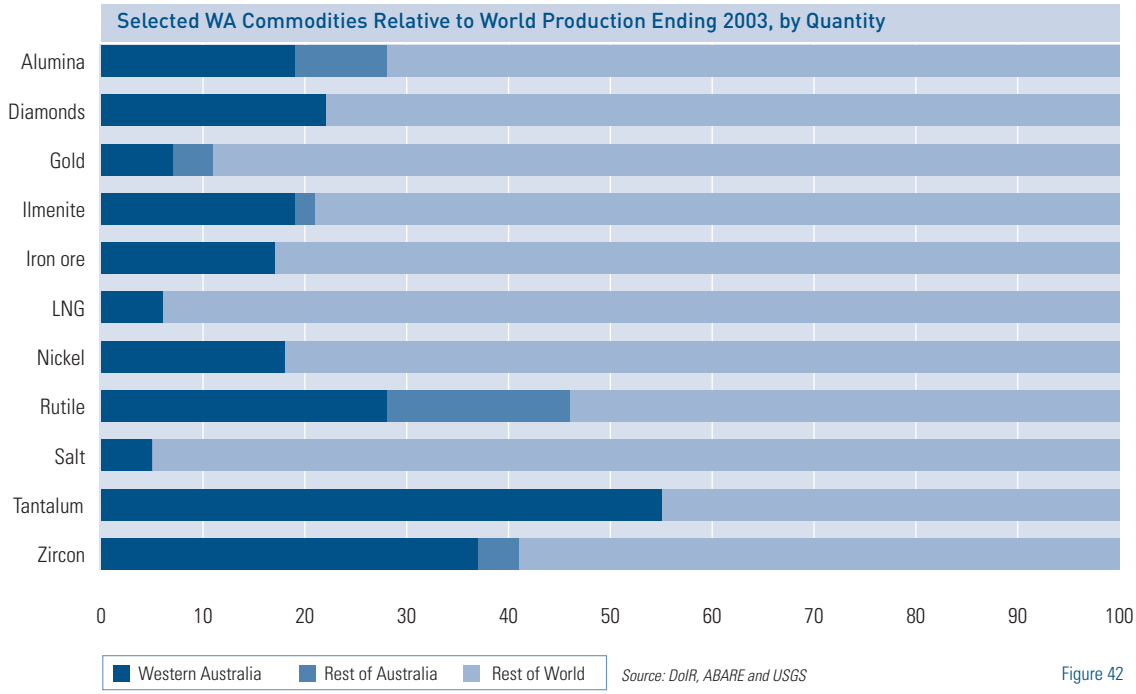
In 2003–04, Western Australian tin export dropped with US dollar price increases being offset by the appreciation of the Australian dollar. In volume terms, tin sales fell by 29 per cent to 540 t. As a result, tin sales values were down six per cent to $4.5 million. In Western Australia, tin is only produced as a by-product of tantalum mining. SOG is also Western Australia's largest tin producer and its Greenbushes operation also produces kaolin.

Manganese

The boom in global steel production strongly assisted by the Chinese demand has been driving the market for manganese. In 2003–04, Western Australia's manganese sales increased marginally one per cent to 624 000 t. While the sales volume increased only slightly, the value of sales increased in Australian dollar terms by almost seven per cent to $80 million. This largely reflected very healthy price gains, which counteracted the appreciation of the Australian dollar.

Consolidated Minerals' (CSM's) Woodie Woodie operation in the Pilbara is Western Australia's sole manganese producer and represents five per cent of the world's high-grade manganese. It produces 600 000 t/a of high-grade 48 per cent manganese ore which is exported, mostly under long-term contracts, to markets in Asia (mostly China) and Eastern Europe (mostly Ukraine). In response to buoyant prices and strong Chinese demand, CSM has been undertaking a $7-million expansion to increase production capacity to 800 000 t/a. The Woodie Woodie expansion was to be commissioned in November 2004, and output is further planned to increase to 1.2 Mt/a. On current reserve/resource inventories, Woodie Woodie has a mine life exceeding 10 years.

It is estimated that Australia has now overtaken Brazil and is 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.



Source: DoIR, ABARE and USGS

Figure 42

The latest comparable data show that the Western Australian share (by quantity) of the world's output of the following products was: alumina 19%, gold 7%, ilmenite 19%, iron ore 17%, LNG (sea-borne trade) 6%, nickel 18%, rutile 28%, salt 5%, tantalum 55%, zircon 37% and 22% of diamonds (mainly industrial grade)

Table 1 Quantity and Value of Minerals and Petroleum

COMMODITY	UNIT	2002–03		2003–04	
		QUANTITY	VALUE	QUANTITY	VALUE
ALUMINA	t	11,132,187	3,204,651,644	11,165,835	3,085,110,026
BASE METALS					
Copper Metal	t	59,447 (r)	138,780,268 (r)	52,792	154,467,966
Lead Metal	t	70,019	31,850,488	28,274	10,959,134
Zinc Metal	t	206,451	173,193,024	107,892	80,773,188
TOTAL BASE METALS			343,823,780 (r)		246,200,288
CHROMITE	t	31,187	6,323,498	95,162	26,425,398
CLAYS					
Attapulgite	t	11,366	1,186,952	10,710	1,118,445
Clay Shale	t	19,117	191,170	12,329	98,626
Fire Clay	t	0	0 (r)	43,256	661,890
Kaolin	t	1,837	147,239	394	43,937
Saponite	t	713	57,919	901	75,417
TOTAL CLAYS			1,583,280 (r)		1,998,315
COAL	t	6,323,197	272,886,748	5,983,579	274,281,359
CONSTRUCTION MATERIALS					
Aggregate	t	477,673	4,354,630	461,384	3,576,082
Gravel	t	154,806 (r)	1,088,798 (r)	108,488	792,728
Rock	t	350,834	3,465,632	364,612	3,129,658
Sand	t	1,436,049 (r)	7,291,151 (r)	2,233,001	11,051,126
Sandstone	t	568	31,240	0	0
TOTAL CONSTRUCTION MATERIALS			16,231,451 (r)		18,549,593
DIAMONDS	ct	38,892,238	773,323,675 (r)	32,499,105	519,689,012
DIMENSION STONE					
Granite	t	769	212,485	2,685	850,895
Marble	t	619 (r)	216,509 (r)	397	136,609
Other	t	100	45,000	0	0
TOTAL DIMENSION STONE			473,994 (r)		987,504
GEM & SEMI-PRECIOUS STONES	kg	180,298 (r)	227,714 (r)	37,942	196,693
GOLD	kg	187,474 (r)	3,445,336,712 (r)	177,013 (e)	3,109,562,344
GYPSUM	t	1,458,625 (r)	24,786,306 (r)	1,528,618	24,130,884
HEAVY MINERAL SANDS					
Garnet	t	110,972 (r)	n/a	118,929	n/a
Ilmenite	t	960,367	136,508,821	789,166	95,870,591
Upgraded Ilmenite (a)	t	597,274	353,782,300 (r)	592,755	304,616,466
Leucoxene	t	38,060	15,935,474	60,301	22,367,391
Rutile	t	113,569	82,530,715	128,417	78,272,220
Staurolite	t	1,613	242,988	2,157	258,370
Zircon	t	411,150 (r)	255,814,591 (r)	445,866	257,201,794
TOTAL HEAVY MINERAL SANDS			844,814,889 (r)		758,586,832
INDUSTRIAL PEGMATITE MINERALS					
Feldspar	t	43,144	2,169,260	35,222	1,806,348
IRON ORE					
Domestic	t	7,739,409	200,420,603	7,416,537	171,375,343
Exported	t	180,778,095 (r)	5,004,850,990 (r)	194,670,404	5,147,867,895
TOTAL IRON ORE		188,517,504 (r)	5,205,271,593 (r)	202,086,941	5,319,243,238

Table 1 Quantity and Value of Minerals and Petroleum cont.

