

Statistics Digest

Mineral and Petroleum Production



1998



DEPARTMENT OF
MINERALS AND ENERGY
WESTERN AUSTRALIA

"Our Resources • Our People • Our Future"



CONTENTS

	Page
FOREWORD	1
1. ECONOMIC AND SOCIAL ENVIRONMENT	2
1.1 World Economy Review	2
1.2 Review of the Western Australian and Australian Economies	5
1.3 Economic Factors Affecting the Mining Industry	7
1.4 Social and Political Factors Affecting the Mining Industry	10
2. REVIEW OF MAJOR MINERALS AND PETROLEUM IN WA	16
2.1 Overview and Outlook	16
2.2 Petroleum	17
2.3 Iron Ore	20
2.4 Gold	23
2.5 Alumina	26
2.6 Nickel	28
2.7 Heavy Mineral Sands	30
2.8 Diamonds	33
2.9 Other Minerals	34
3. EXPLORATION, INVESTMENT AND EMPLOYMENT	38
TABLES	
1. Quantity and Value of Minerals and Petroleum	42
2. Quantity and Value of Selected Major Commodities	44
3. Quantity and Value of Minerals and Petroleum By Local Government Area	47
4. Royalty Receipts 1997 and 1998	54
5. Employment in the Mineral and Petroleum Industries as at December 1998	57
6. Principal Minerals and Petroleum Producers 1998	61
Abbreviations, References, Units and Conversion Factors	65

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LIST OF FIGURES

Figures	Page
1.1 Exchange Rate:AS/US\$	6
1.2 Local Government Boundaries (map)	14
1.3 Major Mineral and Petroleum Projects in Western Australia	15
2.1 Petroleum Exports	17
2.2 Oil and Condensate: Quarterly Production & Value	18
2.3 Crude Oil and Condensate Production	18
2.4 TAPIS Crude Oil Price	19
2.5 Iron Ore Exports	20
2.6 Iron Ore Production	20
2.7 Iron Ore Price	21
2.8 Iron Ore: Quarterly Production & Value	21
2.9 Gold Exports	23
2.10 Gold Price	23
2.11 Gold Production	24
2.12 Cumulative WA Gold Production	24
2.13 Gold: Quarterly Production & Value	25
2.14 Alumina Exports	26
2.15 Alumina Production	26
2.16 Alumina Quarterly Production & Value	26
2.17 Alumina Price	27
2.18 Nickel Exports	28
2.19 Nickel Production	28
2.20 Nickel Price	29
2.21 Nickel Quarterly Production & Value	29
2.22 Heavy Mineral Sands Price Index	30
2.23 Heavy Mineral Sand Exports	31
2.24 Heavy Mineral Sands: Value of Production by Quarter	31
2.25 Ilmenite and Upgraded Ilmenite Production	32
2.26 Selected WA Mineral Commodities Relative to World Production	37
0.1 Comparative Value of Production - 1993 and 1998	46
0.2 Comparative Royalty Receipts - 1993 and 1998	56

FOREWORD



L C Ranford
DIRECTOR GENERAL

A handwritten signature in cursive script that reads "Lee Ranford".

Welcome to the Department of Minerals and Energy's 1998 Statistics Digest. This publication contains the most comprehensive statistical information available on the Western Australian resource industry.

The statistics in this Digest show that revenue growth in the Western Australian minerals and energy industry has slowed with the total value of production in 1998 rising by 3.3% to reach \$17.9 billion. This comes after ten years of solid growth averaging almost 10%.

The total value of production slowed in 1998 due to historically low global commodity prices and despite the fact that physical output of most mineral and petroleum products actually increased during the period. The effects of mineral and energy price cuts were ameliorated by the depreciation of the Australian dollar during 1998.

The State's resource industry is clearly operating in a challenging period and the near term outlook is for continued low commodity prices. In addition, whilst there are indications of stabilisation in parts of the Asian economy, there is a risk of easing growth in the US and there are concerns that growth in domestic demand could moderate in Western Europe. These developments do not bode well for mineral and energy prices in the near term.

Despite the difficult environment, new low cost projects such as those in the nickel industry are being commissioned and expansion of facilities is taking place for example, in the alumina and base metals sectors. Western Australia's fundamental competitive position in the resource industry has not changed and there is reason to look forward to a recovery gaining momentum in 2000. The new project developments will prepare the State's industry for a resurgence as markets recover in the next few years.

It is important to build on the State's advantages with further deregulation and expansion of the State's energy industry. It also important to reduce uncertainties in the local operating environment where possible. Native Title issues are currently of major concern to industry. These and other issues are discussed in the Digest.

It is not possible to prepare such a comprehensive range of information without valuable assistance from outside the Department. I would therefore like to thank all the various resource companies, Australian Bureau of Agricultural and Resource Economics (ABARE), Australian Bureau of Statistics (ABS) and the Western Australian Treasury Department for their cooperation and help during the preparation of the Digest.

1. ECONOMIC AND SOCIAL ENVIRONMENT

1.1 World Economy Review

Growth in the United States and Europe offsets Asian decline.

Despite the Asian economic crisis the world economy overall grew at a robust rate in 1998. Growth was sustained by strong domestic demand in the United States and Europe, which more than offset falling activity in countries affected by the Asian currency crisis. The outlook for 1999, however, is for a decline in the pace of world growth, due to easing in the United States and Europe only partially offset by resumption of growth in key Asian economies.

The United States economy is estimated to have grown by 3.5% in 1998, the seventh consecutive year of expansion. High levels of domestic demand underpinned growth, while net exports detracted from growth. The drag on exports over the year was due to the strength of the United States dollar and the impact of the Asian crisis on US exports, particularly manufacturing exports.

Uncertainty about future direction of growth in the United States.

Interest rate cuts in the US in late 1998 were aimed at underpinning US economic growth. These cuts should also stimulate activity in the second half of 1999. Overall, the OECD forecasts growth in economic activity for 1999 in the United States of 1.5%. However the downside risks to this include insecurity in demand from key export markets, namely Brazil and other Latin American economies, and the possibility of a significant correction in the United States' stock market. Any correction is likely to have an impact on wealth and therefore consumption and on confidence generally. A further risk will be the direction of US interest rates. With the economy running at full employment any increase in labour costs may feed through to potential inflation and prompt the Federal Reserve to increase interest rates.

Government policies attempt to boost economic activity as Japanese economy enters recession.

The Japanese economy contracted in 1998 and was labelled as "officially" in recession. An already poor economic situation, compounded by weakness of the Japanese financial system, was aggravated by the Asian crisis. Activity continued to decline despite continued efforts to stimulate activity through fiscal initiatives and financial sector reform. The impetus from these initiatives was insufficient to offset weak domestic demand due to bank balance sheet and corporate restructuring combined with further declines in land and equity prices which lead to a deterioration in credit conditions, rising unemployment, a decline in consumer confidence and an increase in saving. This was exacerbated by weak external demand, particularly from Japan's East Asian trading partners.

The outlook for Japan is for a continuation of subdued conditions, with growth forecast to resume, albeit at a rate of just 0.2%, in 1999.

South East Asian economies remain weak.

Most South East Asian economies experienced a decline in economic activity in 1998. The fall in activity reflects the impact of the Asian financial crisis on real economic activity in the region.

Investor confidence in the Indonesian economy remained very weak due to substantial structural difficulties. Indonesia's economy is not expected to recover appreciably in the near term. While the large depreciation of the currency should stimulate exports, particularly labour-intensive goods, a

shortage of working capital is limiting the economy's ability to trade out of its problems.

Malaysia has also experienced deterioration in economic and financial conditions. In September 1998 the Malaysian government stopped foreign dealings in the ringgit after an attempt to stimulate domestic demand via interest rate cuts whilst maintaining the value of its currency.

South Korea, after suffering considerable currency depreciation, continued to experience severe economic problems over the first half of 1998. These problems necessitated IMF involvement in an appropriate structural adjustment program for South Korea. There are now signs that the economy has stabilised and of some restoration of investor confidence.

Structural reform crucial for economic growth.

The resumption in growth should be strongest in those countries most active in implementing structural initiatives to address the crisis, namely South Korea and Thailand. Although reform has a long way to go, there are signs of resumption in growth in these economies in 1999. In contrast, those economies less active in implementing reform, most notably Indonesia and Malaysia are expected to continue to experience difficulties.

Taiwan and Singapore have managed to escape the worst of the crisis, although economic activity in Singapore is expected to fall in 1999 by a modest 0.5%. This is a relatively remarkable achievement given the downturn in the region. By comparison, Hong Kong, which experienced an estimated 4.8% decline in activity, is expected to decline by a further 0.8% in 1999. Growth in Taiwan is expected to ease slightly to 4.6% in 1999, down from 4.9% in 1998.

Economic growth in China remains robust. This growth is supported by relatively strong domestic demand since there has been a weakening in the external sector, with China facing increased competition from its Asian neighbours. The maintenance of the US\$ peg has meant that Chinese exports have become much less competitive vis-a-vis those from other Asian nations. However, authorities have managed to offset this through a substantial program of investment in infrastructure. Importantly, China has so far resisted pressure to devalue its currency.

Brazil devalues currency but negotiates agreement with the IMF.

At the beginning of 1998-99 the international financial crisis that began in Asia spread to Latin America, with regional currencies under intense pressure as foreign and domestic investors panicked to remove their capital in the wake of problems in other economies (e.g. Russia). Brazil, which accounts for nearly half of the output in the region and is the world's second-biggest recipient, after China, of emerging market foreign investment, was significantly affected. Brazil's Cardoso Government which had successfully, until October 1998, tamed the country's once runaway inflation (down to 4%), attempted to defend its currency, the real, with 40% interest rates. In spite of winning an IMF international support package to defend the real, Brazil had to admit defeat on 13 January 1999 when Gustavo Franco, Brazil's central bank governor, resigned and his successor allowed the real to devalue 8% against the US dollar. However it appears that the risk of spreading financial crisis in the wake of the devaluation has lessened with the IMF and Brazil coming to a new agreement. Latin America's

Challenges for monetary and fiscal policies in the euro area.

biggest economy will be able to draw on US dollars to shore up the real. The IMF will provide the much needed currency injection in exchange for the Brazilian Government to restore a sustainable budgetary position.

With the treaty on European Union, signed in 1992, the Union set itself the objective of establishing the European Economic and Monetary Union (EMU), ultimately based on a single currency. Convergence towards low rates of inflation and a sound fiscal position were the two most important criteria to be fulfilled before countries could join the monetary union. By mid-1998, eleven out of the fifteen member countries had qualified and agreed to participate from the outset in the project (Germany, France, Italy, Spain, the Netherlands, Belgium, Austria, Finland, Portugal, Ireland and Luxembourg). The single currency of the EMU, the euro, was launched on 4 January 1999. Introduction of the single currency was accompanied by the creation of a European Central Bank (ECB). Virtually all fiscal competencies are to remain at the national level, but the ECB will set monetary policy for the area as a whole. This raises familiar issues in a new context, namely the challenges of safeguarding monetary policy credibility while simultaneously ensuring fiscal prudence.

Instability in Russian financial markets evolved into a full-blown financial crisis by mid-1998. The approval of an IMF aid package in July 1998, worth more than US\$22 billion, proved insufficient to restore investor confidence or bring interest rates down to levels consistent with Russia's emergency fiscal consolidation program. On 17 August 1998, after repeated struggles to defend the rouble and manage government debt, the Russian government and central bank succumbed to market pressure and allowed for the depreciation of the rouble and effective default on domestic government debt. Russia has since entered a period of very high political and economic uncertainty and instability. A new government and central bank management took power in September 1998. The overall chaotic environment was the main cause of the decline of GDP in the second half of 1998.

The Russian crisis impacted on the Baltic countries and the Commonwealth Independent States (CIS).

The Russian economic crisis is being felt in the Baltic countries (Estonia, Latvia and Lithuania), which face large trade exposure to the CIS and in particular to Russia, which absorbs 20-25% of their exports. Of the CIS, Ukraine has been under particularly strong pressure and has also taken measures to devalue its currency. In Eastern Europe in general there have been sharp differences in transition experiences. Output growth in 1998 was negative in Romania, sluggish in Bulgaria and positive in Slovakia and Slovenia.

1.2 Review of the Western Australian and Australian Economies

As expected, growth in the Western Australian economy is beginning to slow, following exceptionally strong gains in 1997.

The pace of growth in the Western Australian domestic economy has begun to ease, following strong growth in 1997. State final demand grew by 5.2% in the year to the September quarter 1998, down from growth of 9.9% in 1997.

Despite the slowing growth, the Western Australian economy continues to be stronger than that of any other State. Demand from Western Australia's industrialised export markets has been particularly strong and has more than offset weaker demand from East Asia.

Growth in private consumption expenditure on trend has stabilised at around 1.0% per quarter, slightly stronger than nationally and a similar rate to that achieved during the sustained expansion in consumer spending of the early-mid 1990s.

Although consumer spending as a whole is growing at a similar pace to the early-mid 1990s, the pattern of consumption growth has been different. In particular, there was a switch from purchases of retail items to purchases of motor vehicles in 1998. This was probably due to a decline in the relative price of new motor vehicles assisted by the appreciation of the Australian dollar relative to East Asian currencies.

The pace of private investment growth slows but levels remain high.

Following steady growth through 1997 and early 1998, dwelling investment has eased since June 1998. Over 1998 there was a slowing in the growth of business investment, from the record rates in 1997-98. However the level of business investment is expected to be more than double (120%) than at the trough in 1991-92 and 61% above the most recent peak in 1989-90.

Strong growth in international demand for Western Australia's exports, despite the slump in Asia, has meant that Western Australia's trade surplus has continued to rise.

Western Australia's overseas trade surplus continues to grow, despite significant increases in imports.

Export growth began to slow in 1998, after exceptional growth in 1997-98, from 17.9% in the year to June 1998 to 12.5% in the year to December 1998. Nevertheless, this remains a very healthy rate of growth and compares with 6.2% growth in exports nationally over the same period (and nearly four times the figure for the rest of Australia of 3.6% i.e. excluding Western Australia).

Following trends evident since the Asian downturn began, exports growth to G-7 countries (Japan, US, UK, Germany, Canada, France and Italy) continue to underpin overall export growth.

As economic prospects for East Asian countries improve over the medium term, Western Australia's exports to these markets are likely to resume.

WA retains strong labour market

Employment grew by 2.9% (or 24,900 persons) in 1998, the second strongest rate of growth after Queensland. Despite this strong growth in employment the unemployment rate remained at around 7%, (the lowest of all States), reflecting an increase in labour market participation. Employment grew by 1.9% nationally with Western Australia accounting for 15% of this increase.

Inflationary pressure remains subdued

Prices continued to increase at a modest pace in the December quarter with the consumer price index (CPI) for Perth increasing by 0.5%. This follows an unprecedented decline in the CPI in 1997-98.

Increased consumer spending has yet to flow through to significant price pressure. This may reflect competition from cheaper imports of consumer goods from Asia, since although the Australian dollar depreciated against most currencies, it appreciated against some South East Asian currencies. The appreciation resulted in decreases in the Australian dollar price of some imports (notably motor vehicles).

Wages growth, also a significant determinant of inflation, has been relatively subdued in recent quarters.

Easing of interest rates in 1998

There was an easing of monetary policy by the Reserve Bank of Australia (RBA) in early December when the Bank announced a 25 point cut in the cash rate to 4.75% - the lowest since 1994.

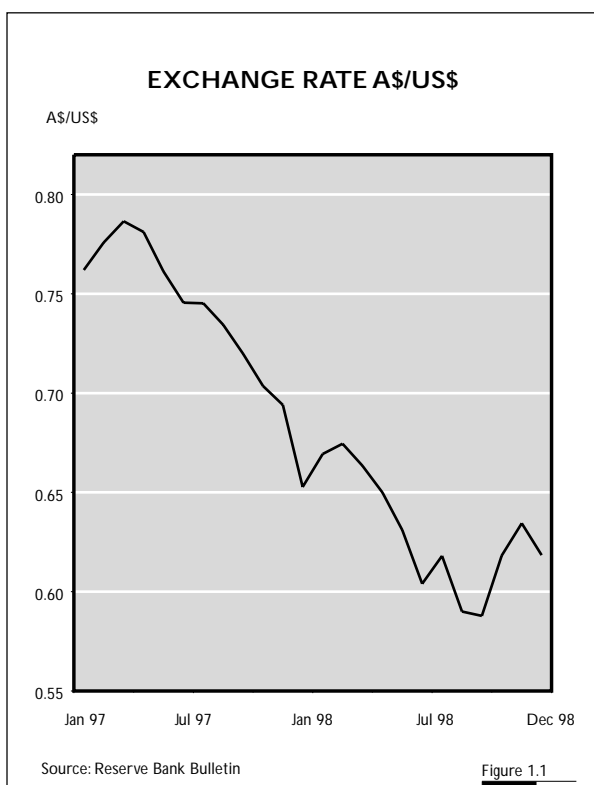
Long term interest rates fell sharply from mid-November onwards, culminating in 10 year bond yields posting a low of 4.7% on 11 December, the lowest yield since regular bond tenders began in 1982.

The fall in Australian bond yields during the latter part of 1998 in part reflected the official statement accompanying the monetary policy easing, in which the RBA forecast a much shallower upswing in inflation than it had previously considered. The fall is also part of a trend towards historically low bond yields in the US and record low yields in Germany and Japan.

The Australian dollar experiences mixed fortunes

The AS fell to an all time low of 55.25 cents US in late August 1998 before it recovered to nearly 65 cents US. However measured against the RBA's Trade Weighted Index, the AS fell to a three and a half year low on 30 December, reflecting renewed strength by the Japanese yen and other Asian currencies.

The mixed fortunes of the AS largely reflect market uncertainty as to the direction of commodity prices this year. While there is increasing confidence that world growth has bottomed and demand in Asian markets should improve over the coming year, this has yet to be reflected in a meaningful improvement in key commodity prices.



1.3 Economic Factors Affecting the Mining Industry

The downward pressure on world mineral and energy commodity prices that began in 1997 with the East Asian financial crisis continued throughout 1998

The downward pressure on world mineral and energy commodity prices that began in 1997 with the East Asian financial crisis continued throughout 1998. The Asian crisis represented the most significant shock to commodity markets since the dissolution of the Soviet Union and the global economic slowdown in the early 1990s. Japan's poor economic performance also continued to undermine commodity markets. Commodity markets were also adversely affected by developments in Russia. Hopes of a recovery in Russia were dashed in mid 1998 by a sharp rise in interest rates from around 20% to 150% before settling at around 80% in an effort by the government to support the rouble. The longer term effect of this is uncertain. Russia may attempt to increase its foreign exchange reserves by increasing its commodity exports. However, Russia's economic difficulties may restrict credit to its metal producers, thereby reducing output. These are disturbing developments, occurring at a time of subdued demand in international commodity markets.

Western Australia's Export Commodity Price Index begins to stabilise

Despite the ongoing turmoil in international commodity markets the State Treasury reports that the world price of Western Australia's major commodity exports in US\$ terms appears to have stabilised, after having fallen substantially since mid-1996. However the stabilisation in overall prices masks changes in individual commodity prices. Prices of alumina, gold, ilmenite and rutile have all risen in recent months, albeit modestly. The increase in these prices has more than offset the impact of falls in the price of oil, LNG, and nickel, on the commodity price index.

Oil prices continued to fall in 1998 in response to decreasing world demand and increasing world supply. Demand for oil in general was down due to both slow demand from industry, particularly in Asia, and from households in the northern hemisphere, where there was a relatively mild winter. On the supply side, downward pressure on oil prices was exacerbated over 1998 by the failure of OPEC to restrict supply from its members and by the return of oil production from Iraq. As a result of these market forces oil prices fell to a 23 year low.

International demand and supply conditions in 1998 resulted in world nickel prices being down about a third compared with 1997. Demand for nickel from Asian stainless steel producers was sluggish in response to the depressed economic conditions experienced by the Asian area. On the supply side there was the ready availability of nickel and stainless steel scrap from Russia plus the expectation of significant additions to world nickel supply from Western Australia's new low-cost lateritic nickel producers.

Commodity price outlook uncertain

The outlook for commodity prices in the immediate future is extremely uncertain. Market sentiment is likely to be the main determinant of price movements in the short term. Market sentiment, however, will not sustain the lift in prices. This will depend on an increase in world consumption of commodities, which in turn depends on the timing of the resumption of growth in the East Asian economies and the strength of economic growth in the United States and Europe.

There are tentative signs that growth in East Asia has bottomed. However, it is too early to conclude that the recovery has commenced. There is, nevertheless,

a general consensus that the recovery will resume late in 2000. This may underpin commodity analysts' expectations of an improvement in prices of most commodity prices in the medium term.

The mining and energy industry continues to reap the benefits of a lower Australian dollar:

As many export contracts are written in US\$, the US\$ -A\$ exchange rate is a significant economic determinant affecting the State's minerals and energy industry. Due to ongoing uncertainty about the outlook for commodity prices, in 1998 the value of the A\$ relative to the US\$ fell 15% averaging 63 US cents. This was the most significant factor contributing to the growth in the value of Western Australia's minerals and energy industry in 1998.

Microeconomic reform of major State utilities continues to benefit the mining industry

The competitiveness of Western Australia's mining industry continued to improve with the ongoing deregulation and expansion of the State's energy industry. The government owned AlintaGas continues to control Western Australia's gas infrastructure, however, since 1 January 1998 gas customers taking at least 250 TJ per annum through a single connection have been able to contract directly with the supplier of their choice. Under the State's deregulation policy this threshold is decreasing every year and by 2000 all householders will be able to buy gas from the supplier of their choice. Further microeconomic reform of the State's gas industry is proposed with the possible sale of AlintaGas. The State Government has undertaken the first step in the proposed privatisation by setting up a Steering Committee which is scheduled to report to Cabinet on privatisation options early in the 1999-2000 financial year.

In March 1998 the Dampier to Bunbury gas pipeline was sold to Epic Energy Australia. At \$2.4 billion the privatisation was the largest in the State's history, surpassing the \$900 million sale of BankWest two years ago. Epic Energy Australia immediately announced it will reduce transportation costs by 20% by 2000, with a further commitment to double the capacity of the pipeline by 2007.

In mid 1998 the State Government announced its intention to privatise the freight business of Westrail. State Cabinet approved the sale in March 1999 and accepted the recommendation from the Westrail Taskforce that the freight section be sold as a fully integrated business, incorporating both rolling stock and track. The business will not be sold to another government operator and the private operator will be required to comply with the State rail access regime. This regime provides a guaranteed right for other operators to negotiate track access on fair terms and conditions. The privatisation and track access offers the potential to enhance the efficiency of rail operations which in turn will be beneficial to those industries that use the State's rail services. These include the resources industry.

Another rail transport competition issue that has implications for the mining industry is the rail access dispute between iron ore producers North and Rio Tinto. In September 1998 North's subsidiary, Robe River Associates, applied to the National Competition Council (NCC) for access to Hamersley Iron's railway in the Pilbara. The application was made under Part IIIA of the Trade Practices Act. In response to this, Rio Tinto's subsidiary, Hamersley, made an application to the Federal Court disputing the NCC's jurisdiction over the matter. The Federal Court began hearing the case in April 1999.

Federal Government proposal to introduce a Goods and Services Tax (GST).

In August 1998 the Federal Coalition released its proposed tax reform package. If the tax reform package is passed by both Houses of Parliament in the form proposed by the Federal Government then there would be several benefits to the mineral and energy industry. These benefits include:

- Exports being GST free, thus enabling tax credits to be claimed on all inputs used to produce the final good or service;
- Extension of the exemption from Fringe Benefits Tax to remote area housing (currently only applicable to primary producers) provided by the mining industry for its employees. This should work towards equalising the options between fly-in fly-out arrangements versus constructing residences in regional mining areas;
- Proposed removal of a range of State taxes, many of which affect the mining industry, in exchange for the States receiving GST revenue as of 1 July 2000. The details regarding the removal of these taxes are yet to be finalised; and
- Introduction of a new diesel fuel credit scheme which will effectively reduce the diesel excise from 43c per litre to zero, and for larger transport users (including rail) from 43c per litre to 18c per litre. This is in addition to savings of 7c per litre for business users of petrol and diesel through their access to a refund of the GST paid on fuel.

Concerns about proposed trade-offs to achieve lower company tax rate

The Review of Business Taxation (better known as the Ralph Review) instigated by the Federal Government has thus far focused on reducing the company marginal tax rate, (from 36% to 30%), in exchange for the removal of other taxation concessions currently applicable to certain businesses. The Ralph Review is basing its work on the premise that all businesses, regardless of different circumstances pertaining to various industry groups, should be treated equally. The minerals and energy industry is particularly concerned about the possible removal of tax concessions such as accelerated depreciation allowances, exploration write-offs and tax deductions for research and development.