COMMODITY	UNIT	2002–03		2003–04	
		QUANTITY	VALUE	QUANTITY	VALUE
LIMESAND-LIMESTONE-DOLOMITE					
Dolomite	t	8,870 (r)	89,697 (r)	10,842	216,353
Limesand-Limestone	t	4,884,233 (r)	19,421,112 (r)	4,606,537	33,597,599
TOTAL LIMESAND-LIMESTONE-DOLOMITE			19,510,809 (r)		33,813,952
MANGANESE ORE	t	619,651	75,377,357 (r)	624,269	80,309,662
NICKEL INDUSTRY					
Cobalt By-Product	t	2,035 (r)	54,471,438 (r)	1,671	75,506,127
Cobalt Metal	t	2,390	55,784,670	3,396	131,256,227
Cobalt Sulphide	t	495	13,926,085	428	25,183,551
TOTAL COBALT			124,182,193 (r)		231,945,905
Nickel Concentrate	t	1,355,882 (r)	1,997,056,701 (r)	1,535,210	2,519,978,800
Nickel Metal	t	37,915	485,414,557	30,492	491,462,505
Palladium By-Product	kg	517 (r)	7,468,326 (r)	502	4,303,189
Platinum By-Product	kg	152 (r)	4,337,857 (r)	78	2,709,968
TOTAL NICKEL INDUSTRY			2,618,459,634 (r)		3,250,400,367
PETROLEUM					
Condensate	kl	6,934,156	2,046,370,293 (r)	6,181,484	1,726,153,992
Crude Oil	kl	14,004,299 (r)	4,258,124,798 (r)	13,239,466	3,757,086,334
LNG	Btu 10^6	403,825,434 (r)	3,130,828,043 (r)	404,937,589	2,775,881,492
LPG - Butane	t	460,467	221,468,636	383,917	154,133,908
LPG - Propane	t	346,596	172,394,567	311,345	128,016,774
Natural Gas	'000m^3	8,120,105 (r)	661,920,544 (r)	8,060,810	681,043,657
TOTAL PETROLEUM			10,491,106,881 (r)		9,222,316,157
PIGMENTS					
Red Oxide	t	1,994 (r)	677,653 (r)	2,070	666,553
SALT	t	9,606,930	227,949,656 (r)	9,881,664	179,849,542
SILICA-SILICA SAND					
Silica	t	93,957	939,568	106,064	1,060,635
Silica Sand	t	658,555	7,075,787	538,141	5,698,983
TOTAL SILICA-SILICA SAND			8,015,355		6,759,618
SILVER	kg	82,591	20,232,606 (r)	57,461	13,982,584
SPONGOLITE	t	12,154	1,739,077	9,956	1,356,814
TALC	t	157,364	14,985,371	116,640	10,224,666
TIN-TANTALUM-LITHIUM					
Spodumene	t	102,573	n/a	114,568	n/a
Tantalite	t	1,006	n/a	873	n/a
Tin Metal	t	763	4,799,655	540	4,504,695
TOTAL TIN-TANTALUM-LITHIUM			217,287,947 (r)		161,586,689
VANADIUM	t	3,332 (r)	20,416,212 (r)	239	2,569,847
TOTAL VALUE			**27,857,663,102 (r)**		**26,350,604,285**

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

Table 2 Quantity and Value of Selected Major Commodities

		1994–95		1995–96		1996–97		1997–98	
	Unit	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M
ALUMINA	Mt	7.91	1,684.60	8.23	1,918.34	8.35	1,955.77	8.51	2,260.54
BASE METALS									
Copper Metal	kt	29.20	76.54	23.96	65.42	27.73	58.98	29.43	61.12
Lead Metal	kt	21.10	9.20	21.28	12.64	13.49	6.09	27.00	10.45
Zinc Metal	kt	132.85	95.84	113.49	75.32	88.37	75.12	124.00	117.11
TOTAL BASE METALS			181.58		153.39		140.19		188.68
COAL	Mt	5.86	274.75	5.90	270.36	5.56	257.30	5.71	257.28
COBALT	kt	0.79	48.07	0.87	66.69	0.88	50.85	1.50	81.78
DIAMONDS	M ct	23.93	480.03	33.52	525.21	52.52	395.79	42.48	537.87
GOLD	t	187.85	3,132.87	205.89	3,404.65	288.02	3,409.61	239.46	3,468.95
HEAVY MINERAL SANDS									
Ilmenite	Mt	0.99	89.65	1.10	111.18	1.10	117.28	1.31	149.14
Rutile	kt	107.78	56.13	119.14	75.06	110.96	77.74	104.13	78.58
Upgraded Ilmenite (Synthetic Rutile)	kt	490.00	228.29	517.00	252.56	545.00	270.48	688.00	355.79
Zircon	kt	477.05	129.77	410.03	181.21	324.09	177.99	321.38	169.13
Other HMS			14.56		18.50		26.51		24.63
TOTAL HEAVY MINERAL SANDS			518.40		638.51		670.00		777.27
IRON ORE	Mt	133.13	2,794.31	132.90	2,924.06	141.29	3,159.65	149.74	3,930.77
MANGANESE ORE	kt	71.91	8.84	347.04	41.34	324.11	37.32	86.30	9.39
NICKEL	kt	92.99	897.12	103.30	1,097.30	114.10	1,051.11	135.19	1,146.64
PETROLEUM									
Condensate	Gl	2.64	398.34	4.65	685.74	5.73	946.15	6.76	1,065.84
Crude oil	Gl	9.90	1,559.65	9.65	1,535.67	10.47	1,915.93	9.85	1,567.16
LNG	Btu 10^{12}	356.11	1,262.51	379.79	1,350.92	370.50	1,528.77	379.54	1,591.94
LPG - Butane	kt	0	0	100.24	22.71	209.69	59.67	376.09	90.47
LPG - Propane	kt	0	0	87.02	19.73	185.74	55.66	263.26	61.26
Natural Gas	Gm^3	5.37	445.71	6.31	454.76	6.89	534.65	6.88	557.47
TOTAL PETROLEUM			3,666.21		4,069.53		5,037.83		4,934.14
SALT	Mt	7.18	155.14	7.45	154.22	7.55	153.62	8.19	188.70
OTHER			116.45		125.75		141.33		153.07
TOTAL			**19,958.37**		**15,389.35**		**16,460.67**		**17,935.08**

1998–99		1999–2000		2000–01		2001–02		2002–03		2003–04	
Quantity	Value $M	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M
8.86	2,367.03	9.35	2,657.89	10.48	3,600.67	10.86	3,584.38	11.13	3,204.65	11.17	3,085.11
24.44	43.71	30.73	64.62	42.62	111.12	53.50	122.57	59.45	138.78	52.79	154.47
51.55	17.25	64.47	20.24	82.33	37.31	75.08	36.72	70.02	31.85	28.27	10.96
194.90	170.73	232.59	251.01	236.01	280.24	223.67	173.82	206.45	173.19	107.89	80.77
	231.69		335.87		428.67		333.11		343.82		246.20
5.80	256.74	6.50	271.53	6.10	252.28	6.16	258.13	6.32	272.89	5.98	274.28
1.09	55.27	2.07	86.26	4.19	174.38	4.43	127.36	4.92	124.18	5.50	231.95
51.23	610.44	50.98	703.67	25.42	614.45	25.69	489.34	38.89	773.32	32.50	519.69
219.26	3,219.52	204.96	2,951.26	201.21	3,245.06	185.00	3,279.50	187.47	3,445.34	177.01	3,109.56
1.32	158.59	1.16	151.66	1.10	168.75	0.80	128.75	0.96	136.51	0.79	95.87
119.71	90.97	98.49	72.78	127.21	110.04	122.61	106.74	113.57	82.53	128.42	78.27
475.54	275.23	552.51	324.65	643.27	409.19	585.91	380.21	597.27	353.10	592.76	304.62
284.53	136.07	348.11	153.27	343.08	198.84	317.77	218.84	411.15	255.81	445.87	257.20
	19.44		28.85		18.08		19.78		16.86		22.63
	680.30		731.20		904.90		854.32		844.81		758.59
141.03	3,898.53	151.16	3,722.12	161.77	4,912.70	164.63	5,207.61	188.52	5,205.27	202.09	5,319.24
27.40	3.42	212.38	25.68	401.36	58.50	474.27	68.62	619.65	75.38	624.27	80.31
125.77	876.62	143.93	1,806.29	167.45	2,238.74	179.46	2,002.07	191.89	2,482.47	180.52	3,011.44
5.55	743.91	6.35	1,583.94	5.81	1,984.53	6.33	1,680.03	6.93	2,046.37	6.18	1,726.16
9.16	1,189.64	12.05	3,144.77	13.96	4,792.05	15.09	4,198.78	14.00	4,258.12	13.24	3,757.09
391.90	1,434.42	393.61	1,971.06	429.54	2,695.53	386.08	2,970.61	403.83	3,130.83	404.94	2,775.88
388.69	90.62	443.58	190.90	428.90	221.97	482.20	193.71	460.47	221.47	383.92	154.13
259.21	57.63	334.57	145.94	333.47	187.54	374.32	167.87	346.60	172.39	311.35	128.02
6.44	549.83	6.55	578.76	7.63	630.36	7.53	643.28	8.12	661.92	8.06	681.04
	4,066.65		7,615.37		10,511.98		9,854.28		10,491.10		9,222.32
8.57	199.64	8.81	208.58	8.30	233.08	8.60	227.95	9.61	227.95	9.88	179.85
	189.73		229.26		371.67		409.47		366.48		312.06
	16,655.58		**21,344.98**		**27,547.08**		**26,696.14**		**27,857.66**		**26,350.60**