1.4 Social and Political Factors Affecting the Mining Industry

Native Title continues to be a major issue impacting on the industry.

The Western Australian Government has been abiding by the future act procedures of the Native Title Act (NTA) since the High Court Decision of 16 March 1995 found the State's Land (Titles and Traditional Usage) Act 1993 to be inoperative. Native Title claims covering over 82% of the State had been registered with the National Native Title Tribunal (NNTT) by the end of December 1998. Claims often overlap and instances where up to 12 or more separate parties have claimed title to the same land have been recorded. The distribution of these claims is such that about 98% of all mineral title applications in Western Australia must now be processed via the future act regime of the NTA.

The impact of the NTA procedures has been to severely delay processing of mineral title applications. Exploration Licences are fast tracked using the 'expedited procedure'. Nevertheless to December 1998, the impact of the NTA procedures has been to delay the grant of Exploration Licences by about six months. Delays in the granting of Mining Leases have been much greater than those associated with Exploration Licences. This is because all Mining Lease applications over areas subject to registered Native Title claim must undergo the 'right to negotiate procedure'. To the end of 1998, over 2,600 applications for Mining Leases had become subject to 'right to negotiate procedures' and 333 agreements had been finalised involving 235 Mining Leases.

In October 1996 the Prime Minister announced a number of proposed amendments to the Native Title Act 1993. The amendments aimed to streamline the NTA to make it more workable.

In December 1996 the High Court ruled in the Wik case that pastoral leases did not extinguish Native Title but the rights of pastoralists and of Native Title-holders could co-exist.

In response to this ruling the Commonwealth Government announced, in April 1997, a 10 point strategy. The major aim of the strategy was to clarify the conditions under which native title and pastoral leases could co-exist.

In September 1997 the Native Title Act Amendment Bill 1997 was introduced to the Commonwealth Parliament. This Bill incorporated the 1996 proposed NTA amendments and the Wik 10 point strategy. In December 1997 the Senate made significant changes to the Bill. The changes were debated fiercely and a compromise was reached culminating in a modified version of the NTA Amendment Bill being passed through the Senate in July 1998.

This Commonwealth legislation enables the States and Territories to establish procedures to deal with Native Title issues at the State level. The state based legislative procedures must be consistent with the amended NTA and be approved by the Federal Government.

On 15 October 1998 State Native Title legislation was introduced into the Western Australian Parliament. The legislation comprised three Bills: i) The Titles Validation Amendment Bill 1998; ii) The Native Title (State Provisions) Bill 1997; and iii) The Acts Amendment (Land Administration, Mining and Petroleum) Bill 1998.

Western Australia is yet to pass its Native Title legislation.

The Validation Bill aims to ensure ongoing security of titles issued under the State Government's previous land titles regime. The Provisions Bill includes provision to establish a State Native Title Commission that would assume the functions of the National Native Title Tribunal. The Acts Amendment Bill provides consequential amendments to existing State Acts and imposes native title liability compensation obligations for future acts on industry.

The Acts Amendment Bill 1998 was passed by Parliament and assented to in December 1998. However the Legislative Council did not pass both the Titles Validation Bill and the State Provisions Bill. The failure to pass the State Provisions Bill resulted in Native Title remaining under Federal Control.

In April 1999 the Premier told the Legislative Assembly that he would agree to pass the significantly amended Titles Validation Bill and to this end he would introduce new legislation covering the Labor amendments in the spring session of Parliament. The Government's Titles Validation Bill aims to extinguish Native Title over most types of rural land tenures. The Labor amendments to the Government's Validation Bill aim to decrease the area of land over which Native Title would be extinguished.

*Miriuwung and Gajerrong
Federal Court decision may
have implications for the
State's resources sector.*

On 24 November 1998 the Federal Court confirmed that Native Title could co-exist with other forms of land tenure. The Native Title claim by the Miriwung and Gajerrong people covered 7 thousand square kilometres of the East Kimberley, including Lake Argyle and the Ord River. The claim also extended into the Northern Territory.

Virtually all the area claimed was allowed with a few exceptions. The Court's decision may have ramifications for the State's proposed Titles Validation Amendment Bill 1998. To the extent that the Bill aims to extinguish Native Title over most types of rural land tenures the State could become subject to compensation claims.

Furthermore the Federal Court's decision may have significant implications for the resources sector since the Court also ruled that Native Title holders had the right to trade in resources and to receive a portion of the resources removed from the area claimed.

The Western Australian Premier has indicated that he will appeal the Federal Court's decision.

*The Framework Convention
on Climate Change (FCCC)
established the mechanisms
for international co-
operative action on
greenhouse gases.*

The Framework Convention on Climate Change (FCCC) established the mechanisms for international co-operative action on greenhouse. The Convention sets out a broad framework and initiated a process covering all aspects of climate change. The international commitments under the FCCC were concluded at the Third Conference of the Parties held at Kyoto, Japan in December 1997.

*Kyoto outcome favourable
for Australia.*

In the Kyoto discussions Australia was able to successfully lobby support for the concept of differentiation. Differentiation means that the FCCC greenhouse gas emissions outcomes should take into consideration the individual circumstances of each participating country. The Kyoto outcome was favourable in that Australia was one of three countries permitted to marginally increase emissions by 8% vis-a-vis 1990 levels.

In 1992 a National Greenhouse Response Strategy (NGRS) was adopted by Australian governments. Following a 1996 review of the strategy it was concluded that governments, stakeholders groups and the community need to do more to reduce Australia's greenhouse gas emissions and to prepare for the potential impacts of climate change.

All States and Territories are currently in the process of inputting into the National Greenhouse Response Strategy (NGRS). The NGRS will indicate the manner in which Australia will constrain its growth in emissions to the 8% increase negotiated under the Kyoto Agreement.

The first stage of the process (now completed) was for the Commonwealth, States and Territories to agree to the principles which should underlie the NGRS. The second stage (currently underway) is for the Commonwealth, States and Territories to develop "Action Plans" for implementation of the NGRS.

In developing State "Action Plans" Western Australia is pursuing the concept of differentiation within the national context. The State's belief is that it should not be unduly penalised because its export goods have high domestic greenhouse emissions, particularly as some help abate emissions abroad. Western Australia is currently in the process of developing the State's Action Plan.

New Commonwealth Bill streamlines the State/ Commonwealth environmental approvals process.

The Federal Environment Protection and Biodiversity Bill 1998 was drafted to replace the existing Commonwealth environmental laws. The Bill enhances the Commonwealth's ability to accredit State environmental procedures and to delegate authority to the State. It therefore removes the Commonwealth from many State and local environment issues. The Federal Bill and the associated streamlined State-Commonwealth environmental approval process have not yet been finalised.

Regional Forest Agreement public consultation paper released.

In May 1998 the joint Western Australian - Commonwealth public consultation paper, "Towards a Regional Forest Agreement" was released, outlining a range of possible approaches to a long-term Regional Forest Agreement (RFA) between Western Australia and the Commonwealth. The release of the document marked the final phase in the RFA's development, which commenced in 1992, when Commonwealth, State and Territory governments signed the National Forest Policy Statement.

The RFA for Western Australia encompasses most of the State's Southwest region. It is an agreement between the State and Commonwealth governments on the future use and management (including exploration and mining) of the forests of Western Australia's south-west. The Agreement will be in place for 20 years, subject to five-yearly reviews.

The last stage of the RFA process entailed considering comments on the consultation paper and development of a preferred approach for submission to the Commonwealth and State governments. It was signed by the Prime Minister and the Premier in May 1999.

New Federal Government administrative arrangements for energy and resources

With the new Ministerial arrangements following the federal election in October 1998 the resources and energy portfolio was amalgamated with industry and science to form the new 'megaportfolio' of Industry, Science

and Resources. The whole Resources and Energy Group of the former Department of Primary Industries and Energy (DPIE) has gone over to the Department of Industry, Science and Resources (DISR). The former DPIE also had charge of the Australian Geological Survey Organisation (AGSO), the Australian Bureau of Agricultural and Resource Economics (ABARE) and the Bureau of Resources Sciences (BRS). Except for its former hydrogeological section and the mineral and petroleum resources part of BRS, AGSO is now within DISR. ABARE and the former hydrogeological section of BRS have gone to the department of Agriculture, Fisheries and Forestry Australia (AFFA) which is the new version of DPIE.

Figure 1.2

LOCAL GOVERNMENT BOUNDARIES

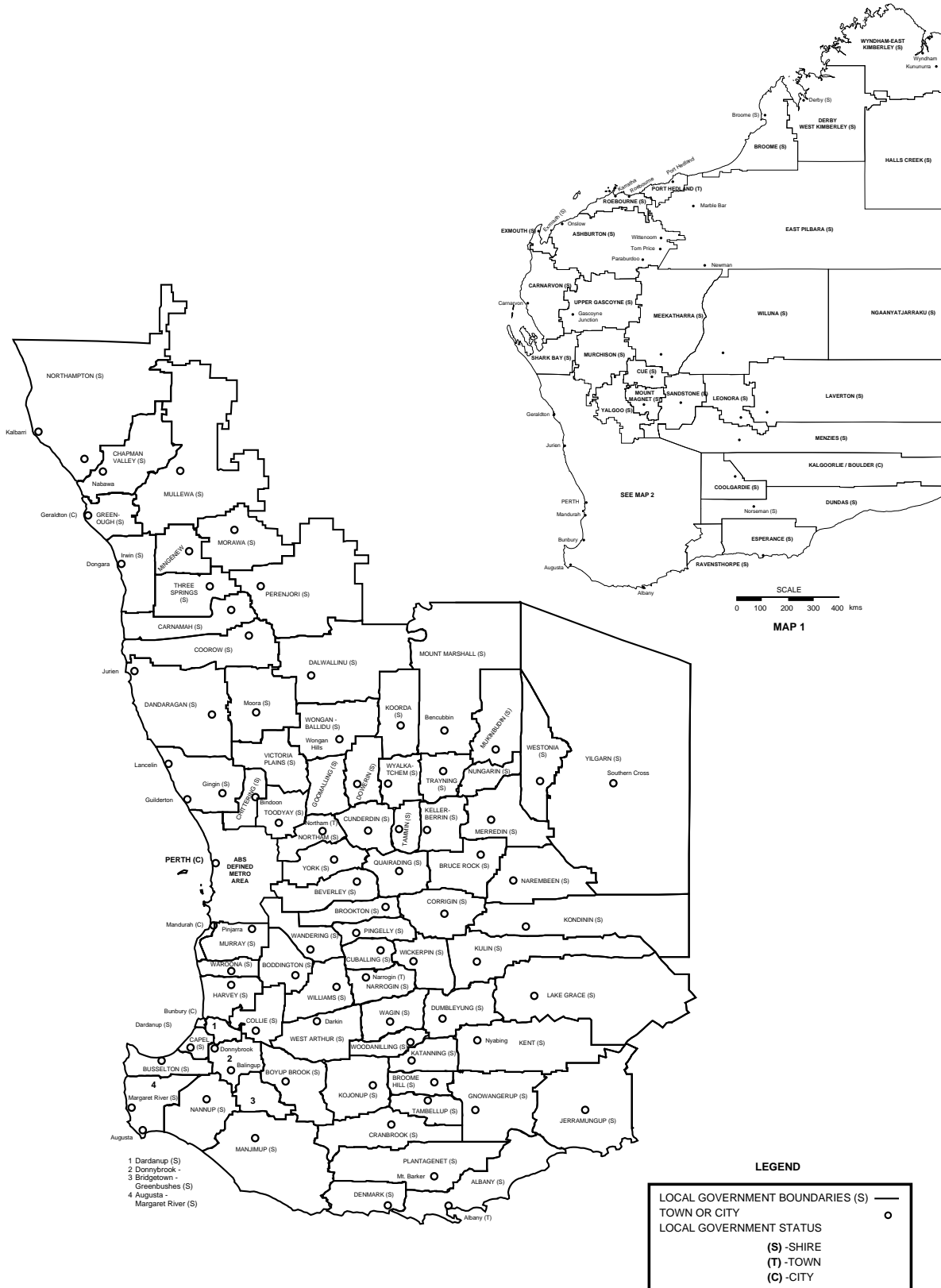


Figure 1.3

MAJOR MINERAL AND PETROLEUM PROJECTS IN WESTERN AUSTRALIA



- | | |
|-----------------------|------------------------|
| ⊙ Base Metals | ◐ Iron Ore |
| △ Bauxite - Alumina | ▲ Nickel |
| ■ Coal | * Petroleum |
| ◆ Diamonds | ★ Salt |
| ● Gold | ○ Talc |
| □ Heavy Mineral Sands | ◇ Tin-Tantalum-Lithium |
| ❖ Gypsum | |

2. REVIEW OF MAJOR MINERALS AND PETROLEUM IN WA

2.1 Overview and Outlook

In 1998 the total value of Western Australia's minerals and energy production grew by 3.3% to reach \$17.9 billion. This amounts to ten years of compound growth averaging almost 10% per annum. The slowing growth was due to low global commodity prices. Physical output of most mineral and petroleum products actually increased and in many instances reached record levels. Falls in commodity prices were so severe in some instances that both rises in quantity and depreciation of the Australian dollar over 1998 were unable to maintain revenues.

Overall growth of the resource sector, albeit at a subdued rate was facilitated by a 15% depreciation of the Australian dollar during 1998. This helped ameliorate price cuts over the year and boosted the few price increases that some commodity suppliers experienced.

With world oil prices falling to their lowest level in 23 years, petroleum was particularly hurt by adverse price conditions. Whilst the output of almost all petroleum products increased with record levels reached for liquefied natural gas (LNG) and condensate, the total value of petroleum production fell by 10% to \$4,646 million. This was the first drop in four years.

In contrast to what was experienced in most other sectors, iron ore production actually fell in 1998 by 6% to 143 million tonnes, but the value of production increased by 13% to reach a record \$4,097 million. This outcome was achieved through a combination of higher prices attained at a previous round of negotiations in early 1998 and the lower value of the Australian dollar.

Depressed international gold prices continued to place pressure on the gold industry to rationalise production with the State's overall gold output dropping in 1998 by 3% to 231 tonnes (7,423 thousand ounces). Thanks to the devaluation of the Australian dollar though, the value of gold output still managed to rise marginally by 2% to \$3,469 million.

Western Australia's alumina output continued to increase, rising by 2% on the previous year to reach a record high of 8.6 million tonnes. Favourable prices

received by local producers resulting from Australian currency devaluation was chiefly responsible for the value of production soaring by 15%, to hit a record \$2,397 million.

Similarly, the State's nickel output also greatly increased, attaining a new record high of 143 thousand tonnes. This was the industry's sixth successive annual output increase. However, the world average nickel price was down by a third compared to the previous year, reaching a 10 year low. Consequently, the value of production suffered a 9% drop to \$1,039 million in 1998.

The heavy mineral sands industry continued to grow for the fifth successive year with the value of production up 9% to \$691 million. This was attributable to increased production of most mineral sand products, local producers receiving favourable contract prices and a weakened Australian dollar. A significant contribution to the industry's growth came from the upgraded ilmenite sector, where the value of production rose 19% to \$283 million.

Both sales value and volume records were broken by the Western Australian diamond industry in 1998. Western Australian diamond sales in 1998 were up by a dramatic 48% to \$622 million. Factors responsible for this were the higher average prices received on sales, mix of diamonds marketed and the depreciation of the Australian dollar. In addition, volume of sales was up in 1998 by over 29% to 52 million carats with a portion of these sales emanating from stocks.

Another sector that experienced growth over 1998 was the salt industry which increased its value of production by over \$38 million to \$210 million. Other sectors helping the resource industry grow were the State's lead and zinc producers who increased production by 35% to over 189 thousand tonnes of combined metals in concentrates. This plus the favourable movement in the exchange rate helped overcome lower prices to see total lead and zinc revenue go up by \$13 million to \$141 million.

Despite overall slower growth of the Western Australian mineral and petroleum industry in 1998, it is noteworthy that the current level is almost 2.5 times higher compared to the value of mineral and petroleum production ten years ago. This is a solid average compound growth rate of 9.6% per annum

and represents a doubling of the value of production every eight years, outstripping growth of the economy in general.

As discussed earlier, world economic conditions are such that the outlook for commodity prices at least in the near term is not good. A critical issue at this stage is how long commodity prices will remain low. As pointed out by ABARE at its March 1999 Outlook Conference, economic conditions in Asia are of critical importance to world commodity prices and the economic recovery in Japan, South Korea and South East Asia is likely to take several years. In China meanwhile, significant reforms are needed to sustain economic growth. Combining this with an assumed weak world economic outlook, the potential of increased commodity supplies is likely to continue to place downward pressure on world prices over the next few years.

However, at the Outlook Conference it was also pointed out that in the longer term a modest recovery in world economic growth is assumed later in 2000 with a strengthening beyond that. This should provide a source of relief for low commodity prices which will be dictated more by the degree to which new mineral and energy supply capacity is brought into production.

2.2 Petroleum

The value of Western Australia's petroleum production fell 10% to \$4,646 million. This comes after four successive years of increases. Physical output of almost all petroleum products increased, with for example, liquefied natural gas (LNG) and condensate rising to new record highs. However, even with the benefit of the depreciated Australian dollar the increased output, was insufficient to counteract world oil prices which fell to their lowest level in 23 years.

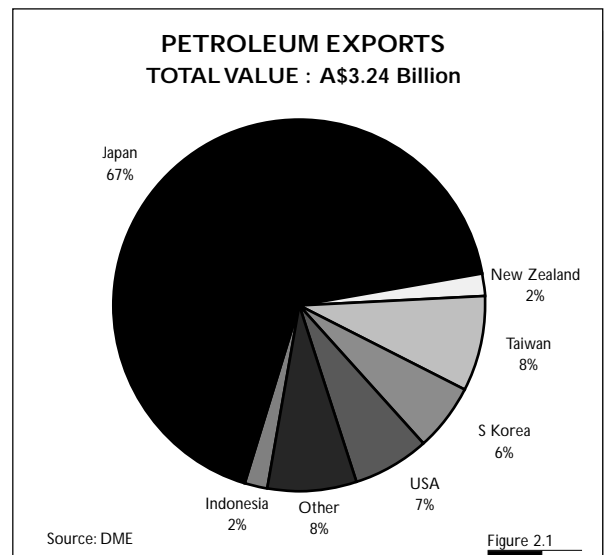
In 1998 the State exported \$3,235 million, or 70% by value, of its petroleum production. The major destinations were Japan (67%), Taiwan (8%) and the US (7%).

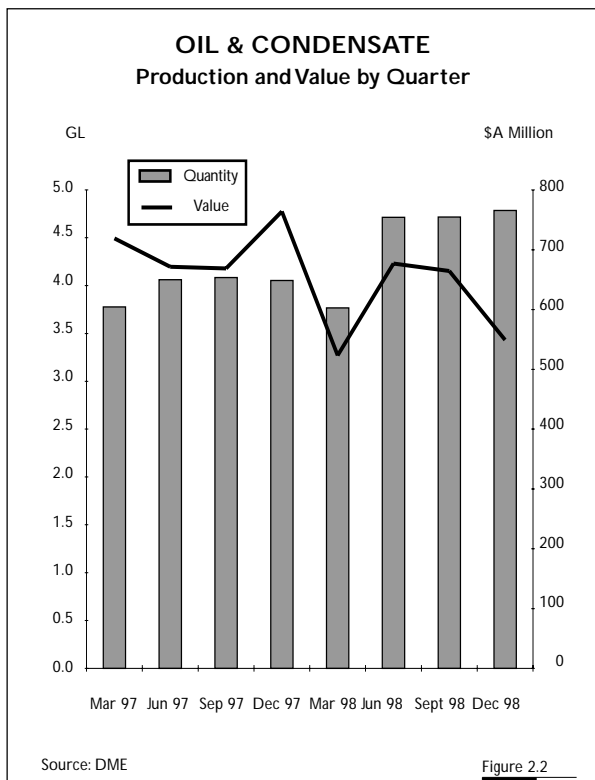
1998 Petroleum Industry Highlights

LNG is Western Australia's most significant petroleum product. Output of LNG in 1998 increased 3% to a new record high of 7.5 million tonnes. Poor oil prices however, caused the value of this production to drop 2% to \$1,562 million.

Western Australia accounts for approximately 10% of world LNG trade and is the third largest exporter in the Asia Pacific region behind Indonesia and Malaysia. Having become a significant supplier in the world market, Perth hosted the world's premier LNG conference in May 1998, attended by the world's major LNG producers and consumers.

A total of 129 LNG shipments to Japan were made in 1998 plus four to the US. The spot sales to the US were made possible by the North West Shelf Gas





during the year. Production in 1998 was also boosted due to higher output from the Griffin project which recommenced production in January 1998 after being shutdown for repairs over the previous three months. Additional contributions to increases in the State's oil output came from the commencement of production from the Stag field in May 1998 plus the first full year of production from the Wandoo 'B' platform, the Agincourt field and the Lambert-Hermes project.

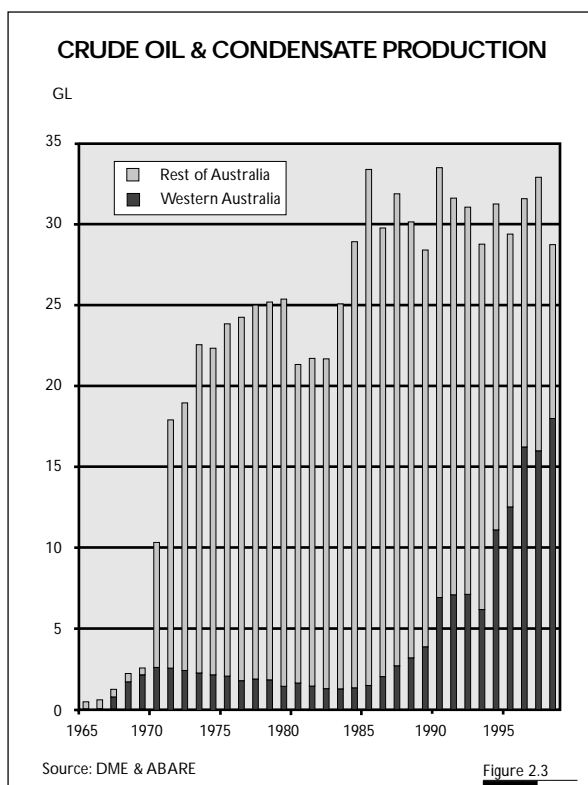
Oil prices halved over the last two years as the Asian economic crisis crushed demand and global inventories ballooned. OPEC production controls have also met with little success resulting in severe oil price drops over 1998. Consequently, despite the State's crude oil output increasing 15%, the low prices converted this into the overall value of crude oil production actually being down 15% to \$1,459 million.

Condensate production increased 9% to reach a new record high of 44 million barrels. This was chiefly due to greater output from the North West Shelf Project, particularly North Rankin and Goodwyn. Again, lower oil prices resulted in the actual value of condensate production being down in 1998 by over 13% to \$956 million. Future output of condensate may increase further, particularly if the NWSGP's

Project (NWSGP) having capacity installed beyond that required to meet the current level of firm long-term contract sales to Japan. Capacity could indeed be increased further if plans to construct two additional LNG trains reach fruition. The NWSGP's expansion plans involve adding two more processing trains to the three that have been operating since the mid 1980s, six extra LNG carriers, a fractionation plant, two additional power generation units, an extra LNG jetty berth, an extra LNG storage tank and a utilities upgrade. This would double LNG production capacity to almost 14.5 million tonnes per annum.

At this stage a front end engineering design for the proposed expansion of the LNG project is being carried out. It is expected to be completed by mid 1999. This is a preliminary step before the calling of final tender contracts for procurement and construction of the proposed expansion. Expenditure on the final tender contracts is conditional upon the NWSGP joint-venture partners securing long term LNG sales contracts with their Japanese customers.

Crude oil production increased 15% to 69 million barrels. A major contribution to this increase came from the State's largest oilfield, Wanaea-Cossack, which despite a temporary shutdown of the Wanaea floating production, storage and off-loading (FPSO) facility in April 1998, overall recorded much higher output



liquids expansion program reaches fruition. This program is part of the NWSGP's expansion plans mentioned earlier and would lift NWSGP condensate production from its present rate of about 115 thousand to 130 thousand barrels a day.