Table 3 **Financial Year 2003–04 Quantity and Value by Local Government Area**

COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUE	Ref (p.54)
ALUMINA	Boddington	3,275,390		901,115,945	
	Murray	5,521,705		1,528,405,808	
	Waroona	2,368,200		655,588,273	
TOTAL ALUMINA		**11,165,835**		**3,085,110,026**	(c), (d)
BASE METALS			Cu tonnes		
Copper By-Product	Coolgardie		2,084.42	5,910,782	
	Dundas		430.29	1,378,993	
	Kalgoorlie - Boulder		308.00	1,001,477	
	Ravensthorpe		153.38	548,305	
	Wiluna		444.54	1,553,086	
	Total		**3,420.63**	**10,392,643**	(a), (b)
			Cu tonnes		
Copper Concentrates	Yalgoo	135,384	27,767	78,702,535	(a)
			Cu tonnes		
Copper Cathode	East Pilbara		21,604	65,372,788	(a)
	Total Copper			**154,467,966**	(a), (b)
			Pb tonnes		
Lead	Derby - West Kimberley	36,897	27,070	10,348,771	
	Yalgoo	5,377	1,204	610,363	
	Total	**42,274**	**28,274**	**10,959,137**	(a)
			Zn tonnes		
Zinc	Derby - West Kimberley	270,599	56,208	39,186,970	
	Yalgoo	119,265	51,684	41,586,218	
	Total	**389,864**	**107,892**	**80,773,188**	(a)
TOTAL BASE METALS				**246,200,288**	
CHROMITE			Cr_2O_3 tonnes		
Chromite Ore	Meekatharra	**227,375**	**95,162**	**26,425,398**	(a)
CLAY					
Attapulgite	Mullewa	10,710		1,118,445	
Clay Shale	Collie	12,329		98,626	
Fire Clay	Broome	1,080		29,250	
	Chittering	42,176		632,640	
	Total	**43,256**		**661,890**	
Kaolin	Bridgetown - Greenbushes	394		43,937	
Saponite	Coorow	901		75,417	
TOTAL CLAY		**67,590**		**1,998,315**	(e)
COAL	Collie	**5,983,579**		**274,281,359**	(f)
CONSTRUCTION MATERIALS					
Aggregate	Ashburton	2,350		11,750	
	Broome	70,193		1,620,131	
	East Pilbara	19,621		98,106	
	Port Hedland Town	22,803		114,014	
	Roebourne	255,500		1,277,499	
	Wyndham - East Kimberley	90,919		454,582	
	Total	**461,384**		**3,576,082**	
Gravel	Broome	14,467		229,081	
	Coolgardie	8,589		42,966	
	Coorow	11,140		27,850	
	Kalamunda	56,055		392,385	
	Kalgoorlie - Boulder	3,314		16,570	
	Port Hedland Town	6,720		33,800	
	Wyndham - East Kimberley	8,205		50,076	
	Total	**108,488**		**792,728**	

Table 3 **Financial Year 2003–04 Quantity and Value by Local Government Area cont.**

COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUE	Ref (p.54)
Rock	Broome	10,274		260,205	
	Derby - West Kimberley	1,189		36,154	
	East Pilbara	314,456		1,572,283	
	Port Hedland Town	28,614		1,260,624	
	Wyndham - East Kimberley	79		392	
	Total	**364,612**		**3,129,658**	
Sand	Broome	74,424		549,379	
	Cockburn	17,698		83,181	
	Coolgardie	105,715		541,894	
	Coorow	3,363		8,891	
	Dandaragan	2,268		11,576	
	Derby - West Kimberley	15,500		129,406	
	Esperance	3,349		16,742	
	Kalgoorlie - Boulder	1,909		9,545	
	Marble Bar	63,450		317,249	
	Meekatharra	23,941		122,195	
	Menzies	24,640		123,200	
	Northam	123,911		619,555	
	Port Hedland Town	82,497		412,483	
	Roebourne	69,077		455,583	
	Wanneroo	1,616,512		7,626,174	
	Wyndham - East Kimberley	1,678		8,716	
	Yilgarn	3,071		15,357	
	Total	**2,233,001**		**11,051,126**	
TOTAL CONSTRUCTION MATERIAL		**3,167,486**		**18,549,593**	(e)
			carats		
DIAMONDS	Derby - West Kimberley		51,351	15,076,383	
	Wyndham - East Kimberley		32,447,754	504,612,629	
TOTAL DIAMONDS			**32,499,105**	**519,689,012**	(a)
DIMENSION STONE					
Granite	Cue	22		9,960	
	Dundas	2,330		818,720	
	Roebourne	333		22,215	
	Total	**2,685**		**850,895**	
Marble	Ashburton	397		136,609	
TOTAL DIMENSION STONE		**3,081**		**987,504**	(e)
GEM & SEMI-PRECIOUS STONES		kg			
Agate	Marble Bar	53,023		27,893	
Amethyst	Upper Gascoyne	113		815	
Chalcedony/Mookaite	Carnarvon	3,835		11,670	
Chrysoprase	Leonora	10,000		5,000	
Jasper	Meekatharra	56,512		16,967	
Tourmaline	Upper Gascoyne	257		853	
Variscite	Carnarvon	107,650		133,495	
TOTAL GEM & SEMI-PRECIOUS STONES		**231,390**		**196,693**	(d)

Table 3 **Financial Year 2003–04 Quantity and Value by Local Government Area cont.**

COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUE	Ref (p.54)
GOLD			Au kg		
	Coolgardie		26,934.122	473,174,733	
	Cue		496.949	8,811,652	
	Dundas		3,824.956	67,181,251	
	Kalgoorlie - Boulder		49,515.403	869,856,974	
	Laverton		7,776.211	136,717,852	
	Leonora		40,631.129	713,588,948	
	Meekatharra		13,604.262	239,098,513	
	Menzies		3,018.640	52,955,319	
	Mt Magnet		7,495.755	131,656,222	
	Sandstone		2,990.118	52,545,383	
	Statewide		284.659	4,996,927	
	Wiluna		12,328.356	216,380,636	
	Yalgoo		1,462.052	25,738,538	
	Yilgarn		6,650.271	116,859,396	
TOTAL GOLD			**177,012.883**	**3,109,562,344**	(g)
GYPSUM	Carnarvon	1,252,632		19,835,858	
	Corrigin	4,060		56,834	
	Dalwallinu	79,939		1,261,175	
	Dandaragan	46,859		1,547,088	
	Dundas	24,037		218,303	
	Esperance	7,303		73,680	
	Kent	27,465		383,148	
	Koorda	180		3,600	
	Lake Grace	23,768		246,120	
	Merredin	450		4,500	
	Nungarin	18,680		186,800	
	Perenjori	846		9,306	
	Ravensthorpe	17,840		108,000	
	Wyalkatchem	24,559		196,472	
TOTAL GYPSUM		**1,528,618**		**24,130,884**	(f)
HEAVY MINERAL SANDS					
Garnet Sand	Northampton	118,929		n/a	
			TiO_2 tonnes		
Ilmenite	Bunbury City	225,288	55.00	26,243,112	
	Capel	239,613	54.18	30,073,645	
	Carnamah	115,598	59.09	12,109,360	
	Dandaragan	83,952	54.00	11,439,630	
	Dardanup	124,715	54.63	16,004,844	
	Total	**789,166**	**55.19**	**95,870,591**	
			TiO_2 tonnes		
Synthetic Rutile	Capel	217,301	199,917	114,681,191	
	Carnamah	162,956	149,919	85,087,408	
	Dandaragan	212,498	195,498	104,847,867	
	Total	**592,755**	**545,334**	**304,616,466**	
			TiO_2 tonnes		
Leucoxene	Bunbury City	4,280	3,937	2,222,027	
	Capel	14,710	13,533	6,173,900	
	Dandaragan	32,820	27,110	9,775,023	
	Dardanup	8,491	7,813	4,196,441	
	Total	**60,301**	**52,393**	**22,367,391**	

Table 3 **Financial Year 2003–04 Quantity and Value by Local Government Area cont.**

COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUE	Ref (p.54)
			TiO_2 tonnes		
Rutile	Bunbury City	1,679	1,580	1,064,043	
	Carnamah	87,774	82,508	53,494,552	
	Dandaragan	38,964	37,405	23,713,625	
	Total	**128,417**	**121,493**	**78,272,220**	
Staurolite	Dandaragan	2,157		258,370	
			ZrO_2 tonnes		
Zircon	Bunbury City	18,548	12,056	10,598,033	
	Capel	53,145	34,544	31,182,702	
	Carnamah	261,440	169,935	153,537,066	
	Dandaragan	96,193	62,525	54,074,480	
	Dardanup	16,540	10,752	7,809,513	
	Total	**445,866**	**289,813**	**257,201,794**	
TOTAL HEAVY MINERAL SANDS				**758,586,832**	(a)
INDUSTRIAL PEGMATITE MINERALS					
Feldspar	East Pilbara	34,805		1,800,994	
	Mukinbudin	417		5,354	
	Total	**35,222**		**1,806,348**	(e)
IRON ORE					
Domestic Ore	East Pilbara	7,414,947		171,340,285	
	Yilgarn	1,590		35,058	
	Total	**7,416,537**		**171,375,343**	
Exported Ore	Ashburton	70,365,127		1,807,578,638	
	Derby - West Kimberley	528,102		16,351,144	
	East Pilbara	118,764,644		3,185,282,549	
	Mullewa	380,780		11,486,776	
	Yilgarn	4,631,751		127,168,788	
	Total	**194,670,404**		**5,147,867,895**	
TOTAL IRON ORE		**202,086,941**		**5,319,243,238**	(a)
LIMESAND-LIMESTONE-DOLOMITE					
Dolomite	Lake Grace	6,599		145,178	
	Yilgarn	4,243		71,175	
	Total	**10,842**		**216,353**	
Limesand - Limestone	Broome	752		6,012	
	Carnamah	17,774		71,096	
	Carnarvon	3,902		46,824	
	Cockburn	2,107,479		5,784,214	
	Coorow	18,632		54,211	
	Dandaragan	39,146		224,137	
	Dundas	177,269		15,832,117	
	Exmouth	15,832,117		78,696	
	Gingin	46,929		1,001,454	
	Irwin	171,650		458,267	
	Kwinana	8,951		26,855	
	Laverton	1,424,122		2,848,244	
	Manjimup	3,291		49,349	
	Shark Bay	2,385		333,859	
	Wanneroo	527,413		6,696,496	
	Wiluna	39,884		79,768	
	Wyndham - East Kimberley	400		6,000	
	Total	**4,606,537**		**33,597,599**	
TOTAL LIMESAND-LIMESTONE-DOLOMITE		**4,617,379**		**33,813,952**	(e)

Table 3 **Financial Year 2003–04 Quantity and Value by Local Government Area**

COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUE	Ref (p.54)
			Mn tonnes		
MANGANESE ORE	East Pilbara	**624,269**	**299,627**	**80,309,662**	(a)
NICKEL INDUSTRY			Co tonnes		
Cobalt By-Product	Coolgardie		636	21,225,798	
	Dundas		155	8,571,099	
	Kalgoorlie - Boulder		185	12,197,799	
	Laverton		280	14,182,246	
	Ravensthorpe		50	4,157,544	
	Wiluna		365	15,171,641	
	Total		**1,671**	**75,506,127**	
Cobalt Metal	Coolgardie		698	36,587,008	
	Kalgoorlie - Boulder		236	3,683,674	
	Laverton		2,462	90,985,545	
	Total		**3,396**	**131,256,227**	
Cobalt Sulphide	Kalgoorlie - Boulder		428	25,183,551	
TOTAL COBALT			**5,495**	**231,945,905**	(a), (b)
			Ni tonnes		
Nickel Concentrates	Coolgardie	544,396	12,270	200,219,292	
	Dundas	55,286	7,961	136,192,356	
	Kalgoorlie - Boulder	176,143	20,886	362,820,924	
	Leonora	358,336	41,954	699,072,551	
	Ravensthorpe	87,956	2,955	54,645,618	
	Wiluna	313,093	64,001	1,067,028,059	
	Total	**1,535,210**	**150,027**	**2,519,978,800**	
			Ni tonnes		
Nickel Metal	Kalgoorlie - Boulder		2,231	32,583,150	
	Laverton		28,261	458,879,355	
	Total		**30,492**	**491,462,505**	(i)
TOTAL NICKEL			**180,519**	**3,011,441,305**	(i)
			Pd kg		
Palladium By-Product	Coolgardie		502	4,303,189	(b)
			Pt kg		
Platinum By-Product	Coolgardie		78	2,709,968	(b)
TOTAL NICKEL INDUSTRY				**3,250,400,367**	
PETROLEUM		Kilolitres			
Condensate	Ashburton	307,670		67,507,765	
	Carnamah	136		6,892	
	Irwin	1,028		238,185	
	Roebourne	5,872,650		1,658,401,150	
	Total	**6,181,484**		**1,726,153,992**	
		Kilolitres			
Crude Oil	Ashburton	3,364,544		924,204,988	
	Derby - West Kimberley	14,392		2,371,763	
	Irwin	398,565		106,713,148	
	Roebourne	9,461,965		2,723,796,435	
	Total	**13,239,466**		**3,757,086,334**	
		Btu 10^6			
LNG	Roebourne	404,937,589		2,775,881,492	
		Tonnes			
LPG - Butane	Roebourne	383,917		154,133,908	
		Tonnes			
LPG - Propane	Roebourne	311,345		128,016,774	

Table 3 **Financial Year 2003–04 Quantity and Value by Local Government Area cont.**