Decreased sale contract volumes and lower realised prices resulted in the value of Western Australian natural gas production in 1998 falling 8% to \$527 million. 1998 was also the second full year of production from Woodside Petroleum's liquefied petroleum gas (LPG) plant. Whilst most exported LPG production continued to go to Japan, new export destinations were China, the Philippines and Lebanon. The new export markets facilitated a 13% increase in production to over 648 thousand tonnes of LPG butane and propane products. However, low prices for petroleum products meant that the total value of production for LPG was down in 1998 by 15% to \$142 million.

World Oil Market and Outlook

Oil prices fell heavily in 1998, being 38% down on average compared to the previous year. A particularly steep decline in oil prices occurred in the closing months of the year with the price of West Texas Intermediate for example, dropping to US\$10.35 per barrel - its lowest level in 23 years. Several factors

have been responsible for this including the failure of OPEC's proposed production cuts in late March 1998 to materialise to the extent promised. A major hindrance to the effectiveness of OPEC controls on output has been the extent of non compliance by OPEC members. Further discussions by OPEC regarding production cuts have been mooted in March of this year, but until the issue of compliance is resolved, it is unlikely they will be carried out.

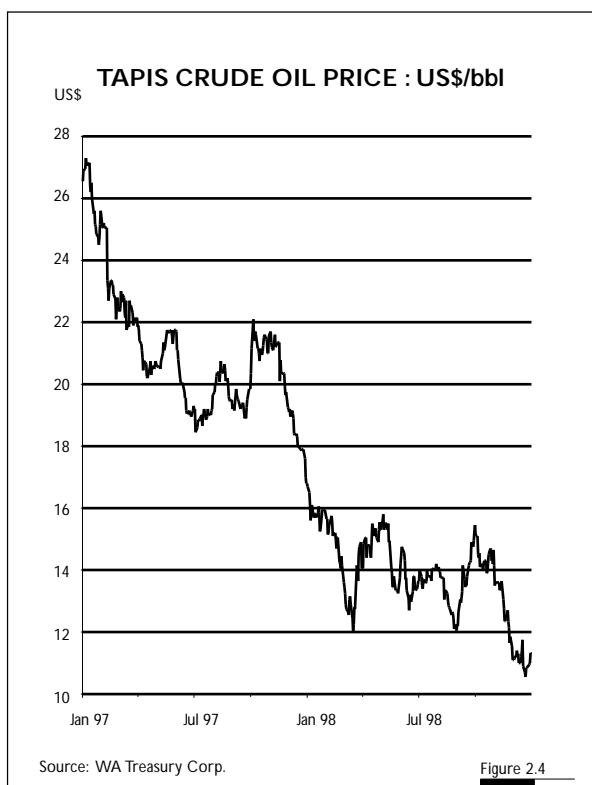
An additional factor the depressed oil market needs to deal with is the return of Iraq to the market. Oil production from Iraq has been surging with the country currently producing 2.7 million barrels a day, its highest output since the end of the Gulf War in 1991. New production has also entered the market from countries such as Russia, Norway, Mexico and Venezuela.

Compounding depressed prices caused by overproduction has been slow demand in Asia, a relatively warm northern hemisphere winter and high global stock levels. The oil price outlook therefore remains weak, with most analysts expecting prices to remain around the US\$13.00 to US\$15.00 per barrel mark over 1999.

State Outlook

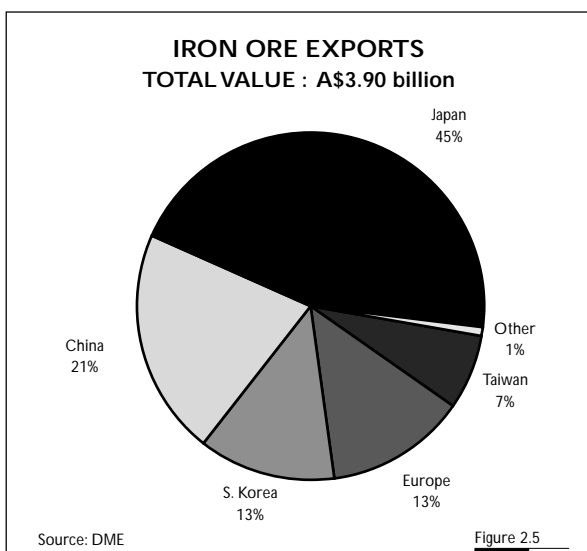
Given the depressed oil price outlook, the short term prognosis for the State's petroleum sector over the coming year is subdued. Significantly, in January 1999 Woodside commenced a major shutdown of the Cossack Pioneer offshore oil and gas production facility for maintenance. The maintenance program is expected to take around six months. This will lower the State's crude oil output at least over the first half of 1999. However, completion of the maintenance program will see oil production from the Wanaea/Cossack field increase from the current output of 90 thousand barrels per day to 115 thousand barrels per day. Gas production from the field is also expected to increase.

In the longer term, current forecasts indicate total condensate and crude oil production will decline after 2002 unless there is a significant increase in successful exploration activity over the next few years. Undermining the exploration effort however has been the global oil price slump. This is forcing companies to cut their exploration budgets, particularly outside the low cost production areas.



Low oil prices and the economic downturn in Asia has also led to uncertainty in the LNG industry. Up until the middle of 1997 demand forecasts were universally confident of continually increasing demand. However, the Asian downturn has put in question the LNG industry's expansion plans. It is almost certain that new LNG projects such as the NWSGP expansion plans mentioned earlier will proceed, the question is when. This similarly applies to greenfield developments such as the Gorgon, North Gorgon, Spar, West Tryal Rocks, Chryasor and Dionysus gas fields. So despite the short-term drop in confidence, the long-term outlook is still good as LNG projects are based on long-term commitments between buyers and sellers and the current downturn is likely to have little effect beyond a delay in start up dates.

With the availability of significant resources, Western Australia's gas production is very much dictated by demand which shows steady growth, not only from existing, but also potential new customers. In particular, strong increases in industrial sector demand are expected. In relation to the chemical sector, of particular relevance was the announcement by the State Government on 10 June 1998 that the Dow Chemical Company and Shell Chemicals Limited had won the right to develop proposals for the construction of a \$3 billion integrated petrochemical plant either on the Burrup Peninsula or Maitland industrial estate near Karratha. The first stage of Dow/Shell's feasibility study was to be completed by the end of 1998 with a view to begin physical implementation of the project in 2000.



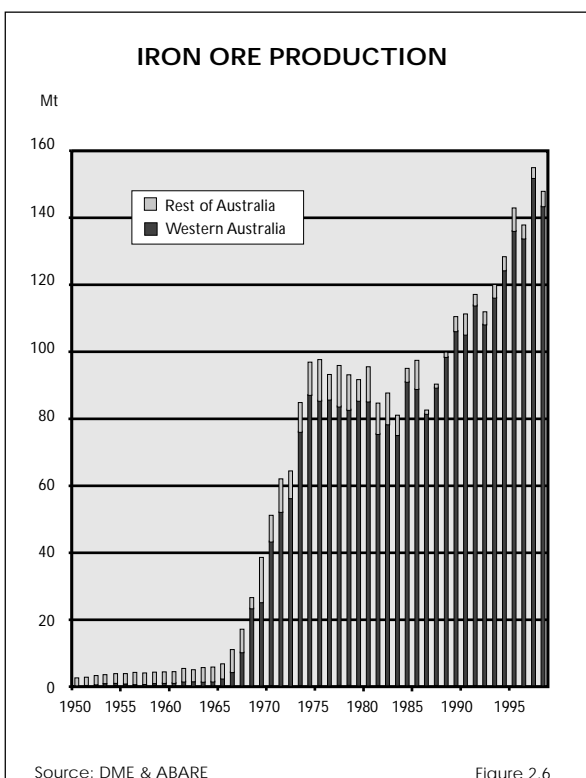
2.3 Iron Ore

Unseasonably wet weather in the middle of the year and contracting steel production led to iron ore output falling in 1998 by 6% to 143 million tonnes. However, the value of production of Western Australia's iron ore industry increased by 13% to reach a record amount of \$4,097 million. This outcome was achieved through a combination of two favourable factors, namely higher prices attained at a previous round of negotiations in early 1998 and the depreciation of the Australian dollar.

Over 95% of Western Australia's iron ore production was exported overseas, with the State being the world's leading iron ore exporter. Almost half of the exported iron ore went to Japan, a quarter to China and the remainder mostly split up between South Korea, Europe and Taiwan.

1998 Iron Ore Industry Highlights

The 15% devaluation of the A\$ relative to the US\$ during 1998 was the most significant contributor to the increased value of production. However, slightly higher prices also helped. For the Japanese fiscal year (JFY), April 1998 to March 1999, Western Australia's three major producers secured from Japanese buyers price increases of 2.9% and 2.8% for lump and fine ore respectively.



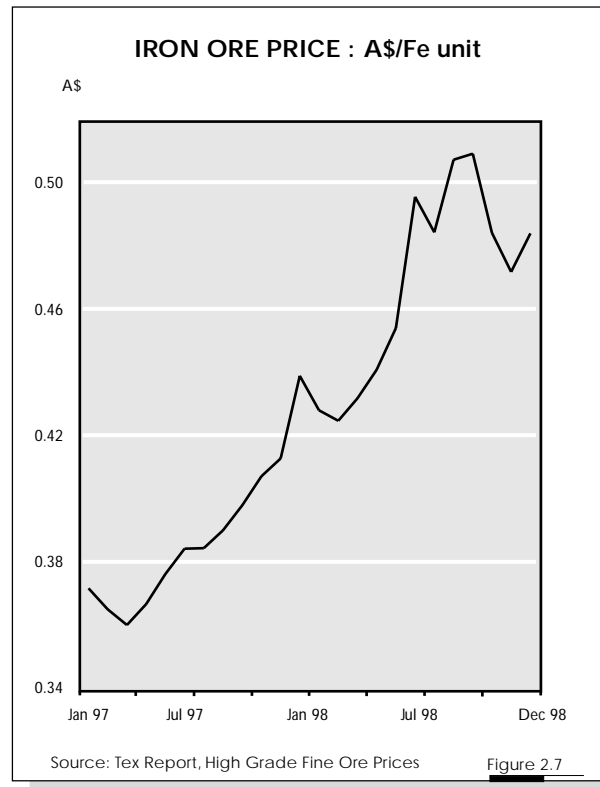
Price increases were nevertheless achieved under difficult negotiating circumstances. In 1998 iron ore markets began to come under increasing downward pressure from collapsing steel and pig iron production which fell around 2% and 1% respectively in 1998. Japan's steel and pig iron production however, underwent greater decreases of around 11% and 4% respectively. Overall, including Japan and China, Asian steel production fell around 2% in 1998, while pig iron production was only down marginally. The overall Asian outcome was not as severe as Japan's due to China in 1998 recording an estimated 5% and 2% growth in its steel and pig iron output respectively.

Locally, the most significant development in the iron ore industry during 1998 was Hamersley Iron's completion of its Yandicoogina (HiYandi) iron ore project. This greenfield project is the second major iron ore development (after BHP's Yandicoogina) in the region east of the Karijini National Park. Hamersley's Yandi mine is located approximately 90km north west of Newman, in close proximity to BHP's Yandi mine. Hamersley commenced mining at Yandi in August 1998 with the first shipment being loaded in January 1999. At full production the mine will produce up to 15 million tonnes per annum of sinter fines material.

Development of HiYandi involved improving and expanding Hamersley's Dampier port facilities to increase its capacity by some 10 million tonnes per annum. The expansion entailed maximising utilisation of existing equipment and infrastructure, installation of new equipment, construction of a lay-by berth at East Intercourse Island and dredging of loading basins at Parker Point. A railway line linking HiYandi to existing rail facilities also needed to be constructed.

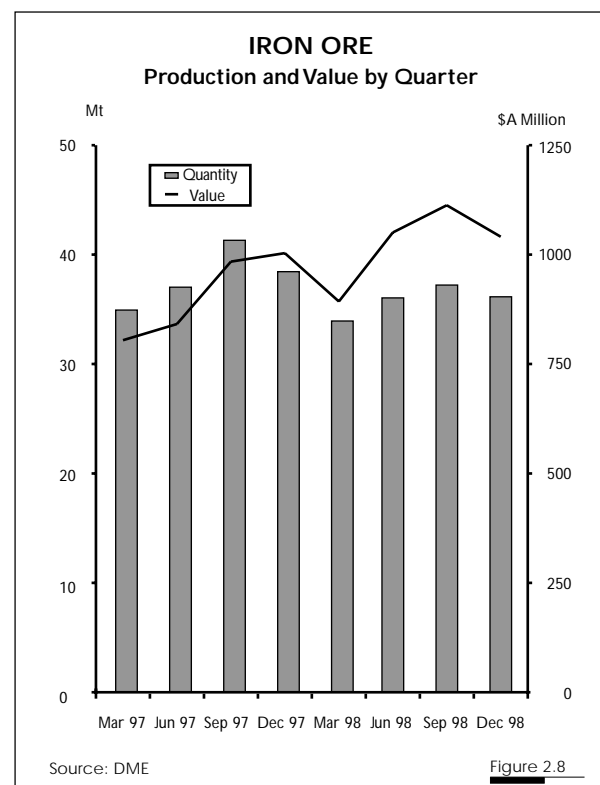
Nearby, BHP's Yandi mine also reached a significant milestone in 1998 by having crushed 100 million tonnes of iron ore since the mine commenced production in 1992. This was achieved after only six years of operation during which Yandi has become one of the worlds top six iron ore mines.

BHP also mostly completed its iron ore capacity expansion at Nelson Point in Port Hedland in 1998. Since late 1996, the upgrading of ore handling facilities at Nelson Point has included the installation of a third ore car dumper, crushing and screening plant upgrades, new marshalling yard facilities and rail line debottlenecking. All up, these upgrades have enabled



BHP to lift ore handling capacity at Nelson Point from 44 million to 66 million tonnes per annum.

However, the economic turmoil in Asia forced BHP to suspend mine development of its Mining Area C (MAC) and Newman Orebody 18, even though the



latter already had railroad formation earthworks in place and a power line under construction.

Outlook

Prospects of the iron ore industry are of course reliant on the fortunes of the steel making industry which in turn depend on world growth. After slowing from 4.1% in 1997 to 2.3% in 1998, ABARE has tipped another fall in global economic growth to 1.9% in 1999. This does not bode well for steel demand. Steel consumption in the US and Western Europe is forecast to slow in line with slowing industrial production growth in those regions. Of particular concern has been the accelerated rate at which steel and pig iron production began to fall in Europe and the US towards the end of 1998. Up to now weakness in the steel market was restricted to Asia. Analysts now predict a contraction in global iron ore trade of over 3% in 1999.

Of special relevance to the local iron ore industry is the predicted continuity of depressed steel production in the recession hit Japanese steel making industry. Japanese crude steel production has been depressed and unfortunately suffered greater production cuts as 1998 drew to a close. A collapse in demand at home and abroad has seen Japanese steel production tipped to fall in 1999 to its lowest level in 27 years, with Japanese steel makers suggesting that their output could be down 8% to 84 million tonnes in the coming year.

Consequently, in February 1999 Western Australian iron ore producers had to accept much lower than expected prices for the Japanese fiscal year (JFY), April 1999 to March 2000. BHP and Hamersley Iron both settled for an 11.0% cut in their fine ore price to US\$26.63cents per dry long ton unit (about US\$17 per tonne) and a 10.2% cut in the lump ore price to US\$34.83 cents per dry long ton unit (about US\$22 per tonne). North Ltd's Robe River joint venture had to accept a 13.4% cut for its lesser quality fines product. BHP suffered a double blow insofar it also had to drop agreed deliveries by some 8%. Hamersley's tonnage was cut back by a smaller 4%.

It is unclear as to the direction in which Chinese steel production is headed. The Chinese Government's announcement that it would spend more on building roads, highways and telecommunications networks has been interpreted by some as meaning that China's steel requirements and hence iron ore imports will

rise. However, China's steel inventories are believed to have increased markedly in 1998 and this has prompted Chinese authorities to slash the country's steel output in 1999 by 10% in an effort to curb the slide in price and ease domestic oversupply. Chinese steel makers have also remarked that they are experiencing profit drops or losses. A similar picture is emerging for another major importer, South Korea. In late 1998, South Korea's main steel producer, Posco, announced that steel production and exports would be temporarily cut in response to the low level of international demand. This is interrelated with the increased difficulties Asian countries in general are now experiencing in exporting steel to Europe and the US. Steel producers in both these regions (plus to a lesser extent Brazil, Mexico and Thailand) believe their countries are importing cut price 'dumped' steel and are calling on their respective governments to restrict foreign access to their domestic markets.

In total, global economic and steel industry developments do not augur well for Western Australian iron ore producers. Global economic developments, particularly in Asia, have also enforced a more critical consideration of new iron ore projects and in particular, moves towards downstream processing. A plethora of iron ore processing projects remain simply 'under consideration'. Western Australia has a ready availability low cost iron ore and natural gas resources, close proximity to Asia and sophisticated infrastructure. Unfortunately, the Asian economic slowdown now looms as the major hurdle, posing not only marketing difficulties for potential new DRI projects but also initial financing hindrances. Significantly though, after 40 months BHP completed construction of its direct reduced iron (DRI) plant in Port Hedland. This is Western Australia's first new downstream iron ore processing facility. Though commissioning of the project is still underway, the first briquettes from this plant were produced in late February 1999 and the first shipment of briquettes in April 1999.

2.4 Gold

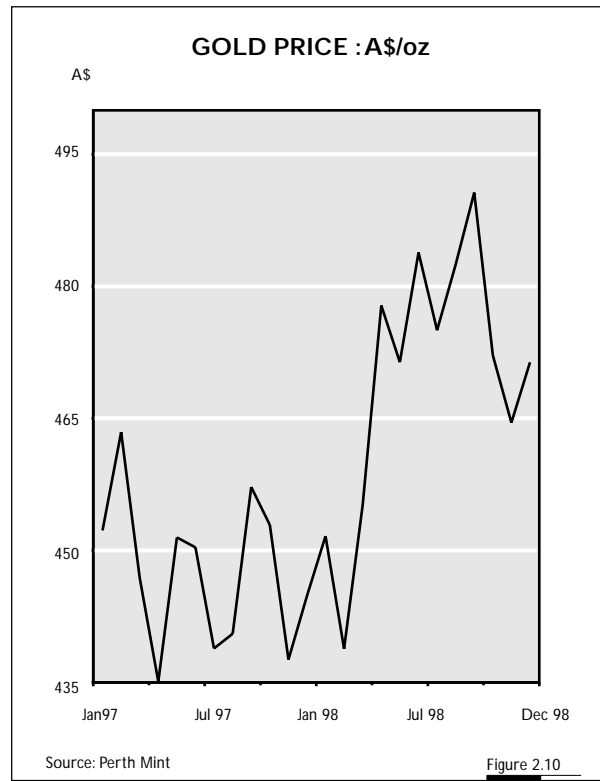
Depressed international gold prices have continued to place pressure on the industry to rationalise production. Closure of gold projects resulted in the State's overall gold production dropping in 1998 by 3% to 231 tonnes (7,423 thousand ounces). Nevertheless, thanks to the devaluation of the Australian dollar in 1998, the value of the State's gold output still managed to rise, albeit by a small 2% to \$3,469 million.

The international gold price averaged US\$294 per oz in 1998. This was 11% lower compared to the average price in 1997. Local producers were sheltered from the full effect of the lower gold price thanks to a depreciated Australian currency. This converted the international price decrease to a 5% average increase in Australian prices over 1998. Local producers were also assisted by maintaining extensive gold hedging positions.

In 1998 the State's gold exports amounted to \$4,089 million. This exceeded the value of production because previously stockpiled refined gold stocks were included in exports. Predominant gold export markets were the UK (24%), South Korea (17%), Singapore (12%), Switzerland (11%) and the US (10%).

Gold Industry Highlights

Low gold prices have inevitably seen the gold mining industry in Western Australia undergo some rationalisation. This has manifested itself through tenement or lease rationalisation, closures,

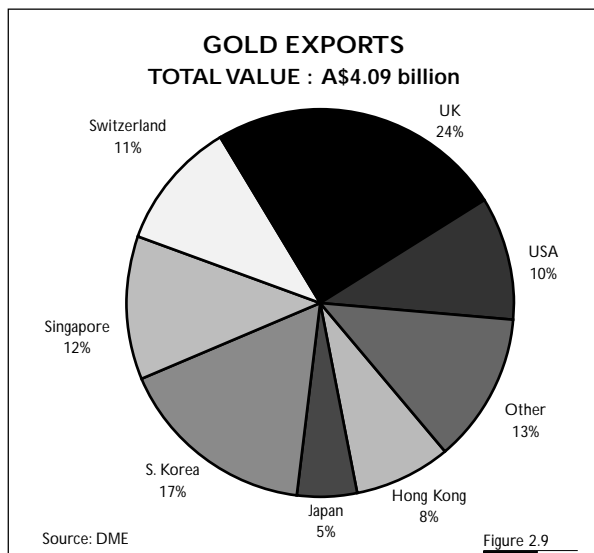


consolidation of operations and also expansion of some mining companies via corporate takeovers and acquisitions to reap economies of scale in an effort to reduce costs. An example of this was Great Central Mines (GCM) twin takeover of Wiluna Mines and Eagle Mining Corporation. This was part of a strategy by GCM to rationalise and consolidate properties in the Yandal and adjacent Milrose and Wiluna Belts in Western Australia. Also, Normandy as part of its Boddington joint venture in late 1998 purchased the resources of the nearby Hedges gold mine. Normandy has since figured again in the ownership change stakes by taking up a significant share in GCM.

Weakness in the A\$ has also increased the attractiveness of local companies to overseas gold mining companies, particularly from North America. This was exemplified earlier in 1998 by Homestake Mining Company's acquisition of Plutonic Resources, where not only a large production base was absorbed but also a substantial tenement position in the Yandal Belt.

Over half (52%) of Western Australia's gold output in 1998 was accounted for by the following 11 projects:

- Golden Mile (Normandy, Homestake) — 24.3 tonnes
- Granny Smith (Placer, Delta) — 16.9 tonnes



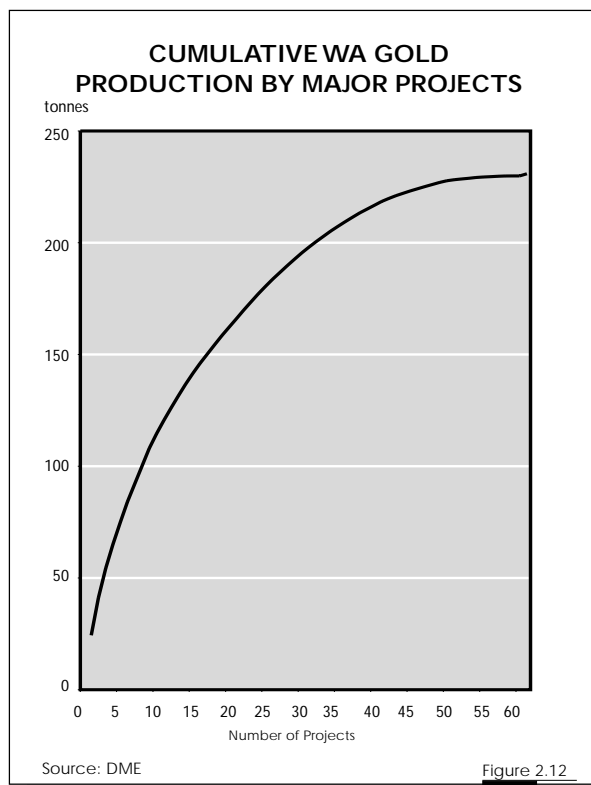
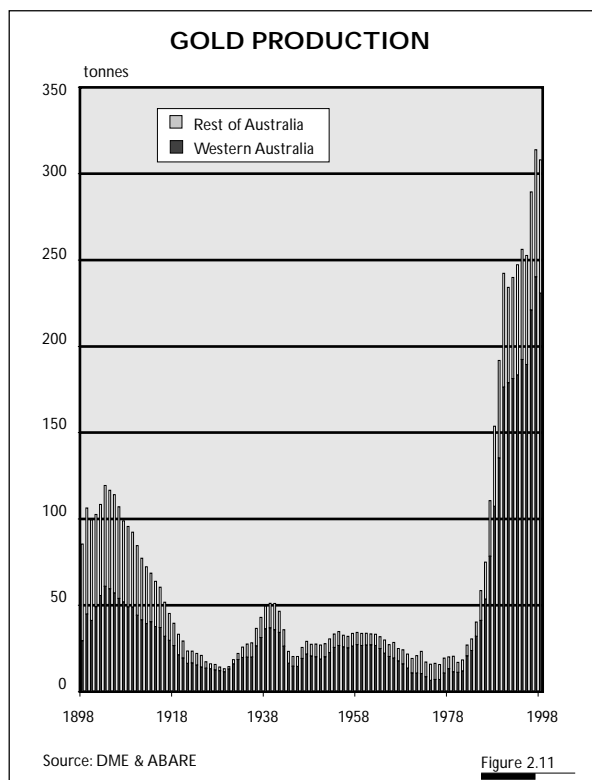
- Kambalda St Ives (WMC) — 13.2 tonnes
- Telfer (Newcrest) — 10.6 tonnes
- Jundee-Nimary (Great Central Mines) — 9.8 tonnes
- Kanowna Belle (North, Delta) — 9.3 tonnes
- Plutonic (Homestake) — 8.1 tonnes
- Bronzewing (Great Central Mines) — 7.9 tonnes
- Boddington (Newcrest, Normandy, Acacia) — 7.9 tonnes
- Paddington (Goldfields Kalgoorlie) — 6.5 tonnes
- Sunrise Dam (Acacia) — 5.9 tonnes

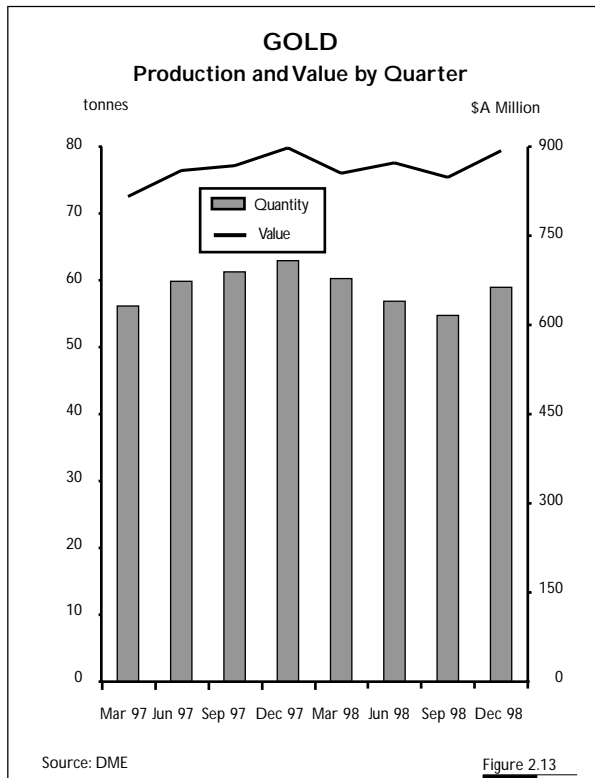
Notably, ownership of the above list of 11 projects is relatively concentrated amongst several significant mining companies. Rationalisation also meant that 1998 saw a number of relatively large gold mines cease operation and reconfiguration of some operations. Sons of Gwalia for example, as part of its rationalisation of operations closed down its Nevorja and Laverton mines and St Barbara ceased open pit mining in Meekatharra. Mine closures in 1998 also included Bullabulling, Mt Gibson, Mt Morgans, Marymia, Lynas Find, Bannockburn, Reedy and Two Boys. These operations in total produced approximately 17 tonnes of gold in the previous year.

Decreases in Western Australia's gold output due to closures was made up for by increased output from some existing projects plus the start up of new mining operations such as Golden Feather, Paraburadoo, Cornishman and Karonie.

Takeovers and amalgamations also extended to the gold refining business. In October 1998 the Western Australian Government's Gold Corporation (GoldCorp) and Golden West Refining Corporation reached an agreement to establish one of Australia's largest refiners of gold and silver. The new joint venture company, headquartered in Perth utilises all the assets of Golden West and the Indonesian, Thai, Hong Kong and Australian assets of GoldCorp, with the exception of its coin and minting business.

On a national scale, the low gold price motivated the Australian gold industry in October to band together to form the Australian Gold Council (AGC). The council's aim is to raise the profile of the gold industry on the national and international stage. It also planned to, among other, to facilitate research into the economic and social contribution of the gold industry, address specific tax issues, produce publications, generate education initiatives and lobby the ASX to develop a world class gold index.





little changed during the coming year. At ABARE's Outlook Conference in March 1999 the gold price was forecast to remain subdued in 1999 (averaging US\$295 per oz). This forecast was based on the expectation that world gold fabrication demand will remain weak in 1999 despite some recovery in Asia. Gold used for fabrication purposes in India, China, and the Middle East was forecast to decline by around 6%, while growth in gold fabrication use in Europe and US was expected to slow. Beyond 2000, ABARE saw the most positive fundamental influences on the gold price to be an expected slight decline in mine production and recovery in fabrication demand.

The most unpredictable element however is the extent to which official and private sector above ground stocks were available to fill any gaps between mine supply and fabrication demand. Most analysts predict that high levels of official sector sales and lending, producer hedging and private disinvestment will lead to real gold prices continuing their easing downward trend of the past two decades.

World Gold Market

The year started badly for gold prices, hitting an 18-year low of US\$280 per oz in January 1998. Prices subsequently moved upward to a high of US\$314 per oz in April, but a weaker yen prompted fears of a further slowdown in demand for gold from Asia. Hence, by August prices had fallen again to near US\$270 per oz.. Prices subsequently managed to scramble up to average around US\$291 per oz for the remainder of the year. Overall, the international gold price averaged US\$294 per oz in 1998, 11% down compared to the average price in 1997. This was the lowest average annual gold price since 1978.

A major feature of 1998 was the failure of gold to respond in any way that suggested a 'safe haven' role for the metal. Many analysts pointed to the numerous events in 1998 that might have attracted funds into gold but failed to do so, including diverse events as US presidential impeachment proceedings, Wall Street stock market shocks, events in Iraq and Russia's debt problem. These exemplified that gold has in recent years been increasingly acquiring the status of a commodity, rather than that of a financial vehicle.

Gold Market Outlook

Low global growth, modest inflation outlook and an unchanged fundamental picture point to gold trading

2.5 Alumina

Western Australia's alumina output continued to increase, up by 2% on the previous year to reach a new record high of 8.6 million tonnes. The value of this production also soared, by 15%, to hit a record \$2,397 million. Favourable prices received by local producers resulting from Australian currency devaluation was chiefly responsible for the increased value of production.

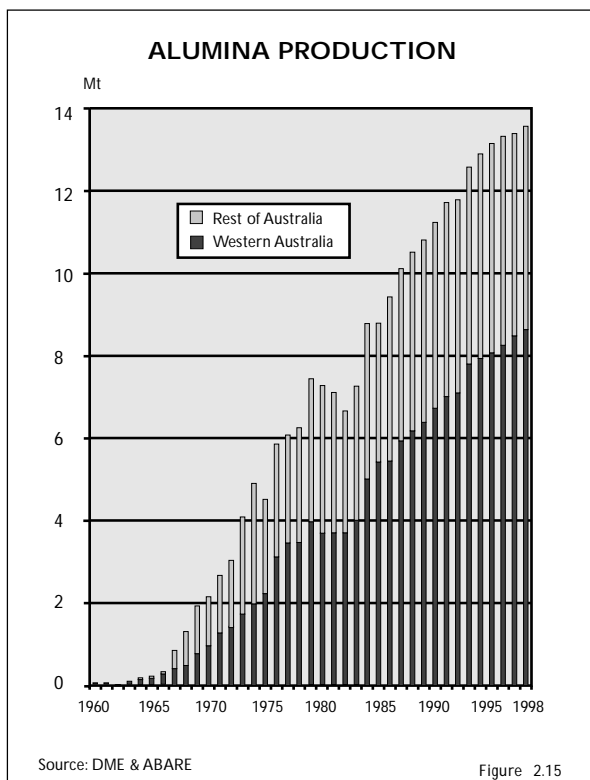
Over 90% of the State's alumina production was exported overseas. Over a quarter went to the US (26%), with other significant destinations being South Africa (18%), Canada (14%) and Bahrain (13%).

1998 Alumina Industry Highlights

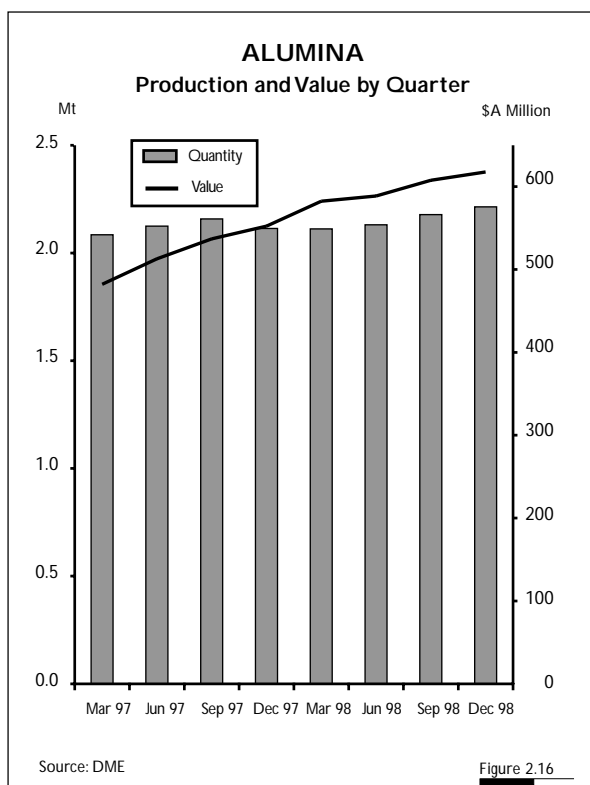
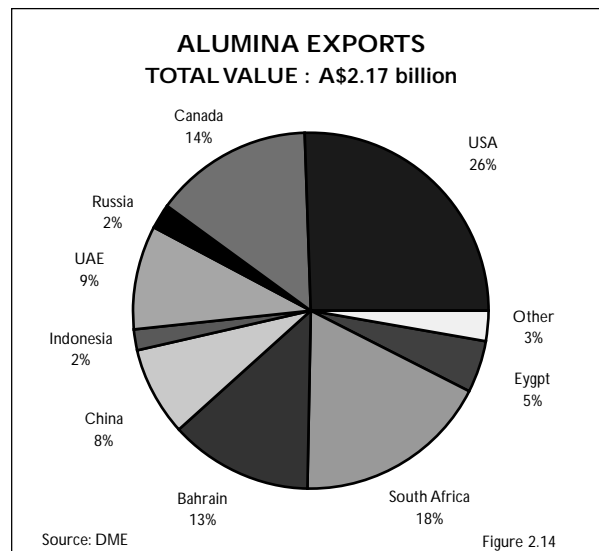
After rising in 1997, spot prices for alumina fell in 1998, particularly in the later half of the year. Overall, the world alumina spot price averaged US\$192 per tonne in 1998 which was 11% down on the previous year. Several factors contributed to the price fall. Firstly, approximately 90% of the western world's aluminium producers source some of their alumina via contracts which are based on the LME aluminium price. Hence, alumina prices fell as the aluminium price decreased.

Secondly, the consumption of alumina by primary aluminium smelters increased by less than 1% in 1998. This weak demand largely reflected production problems that beset numerous aluminium producers in 1998. Combined with a 2% increase in world alumina production, these factors placed downward pressure on prices.

In 1998 work on the Worsley Alumina refinery expansion continued. In December 1998 the



engineering component of the project was about 70% finished with the construction phase about 15% complete. This is the largest resource development project in the State's South West region for over a decade. Completion of the Worsley refinery is forecast to increase alumina production from the present level



of 1.75 million tonnes per annum to 3.1 million tonnes per annum by the first quarter of 2000. Worsley also expects to reduce its operating costs by at least 10% to US\$92 per tonne as a result of the expansion. This should position it as the world's lowest cost alumina producer.

The State's other alumina producer, Alcoa, also continued work on its Wagerup refinery expansion. The Wagerup refinery is the third of Alcoa's three refineries in Western Australia. The Wagerup refinery's current capacity is 1.75 million tonnes a year and the expansion will take the refinery's capacity to 2.19 million tonnes per year. Completion is expected by mid 1999. The expansion is the first stage of an overall program to enhance the Wagerup refinery's capacity to 3.3 million tonnes per annum. Alcoa's other two refineries in Western Australia are Pinjarra and Kwinana (capacity of 3.1 and 1.9 million tonnes respectively).

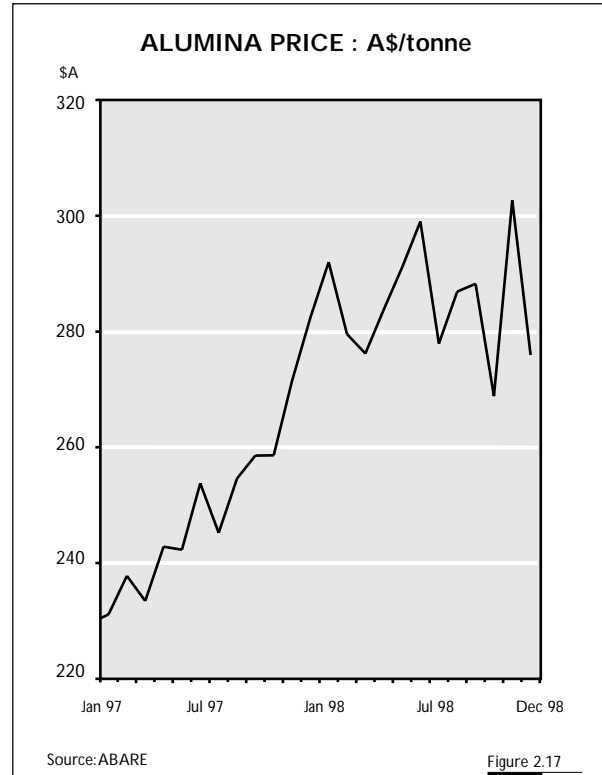
In 1998 mining was concluded at Alcoa's Jarrahdale operation. Started in 1963, Jarrahdale was the oldest bauxite mine operated by Alcoa in Western Australia. Closure took place as the technology at Jarrahdale lacked the flexibility and economies of scale at Alcoa's two other bauxite mines at Huntly and Willowdale. It is planned that Alcoa's Huntly mine east of Pinjarra will be expanded to become a 20 million tonne per annum operation effectively absorbing Jarrahdale's output of 7 million tonnes per annum.

In other developments, Alichem continued work on its plans to establish Australia's first aluminium fluoride plant at Kwinana. A pre-feasibility study for processing alumina hydrate to produce 40 thousand tonnes per annum of aluminium fluoride has been completed.

Outlook

At ABARE's Outlook 99 Conference aluminium stocks were expected to rise as production exceeded consumption. Consequently, an approximate 13% decrease in spot aluminium prices during 1999 was forecast. However, it was cautioned that there were several uncertainties regarding the final price outcome such as the timing and extent of economic recovery in Asia, producers shutting down high cost capacity in response to falling prices and the extent to which hedging activity will drive short term price movements.

Alumina prices were therefore projected to weaken further in 1999 and 2000, in line with the predicted fall in aluminium prices, to average around US\$140 per tonne. This is based on new alumina refining



capacity anticipated to commence production in the next two years including the aforementioned Wagerup and Worsley refinery expansions, a 400 thousand tonne a year expansion at Nalco's Damanioli refinery in India; and a new refinery being built in Iran with an expected capacity of 280 thousand tonnes a year.

2.6 Nickel

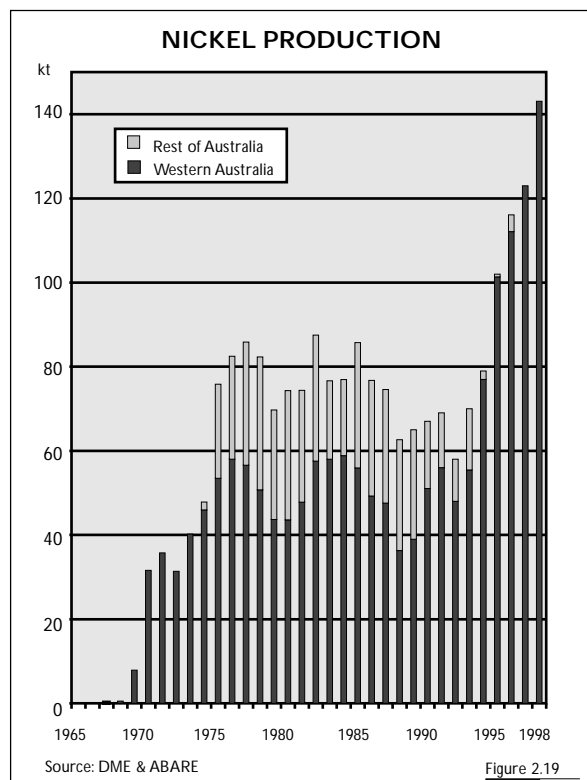
Western Australia's nickel output underwent its sixth successive annual increase in 1998. Output of matte, metal and concentrate nickel products in 1998 was up by 14% to reach a new record high of 143 thousand tonnes of contained metal. However, the higher output was insufficient to counteract very low nickel prices in 1998. International nickel prices were down on average in 1998 by a third compared to the previous year. As a result, the value of the State's production was down 9% to \$1,039 million.

Western Australia accounted for around 99% of Australia's nickel production, with almost all production exported overseas. The dominant export destination was Europe, with over half of production shipped to that region.

1998 Nickel Industry Highlights

Western Australia's nickel production continued to climb in 1998. This was due to increased production levels from WMC's Mt Keith and Kambalda operations along with higher output from the company's Kalgoorlie smelter and Kwinana refinery. New nickel operations also helped boost output.

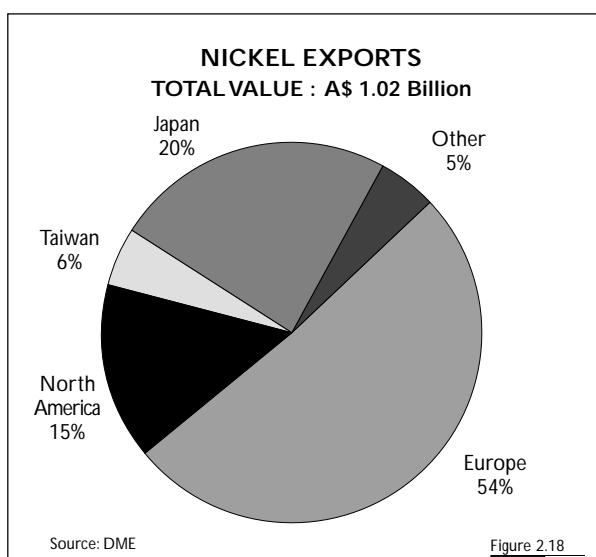
A new project which added to output in 1998 was Black Swan Nickel's underground mine at Silver Swan near Kalgoorlie. This operation commenced shipping concentrates from Esperance in 1997. A full year's production from the project in 1998 saw it contribute over 12 thousand tonnes of contained nickel to the State's output of various nickel products in 1998. On

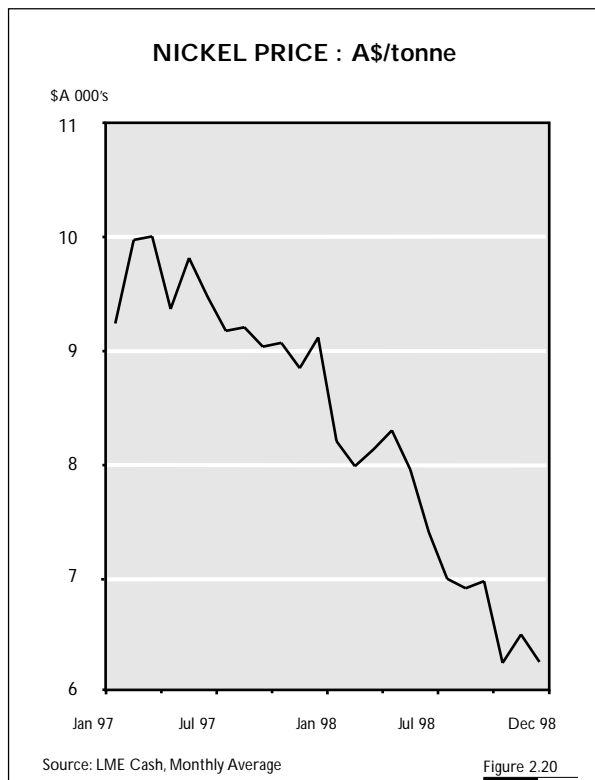


a smaller scale, in April 1998 Titan Resources began production from the resurrected Radio Hill nickel mine, 30 km south of Karratha. Concentrates from Radio Hill are delivered to WMC's drying plant in Kambalda via a 1,900 km inland transport route, believed to be the longest road haul for a resource product anywhere in the State, if not Australia.

In other developments, Dominion Mining finally sold its dormant Yakabindie nickel project to North Ltd. Yakabindie is one of the world's largest undeveloped nickel projects and the sale to North included a licence for the use of the innovative activox processing technology.

The nickel market has been in poor condition due to surplus stocks, lacklustre demand from stainless steel producers, the ready availability of nickel and steel scrap from Russia plus the imminent start up of new, low-cost nickel supplies. Of particular note in 1998, nickel demand was hurt by falls in stainless steel demand in Asia. Japan's stainless steel output fell 17% in 1998 as a result of reduced export opportunities in Asia and a marked slump in demand in its domestic economy. After relative buoyancy in the first half of the year, stainless steel consumption in the rest of Asia also fell dramatically in line with contraction in industrial activity in the region. This region's stainless





steel output and thus nickel demand was supported in the first half of the year by increased export of stainless steel to Europe and the US. But opportunities to export to these sources and exploit Asia's weakened currencies diminished in the latter half of 1998 as anti dumping barriers began to be raised.

A positive factor in 1998 was growing industrial production in Western Europe and the US which supported increased stainless steel production. However, this was insufficient to halt the downward slide in the nickel price over the last two years. It culminated in December 1998 with nickel hitting a 15 year low of US\$3,726 per tonne (US\$1.69 per lb) based on fears of world oversupply because of new nickel projects coming on stream. Overall, nickel prices were down on average in 1998 by 33% compared to the previous year.

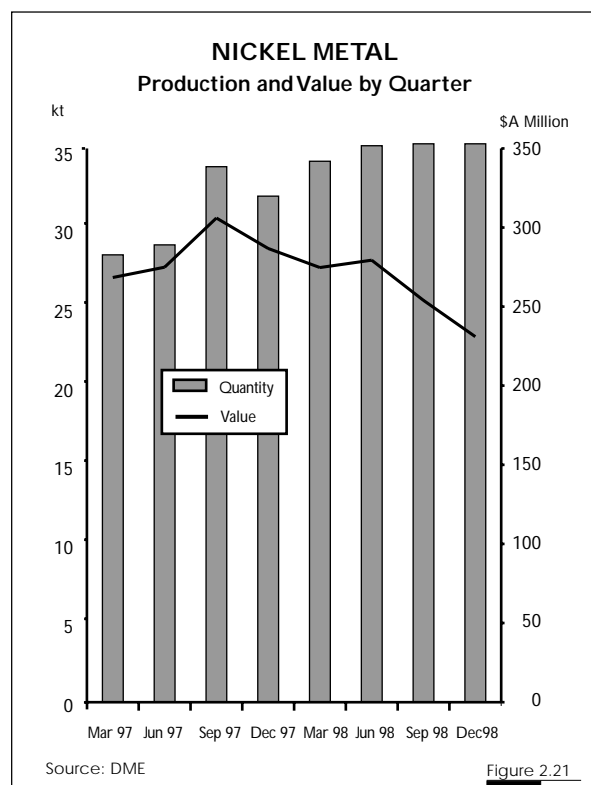
The significant fall in the price of nickel and poor outlook led WMC to announce in September 1998 the closure of three high-cost mines at its Kambalda nickel operation (Wannaway, Blair and Otter-Juan). These closures alone represent a cut in WMC's production of about 10,000 tonnes a year, or approximately 10%. Further cutbacks in WMC's Kambalda operations were announced in March 1999 with the closure of the Long-Victor and Mariners underground mines. This will cut

another 10,000 tonnes of nickel from WMC's output. These cuts leave the Lanfranchi/Schmitz and Coronet sites as the last two producing nickel mines in WMC's Kambalda operations.

Outlook

The market outlook is for nickel prices to initially rise in the first half of 1999 and then to subsequently ease as additional low cost capacity comes into production in Western Australia. Initial price increases have already been realised in the first quarter of 1999 as nickel output has been cut. In addition to the aforementioned Kambalda mine closures by WMC, the company also temporarily shutdown its Kalgoorlie smelter in January 1999 for a major maintenance program following the detection of a furnace leak. Operations have since returned to normal but it has been estimated that WMC's refined nickel metal output for 1999 could have been cut down by up to 15%.