COMMODITY	LOCAL GOVT AUTHORITY	QUANTITY (TONNES)	CONTENT	VALUES	Ref (p.54)
		'000 m^3			
Natural Gas	Ashburton	1,198,442		86,793,447	
	Carnamah	38,622		3,629,147	
	Irwin	120,290		12,719,884	
	Roebourne	6,703,456		577,901,179	
	Total	**8,060,810**		**681,043,657**	
TOTAL PETROLEUM PRODUCTS				**9,222,316,157**	(d)
PIGMENTS					
Red Oxide	Cue	**2,070**		**666,553**	(a)
SALT	Ashburton	1,360,397		21,241,000	(a)
	Carnarvon	1,299,050		23,730,606	(a)
	Esperance	11,967		541,541	(h)
	Port Hedland Town	2,408,044		44,497,523	(a)
	Roebourne	3,621,857		63,114,094	(a)
	Shark Bay	1,062,029		20,369,516	(a)
	Wyalkatchem	161		15,234	(h)
	Yilgarn	118,159		6,340,028	(h)
TOTAL SALT		**9,881,664**		**179,849,542**	
SILICA-SILICA SAND					
Silica	Moora	106,064		1,060,635	
Silica Sand	Albany	150,084		2,908,478	
	Coolgardie	172,873		423,538	
	Swan	215,184		2,366,967	
	Total	**538,141**		**5,698,983**	
TOTAL SILICA-SILICA SAND				**6,759,618**	(a)
			Ag kg		
SILVER BY-PRODUCT	Coolgardie		109	24,647	(a), (j)
	Derby - West Kimberley		13	2,831	(a), (b)
	Statewide		27,192	6,344,920	(a), (j)
	Yalgoo		30,147	7,610,186	(a), (j)
TOTAL SILVER			**57,461**	**13,982,584**	
SPONGOLITE	Plantagenet	**9,956**		**1,356,814**	(h)
TALC	Meekatharra	15,554		1,885,044	
	Three Springs	101,086		8,339,622	
TOTAL TALC		**116,640**		**10,224,666**	(f)
TIN-TANTALUM-LITHIUM			Li_2O tonnes		
Spodumene	Bridgetown - Greenbushes	114,568	6,922	n/a	
Tantalite	Bridgetown - Greenbushes	788		n/a	
	Coolgardie	85		n/a	
	Total	**873**		**n/a**	
			Sn tonnes		
Tin	Bridgetown - Greenbushes		540	4,504,695	
TOTAL TIN-TANTALUM-LITHIUM				**161,586,689**	(a)
			V_2O_5 tonnes		
VANADIUM	Mt Magnet		**239**	**2,569,847**	(f)
TOTAL VALUE				**26,350,604,285**	

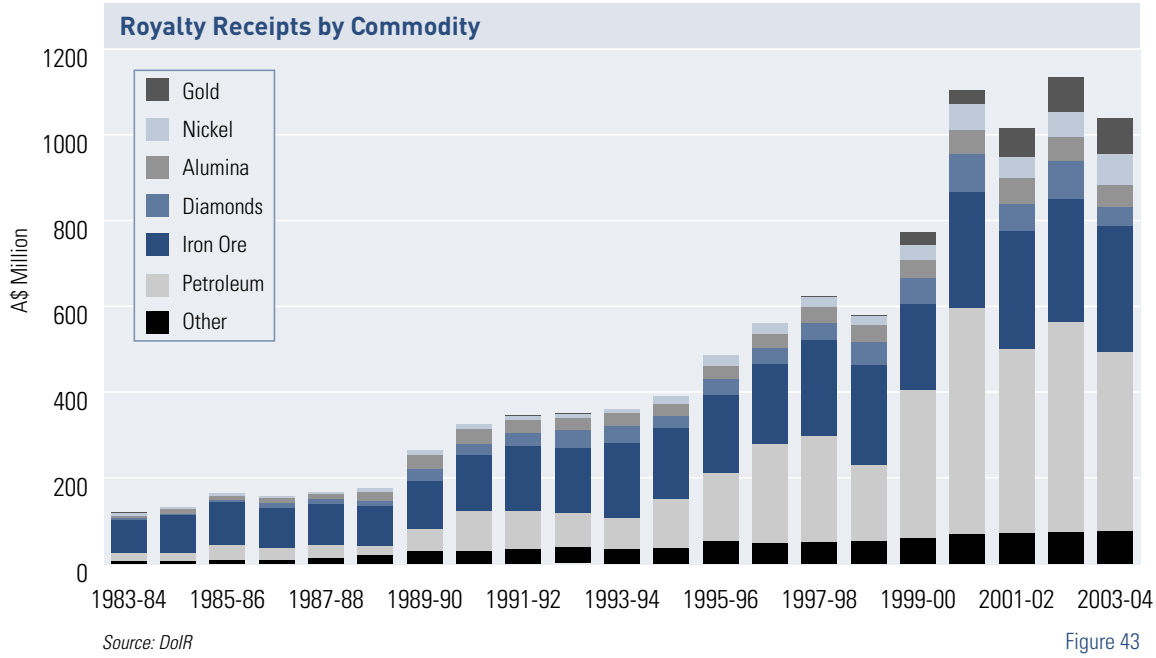
Table 4 **Royalty Receipts 2002–03 and 2003–04**

COMMODITY	2002–03 Total A$	2003–04 Total A$	2003–04 Growth A$	2003–04 Growth %
ALUMINA	54,952,314	49,998,033	-4,954,033	(9)
BASE METALS				
Copper	4,524,661	5,808,644	1,283,983	28.4
Lead	1,289,977	1,139,745	-150,232	(12)
Zinc	7,779,257	7,233,354	-545,903	(7)
TOTAL BASE METALS	13,593,895	14,181,743	587,848	4
CHROMITE	292,425	1,117,826	855,401	326
CLAYS	76,471	80,357	3,886	5
COAL	16,584,755	13,522,666	-3,062,089	(18)
CONSTRUCTION MATERIALS				
Aggregate	169,681	134,818	-34,863	(21)
Gravel	97,245	30,822	-66,423	(68)
Rock	107,769	94,678	-13,091	(12)
Sand	404,299	585,158	180,859	45
TOTAL CONSTRUCTION MATERIALS	778,994	845,476	66,482	9
DIAMONDS	89,292,744	45,022,369	-44,270,375	(50)
DIMENSION STONE	808	1,706	898	111
GEM AND SEMI-PRECIOUS STONES	45,290	14,582	-30,708	(68)
GOLD	85,356,089	79,500,095	-5,855,994	(7)
GYPSUM	523,391	470,469	-52,922	(10)
HEAVY MINERAL SANDS				
Garnet	534,804	777,394	242,590	45
Ilmenite	8,036,174	7,947,561	-88,613	(1)
Leucoxene	716,390	960,517	244,127	34
Rutile	4,958,734	4,458,431	-500,303	(10)
Staurolite	12,077	13,488	1,411	12
Zircon	12,402,779	12,052,314	-350,465	(3)
TOTAL HEAVY MINERAL SANDS	26,660,958	26,209,705	-451,253	(2)
INDUSTRIAL PEGMATITE MINERALS				
Feldspar	103,081	75,548	-27,533	(27)
IRON ORE	286,707,552	293,675,166	6,967,614	2
LIMESAND-LIMESTONE-DOLOMITE				
Dolomite	6,653	3,078	-3,575	(54)
Limesand - Limestone	1,754,588	2,145,461	390,873	22
TOTAL LIMESAND-LIMESTONE-DOLOMITE	1,761,241	2,148,539	387,298	22
MANGANESE	3,983,891	3,164,431	-819,460	(21)
NICKEL				
Cobalt	2,935,195	3,819,654	884,459	30
Nickel	56,690,384	72,781,351	16,090,967	28
Palladium by-product	242,558	85,455	-157,103	(65)
Platinum by-product	82,806	82,585	-221	(0)
TOTAL NICKEL INDUSTRY	59,950,943	76,769,045	16,818,102	28

Table 4 **Royalty Receipts 2002–03 and 2003–04**

COMMODITY	2002–03 Total A$	2003–04 Total A$	2003–04 Growth A$	2003–04 Growth %
PETROLEUM				
Condensate	121,492,454	88,570,858	-32,921,596	(27)
Liquified Natural Gas	147,784,874	121,262,529	-26,522,345	(18)
LPG - Butane	12,375,807	8,730,167	-3,645,640	(29)
LPG - Propane	9,695,963	7,130,002	-2,565,961	(26)
Natural gas	36,516,444	35,463,262	-1,053,182	(3)
Oil	160,703,958	155,174,688	-5,529,270	(3)
TOTAL PETROLEUM	488,596,500	416,331,506	-72,237,994	(15)
PIGMENTS				
Red oxide	45,002	46,584	1,582	4
SALT	2,146,242	2,293,565	147,323	7
SILICA SAND	306,711	314,026	7,315	2
SILVER	609,910	412,337	-197,573	(32)
SPONGOLITE	89,846	64,969	-24,877	(28)
TALC	72,995	65,900	-7,095	(10)
TIN-TANTALUM-LITHIUM				
Spodumene	875,739	991,350	115,611	13
Tantalite	5,332,841	5,652,060	319,219	6
Tin	126,983	102,293	-24,690	(19)
TOTAL TIN-TANTALUM-LITHIUM	6,335,563	6,745,703	410,140	6
VANADIUM	168,577	509,643	341,066	202
TOTAL REVENUE	**1,138,979,188**	**1,033,581,989**	**-105,397,199**	**(9)**