Other nickel production cuts have also been announced from further afield, by Inco of Canada, Norilsk of Russia and Larco of Greece. However, whilst the cuts have come as a welcome reprieve for the battered nickel price, any gains may be short lived. Most of the capacity can be brought back into production relatively quickly and pressure on prices



to go down and established producers to reduce output will be exacerbated if new producers (with potentially much lower production costs) succeed in quickly moving to rated capacity.

The new producers are namely Western Australia's three new lateritic nickel projects - Cawse, Bulong and Murrin Murrin which all entered the final stages of commissioning in the first quarter of 1999. These projects utilise new high pressure acid leach technology to extract nickel. Centaur Mining's Cawse nickel project has been the first of the new operations in the State to deliver product to the market. Notably, Cawse is the first plant worldwide to produce commercial quantities of nickel metal using an integrated process plant incorporating the pressure acid leach, solvent extraction and electrowinning process to treat lateritic ores.

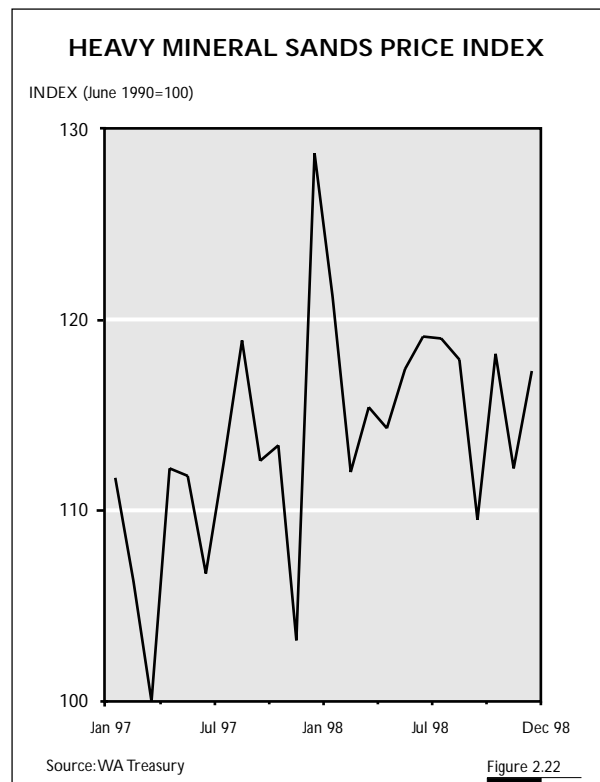
The Cawse operation has a designed annual capacity of around 9,000 tonnes of nickel and 2,000 tonnes of cobalt. The first shipment of cobalt was despatched from the Cawse plant in January 1999. Nickel production started in January 1999 with the first commercial shipment of nickel cathodes despatched from the site in February. The cobalt sulphide product contains about 40% cobalt and the nickel cathode contains 99.8% nickel.

Preston Resource's Bulong operation is of similar capacity to Cawse, with an annual capacity of 9,000 tonnes of nickel and around 1,000 tonnes of cobalt. However, it produces nickel metal directly from high pressure acid leaching by hydrometallurgical processing without generating, unlike Cawse and Murrin Murrin, an intermediate solid product. At the time of writing, the first commercial production was expected to begin in March 1999.

Anaconda-Glencore's Murrin Murrin facility near Leonora is the largest of the new lateritic nickel operations, with annual capacity of 45,000 tonnes of nickel and 3,000 tonnes of cobalt. Anaconda reported in early 1999 that the project was 70% complete. Shipment of the first metal was expected in April. The project proponent's ambitions are to later expand production to produce around 70,000 tonnes of contained nickel per annum. There are also plans to expand to a second stage reaching 115,000 tonnes per annum. This is almost equivalent to the entire current State output.

2.7 Heavy Mineral Sands

The heavy mineral sands industry continued to grow for the fifth successive year with the value of production up by 9% to \$691 million. This was attributable to increased production of most mineral sand products and local producers receiving favourable contract prices thanks to a weakened Australian dollar.



The total value of exported mineral sands reached \$606 million. Significantly, well over 60% of heavy mineral sands exports went to destinations outside Asia such as Europe and the US which alone accounted for 36% and 28% respectively (Figure 2.23). It is not surprising therefore that the heavy mineral sands industry has weathered the Asian economic crisis relatively unscathed compared to other mineral sectors.

1998 Heavy Mineral Sands Industry Highlights

A significant contribution to the industry's growth came from the upgraded ilmenite sector, where the value of production rose 19% to \$283 million. This was the result of local producers receiving higher prices, principally through the devaluation of the AS

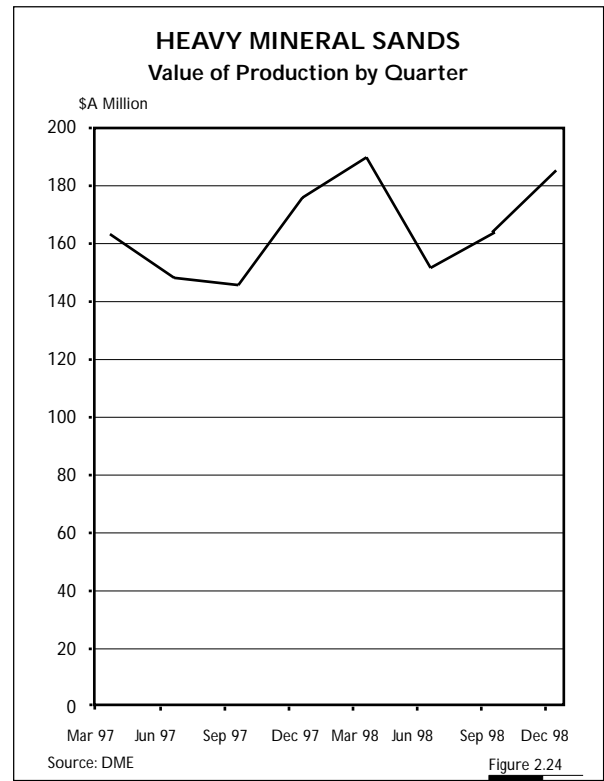
and an 11% increase in output of upgraded ilmenite to 524 thousand tonnes. Output of upgraded ilmenite (or synthetic rutile) rose in 1998 due to a full year's production from Westralian Sands new synthetic rutile plant. This is Westralian Sands' second plant at North Capel and has more than doubled the company's upgraded ilmenite production. In Western Australia upgraded ilmenite is also produced by RGC Mineral Sands at Capel and Narngulu, and TiWest which has a plant at Chandala.

Ilmenite output increased over 4% in 1998 to reach 1.3 million tonnes. Devaluation of the A\$ helped the value of this production to increase by 13% to \$151 million. Increases in output were facilitated by additional output from Cable Sands' new Yarloop mining operation and BHP's new Beenup project.

Whilst BHP's Beenup project contributed to the State's growth in mineral sands output, it was nevertheless plagued with problems and only able to operate at around 40% of its capacity. Principal troubles related to the design and performance of the floating mineral extraction plant, dredge and tailings disposal. This led to BHP to announce in February 1999 the closure of its Beenup operation.

Another operation which ceased activity was Westralian Sands' Yoganup North mine at Boyanup. After having produced over 20 million tonnes of ore over its 11 year life, in October 1998 the mine was closed after having exhausted its resource.

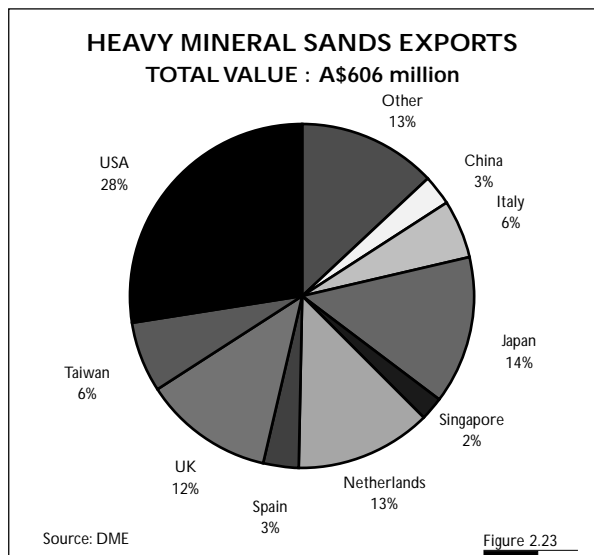
Rutile production fell 15 thousand tonnes or 13% to 97 thousand tonnes. However, as the average price of



rutile received by producers was 17% higher in 1998 (thanks largely to the depreciation of the A\$), value of the State's rutile output only decreased by 3% to \$76 million.

Zircon production in 1998 was up 3% to 300,467 tonnes. This was despite declining grades from RGC's Eneabba operation. Zircon prices have experienced a downturn which has been somewhat inevitable after a period of very strong demand and high prices. This product is traditionally in heavy demand in the Asian ceramics industry, but prices were cut by a price war between suppliers and further damage was done by the Asian downturn, economic upheavals in Russia and China's higher production levels. Despite devaluation of the A\$, overall average zircon prices received by Western Australian producers were therefore down by 6%. Consequently, the value of the State's production did not follow physical output, with the total value of zircon production down 4% to \$154 million.

On the corporate front, the make up of the Western Australian mineral sands industry changed at the end of 1998 with the merger between RGC and Westralian Sands. The merged entity will dominate the State's mineral sands industry and in production terms is expected to rank amongst the world's larger producers accounting for approximately a third of



the global titanium dioxide market. The merger brings not only increased market power but also a range of rationalisation measures including the closure of RGC's Sydney office and downsizing of its Geraldton office. RGC also closed the Eneabba dry separation plant with an increased amount of shipment contracts expected to be met through the consolidation of minable reserves at RGC's and Westralian's Capel operations.

Outlook

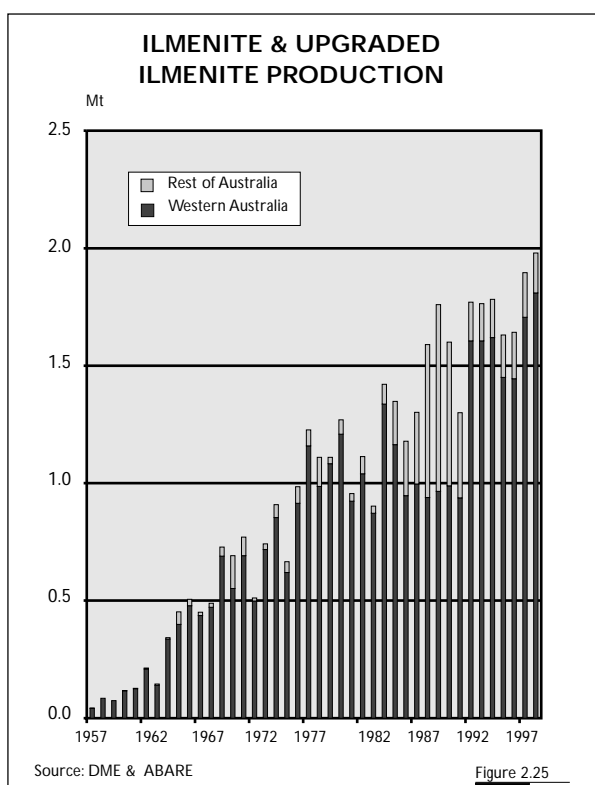
Mineral sands have comparatively high technology end use, chiefly in paint pigment and titanium metal products such as sporting goods, aircraft and military hardware. Therefore, prices for the titanium group of mineral sand products (ilmenite, rutile and leucoxene) have been relatively robust during the economic crisis that swept through Asia, Eastern Europe and Latin America. This is partly due to the high intensity of usage in the strong US economy and the fact that global capacity has quite a high concentration of ownership, hence limiting the periodic 'dumping' that affects so many other resources.

Not surprisingly, ABARE has consequently predicted that titanium based mineral sand prices are expected to ease over 1999. This is based on an expectation of slowing titanium dioxide pigment demand in line with

assumed lower economic growth in Europe and the US. There has already been evidence of this at the end of 1998 and early 1999 with downward 'price corrections' for ilmenite and in particular, rutile. However, price decreases should be moderated by supply which to some extent is restricted. As an example, in Western Australia, Westralian Sands/RGC's high grade deposits at Capel and Eneabba are largely depleted and BHP's Beenup operation has closed. Also, whilst substantial exploration activity is taking place in the Murray Basin mineral province, encompassing South Australia, New South Wales and Victoria, production would appear to be limited to rutile and zircon because of the distance to the nearest shipping port. Further afield, the most significant new source of supply, Sierra Rutile's mine in Sierra Leone has remained closed. The future of mining activities in Sierra Leone remain uncertain following persistent political unrest which led to the mine's closure in 1995.

The price situation for zircon is similar with downward price movement already experienced in early 1999. This has been due to increased output from two South African suppliers which may have been short lived. Prices should remain subdued due to weak demand in Asia, particularly Japan.

Uncertainty generated by world economic upheavals, particularly those in Asian markets and/or environmental factors have put on hold several new Western Australian mineral sands projects. These include Cable Sands' Jangardup South and Kemerton mines, Millennium Inorganic Chemicals' titanium dioxide pigment plant expansion at Kemerton and Tiwest's Kwinana pigment plant expansion.



2.8 Diamonds

Both sales value and volume record were broken by the Western Australian diamond industry in 1998. The volume of diamonds sold in 1998 was up by over 29% to 52 million carats. A large portion of this increase was accounted for by the sales from stocks. Thanks in large part to the devaluation of the Australian dollar the value of sales in 1998 was also up by a dramatic 48% to \$622 million. This outcome was particularly noteworthy given that US\$ prices were down on average over the year. All Western Australian production was from the Argyle operation, the world's biggest individual diamond mine.

1998 Diamond Industry Highlights

In 1998 the increased sales volume and 15% depreciation of the Australian currency both played significant roles in boosting the value of the State's output, counteracting slightly lower average US\$ diamond prices. Another beneficial factor in the pricing equation however was the adjustment made to the sales mix of goods to help maintain higher prices and sales during what was otherwise another difficult year.

The type of diamonds marketed by the Argyle operation played an important role in boosting physical sale quantities. Ironically, market developments stemming from the economic downturn in Asia have been a factor in the strong growth in demand for lower value diamond products. While strong demand continued from the US, a key market for the Argyle product, benefits have also arisen from 'trading down' evident in the traditionally higher value markets of Japan, India and parts of South East and East Asia. Basically, gem buyers in Asia are opting to buy lower quality diamonds to help overcome the weaker purchasing power of their own currencies. Argyle was able to capitalise on this demand by offering better assortments to customers.

The sale of a greater proportion of higher-grade diamonds (gem and near gem) was also enabled by more selective production and improved processing techniques. This vastly improved the presentation of rough diamonds. Combined, these aided in maximising the run of mine price.

In 1998 Argyle diamond mine partners, Ashton Mining and Rio Tinto finally revealed plans as to Argyle's future. In June 1998 it was announced that

underground mining plans at the Argyle operation were dropped in favour of a major expansion of the existing open pit operations. The first stage of the expansion involves a substantial cutback of an existing pit wall which will sustain the mine for an extra 18 months. In addition, if given the go ahead, a second phase expansion of the pit will expose enough new ore to keep the mine operational for another seven to 10 years. The second phase expansion, upon completion still provides for the possibility of an underground operation. Prior to these expansion plans, ore reserves in the Argyle operation were scheduled for depletion in 2003.

Outlook

The World Diamond Conference was held in Perth in October 1998. It pointed out that demand in the US and Europe was relatively buoyant, taking up some of the slack from a lacklustre Asian market. World production had also dropped and the CSO was restraining sales, so it appeared as if there was at least some degree of broad balance between overall production and retail demand. However, inventories were still high and production cuts may be insufficient to ward off the effects of the Asian crisis and downturn in the Japanese economy. The Diamond Conference also did not appear to reach a consensus as to the supply side of the equation. From one perspective, the supply side was seen as more comfortable insofar Russian output of diamonds was drying up and amidst the economic and political turmoil of that country, it was difficult, if not impossible to refinance and develop Russia's diamond operations. Similar scenarios were unveiled for Angola, the Democratic Republic of Congo and Sierra Leone.

A supply side factor which could compound diamond marketing difficulties is the ever growing supply from new and potential projects. The strategy of the CSO is to maintain a tight rein on supply, but this is an increasingly difficult task. Argyle has already abandoned the cartel and the CSO has weathered competition from this source by virtue of Argyle output, albeit huge, being of comparatively low value. However, two new mines have been of greater concern to the cartel.

The two new mines of particular significance are Rio Tinto's Diavik and BHP's Ekati (Lac de Gras) operations, both in Canada. Combined, these two operations could account for about 10% of future

world supply. In the case of BHP's Ekati mine, the first parcel of diamonds from the project was sold at the end of 1998. Importantly for the CSO, in January this year BHP and its partner Dia Met Minerals signed a memorandum of understanding with the CSO specifying that 35% of all diamonds produced from the Ekati mine will be sold to the CSO.

As for the Diavik project, it is not expected to begin production until at least 2001. Diavik is co-owned by Rio Tinto and Aber Resources. At this stage the project participants are still considering whether they will be marketing part of the mine's production through the CSO.

Whatever arrangements are put in place, care will have to be taken to maintain confidence in what is now a fragile market. The emphasis will need to be on continuing to strengthen prices rather than just volumes. Clearly, global economic conditions are creating a very challenging diamond marketing environment.

2.9 Other Minerals

Coal

Western Australian overall coal production from its Griffin and Wesfarmers operations in Collie was marginally down by 1% to 5.6 million tonnes in 1998. Reflecting lower energy prices, the value of production dropped by 4% to \$249 million. Operations at Wesfarmers' Premier Mine continued to see the consolidation of pits and the introduction of new coal handling equipment. Coal production from the Premier Mine will play an integral part in providing feedstock for the 300MW coal fired power station in Collie. Wesfarmers' seven year contract to supply the new Collie power station is to commence from July 1999.

Salt

Salt production increased by 4% to 8.5 million tonnes and thanks to favourable prices and devaluation of the Australian dollar, the value of this production increased by 22% to \$210 million. In 1998 the expansion of Dampier Salt's operations near Karratha was completed. This boosted salt production capacity at Dampier from 2.5 million to 4 million tonnes per annum. In combination with the use of bigger vessels, it is hoped by Dampier Salt that competitiveness of the State's product will increase. Shark Bay Salt also started expansion of its primary ponds to increase production capacity and 1998 also saw construction of the new Onslow salt project. Approximately \$100 million has been invested in the Onslow Salt project by the Dutch company Akzo Nobel. It is expected to produce 2.5 million tonnes of salt per annum with first production expected in late 1999.

Base Metals

Total value of base metals production increased only 4% to \$199 million. The chief contributors to this were increases in zinc and lead production. Zinc output was up by 32 thousand tonnes, or 27% to 149 thousand tonnes. Zinc prices continued to fall during 1998, being on average down by some 22% compared to the previous year. Overall therefore, the growth in the value of zinc production lagged physical output growth, with total value up 7% or \$8 million to \$126 million.

Western Australia's zinc production continued to come from two sources, Normandy's Scuddles operation and Western Metals' Lennard Shelf mining

operations. Both these operations increased output by about a third, although mining at Western Metals' Cadjebut mine ceased. The Western Metals operation started life mining the Cadjebut deposit in 1994 after taking over the interests from BHP and Shell. Now two new nearby mines, Kapok and Goongewa provide the ore which is transported to Cadjebut for processing.

Lead production emanated solely from Western Metals' operations, which in 1998 increased shipments by a dramatic 70% to 40 thousand tonnes. As for most commodities, international lead prices were down, hitting four year lows to record an average price over 1998 of US\$529 per tonne. This was a 15% decrease in average prices compared to 1997. Depreciation of the A\$ helped ameliorate the poor prices and with the increase in reported shipments, this meant that the total value of lead production increased by 52% or \$5.2 million to \$15.1 million.

1998 saw the resurrection of Derby as a shipping port with the commencement of monthly zinc and lead concentrate shipments from Western Metals' operations. Zinc and lead shipments from Derby should increase with Western Metals' development of its \$80 million Pillara operation (formerly known as Blendevale). Pillara is predicted to more than double Western Metals' annual production to around 165 thousand tonnes of zinc metal and elevate the Lennard Shelf operations to the world's seventh biggest zinc mining complex.

Whilst Western Australia's zinc and lead production can therefore be expected to grow in the coming year, increases in the value of production will be challenged by world prices. The downward pressure on zinc prices in 1998 was a consequence of an apparent drop in world zinc consumption reflecting the economic downturn in Asia. ABARE reported that consumption in Asian countries fell by around 4% which more than offset consumption increases in some Western European countries and North America. Similarly, world consumption of lead metal also fell marginally in 1998. Both these commodities are expected to continue to face weak demand conditions in Asia (where a substantial proportion of the growth in base metals consumption had occurred in recent years) and moderating demand growth in Western Europe and the US.

On the other hand, world mine production of zinc is

forecast by ABARE to rise in 1999. The major contributions to the forecast increase are expected to emanate from Western Australia (Pillara), Queensland (Cannington and Century), Ireland (Lisheen) and Alaska (Red Dog). Several mines in Sweden and the US are also expected to expand output. Lead output should also increase as the production is heavily reliant on the viability of zinc mines which produce the bulk of the world's lead as a co-product.

These fundamentals therefore point to continued depressed prices for zinc and lead. Zinc and lead are also heavily traded metals in the commodities market. So, to some extent the current general lacklustre sentiment towards commodities will likely further aggravate the downward pressure on base metal prices.

In a particular slump was copper, whose price continued to slide downwards hitting 12 year lows towards the end of 1998. Overall, the price of copper in 1998 averaged US\$1,654 per tonne, this was down a dramatic 27% compared to the previous year. Western Australian copper shipments in 1998 were also down, by over 3% to 27 thousand tonnes. This was chiefly due to a decrease in shipments from Normandy's Scuddles operation outweighing increased copper shipments from Straits Resources' (formerly WMC) Nifty mine and copper by product from WMC (Kambalda), Newcrest (Telfer) and Titan Resources (Radio Hill).

In July 1998 WMC's Nifty mine was acquired by Straits Resources Ltd. The Nifty heap leach solvent - electrowinning (SX-EW) operation is similar in nature to Straits Resources' Girilambone joint venture copper project in New South Wales. Straits Resources planned to lift output from Nifty via a capital expenditure program and has also flagged the possibility of expanding the mine into an underground operation.

Despite a number of price induced production cutbacks, mine closures and deferrals which were announced in 1998, global copper production has been forecast by ABARE to increase in 1999. This forecast is based on the expectation that the output from a substantial number of new and expected mines and smelters (e.g. Olympic Dam in South Australia, Andina and Collahuasi in Chile, Gresik in Indonesia, and Port Kembla refurbishment in New South Wales) will outweigh the production losses. Coupled with

continued weak copper consumption in parts of Asia and rising stocks, the prognosis is for copper prices to remain low.

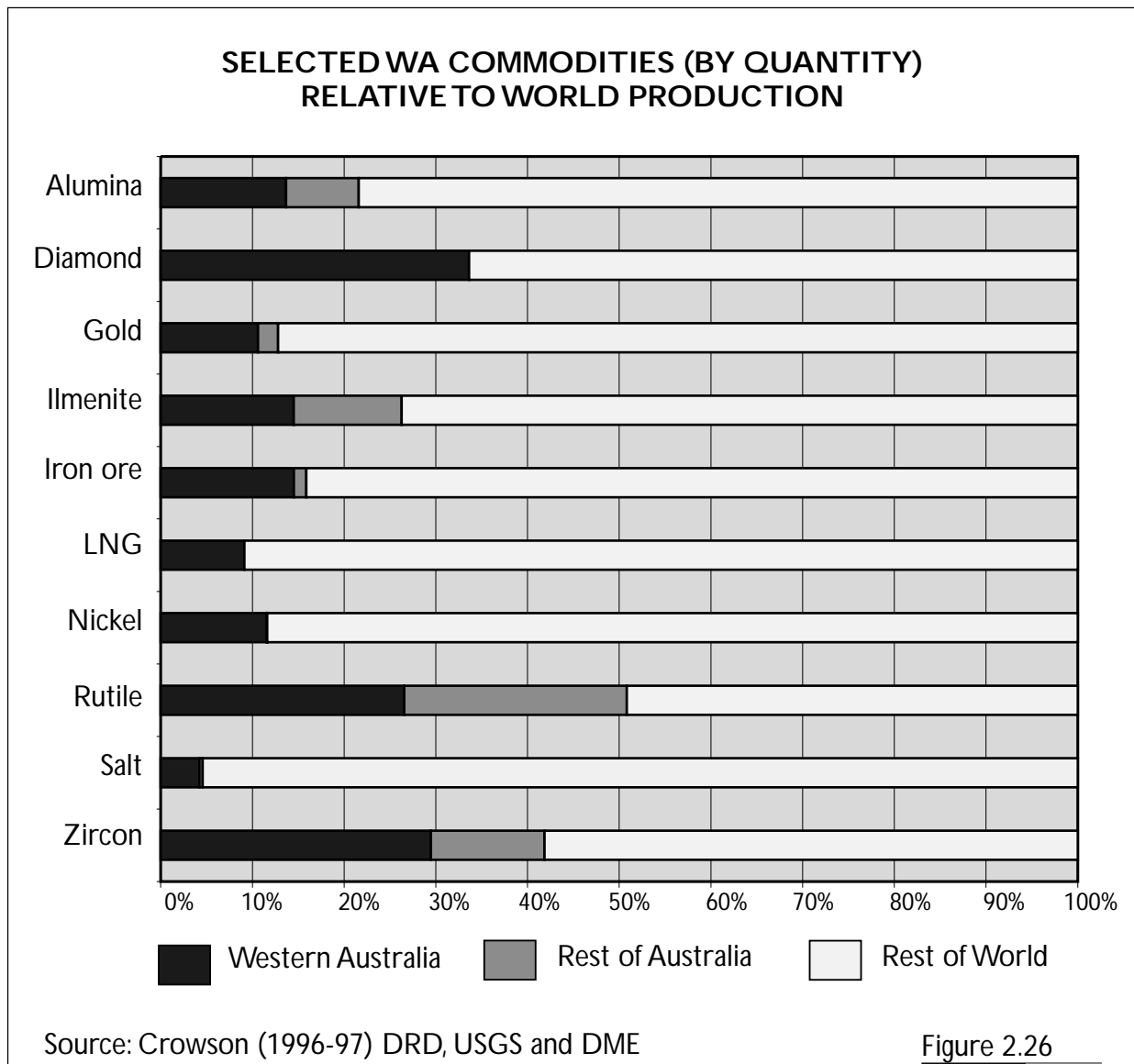
Other

Tantalite production increased significantly, by 34% to 400 tonnes. Tantalite has relatively specialised uses in the electronics industry, and is also used in tool steel, super alloys in the aviation industry and in the chemicals industry. Tantalite prices have therefore not followed the downward trend displayed by most heavily traded mineral commodities in general. Whilst tantalite prices achieved in the past have been high, they have also displayed a certain degree of fluctuation. In 1998 however, prices achieved for various sales were remarkable in being consistently higher. In combination with the depreciation of the A\$, this translated to the value of sales in 1998 increasing by a dramatic 91% to \$59 million.

Tantalite is chiefly sourced from Gwalia Consolidated's Greenbushes mine, as is spodumene, the production of which totalled 42 thousand tonnes worth \$10 million in 1998. The Greenbushes mine is reportedly the world's largest hard rock tantalum resource and Gwalia also operates Australia's only tin smelter at Greenbushes. Tin production reached 588 tonnes worth \$4.9 million in 1998.

The value of Western Australian gypsum production jumped almost fivefold to \$18.3 million in 1998. This was due to the first full year of shipments from Lake MacLeod Gypsum. Lake MacLeod Gypsum is 68% owned by Rio Tinto and is an offshoot of the parent company, Dampier Salt. The gypsum and salt projects share an operational base and shipping port facilities at Lake MacLeod north of Carnarvon. Western Australia's total gypsum output in 1998 was over one million tonnes. Lake MacLeod Gypsum accounted for well over 70% of this output, making it Australia's largest producer.

Although the State's sole manganese operation, at Woodie Woodie in the Pilbara, has been closed since early 1997, the State still recorded shipments in 1998 totalling 79 thousand tonnes worth over \$8 million. These shipments were from stockpiles. However, it is expected that mining at Woodie Woodie will commence again in 1999 by Consolidated Minerals.



The latest comparable data shows that the Western Australian share (by quantity) of the world's output of the following products was: diamonds 34%, zircon 29%, rutile 27%, alumina 14%, iron ore 15%, ilmenite 15%, gold 11%, nickel 12%, LNG 9% and salt 4%.

3. EXPLORATION, INVESTMENT AND EMPLOYMENT

Mineral Exploration

According to the Australian Bureau of Statistics (ABS), mineral exploration expenditure in Western Australia reached \$616 million in 1998. This was down by 12% based on the 1997 record level of \$699 million. This is still a solid performance given the depressed state of commodity prices during 1998 and the uncertain economic outlook. Given these factors it will probably prove difficult to maintain exploration at record levels in 1999.

Western Australia received approximately 64% of total Australian mineral exploration expenditure in 1998. This was up from 60% in 1997.

Depressed gold prices made themselves felt with exploration expenditure in that sector falling from \$511 million in 1997 to \$400 million in 1998. The decrease in gold exploration was the chief factor behind the overall fall in the State's exploration expenditure during the year. Gold nevertheless continued to dominate the State's exploration effort accounting for nearly 65% of all Western Australian expenditure in 1998. This represented 71% of Australia's total gold exploration funds.

Exploration for base metals (i.e. ABS definition - copper, silver-lead-zinc, nickel and cobalt) in Western Australia increased from \$104 million in 1997 to \$112 million in 1998. The 1998 expenditure accounted for 55% of Australia's total base metal exploration expenditure, up from 45% in 1997. Most of this expenditure was on lateritic nickel prospects (particularly in the first half of the year), with copper-lead-zinc exploration believed to be stagnant or falling.

Expenditure on iron ore exploration increased 68% in 1998 to \$44 million. This was mainly 'brownfields' activity, representing the 'proving up' of resources. It accounted for almost all of Australia's iron ore exploration expenditure. However, with cuts in contract iron ore prices, producers are under extreme pressure to reduce costs and remain competitive with development by BHP of the iron ore mines at Mining Area C and Orebody 18 for example, now being put on hold.

Heavy mineral sands exploration also increased significantly, by 59% in 1998 to \$12 million. Whilst this accounts for 50% of total Australian expenditure for mineral sands, it represents only 2% of Western Australia's total exploration expenditure.

Another relatively small exploration expenditure sector is diamonds, where in 1998 expenditure totalled \$36 million, down from the 1997 level of \$37 million. Nevertheless, Western Australia accounted for nearly 80% of Australia's total diamond exploration effort.

Petroleum Exploration

ABS data showed a record level of petroleum exploration expenditure in Western Australia of \$550 million (this figure includes expenditure on Western Australian leases in the Timor Gap Zone of Cooperation, Area B). Calendar 1998 exhibited a continued long-term rise in petroleum exploration in Western Australia to new record levels. Western Australia is perceived to be one of the most attractive exploration areas in the world and this has been reflected in the number of new international companies applying for acreage and the high level of work programs proposed. Not surprisingly therefore, the State's share of Australia's petroleum exploration (\$1,047 million) passed the half way mark, with expenditure increasing from 42% in 1997 to 53% in 1998.

In total, Western Australia had 44 new field wildcat wells drilled in 1998 compared to 34 in 1997. Exploration drilling offshore continued at increasingly high levels with 35 new field wildcat wells drilled during the year, compared to 24 in 1997. Drilling effort was again concentrated in the offshore Carnarvon Basin (20 exploration wells). There was also an increase in activity in the Browse and Bonaparte Basins.

Offshore seismic activity increased dramatically in 1998 with a total of 64,478 line kilometres of new 2D and 13,053 square kilometres of 3D data acquired compared to 27,756 line kilometres and 12,811 square kilometres respectively in 1997.

Onshore, only 9 new field wildcat wells were drilled compared to 10 in 1997 and seismic activity was also little changed. Onshore exploration drilling continues to be relatively active, but the level of activity is broadly unchanged to that of five years ago and there are signs that the interest in onshore exploration is starting to wane. A major factor is Native Title, with its lengthy Right-to-Negotiate process and the accompanying uncertain outcomes.

In an effort to assist in redressing the unequal attention of industry between onshore and offshore exploration, DME's Geological Survey Division has been running the Petroleum Exploration Initiative. Introduced in 1994-95, this is a \$17 million, 6-year program, mainly directed at enhancing petroleum prospectivity through the study of the onshore sedimentary basins of Western Australia.

Mining Investment

ABS private new capital expenditure statistics for 1998 indicate that mining accounted for nearly 60% of Western Australia's total investment, compared to 66% in 1997. Total State investment increased by just over 14%, from the 1997 level of \$7,494 million to \$8,553 million. The actual level of mining investment in Western Australia was \$5,092 million in 1998, nearly 4% above the 1997 amount of \$4,908 million. This accounted for approximately half of national mining investment.

ABS mining investment figures, however, need to be treated carefully as they do not capture all mining investments. Investment in downstream processing and some mineral projects (such as mineral sands and alumina) are categorised by the ABS as manufacturing investment. A breakdown of the manufacturing figures into resource processing and other categories is not available.

The Delta Electricity and Access Economics Investment Monitor for December 1998, indicated that there was approximately \$37 billion worth of mining projects in Western Australia either under construction, committed, considered or possible. When including projects with linkages to mining such as further processing and infrastructure to service the industry, the Western Australian investment figure increases to well over \$50 billion.

Focusing on the value of mining and petroleum projects under construction or committed, the Investment Monitor for December 1998 showed this to total over \$4 billion. Some of the more notable projects include:

- The \$800 million expansion of the Worsley alumina refinery;
- Alcoa's \$260 million expansion of its Wagerup refinery;
- Precious Metals Australia's \$200 million Windimurra vanadium operation;

- \$190 million refit of the Cossack Pioneer floating petroleum production vessel;
- Anaconda Nickel/Glencore International's \$1,000 million Murrin Murrin nickel mine which is due to commence production in 1999; and
- The \$874 million doubling of the capacity of the Dampier to Bunbury gas pipeline.

Mining Employment

The Department of Minerals and Energy's official employment statistics are compiled from monthly industry returns and include contract labour working on the mine sites.

In 1998 employment in the State's mineral and petroleum industries increased 2% from 40,488 in 1997 to 41,302 persons. Overall, the decreases in employment by specific sector were offset by the increases in others.

The most significant increase in employment 26%, occurred in the nickel sector. This was a result of the Murrin Murrin and Cawse projects being under construction or on the verge of commissioning.

Employment growth was also substantial in the base metals sector with an increase of 18%. The most notable increases in this sector occurred at Western Metals' Pillara mine and Normandy Mining's Scuddles (Golden Grove) mine.

In addition bauxite-alumina employment was up by 16% due mainly to expansion of the Worsley and Wagerup alumina refineries.

The most significant decrease in employment occurred in the heavy mineral sands sector, which was down by 19%. This was mainly due to the closure of RGC Mineral Sands' Eneabba mine. The gold sector also experienced a decrease in employment with an overall fall of 5%. This fall came from the scaling down of large mines like Bronzewing, the closure of Centaur Mining's Ora Banda and closures of other small mines. In 1997 there were 12,806 people employed at the sites and in 1998 this fell to 12,145.

Other sectors with decreases in employment were coal down 6%, iron ore down 3% and salt down 1%.

NOTE

The petroleum employment statistics shown in the 1997 Statistics Digest and prior volumes cannot be directly compared to those published in this and future issues. Previous statistics for the petroleum sector did not include contract employees. The employment statistics published in this issue for the petroleum sector in 1997 and 1998 are comparable.

TABLES

1.	Quantity and Value of Minerals and Petroleum	42
2.	Quantity and Value of Selected Major Commodities	44
3.	Quantity and Value of Minerals and Petroleum By Local Government Area	47
4.	Royalty Receipts 1997 and 1998	54
5.	Employment in the Mineral and Petroleum Industries as at December 1998	57
6.	Principal Minerals and Petroleum Producers 1998	61

1998 STATISTICS DIGEST

TABLE 1 QUANTITY AND VALUE OF MINERALS AND PETROLEUM

COMMODITY/Mineral	UNIT	1997		1998	
		QUANTITY	VALUE (\$A)	QUANTITY	VALUE (\$A)
BASE METALS					
Copper Metal	t	28,319 (r)	62,457,288 (r)	27,370	57,116,455
Lead Metal	t	23,201	9,914,174 (r)	39,518	15,085,665
Zinc Metal	t	117,198 (r)	118,102,298 (r)	149,369	126,335,610
TOTAL BASE METALS			190,473,760 (r)		198,537,730
BAUXITE-ALUMINA					
Alumina	t	8,481,895	2,084,713,647	8,633,833	2,396,609,727
Gallium	kg	7,299	2,335,724	0	0
TOTAL BAUXITE - ALUMINA			2,087,049,371		2,396,609,727
CHROMITE	kg	7,751	1,774,752	29,645	7,030,547
CLAYS					
Attapulgite	t	28,262	4,203,131	15,670	2,338,492
Clay Shale	t	45,530	663,502	5,541	55,410
Fire Clay	t	84,688	101,626	56,663	67,995
Kaolin	t	3,307	215,618	352	41,571
White Clay	t	2,360	14,160	0	0
TOTAL CLAYS			5,198,037		2,503,468
COAL	t	5,692,147	260,534,172	5,609,555	249,348,279
CONSTRUCTION MATERIALS					
Aggregate	t	453,971	2,858,956	307,253	2,459,919
Gravel	t	176,792	963,578	181,854	1,113,735
Rock	t	210,401	1,324,367	416,078	2,715,818
Sand	t	1,577,080 (r)	7,723,332 (r)	1,614,131	7,191,654
TOTAL CONSTRUCTION MATERIALS			12,870,233 (r)		13,481,126
DIAMOND	ct	40,421,889	421,193,947	52,250,618	621,781,577
DIMENSION STONE					
Black Granite	t	958	287,457	0	0
Granite	t	316	77,050	698	59,150
Spongolite	t	0	0	5,380	430,353
TOTAL DIMENSION STONE			364,507		489,503
GEM & SEMI-PRECIOUS STONE					
Agate	kg	5,149 (r)	3,089	0	0
Chalcedony	kg	0	0	8,053	4,027
Chrysoprase	kg	21,536 (r)	8,936	0	0
Jasper	kg	38,796 (r)	22,585	0	0
Variscite	kg	28,730 (r)	17,238	0	0
TOTAL GEM & SEMI-PRECIOUS STONE			51,848		4,027
GOLD	kg	238,335	3,414,610,762 (r)	230,865 (e)	3,469,181,839 (e)
GYPSUM	t	315,363 (r)	3,934,459 (r)	1,074,742	18,342,182
HEAVY MINERAL SANDS					
Garnet	t	97,109	11,168,442	117,397	14,204,167
Ilmenite	t	1,233,849	133,592,283	1,287,196	150,848,771
Upgraded Ilmenite (a)	t	471,866	237,850,873	523,643	283,220,630
Leucoxene	t	22,482	11,687,280	28,971	11,680,489
Rutile	t	111,779	78,531,838	96,928	76,449,238
Zircon	t	292,791	160,337,523	300,467	154,374,737
TOTAL HEAVY MINERAL SANDS			633,168,239		690,778,032

TABLE 1 (Cont.) QUANTITY AND VALUE OF MINERALS AND PETROLEUM

COMMODITY/Mineral	UNIT	1997		1998	
		QUANTITY	VALUE (\$A)	QUANTITY	VALUE (\$A)
INDUSTRIAL PEGMATITE MINERALS					
Felspar	t	65,818	3,043,804 (r)	624	13,843
IRON ORE					
Domestic	t	7,413,286	183,370,087	6,565,620	194,596,981
Exported	t	144,305,307	3,449,970,594	136,765,690	3,901,941,811
TOTAL IRON ORE		151,718,593	3,633,340,681	143,331,310	4,096,538,792
LIMESAND-LIMESTONE-DOLOMITE					
Dolomite	t	4,387	126,045	3,624	86,372
Limesand-Limestone	t	2,277,880	13,685,622	2,953,291	11,945,601
TOTAL LIMESAND-LIMESTONE-DOLOMITE			13,811,667		12,031,973
MANGANESE ORE	t	176,990	22,153,201	79,430	8,129,205
NICKEL INDUSTRY					
Cobalt by-product	t	1,219	58,771,721	1,269	84,579,343
Nickel Concentrate	t	873,119	1,136,002,794	952,901	1,039,024,976
Palladium by-product	kg	429	3,227,915	2,042	10,096,972
Platinum by-product	kg	315	2,419,386	209	2,852,073
TOTAL NICKEL INDUSTRY			1,200,421,816		1,136,553,364
PETROLEUM					
Condensate	kl	6,436,741	1,103,314,266 (r)	6,988,530	955,825,928
Crude Oil	kl	9,539,869	1,719,801,811	10,994,007	1,459,341,583
LNG	Btu 10 ⁶	375,600,011	1,595,472,848	386,848,099	1,561,708,998
LPG - Butane	t	320,425	93,168,890	384,543	86,580,631
LPG - Propane	t	253,817	73,825,137	263,815	55,771,778
Natural Gas	'000m ³	7,331,730	571,510,516	6,328,079	526,529,148
TOTAL PETROLEUM			5,157,093,469 (r)		4,645,758,066
PIGMENTS					
Red Oxide	t	5,340	1,014,600	1,570	298,300
SALT	t	8,115,941	172,120,951	8,477,019	210,172,594
SILICA-SILICA SAND					
Silica	t	84,582	845,819	91,821	918,215
Silica Sand	t	720,155	7,199,961	654,451	6,262,395
TOTAL SILICA-SILICA SAND			8,045,780		7,180,610
SILVER	kg	51,252	9,546,962	52,355	12,967,881
TALC	t	188,835	14,971,392	164,072	13,040,168
TIN-TANTALUM-LITHIUM					
Spodumene	t	56,567	10,701,568	42,337	10,243,876
Tantalite	t	299	30,550,308	400	58,503,807
Tin Metal	t	523	3,637,931	588	4,894,812
TOTAL TIN-TANTALUM-LITHIUM			44,889,807		73,642,495
TOTAL VALUE			17,311,678,216 (r)		17,884,415,326(e)

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

1998 STATISTICS DIGEST

TABLE 2 **QUANTITY AND VALUE OF SELECTED MAJOR COMMODITIES**

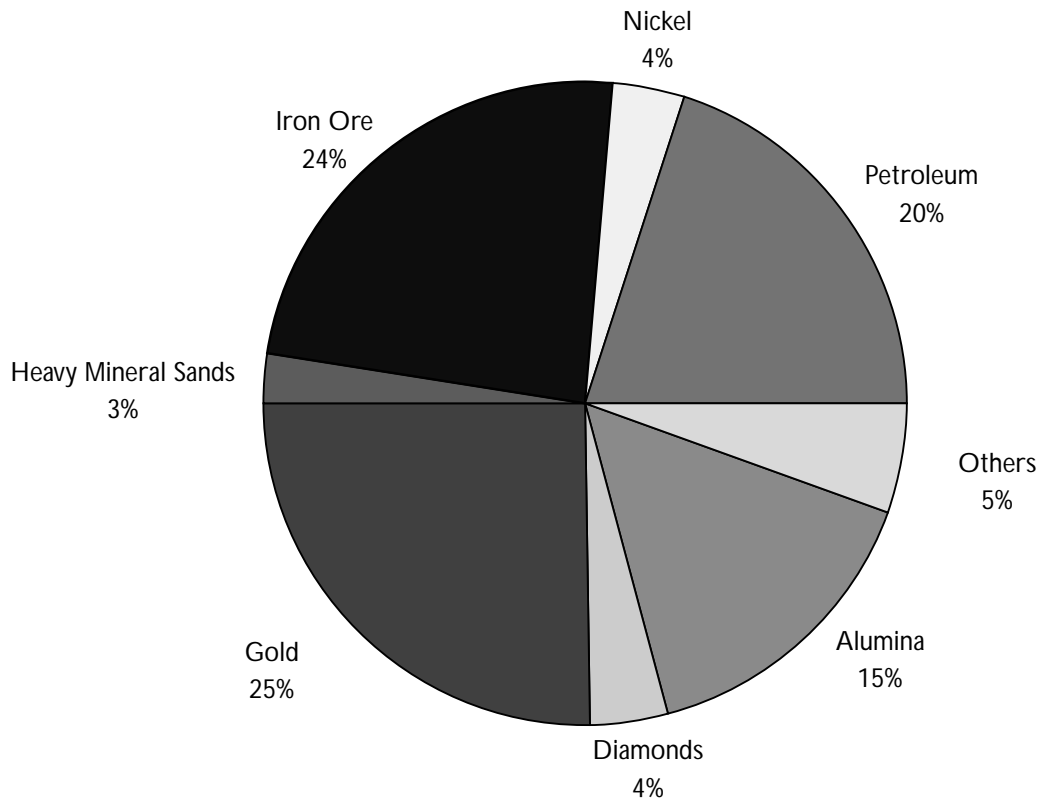
	Unit	1989		1990		1991		1992	
		Quantity	Value \$m	Quantity	Value \$m	Quantity	Value \$m	Quantity	Value \$m
ALUMINA	Mt	6.38	2,096.79	6.72	2,358.95	7.01	1,844.03	7.08	1,689.72
BASE METALS									
copper metal	kt	19.04	40.70	14.96	22.55	11.79	17.92	12.09	18.68
lead metal	kt	7.85	4.42	13.61	7.18	10.70	4.35	20.96	7.43
zinc metal	kt	38.06	48.15	51.70	61.55	112.01	94.69	141.39	132.98
TOTAL BASE METALS			93.27		91.28		116.96		159.09
COAL	Mt	3.83	166.80	4.83	214.25	5.11	228.56	5.66	251.76
DIAMOND	M ct	37.51	427.45	31.18	429.93	33.36	456.93	41.15	565.06
GOLD	tonnes	147.28	2,295.58	176.35	2,794.00	186.34	2,800.18	182.10	2,751.38
HEAVY MINERAL SANDS									
ilmenite	Mt	0.96	77.07	0.99	86.20	0.94	81.50	1.04	87.30
rutile	kt	88.97	58.36	76.07	57.91	59.13	39.66	68.96	39.05
upgraded ilmenite (synthetic rutile)	kt	261.60	115.53	249.27	120.77	317.96	162.17	334.48	157.88
zircon	kt	343.82	187.95	224.46	126.68	204.33	79.16	265.17	51.46
other HMS			10.12		9.37		5.14		10.26
TOTAL HEAVY MINERAL SANDS			449.03		400.93		367.63		345.95
IRON ORE	Mt	106.47	2,122.07	103.85	2,426.81	114.17	2,978.72	108.15	2,921.98
MANGANESE ORE	kt	11.74	0.05	364.58	57.93	209.64	37.77	402.84	72.20
NICKEL METAL	kt	42.79	688.85	50.91	557.97	55.76	569.24	48.04	461.54
PETROLEUM									
condensate	Gl	1.35	197.16	1.72	333.90	1.87	313.74	2.06	366.70
crude oil	Gl	2.51	369.85	5.20	1,023.22	5.21	901.42	5.05	917.36
lng	btu 10 ¹²	37.68	113.43	153.14	508.10	204.80	957.95	237.64	966.47
lpg - butane	kt	0	0	0	0	0	0	0	0
lpg - propane	kt	0	0	0	0	0	0	0	0
natural gas	Gm ³	3.74	321.73	3.70	366.43	3.74	372.20	3.78	368.96
TOTAL PETROLEUM			1,002.17		2,231.65		2,545.31		2,619.49
SALT	Mt	5.90	112.38	6.12	130.77	6.83	149.36	6.67	155.39
OTHER			88.68		99.56		91.69		132.36
TOTAL			9,543.12		11,794.03		12,186.38		12,125.92