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 43

Table 5 Average Number of Persons Employed in the WA Mineral and Petroleum Industries

MINERAL/Company	Operating Site	2002–03	2003–04
BAUXITE - ALUMINA			
Australian Fused Materials Pty Ltd	Rockingham Fused Alumina Plant	208	204
Alcoa World Alumina Australia	Huntly	792	920
	Kwinana Alumina Refinery	1,513	1,493
	Pinjarra Refinery	1,408	1,348
	Wagerup Alumina Refinery	981	978
	Willowdale	334	366
Worsley Alumina Pty Ltd	Worsley Mining Operations	220	261
	Worsley Refinery	1,379	1,588
TOTAL BAUXITE - ALUMINA		**6,835**	**7,158**
BASE METALS			
Normandy Mining Ltd	Scuddles	316	404
Straits Resources Ltd	Nifty	316	321
Western Metals Ltd	Lennard Shelf	515	183
Various	Other	2	7
TOTAL BASE METALS		**1,149**	**915**
COAL			
Griffin Coal Mining Co. Pty Ltd	Muja	302	307
Wesfarmers Coal Ltd	Premier/WCL	338	333
TOTAL COAL		**640**	**640**
DIAMONDS			
Argyle Diamond Mines Pty Ltd	Lake Argyle	1,029	1,078
Kimberley Diamond Company NL	Ellendale	66	136
TOTAL DIAMONDS		**1,095**	**1,214**
GOLD			
Agnew Gold Mining Company Pty Limited	Emu	946	890
AngloGold Australia Ltd	Sunrise Dam	688	826
Australian Gold Resources Ltd	Perth Mint	102	118
Barminco Pty Ltd	Lights of Israel Underground	41	43
Barra Resources Ltd	First Hit	12	0
Barrick Gold of Australia Limited	Darlot	132	127
	Lawlers	268	261
BGM Group	Boddington	48	48
	Plutonic	607	607
Big Bell Gold Operations Pty Ltd	Big Bell Consolidated	341	33
Central Norseman Gold	Norseman	237	221
Coolgardie Mining Company Pty Ltd	Coolgardie Group	0	162
Croesus Mining NL	Binduli	2	0
	Davyhurst	92	91
	Hannan South	30	26
Delta Gold	Kanowna Belle	479	473
Equigold NL	Kirkalocka	117	106
Gidgee Gold Pty Ltd	Gidgee	120	112
Gindalbie Gold NL	Minjar	66	51
Paddington Gold Pty Limited	Paddington - Mt Pleasant	447	491
Normandy Mining Ltd	Bronzewing - Mt McClure	444	224
	Jundee - Nimary	410	500
	Wiluna	197	199

Table 5 **Average Number of Persons Employed in the WA Mineral and Petroleum Industries cont.**

MINERAL/Company	Operating Site	2002–03	2003–04
Haoma Pty Ltd	Normay	6	0
Hill 50 Gold NL	Hill 50 - Mt Magnet	399	404
Kalgoorlie Consolidated Gold Mines Pty Ltd	Golden Mile - Super Pit	1,269	1,350
King Solomon Mines Limited	Gullewa	12	0
Kundana Gold Pty Ltd	Kundana	104	0
LionOre Australia (Wildara) NL	Thunderbox	172	202
Mines and Resources Australia Pty Ltd	Frogs Legs Group	0	104
Newcrest Australia Ltd	Telfer	630	1,476
Newfield Central Pty Ltd	Newfield Central	0	11
Nickelseekers Pty Limited	Daisy - Milano	22	39
Placer Dome Inc	Granny Smith	417	525
Resolute Ltd	Chalice	2	0
Rewa Gold Mining Ltd	Nicholsons Find	15	0
Sipa Resources International NL	Mt Olympus	56	33
Sons of Gwalia NL	Carosue Dam	295	465
	Marvel Loch - Yilgarn Star	518	493
	Sons of Gwalia	339	361
	Tarmoola	123	0
South Kal Mines Pty Ltd	New Celebration, Jubilee, New Hampton	441	388
St Barbara Mines Ltd	Bluebird Group	196	80
St Ives Gold Mining Company Pty Limited	Kambalda–St Ives	1,444	1,525
Troy Resources Ltd	Mt Klemptz	54	0
	Sandstone Group	0	50
Viceroy Resource Corporation	Bounty	8	0
Other	Various	29	21
TOTAL GOLD		12,567	13,150
HEAVY MINERAL SANDS			
BHP Titanium Minerals Pty Ltd	Beenup	27	14
Cable Sands Pty Ltd	Bunbury	292	289
Doral Mineral Sands Pty Ltd	Dardanup	104	140
GMA Garnet Pty Ltd	Narngulu Garnet Plant	33	31
	Port Gregory - Hutt Lagoon	17	23
Hanwah Advanced Ceramics Australia Pty Ltd	Rockingham Zirconia Plant	26	24
Iluka Resources Limited	Capel	446	490
	Eneabba	290	301
	Narngulu Synthetic Rutile Plants	368	463
TiWest Pty Ltd	Chandala - Muchea	216	232
	Cooljarloo	259	363
TOTAL HEAVY MINERAL SANDS		2,078	2,370
IRON ORE			
BHP Iron Ore (Goldsworthy) Ltd	Finucane Island	533	234
	Yarrie	206	220
BHP Iron Ore (Jimblebar) Ltd	Jimblebar	157	148

Table 5 **Average Number of Persons Employed in the WA Mineral and Petroleum Industries cont.**

MINERAL/Company	Operating Site	2002–03	2003–04
IRON ORE cont.			
BHP Iron Ore Ltd	Mining Area C	276	205
	Mt Newman Railway	778	436
	Mt Whaleback	1,109	1,314
	Nelson Point	1,022	601
	Orebody 25	106	135
	Mt Newman Orebody 25	103	115
	Port Hedland HBI Plant	959	1,331
	Yandi	338	389
Hamersley Iron Pty Ltd	Brockman No. 2 Detritals Group	139	129
	Dampier Port Operations	750	955
	Eastern Range Group	28	145
	Hlsmelt - Kwinana	368	736
	Marandoo	197	205
	Paraburdoo–Channar	642	642
	Tom Price	1,074	1,094
	Yandicoogina	296	477
Mine and Port Developments Joint Venture	PACE-RGP Group	0	386
	West Angelas Plant	193	352
Mount Gibson Mining	Tallering Peak	0	43
	Cockatoo Island	87	83
	Koolyanobbing	174	225
Robe River Mining Co. Pty Ltd	Cape Lambert	579	703
	Pannawonica Deepdale	395	439
Pilbara Railway Company	Hamersley, Robe River and West Angelas Rail	470	460
TOTAL IRON ORE		10,876	12,087
NICKEL			
Anaconda Nickel Ltd	Murrin Murrin	661	686
BHP Billiton Minerals Pty Ltd	Ravensthorpe	5	3
Kimberley Nickel Mines Pty Ltd	Sally Malay Group	0	36
Lightning Nickel Pty Ltd	Long Nickel	58	111
LionOre Australia (Nickel) Ltd	Emily Ann	146	222
MacMahon Holdings	Blair	0	31
Mincor Resources NL	Miitel	127	151
	Wannaway	59	36
MPI Mines Ltd	Black Swan	227	219
OMG Cawse Pty Ltd	Cawse	191	210
Preston Resources Ltd	Bulong	365	131
Reliance Operations Limited	Beta-Hunt Nickel Group	0	31
Sir Samuel Mines NL	Cosmos	92	100
Tectonic Resources NL	RAV8	68	75
Titan Resources NL	Radio Hill	10	13
View Resources Ltd	Carnilya Hill - Carnilya East	0	9
Western Mining Corporation Ltd	Kalgoorlie Nickel Smelter	805	910
	Kambalda	245	361
	Kwinana Refinery	320	454
	Leinster	960	1,147
	Mt Keith	1,004	951
TOTAL NICKEL		5,343	5,887