1998 STATISTICS DIGEST

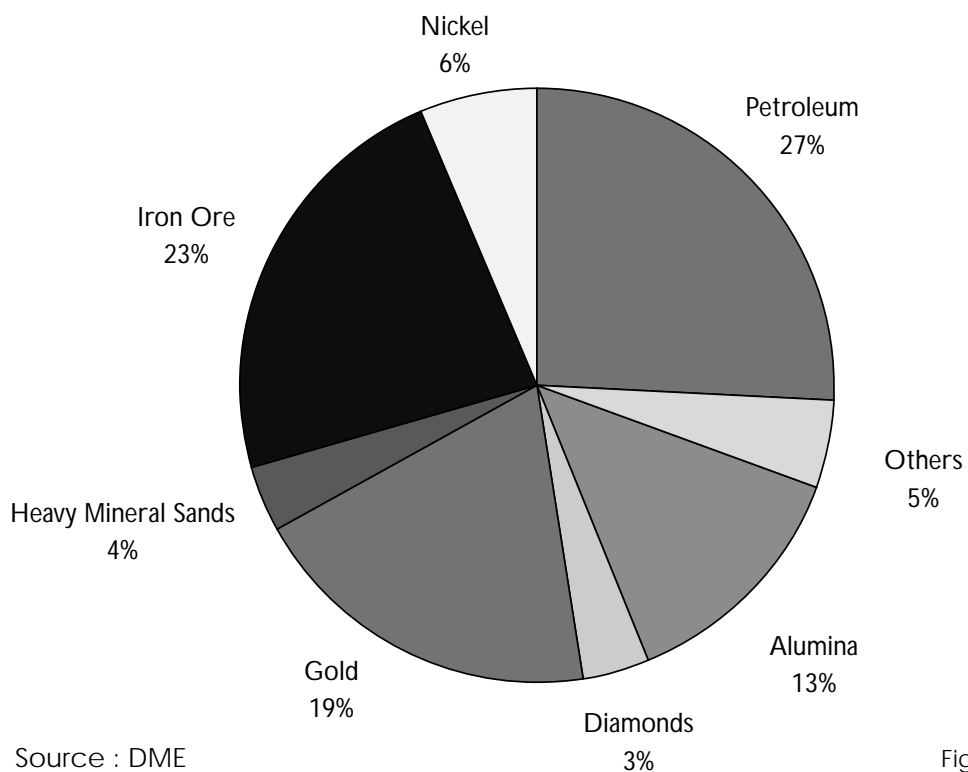
1993		1994		1995		1996		1997		1998	
Quantity	Value \$m	Quantity	Value \$m	Quantity	Value \$m	Quantity	Value \$m	Quantity	Value \$m	Quantity	Value \$m
7.80	1,891.86	7.93	1,684.58	8.07	1,757.36	8.25	1,967.81	8.48	2,084.71	8.63	2,396.61
28.98	30.21	35.11	68.13	24.31	73.29	23.07	51.28	28.32	62.46	27.37	57.12
32.28	7.84	20.29	7.32	15.64	8.25	17.08	9.90	23.20	9.91	39.52	15.09
141.10	87.02	123.62	85.14	126.34	87.73	106.86	71.28	117.20	118.10	149.37	126.34
	125.07		160.59		169.27		132.46		190.47		198.54
5.47	248.44	5.03	234.02	6.06	280.66	5.81	268.38	5.69	260.53	5.61	249.35
22.65	486.77	27.72	470.34	23.45	480.15	47.43	442.01	40.42	421.19	52.25	621.78
183.47	3,139.61	192.98	3,265.93	189.48	3,163.66	221.18	3,528.64	238.34	3,414.61	230.86	3,469.18
1.01	85.40	1.08	93.52	1.00	96.27	1.08	114.29	1.23	133.59	1.29	150.85
56.60	29.97	87.16	44.46	124.87	68.14	110.65	79.17	111.78	78.53	96.93	76.45
308.60	143.53	357.53	164.53	452.74	215.43	367.53	181.81	471.87	237.85	523.64	283.22
299.76	46.26	444.26	99.00	458.44	152.54	372.70	197.54	292.79	160.34	277.35	154.37
	6.49		6.62		8.07		25.26		22.86		25.88
	311.65		408.13		540.45		598.07		633.17		690.78
116.34	2,996.73	124.26	2,630.61	135.97	2,980.69	133.65	2,924.48	151.72	3,633.34	143.33	4,096.54
247.86	43.40	202.52	22.74	227.90	28.42	296.81	32.67	176.99	22.15	79.43	8.13
55.46	437.74	77.00	630.13	101.36	1,094.17	108.38	1,033.88	122.99	1,136.00	143.08	1,039.02
2.17	359.86	2.34	331.19	3.83	564.91	4.97	773.72	6.44	1,103.31	6.99	955.83
4.05	709.32	8.75	1,299.75	8.68	1,384.83	11.26	1,958.82	9.54	1,719.80	10.99	1,459.34
264.75	997.88	335.11	1,080.17	375.37	1,390.75	377.82	1,391.20	375.60	1,595.47	386.85	1,561.71
0	0	0	0	19.42	4.73	158.96	37.44	320.43	93.17	384.54	86.58
0	0	0	0	14.14	3.44	150.84	36.93	253.82	73.83	263.82	55.77
4.21	422.96	4.92	441.96	5.83	421.92	6.62	494.68	7.33	571.51	6.33	526.53
	2,490.02		3,153.07		3,770.58		4,692.80		5,157.09		4,645.76
6.53	159.57	6.86	153.49	7.29	155.81	7.21	143.61	8.12	172.12	8.48	210.17
	112.77		149.67		182.81		207.71		186.27		258.20
12,443.63		12,963.30		14,604.03		15,972.52		17,311.68		17,884.42	

COMPARATIVE VALUE OF PRODUCTION

1993 Total : A\$12.44 billion



1998 Total : A\$17.88 billion



Source : DME

Figure 0.1

TABLE 3 QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE \$A	Ref. (p.65)
BASE METALS			Cu Tonnes		
Copper By-Product	Coolgardie		5,037.671	8,074,909(a),(b)	
	West Pilbara		767.162	1,016,944	
Total Copper By-Products			5,804.833	9,091,853	
Copper Concentrates			Cu %		
	East Pilbara	12,737	20.02	4,329,830	
	Yalgoo	21,529	18.37	4,848,735	
Total Copper Concentrates		34,266		9,178,565	(a)
Copper Cathode			Cu Tonnes		
	East Pilbara		15,059.65	38,846,037	(a)
Total Copper				57,116,455	
Lead			Pb %		
	Derby-West Kimberley	54,373	72.68	15,085,665	(a)
Zinc			Zn %		
	Derby-West Kimberley	140,035	51.26	64,718,463	
	Yalgoo	184,806	41.98	61,617,147	
		324,841		126,335,610	(a)
TOTAL BASE METALS				198,537,730	
BAUXITE - ALUMINA					
Alumina	Boddington	1,709,596		462,694,141	
	Murray	3,193,914		892,043,879	
	Serpentine-Jarrahdale	1,947,509		543,967,229	
	Waroona	1,782,814		497,904,478	
TOTAL BAUXITE - ALUMINA		8,633,833		2,396,609,727(c),(j)	
CHROMITE - PLATINOIDS			Cr ₂ O ₃ %		
Chromite Ore	Meekatharra	72,496	40.89	7,030,547	
CLAYS					
Attapulgit	Mullewa	15,670		2,338,492	(a)
Clay Shale	Collie	5,541		55,410	(a)
Fire Clay	Chittering	56,663		67,995	(d)
Kaolin	Bridegetown-Greenbushes	352		41,571	(d)
TOTAL CLAYS		78,226		2,503,468	
COAL	Collie	5,609,555		249,348,279	(e)
CONSTRUCTION MATERIALS					
Aggregate	Broome	4,612		94,486	
	Exmouth	91,890		1,096,649	
	Nannup	441		4,860	
	Port Hedland Town	79,979		479,741	
	Roebourne	67,867		432,776	
	Wyndham-East Kimberley	62,464		351,407	
Total Aggregate		307,253		2,459,919	

TABLE 3 (cont.) QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE \$A	Ref. (p.65)	
Gravel	Broome	7,663		30,945		
	Coolgardie	45,592		260,926		
	Exmouth	1,600		9,600		
	Kalamunda	101,861		652,884		
	Kalgoorlie-Boulder	395		4,530		
	Port Hedland Town	5,457		45,000		
	W. Kimberley	11,870		90,860		
	Wyndham-East Kimberley	7,416		18,990		
Total Gravel		181,854		1,113,735		
Rock	Broome	5,803		257,039		
	Derby-West Kimberley	678		4,070		
	East Pilbara	54,784		328,704		
	Kalgoorlie-Boulder	351,957		2,111,737		
	Wyndham-East Kimberley	2,856		14,268		
Total Rock		416,078		2,715,818		
Sand	Ashburton	69		1,665		
	Broome	20,177		151,395		
	Collie	70,637		423,820		
	Coolgardie	164,353		925,723		
	Coorow	910		4,550		
	Dandaragan	5,102		28,612		
	Derby-West Kimberley	5,991		30,636		
	Exmouth	141		846		
	Kalgoorlie-Boulder	12,817		73,823		
	Leonora	23,688		118,440		
	Meekatharra	31,196		187,175		
	Menzies	6,310		31,548		
	Northam	16,372		49,116		
	Port Hedland Town	53,501		275,186		
	Roebourne	23,025		144,747		
	Wanneroo	1,160,281		4,641,124		
	Wyndham-East Kimberley	15,915		85,019		
	Yilgarn	3,646		18,229		
	Total Sand		1,614,131		7,191,654	
	TOTAL CONSTRUCTION MATERIALS				13,481,126	(d)
DIAMOND	Wyndham-East Kimberley	52,250,618	Carats	621,781,577	(a)	
DIMENSION STONE						
Granite	Ashburton	485		48,500		
	Roebourne	213		10,650		
Total Granite		698		59,150		
Spongolite	Plantagenet	5,380		430,353		
TOTAL DIMENSION STONE				489,503	(d)	

1998 STATISTICS DIGEST

TABLE 3 (cont.)
QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE SA	Ref. (p.65)
GEM & SEMI-PRECIOUS STONE		kg			
Chalcedony	Carnarvon	8,053		4,027	
TOTAL GEM & SEMI-PRECIOUS STONE				4,027	
			Au kg		
GOLD	Boddington		11,217.210	168,308,656	
	Coolgardie		27,299.638	409,116,030	
	Cue		6,424.278	96,346,986	
	Dundas		3,651.650	54,963,488	
	East Pilbara		12,300.597	185,070,645	
	Kalgoorlie-Boulder		53,303.996	802,152,983	
	Laverton		17,958.612	269,558,295	
	Leonora		42,871.944	644,287,415	
	Meekatharra		14,480.552	217,230,525	
	Menzies		1,374.836	21,097,900	
	Mt Magnet		6,325.856	95,304,133	
	Sandstone		3,937.141	59,104,119	
	Wiluna		14,964.058	225,108,804	
	Yalgoo		756.237	11,302,519	
	Yilgarn		13,998.241	210,229,341	
TOTAL GOLD			230,864.846	3,469,181,839	(f)
GYPSUM	Bruce Rock	980		7,840	(e)
	Carnarvon	792,852		15,248,845	(e)
	Dalwallinu	75,432		1,545,608	(e)
	Dandaragan	10,530		105,300	(e)
	Dundas	12,342		74,051	(e)
	Esperance	17,509		105,054	(e)
	Kondinin	2,375		23,750	(d)
	Koorda	300		3,600	(e)
	Lake Grace	45,251		347,482	(e)
	Merredin	2,000		12,000	(e)
	Mt Marshall	3,480		27,840	(e)
	Nungarin	26,358		158,148	(e)
	Ravensthorpe	17,325		138,600	(d)
	Wyalkatchem	61,323		490,584	(e)
	Yilgarn	6,685		53,480	(e)
TOTAL GYPSUM		1,074,742		18,342,182	
HEAVY MINERAL SANDS					
Garnet Sand	Bunbury City	43		5,160	(g)
	Northampton	117,354		14,199,007	(e)
Total Garnet Sand		117,397		14,204,167	

TABLE 3 (cont.) QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE \$A	Ref. (P.65)
Ilmenite	Augusta-Margaret River	101,303	TiO ₂ % 55.87	11,599,430	
	Bunbury City	498,199	56.20	70,036,962	
	Capel	378,108	55.43	43,064,656	
	Carnamah	292,718	57.87	24,264,917	
	Northampton	16,868	40.08	1,882,806	
Total Ilmenite		1,287,196		150,848,771	(a)
Upgraded Ilmenite	Capel	289,163	TiO ₂ % 92.48	148,990,132	
	Carnamah	174,333	92.63	94,307,428	
	Dandaragan	60,147	92.00	39,923,070	
Total Upgraded Ilmenite		523,643		283,220,630	(a)
Leucoxene	Bunbury City	4,279	TiO ₂ Tonnes 1,787.400	3,218,700	
	Capel	4,018	3,024.600	2,779,582	
	Dandaragan	20,674	9,899.200	5,682,207	
Total Leucoxene		28,971	14,711.200	11,680,489	(a)
Rutile	Bunbury City	7,077	TiO ₂ Tonnes 6,595.675	6,030,090	
	Carnamah	74,216	69,915.180	59,954,237	
	Dandaragan	15,635	8,227.960	10,464,911	
Total Rutile		96,928	84,738.815	76,449,238	(a)
Zircon	Augusta-Margaret River	20	ZrO ₂ Tonnes 13.000	12,298	
	Bunbury City	32,960	15,745.939	17,043,084	
	Capel	57,702	30,817.050	29,051,914	
	Carnamah	145,158	78,977.950	73,167,764	
	Dandaragan	64,627	35,630.650	35,099,677	
Total Zircon		300,467	161,184.589	154,374,737	(a)
TOTAL HEAVY MINERAL SANDS				690,778,032	
INDUSTRIAL PEGMATITE MINERALS					
Felspar	Mukinbudin	624		13,843	
TOTAL INDUSTRIAL PEGMATITE MINERALS				13,843	
IRON ORE					
Domestic Ore	East Pilbara	6,565,620	Fe% 62.72	194,596,981	
Exported Ore	Ashburton	78,057,341	Fe% 61.68	2,170,487,907	
	Derby-West Kimberley	822,821	76.55	20,110,258	
	East Pilbara	56,208,946	61.82	1,673,959,369	
	Yilgarn	1,676,582	38.07	37,384,277	
Total Exported Ore		136,765,690		3,901,941,811	(a)
TOTAL IRON ORE		143,331,310		4,096,538,792	

TABLE 3 (cont.)
QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE SA	Ref. (P.65)
LIMESAND - LIMESTONE-DOLOMITE					
Dolomite	Lake Grace	3,414		81,122	
	Yilgarn	210		5,250	
Total Dolomite		3,624		86,372	
Limesand - Limestone	Carnamah	8,035		32,140	
	Cockburn	1,880,791		4,673,639	
	Coorow	15,569		77,846	
	Dandaragan	28,019		161,791	
	Dundas	116,843		1,752,645	
	Exmouth	103,797		433,705	
	Gingin	127,072		1,254,526	
	Irwin	150,174		462,309	
	Kwinana	398,139		1,194,417	
	Manjimup	5,579		83,685	
	Wanneroo	119,273		1,818,898	
Total Limesand-Limestone		2,953,291		11,945,601	
TOTAL LIMESAND-LIMESTONE-DOLOMITE				12,031,973	(d)
MANGANESE ORE					
	East Pilbara	79,430	Mn % 49.23	8,129,205	(a)
NICKEL INDUSTRY					
Cobalt By-Product			Co Tonnes		
	Coolgardie		1,227.48	81,785,613(a),(b)	
	Kalgoorlie-Boulder		1.34	70,410	
	Roebourne		40.49	2,723,320	
Total Cobalt By-Product				84,579,343	
Nickel Concentrates			Ni %		
	Coolgardie	254,567	12.84	238,554,241	
	Kalgoorlie-Boulder	84,399	17.80	107,817,958	
	Kondinin	42,524	15.26	48,150,759	
	Leonora	336,519	13.23	320,982,332	
	Roebourne	25,487	10.00	17,642,284	
	Wiluna	209,405	19.98	305,877,402	
Total Nickel Concentrates		952,901		1,039,024,976	(i)
Palladium By-Product	Coolgardie		Pd kg 2,042.499	10,096,972(a),(b)	
Platinum By-Product	Coolgardie		Pt kg 209.483	2,852,073(a),(b)	
TOTAL NICKEL INDUSTRY				1,136,553,364	
PETROLEUM					
			Kilolitres		
Condensate	Ashburton	160,371		22,435,526	(d)
	Carnamah	238		8,151	(d)
	Irwin	1,007		212,666	(d)
	Roebourne	6,826,914		933,169,585	(a)
Total Condensate		6,988,530		955,825,928	

TABLE 3 (cont.) QUANTITY & VALUE OF MINERALS & PETROLEUM BY LOCAL GOVERNMENT AREA

MINERAL	LOCAL GOVERNMENT AREA	QUANTITY TONNES	METALLIC CONTENT	VALUE \$A	Ref. (P.65)
		Kilolitres			
Crude Oil	Ashburton	4,638,645		627,067,496	
	Derby-West Kimberley	9,102		1,087,393	
	Irwin	10,692		1,184,625	
	Roebourne	6,335,568		830,002,069	
Total Crude Oil		10,994,007		1,459,341,583	(a)
		Btu 10 ⁶			
Liquified Natural Gas	Roebourne	386,848,099		1,561,708,998	
		Tonnes			
LPG - Butane	Roebourne	384,543		86,580,631	(j)
		Tonnes			
LPG - Propane	Roebourne	263,815		55,771,778	(j)
		'000 m ³			
Natural Gas	Ashburton	898,218		72,221,306	(j)
	Carnamah	45,765		6,500,523	(j)
	Irwin	138,939		17,829,166	(j)
	Roebourne	5,245,157		429,978,154	(d)
Total Natural Gas		6,328,079		526,529,148	
TOTAL PETROLEUM PRODUCTS				4,645,758,066	
PIGMENTS					
Red Oxide	Cue	1,570		298,300	
SALT					
	Carnarvon	1,255,079		33,079,948	
	Dalwallinu	6		20	
	Esperance	15,258		538,919	
	Port Hedland Town	2,761,727		69,150,011	
	Roebourne	3,644,596		89,122,989	
	Shark Bay	685,268		13,348,093	
	Wyalkatchem	105		6,800	
	Yilgarn	114,980		4,925,815	
TOTAL SALT		8,477,019		210,172,594	(a)
SILICA-SILICA SAND					
Silica	Moora	91,821		918,215	(a)
Silica Sand	Albany	89,145		1,337,205	(a)
	Cockburn	132,348		1,455,828	(a)
	Coolgardie	148,082		362,800	
	Swan	284,876		3,106,562	(a)
	Total Silica Sand		654,451		6,262,395
TOTAL SILICA-SILICA SAND				7,180,610	
SILVER BY-PRODUCT		Ag kg			
	Coolgardie	194		51,143	
	Derby-West Kimberley	5,487		1,086,050(a), (b)	
	East Pilbara	1,260		314,085(a), (l)	
	Statewide	25,846		6,157,409	
	Yalgoo	19,568		5,359,193(a), (l)	
TOTAL SILVER BY-PRODUCT		52,355		12,967,881	

TABLE 4 ROYALTY RECEIPTS 1997, 1998

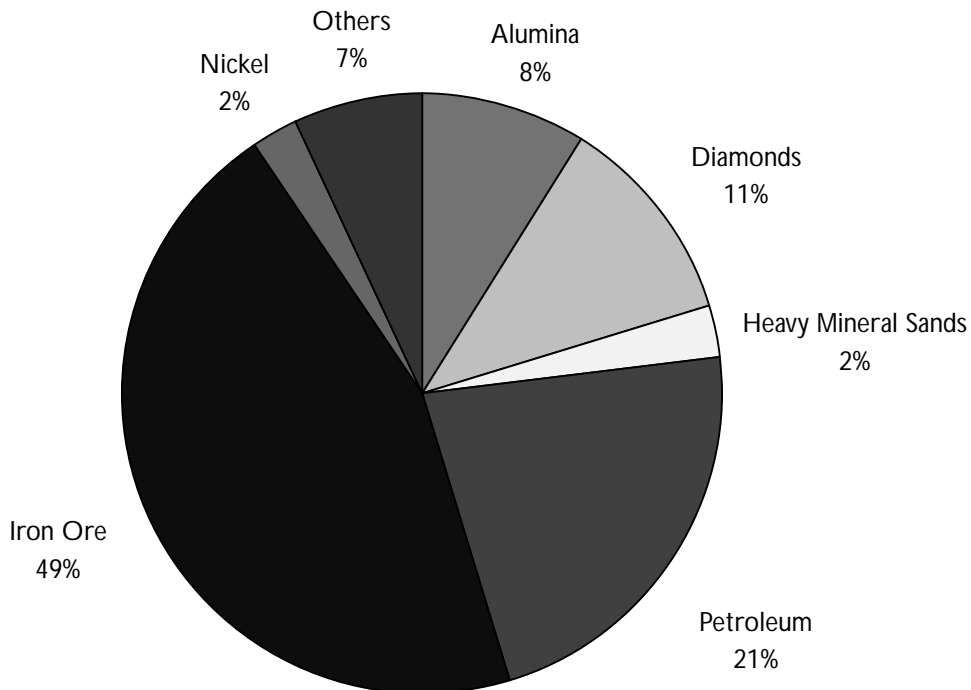
MINERAL	1997	1998	1998 GROWTH	
	\$A	\$A	\$A	%
BASE METALS				
Copper	2,810,095	1,849,497	-960,598	(34)
Lead	627,517	584,181	-43,336	(7)
Zinc	5,550,953	6,401,076	850,123	15
TOTAL BASE METALS	8,988,566	8,834,754	-153,811	(2)
BAUXITE-ALUMINA				
Alumina	34,465,299	38,281,457	3,816,158	11
Gallium	102,900	0	-102,900	(100)
TOTAL BAUXITE-ALUMINA	34,568,199	38,281,457	3,713,258	11
CHROMITE - PLATINOIDS				
Chromite	0	332,544	332,544	n/a
CLAYS	198,150	226,754	28,604	14
COAL	11,397,218	13,339,498	1,942,280	17
CONSTRUCTION MATERIALS				
Aggregate	133,856	65,610	-68,246	(51)
Gravel	71,236	50,683	-20,553	(28)
Rock	60,224	133,418	73,194	122
Sand	474,850	480,626	5,776	1
TOTAL CONSTRUCTION MATERIALS	740,165	730,337	-9,829	(1)
DIAMOND	36,098,081	45,192,711	9,094,630	25
DIMENSION STONE	534	477	-57	(11)
GEM & SEMI-PRECIOUS STONE	7,054	1,610	-5,444	(77)
GOLD	436,012	9,270,938	8,834,926	2,026
GYPSUM	107,853	376,626	268,773	249
HEAVY MINERAL SANDS				
Garnet	548,410	647,689	99,279	18
Ilmenite	7,617,419	9,461,924	1,844,505	24
Leucoxene	677,780	512,940	-164,840	(24)
Rutile	3,813,218	3,970,639	157,421	4
Zircon	8,401,130	7,838,210	-562,921	(7)
TOTAL HEAVY MINERAL SANDS	21,057,957	22,431,401	1,373,444	7
INDUSTRIAL PEGMATITE MINERALS				
Felspar	139,920	89,593	-50,326	(36)
IRON ORE	181,589,062	208,334,420	26,745,358	15
LIMESAND-LIMESTONE-DOLOMITE				
Dolomite	1,316	1,087	-229	(17)
Limesand-Limestone	320,702	636,869	316,167	99
TOTAL LIMESAND-LIMESTONE-DOLOMITE	322,019	637,957	315,938	98