Table 5 **Average Number of Persons Employed in the WA Mineral and Petroleum Industries cont.**

MINERAL/Company	Operating Site	2002–03	2003–04
PETROLEUM PRODUCTS			
Agip Australia Ltd	Woollybutt	2	2
Apache Energy Ltd	East Spar, Harriet, Stag, Campbell, Chervil, Agincourt-Wonnich, Sinbad, Tanami, North Herald, South Pepper	218	202
ARC Energy NL	Dongara, Eremia, Hovea	12	29
BHP Billiton Petroleum (North West Shelf) Pty Ltd	Griffin	93	93
ChevronTexaco Australia Pty Ltd	Barrow Island, Cowle, Crest, Roller-Skate, Saladin, Yammaderry	128	131
Kimberley Oil NL	Blina, Boundary, Lloyd, Sundown, West Terrace	4	2
Mobil Exploration & Producing Australia Pty Ltd	Wandoo	27	28
Nexen Petroleum Australia Pty Ltd	Buffalo	23	23
Origin Energy Resources Ltd	Beharra Springs, Tubridgi, Jingemia	22	22
Woodside Energy Ltd	Athena, Cossack, Echo–Yodel, Goodwyn, Hermes, Lambert, Legendre, North Rankin	957	657
	LNG 4th Train Construction	1,163	1,280
	2nd Trunkline Construction	n/a	47
TOTAL PETROLEUM PRODUCTS		**2,654**	**2,519**
SALT			
Dampier Salt Ltd	Port Hedland	101	99
	Dampier	229	224
	Lake MacLeod	163	162
Onslow Solar Salt Pty Ltd	Onslow	90	95
Shark Bay Salt JV	Useless Loop	67	65
TOTAL SALT		**659**	**657**
TOTAL CLAYS		*67*	*65*
TOTAL CONSTRUCTION MATERIALS		*305*	*287*
TOTAL DIMENSION STONE		*100*	*125*
TOTAL INDUSTRIAL PEGMATITE MINERALS		*25*	*22*
TOTAL LIMESTONE - LIMESAND		*118*	*112*
TOTAL MANGANESE ORE		*126*	*154*
TOTAL PHOSPHATE		*187*	*137*
TOTAL SILICA - SILICA SAND		*214*	*190*
TOTAL TALC		*97*	*108*
TOTAL TIN - TANTALUM - LITHIUM		*457*	*479*
TOTAL VANADIUM		*63*	*19*
TOTAL CHROMITE		*23*	*40*
ALL OTHER MATERIALS		*48*	*68*
TOTAL		**45,637**	**48,227**

(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 December 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

Lead–Zinc

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

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

Attapulgite

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

Clay Shale

The Griffin Coal Mining Company Pty Limited,
Level 15, 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,
Level 15, 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,
Boodarrie, Burrup–Dampier,
www.readymix.com.au

Gravel

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,
Drydens Find Granites.

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,
Level 5, 50 Colin 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 4604,
Sunrise Dam,
www.anglogold.com

Barrick Gold of Australia Limited,
Level 10, 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,
Level 1, 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 Colin 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, 152–158 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

Ilmenite, Leucoxene, Rutile and Zircon

Cable Sands (BeMax Resources),
250 St Georges Tce,
Perth WA 6000,
(08) 9212 6000,
Jangardup, Sandalwood, Yarloop,
www.cablesands.com.au

Doral Mineral Industries Ltd
Lot 7 Harris Road,
PICTON WA 6229,
(08) 9725 4899,
Dardanup,
www.doral.com.au

Table 6 **Principal Mineral and Petroleum Producers** Effective 1 December 2004

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,
152–158 St Georges Terrace,
Perth WA 6000,
(08) 9327 2327,
Brockman, Marandoo, Paraburdoo, Tom Price,
Yandicoogina,
www.hamersleyiron.com

Mt Gibson Iron Limited,
1st Floor,
7 Havelock Street,
West Perth WA 6005,
(08) 9485 2355,
Tallering Peak,
www.mtgibsoniron.com.au

Portman Iron Ore Ltd,
Level 11, 1 William Street,
Perth WA 6000,
(08) 9426 3333,
Cockatoo Island, Koolyanobbing,
www.portman.com.au

Robe River Iron Associates,
Level 27, Central Park,
152–158 St Georges Terrace,
Perth WA 6000,
(08) 9327 2800,
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) 9242 1091,
Wanneroo, Moore River, Carabooda,
www.limestone-resources.com.au

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

Australian Mines Ltd,
Level 1, 681 Murray Street,
West Perth WA 6005,
(08) 9481 5811,
Blair,
www.australianmines.com.au

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.independencegroup.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

Reliance Operations Ltd,
Level 36, Exchange Plaza,
2 The Esplanade,
Perth WA 6000,
(08) 9220 9880,
Beta Hunt,
www.reliancemining.com.au

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,
Level 3, 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 12, London House,
216 St Georges Terrace,
Perth WA 6000,
(08) 9226 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, 575 Canning Highway,
Alfred Cove WA 6154,
(08) 9330 8876,
Blina, Boundary, Lloyd,
Sundown, West Terrace,
www.kimberleyoil.com.au

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

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

Origin Energy Resources Ltd,
34 Colin Street,
West Perth WA 6005,
(09) 9324 6111,
Beharra Springs, Tubridgi, Jingamia,
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,
Level 3, 22 Mount Street,
Perth WA 6000,
(08) 9420 4320,
Useless Loop.

WA Salt Supply Ltd,
Lot 103, Cockburn Road,
Hamilton Hill WA 6163,
(08) 9430 5495,
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,
www.haddington.com.au

Abbreviations

A$	Australian Dollar	km	kilometres
ABARE	Australian Bureau of Agricultural and Resource Economics	km^2	square kilometres
ABS	Australian Bureau of Statistics	LME	London Metal Exchange
AFR	Australian Financial Review	Mbbl	thousand barrels of oil
ANZ	Australia New Zealand bank	MMbbl	million barrels of oil
bbl	barrel of oil	Mct	million carats
Bcm	billion cubic metres	Moz	million ounces
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	oz	ounce
DRI	Direct Reduced Iron	RBA	Reserve Bank of Australia
ECB	European Central Bank	SARS	Severe Acute Respiratory Syndrome
f.o.b.	free-on-board	t	tonnes
f.o.t.	free-on-truck	t/a	tonnes per annum
GDP	Gross Domestic Product	Tcf	trillion cubic feet
HBI	Hot Briquetted Iron	US$	United States Dollar
IMF	International Monetary Fund	WTI	West Texas Intermediate

References Table 3

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

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 (lb)
	1 tonne	t	=	1.10231 United States short ton [1 US short ton = 2,000 lb]
	1 tonne	t	=	0.98421 United Kingdom long ton [1 UK long ton = 2,240 lb]
	1 tonne LNG	t	=	52,000,000 (Btu)
Volume	1 kilolitre	kl	=	6.28981 barrels (bbl)
	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	Prefix	
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

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.

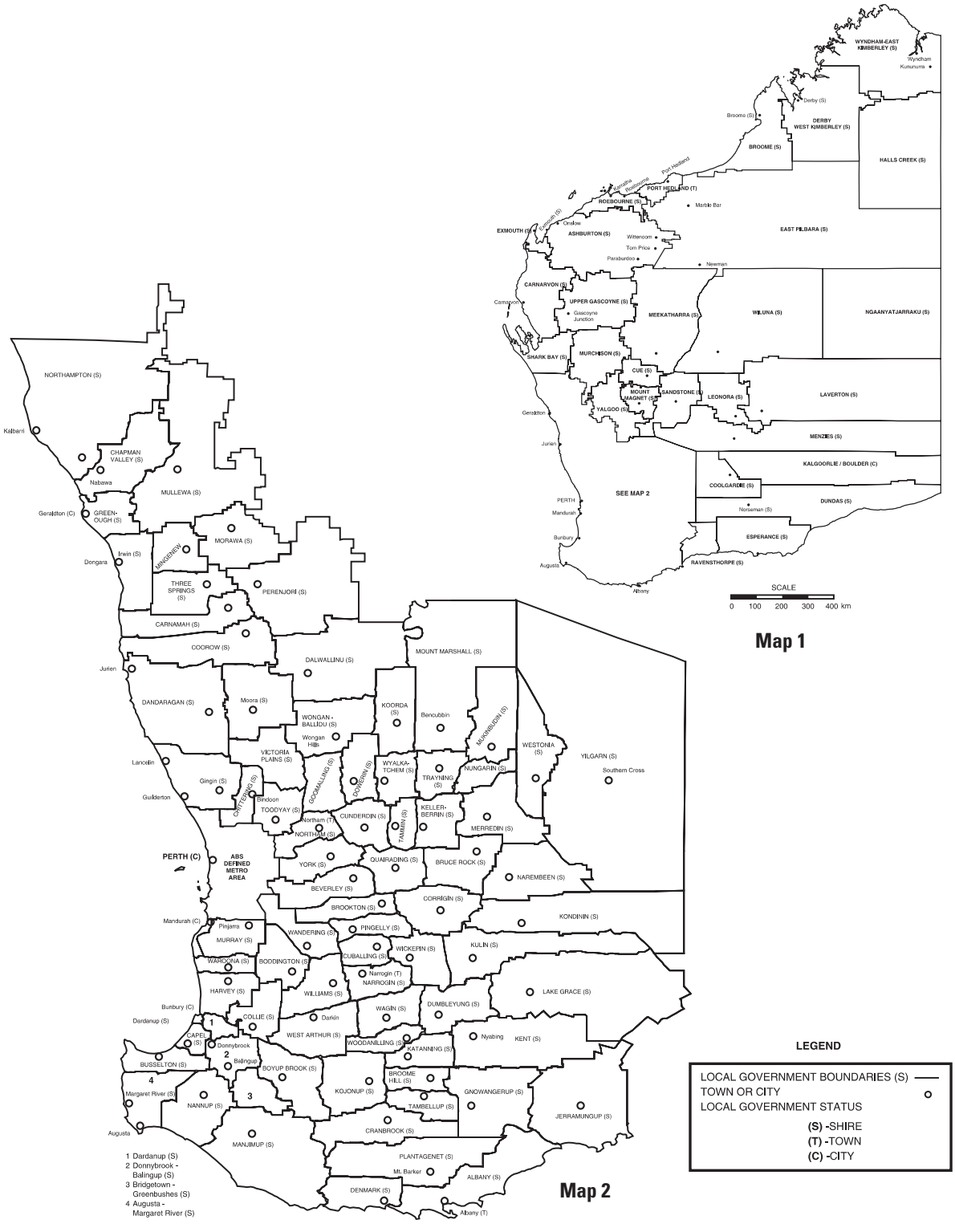
Mine Production
Clays
Coal
Construction Materials
Dimension Stone
Gold
Gypsum
Limesand -Limestone -Dolomite
Silica - Silica Sand
Talc
Sales
Alumina
Base Metals (Copper, Lead and Zinc)
Chromite
Diamonds
Gem and Semi-Precious Stones
Heavy Mineral Sands
Industrial Pegmatite Minerals
Iron Ore
Manganese
Nickel Industry (Nickel, Cobalt, Platinum and Palladium)
Petroleum
Pigments
Salt
Silver
Spongolite
Tin -Tantalum - Lithium
Vanadium

Classification of Countries

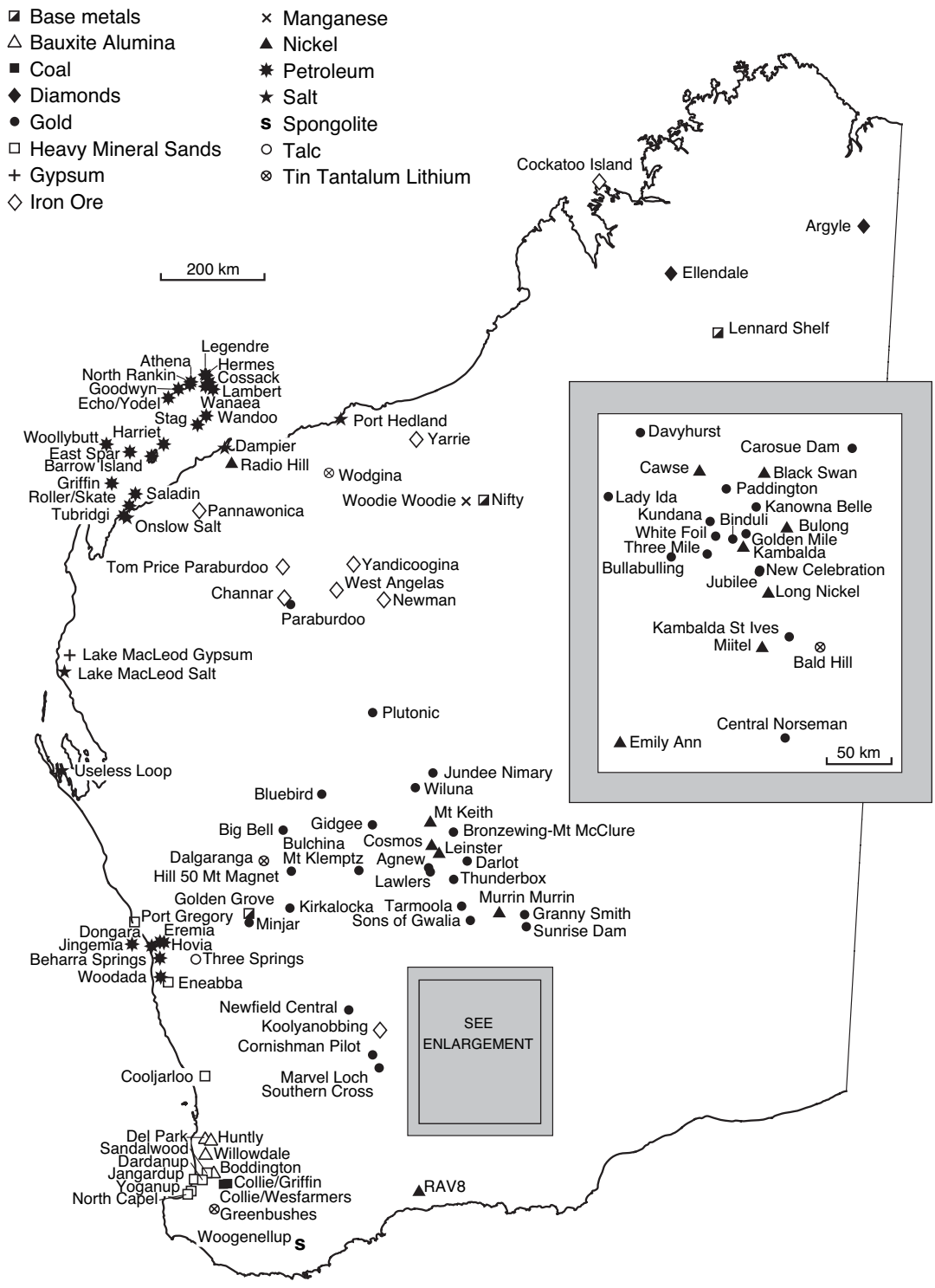
Euro area[1]/ European Union	
Austria	*Italy*
Belgium	Latvia
Cyprus	Lithuania
Czech Republic	*Luxembourg*
Denmark	Malta
Estonia	*Netherlands*
Finland	Poland
France	*Portugal*
Germany	Slovakia
Greece	Slovenia
Hungary	*Spain*
Ireland	Sweden
	United Kingdom
Non-Japan Asia	
Afghanistan	Nepal
Bangladesh	Pakistan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

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

Local Government Boundaries



Major Mineral and Petroleum Projects in Western Australia



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 in Western Australia
Prospect magazine

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