TABLE 4 (cont.) ROYALTY RECEIPTS 1997, 1998

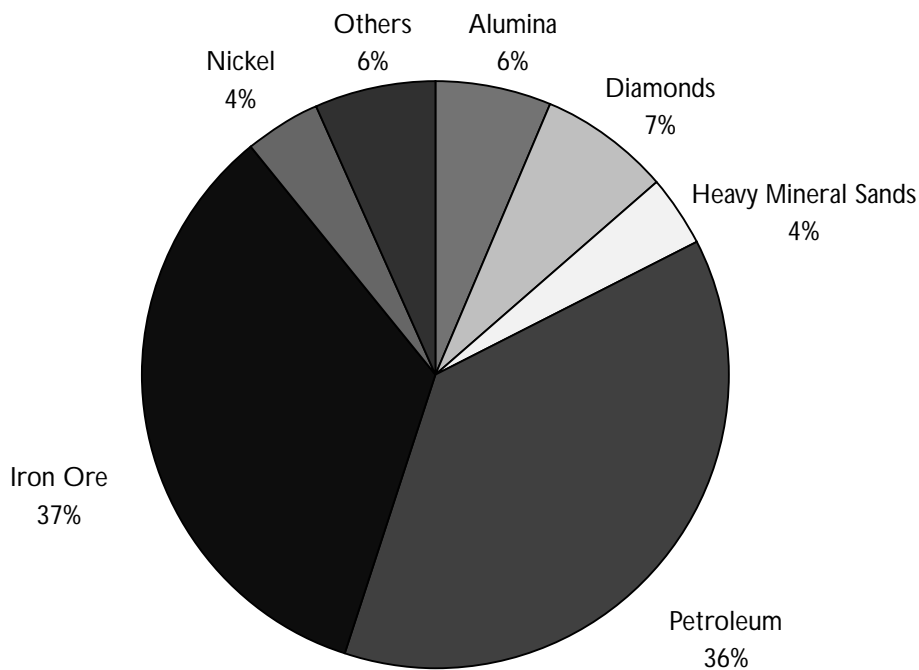
MINERALS	1997	1998	1998 GROWTH	
	\$A	\$A	\$A	%
MANGANESE	81,723	1,176,647	1,094,925	1,340
NICKEL INDUSTRY				
Cobalt by-product	1,079,863	1,810,637	730,773	68
Nickel	21,581,045	24,603,510	3,022,465	14
Palladium by-product	60,102	184,818	124,717	208
Platinum by-product	118,594	94,660	-23,934	(20)
TOTAL NICKEL INDUSTRY	22,839,604	26,693,625	3,854,021	17
OTHER MINERALS				
Spongolite	0	90,624	90,624	n/a
PETROLEUM				
Condensate	44,490,818	53,529,490	9,038,672	20
Liquified Natural Gas	80,761,811	88,846,086	8,084,275	10
LPG - Butane	3,650,015	4,412,447	762,431	21
LPG - Propane	3,173,541	3,251,059	77,518	2
Natural gas	28,489,289	26,284,039	-2,205,250	(8)
Oil	76,270,007	52,451,819	-23,818,188	(31)
TOTAL PETROLEUM	236,835,483	228,774,940	-8,060,543	(3)
PIGMENTS				
Red oxide	0	65,645	65,645	n/a
SALT	1,815,898	1,933,821	117,924	7
SILICA SAND	373,697	337,193	-36,504	(10)
SILVER	260,278	366,831	106,553	41
TALC	77,664	107,549	29,885	39
TIN-TANTALUM-LITHIUM				
Spodumene	791,751	521,677	-270,074	(34)
Tantalite	736,206	1,295,490	559,284	76
Tin	87,792	110,504	22,712	26
TOTAL TIN-TANTALUM-LITHIUM	1,615,749	1,927,671	311,922	19
TOTAL ROYALTY RECEIPTS	559,550,883	609,555,622	49,914,115	9
IRON ORE ADDITIONAL RENTAL	25,398,812	26,729,017	1,330,205	5
TOTAL REVENUE	584,949,695	636,284,639	51,244,320	9

COMPARATIVE ROYALTY RECEIPTS

1993 Total : A\$373.80 million



1998 Total : A\$636.28 million



Source : DME

Figure 0.2

TABLE 5 PERSONS EMPLOYED IN THE W.A. MINERALS & PETROLEUM INDUSTRIES AS AT 31 DECEMBER 1998

MINERAL/Company	Operating Site	1997	1998
BASE METALS			
Normandy Mining Ltd	Scuddles	279	361
Straits Resources Ltd	Nifty	327	281
Western Metals Ltd	Cadjebut	419	0
	Pillara	0	568
TOTAL BASE METALS		1,025	1,210
BAUXITE - ALUMINA			
Alcoa of Australia Ltd	Del Park	331	410
	Jarrahdale	260	186
	Kwinana Alumina Refinery	1,387	1,416
	Pinjarra Refinery	1,405	1,430
	Wagerup Alumina Refinery	902	1,255
	Willowdale	179	182
Australian Fused Materials Pty Ltd	Rockingham Fused Alumina Plant	73	75
Worsley Alumina Pty Ltd	Worsley - includes Mount Saddleback	155	170
	Worsley Refinery	1,085	1,594
TOTAL BAUXITE - ALUMINA		5,777	6,718
COAL			
Griffin Coal Mining Co. Pty Ltd	Muja	360	344
Wesfarmers Coal Ltd	Central Services	53	0
	Premier/WCL	126	349
	Western No. 5	201	0
TOTAL COAL		740	693
DIAMOND			
Argyle Diamond Mines Pty Ltd	Lake Argyle	1,003	1,003
GOLD			
Australian Resources Pty Ltd	Gidgee	156	170
	Mt McLure	134	158
Australian Gold Fields NL	Bannockburn	118	2
Australian Gold Resources Ltd	Perth Mint	77	66
Barminco Pty Ltd	Two Boys	78	0
Border Gold NL	Karonie	0	13
Camelot Resources NL	Mt Gibson	58	0
	Tarmoola	231	321
Centaur Mining & Exploration Ltd	Mt Pleasant	378	497
	Ora Banda	222	0
Central Norseman Group	Norseman	217	266
Como Engineers	O'Conner - Carbon Stripping Plant	0	3
Consolidated Gold NL	Bardoc - Davyhurst	116	55
	Miranda	55	0
Croesus Mining NL	Binduli	26	56
Dalrymple Resources NL	Sandstone	1	0
Delta Gold NL	Golden Feather Group	0	226

TABLE 5 (cont.) PERSONS EMPLOYED IN THE W.A. MINERALS & PETROLEUM INDUSTRIES AS AT 31 DECEMBER 1998

MINERAL/Company	Operating Site	1997	1998
GOLD (Continued)			
Equigold NL	Dalgaranga	81	135
Goldfields Kalgoorlie Ltd	Kundana	253	262
	Paddington	365	216
	Kewdale - Golden West Refinery	33	26
Golden West Refining Corporation Ltd	Kewdale - Golden West Refinery	33	26
Great Central Mines NL	Bronzewing	333	223
	Jundee	519	542
	Wiluna	464	368
Hedges Gold Pty Ltd	Hedges	127	67
Herald Resources Ltd	Sandstone	39	33
	Three Mile Hill	149	63
	Hill 50	255	314
Hill 50 Gold NL	Hill 50	255	314
	Darlot	460	482
	Lawlers	194	194
Homestake Mining Company	Mt Morgans	176	0
	Plutonic	389	382
	Golden Mile - Super pit	1,241	1,228
Kalgoorlie Consolidated Gold Mines Pty Ltd	Golden Mile - Super pit	1,241	1,228
Lionore Australia Pty Ltd	Bounty	227	262
Lynas Gold NL	Lynas Find	51	0
	Mt Olympus	0	34
	Hannan South	23	17
Morning Star Mines NL	Hannan South	23	17
Mount Mine Joint Venture	Mount Group	0	3
Mt Lyell Mining Company Ltd	Reedy	75	0
New Hampton Goldfields NL	Dawns Hope	217	245
Newcrest Mining Ltd	New Celebration	219	206
	Telfer	523	609
	Big Bell	330	397
Normandy Mining Ltd	Kaltails	86	107
	Kanowna Belle	303	360
	Peak Hill	33	35
Perilya Mines NL	Fortnum	74	85
Placer Dome Inc	Granny Smith	327	328
Resolute Ltd	Chalice	152	113
	Marymia	96	0
	Barnicoat	86	0
Sons of Gwalia NL	Copperhead	106	56
	Cornishman	0	75
	Golden Pig and Frasers	61	49
	Marvel Loch	141	216
	Sons of Gwalia	168	234
	Yilgarn Star	322	170
	Bluebird	340	134
	Sunrise Dam	143	125
	Emu	248	588
St. Barbara Mines Ltd	Kambalda/St. Ives	1,078	756
	Boddington	432	573
Stockdale Prospecting Ltd	Sunrise Dam	143	125
WMC Resources Ltd	Emu	248	588
Worsley Alumina Pty Ltd	Kambalda/St. Ives	1,078	756
	Boddington	432	573
TOTAL GOLD		12,806	12,145

TABLE 5 (cont.) PERSONS EMPLOYED IN THE W.A. MINERALS & PETROLEUM INDUSTRIES AS AT 31 DECEMBER 1998

MINERAL/Company	Operating Site	1997	1998
HEAVY MINERAL SANDS			
BHP Titanium Minerals Pty Ltd	Beenup	189	184
Cable Sands Pty Ltd	Bunbury	317	339
GMA Garnet Pty Ltd	Narngulu Garnet Plant	24	23
	Port Gregory - Hutt Lagoon	20	22
Hanwah Advanced Ceramics Australia Pty Ltd	Rockingham Zirconia Plant	21	19
RGC Mineral Sands Pty Ltd	Capel	154	156
	Eneabba	476	0
	Narngulu Synthetic Rutile Plants	221	162
	Narngulu Dry Plant	67	61
TiWest Pty Ltd	Chandala-Muchea	234	200
	Cooljarloo	128	258
Westralian Sands Ltd	Capel	583	539
TOTAL HEAVY MINERAL SANDS		2,434	1,963
IRON ORE			
BHP Iron Ore (Goldsworthy) Ltd	Finucane Island	406	281
	Yarrie	175	274
BHP Iron Ore (Jimblebar) Ltd	Jimblebar	110	151
BHP Iron Ore Ltd	Mt Whaleback	1,597	1,390
	Nelson Point	844	918
	Orebody 25	85	116
	Mt Newman Railway	622	539
	Yandi	130	238
Hamersley Iron Pty Ltd	Brockman No. 2 Detritals Group	124	155
	Dampier Port Operations	937	610
	Hismelt/Kwinana	114	114
	Marandoo	215	161
	Paraburdoo/Channar	634	574
	Hamersley Railway	349	305
	Tom Price	792	954
Koolyanobbing Iron Pty Ltd	Cockatoo Island	45	13
	Koolyanobbing	27	25
Robe River Mining Co. Pty Ltd	Cape Lambert	470	576
	Pannawonica Deepdale	430	417
	Robe River Railway	76	100
TOTAL IRON ORE		8,182	7,911
NICKEL			
Anaconda Nickel Ltd	Murrin Murrin Plant	732	1,293
Murrin Murrin Operations	Murrin Murrin	0	463
Centaur Mining & Exploration	Cawse	0	210
Outokumpu Mining Australia Pty Ltd	Black Swan	138	121
	Forrestania	182	161
Resolute Ltd	Bulong	291	241
Titan Resources NL	Radio Hill	7	51
Western Mining Corporation Ltd	Kalgoorlie Nickel Smelter	359	460
	Kambalda/Blair	899	684
	Kwinana Refinery	414	322
	Leinster	816	721
	Mt Keith	696	978
TOTAL NICKEL		4,534	5,705

TABLE 5 (cont.) PERSONS EMPLOYED IN THE W.A. MINERALS & PETROLEUM INDUSTRIES AS AT 31 DECEMBER 1998

MINERAL/Company	Operating Site	1997	1998
PETROLEUM PRODUCTS			
Apache Energy Ltd	Campbell, Agincourt, East Spar, Harriet, Rosette, Sinbad, Tanami, Stag	131	147
ARC	Dongara	6	6
BHP Petroleum (Australia) Pty Ltd	Griffin	58 (e)	71
	Tubridgi	0	28
Boral	Beharra Springs, Tubridgi	12	12
Capital	Blina, Boundary, Lloyd, Sundown, West Terrace	4	4
Mobil Exploration & Producing Australia Pty Ltd	Wandoo	36	36
Novus	Chervil, North Herald, South Pepper, Airlie Island	6	4
Phoenix	Woodada	12	12
Premier Oil Australia Pty Ltd	Mt Horner	6	7
West Australian Petroleum Pty Ltd (WAPET)	Barrow Island, Cowle, Crest, Roller-Skate, Saladin, Yammaderry	218	202
Woodside Energy Ltd	Cossack, Goodwyn, Hermes, North Rankin, Wanaea	1,334	1,291
TOTAL PETROLEUM PRODUCTS		1,823	1,820
SALT			
Cargill Salt Co.	Port Hedland	111	112
Dampier Salt Ltd	Dampier	229	212
	Lake MacLeod	139	163
Onslow Solar Salt Pty Ltd	Onslow	86	117
Shark Bay Salt JV	Useless Loop	121	73
TOTAL SALT		686	677
TOTAL CLAYS		62	55
TOTAL CONSTRUCTION MATERIALS		329	347
TOTAL DIMENSION STONE		71	30
TOTAL INDUSTRIAL PEGMATITE MINERALS		32	30
TOTAL LIMESTONE - LIMESAND		208	156
TOTAL MANGANESE ORE		0	6
TOTAL SILICA - SILICA SAND		241	207
TOTAL TALC		37	37
TOTAL TIN - TANTALUM - LITHIUM		273	255
ALL OTHER MATERIALS		225	334
TOTAL		40,488	41,302

(SOURCE:AXTAT REPORTING SYSTEM, MINING OPERATIONS DIVISION),

TABLE 6

PRINCIPAL MINERALS AND PETROLEUM PRODUCERS 1998

BASE METALS**Copper**

Murchison Zinc Co. Pty Ltd, 100 Hutt Street, Adelaide SA 5000, (08) 8303 1700: Golden Grove.

Newcrest Mining Ltd, 600 St Kilda Road, Melbourne Vic, 3004, (03) 9522 5333: Telfer.

Straits Resources Ltd, 1 Alfred Street, Sydney NSW 2000, (02) 9252 2011: Nifty.

WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000: Kambalda

Lead - Zinc

Murchison Zinc Co. Pty Ltd, 100 Hutt Street, Adelaide SA 5000, (08) 8303 1700: Golden Grove.

Western Metals Ltd, 263 Adelaide Terrace, Perth WA 6000, (08) 9221 2555: Cadjebut.

BAUXITE - ALUMINA**Alumina**

Alcoa of Australia (WA) Ltd, cnr Davey and Marmion Streets, Booragoon WA 6154, (08) 9316 5111:
Del Park, Jarrahdale, Willowdale.

Worsley Alumina Pty Ltd, PO Box 344, Boddington WA 6225, (08) 9734 8311: Boddington.

CHROMITE**Chromite Ore**

Danelagh Resources Pty Ltd, 32 Kings Park Rd, West Perth WA 6005, (08) 9486 7640: Coobina.

CLAY**Attapulgitite**

Hudson Resources Ltd, James St Narngulu, Geraldton WA 6530, (08) 9923 3604: Lake Nerramyne.

Fire Clay

Midland Brick Co. Pty Ltd, Bassett Rd, Middle Swan WA 6056, (08) 9273 5522: Bullsbrook.

COAL

Griffin Coal Mining Co. Ltd, 28 The Esplanade, Perth WA 6000, (08) 9325 8155: Collie.

Wesfarmers Coal Ltd, 276 Leach Highway, Myaree WA 6153, (08) 9333 0391: Collie.

CONSTRUCTION MATERIALS**Aggregate**

Pioneer Concrete (WA) Pty Ltd: 123 Burswood Rd, Victoria Park WA 6100, (08) 9311 8811: Learmonth.

The Readymix Group (WA), 75 Canning Highway, Victoria Park WA 6100, (08) 9472 2000: Boodarrie,
Burrup-Dampier.

Gravel

Boral Resources (WA) Ltd, 63 Abernethy Road, Belmont WA 6104, (08) 9333 3400: Grosmont.

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

Rock

The Readymix Group (WA), 75 Canning Highway, Victoria Park WA 6100, (08) 9472 2000: Kalgoorlie.

Sand

Boral Resources (WA) Ltd, 63 Abernethy Rd, Belmont WA 6104, (08) 9333 3400: Gnarlbine, Grosmont.

Rocla Quarry Products, 1 Newburn Road, Kewdale WA 6105, (08) 9353 3030: Gnangarra.

The Readymix Group (WA), 75 Canning Highway, Victoria Park WA 6100, (08) 9472 2000: Comet Vale,
Pinnacles, Sandy Creek, Sandy Hill, Sullivan's Creek, Turner River, Warrawanda, Widgiemooltha.

DIAMOND

Argyle Diamond Mines, 2 Kings Park Road, West Perth WA 6005, (08) 9482 1166: Argyle.

TABLE 6 (cont.)

PRINCIPAL MINERALS AND PETROLEUM PRODUCERS 1998

GOLD

- Acacia Resources Ltd, 60 City Road, South Melbourne VIC 3006, (03) 9684 4999: Sunrise Dam.
- Australian Resources Ltd, 100 Williams Street, East Sydney NSW 2010, (02) 9326 9277: Gidgee, Mt McClure.
- Barmenco Pty Ltd, 9 Bowman Street, South Perth WA 6151, (08) 9474 1340: Karonie.
- Centaur Mining & Exploration Ltd, 210 Kings Way, South Melbourne VIC 3205, (03) 9234 1122: Mt Pleasant-Golden Kilometre, Ora Banda.
- Central Norseman Gold Corp. NL, 60 City Road, Southbank VIC 3006, (03) 9685 6000: Central Norseman.
- Croesus Mining NL, 39 Porter Street, Kalgoorlie WA 6430, (08) 9091 2222: Binduli.
- Davyhurst Project Pty Ltd, PMB 14, Kalgoorlie WA 6430, (08) 9269 1800: Davyhurst.
- Delta Gold NL, 99 Walker Street, North Sydney NSW 2060, (02) 9903 4000: Golden Feather.
- Equigold NL, 7 Sleat Street, Applecross WA 6153, (08) 9316 3661: Dalgara.
- Goldfields Kalgoorlie Ltd, 1 Alfred Street, Sydney NSW 2000, (02) 9934 8800: Kundana, Paddington.
- Great Central Mines NL, 210 Kings Way, Sth Melbourne VIC 3205, (03) 9234 1111: Bronzewing, Jundee-Nimary, Wiluna.
- Hedges Gold Pty Ltd, Pinjarra - Williams Road, Boddington WA 6390, (08) 9538 4500: Hedges.
- Herald Resources Ltd, 40 Kings' Park Road, West Perth WA 6005, (08) 9322 2788: Sandstone, Coolgardie.
- Hill 50 Gold NL, 10 Ord Street, West Perth WA 6005, (08) 9485 0070: Hill 50 Mt Magnet.
- Homestake Mining Company, 2 Mill Street, Perth WA 6000, (08) 9212 5777: Darlot, Lawlers, Plutonic.
- Kalgoorlie Consolidated Gold Mines Pty Ltd, Private Bag 27, Kalgoorlie WA 6430, (08) 9022 1100: Golden Mile.
- Lionore Australia Pty Ltd, 15 Ord Street, West Perth WA 6005, (08) 9481 5656: Bounty.
- Lynas Gold NL, 50 Colin St, West Perth WA 6005, (08) 9481 3400: Paraburdoo.
- Newcrest Mining Ltd, 600 St Kilda Road, Melbourne VIC 3004, (03) 9522 5333: New Celebration, Telfer.
- New Hampton Goldfields NL, 9 Havelock Street, West Perth WA 6005, (08) 9321 0611: Jubilee
- Normandy Mining Ltd, 100 Hutt Street, Adelaide SA 5000, (08) 8303 1700: Big Bell, Golden Crown, Kaltails.
- North Ltd, 476 St Kilda Road, Melbourne VIC 3004, (03) 9207 5111: Kanowna Belle, Peak Hill.
- Pacific Mining Corporation Ltd, 35 Ventnor Ave, West Perth WA 6005, (08) 9321 0616: Tarmoola.
- Perilya Mines NL, 31 Ventnor Avenue, West Perth WA 6005, (08) 9423 1700: Fortnum.
- Placer Dome Inc, 1 Alfred Street, Sydney Cove NSW 2000 (02) 9256 3800: Granny Smith.
- Resolute Ltd, 28 The Esplanade, Perth WA 6000, (08) 9261 6100: Chalice.
- Sons of Gwalia NL, 16 Parliament Place, West Perth WA 6005, (08) 9263 5555: Bullfinch, Marvel Loch-Southern Cross, Sons of Gwalia, Yilgarn Star.
- St Barbara Mines Ltd, 2 The Esplanade, Perth WA 6000, (08) 9323 3333: Bluebird.
- WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000: Agnew, Kambalda-St Ives.
- Worsley Alumina Pty Ltd, PO Box 48, Boddington WA 6390, (08) 9883 8260: Boddington.

GYPSUM

- Dampier Salt (Operations) Pty Ltd, 152 St George's Terrace, Perth WA 6000, (08) 9327 2257: Lake Macleod.
- Swan Cement Ltd, PO Box 528, Kwinana WA 6966, (08) 9499 2222: Lake Hillman.
- Westdeen Holdings Pty Ltd, 7 Armstrong Rd, Applecross WA 6153 (08) 9364 4951: Lake Cowcowing.

TABLE 6 (cont.)

PRINCIPAL MINERALS AND PETROLEUM PRODUCERS 1998

HEAVY MINERAL SANDS**Garnet Sand**

GMA Garnet Pty Ltd, PO Box 188, Geraldton WA 6530, (08) 9923 3644: Port Gregory.

Ilmenite, Leucoxene, Rutile and Zircon

BHP Titanium Minerals Pty Ltd, PO Box 22, Karridale WA 6288, (08) 9758 2500: Beenup.

Cable Sands (WA) Pty Ltd, PO Box 133, Bunbury WA 6230, (08) 9721 4111: Busselton, Jangardup, Waroona, Sandalwood.

RGC Mineral Sands, PO Box 84, Geraldton WA 6530, (08) 9956 8222: Capel, Eneabba.

TiWest Pty Ltd, 1 Brodie-Hall Drive, Bentley WA 6102, (08) 9365 1333: Cooljarloo.

Westralian Sands Ltd, PO Box 96, Capel WA 6271, (08) 9780 3200: Busselton, Capel, Yoganup.

IRON ORE

BHP Iron Ore (Goldsworthy) Ltd, 200 St George's Terrace, Perth WA 6000, (08) 9320 4444: Nimingarra.

BHP Iron Ore (Jumblebar) Ltd, 200 St George's Terrace, Perth WA 6000, (08) 9320 4444: Jumblebar.

BHP Iron Ore Ltd, 200 St George's Terrace, Perth WA 6000, (08) 9320 4444: Newman, Yandicoogina.

Channar Mining Pty Ltd, 152 St George's Tce, Perth WA 6000, (08) 9327 2327: Channar.

Hamersley Iron Pty Ltd, 152 St George's Terrace, Perth WA 6000, (08) 9327 2327: Brockman, Marandoo, Paraburdoo, Tom Price.

Koolyanobbing Iron Pty Ltd, 1 William St, Perth WA 6000, (08) 9426 3388: Cockatoo Island, Koolyanobbing.

Robe River Iron Associates, 12 St George's Terrace, Perth WA 6000, (08) 9421 4747: Pannawonica.

LIMESAND - LIMESTONE

Cockburn Cement Ltd, Russell Road, East Munster WA 6166, (08) 9411 1000: Cockburn Sound, Dongara.

Limestone Resources Australia Pty Ltd, Parkland Road (cnr Hasler Road) Osborne Park WA 6017, (08) 944 4244: Moore River, Wanneroo.

Loongana Lime Pty Ltd, PO Box 808, Kalgoorlie WA 6430, (08) 9021 8055: Loongana.

WA Limestone Co, 41 Spearwood Ave, Bibra Lake WA 6163, (08) 9434 2299: Postans.

Westdeen Holdings Pty Ltd, 7 Armstrong Rd, Applecross WA 6153 (08) 9364 4951: Dongara-Denison, Cervantes, Lancelin, Yanchep.

MANGANESE

Consolidated Minerals Ltd, Level 1, 88 Colin St, West Perth 6005 (08) 9321 3633: Woodie Woodie.

NICKEL

Australian Nickel Mines, 1st Floor, 24 Outram St, West Perth WA 6005, (08) 9481 6040: Radio Hill.

Black Swan Nickel Pty Ltd, Locked Bag 50, Kalgoorlie Business Centre, Kalgoorlie WA 6430 (08) 9024 0240: Black Swan, Silver Swan.

Outokumpu Australia Pty Ltd, 141 Burswood Road, Burswood WA 6100, (08) 9472 3144: Forrestania.

WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000: Kambalda/Blair, Leinster, Mt Keith, Carnilya Hill.

PETROLEUM

Apache Energy Ltd, Level 3, 256 St George's Terrace, Perth WA 6000, (08) 9422 7222: East Spar, Harriet, Stag, Airlie Island.

ARC Energy NL, 35 Ventnor Avenue, West Perth WA 6005, (08) 9486 7333: Dongara.

BHP Petroleum Pty Ltd, Central Park, 152-158 St George's Terrace, Perth WA 6000, (08) 9278 4888: Griffin

TABLE 6 (cont.)

PRINCIPAL MINERALS AND PETROLEUM PRODUCERS 1998

PETROLEUM (Continued)

Boral Energy Resources Ltd, 339 Coronation Drive, Milton QLD 4064, (07) 3858 0257: Beharra Springs, Tubridgi.

Capital Energy NL, Level 7, The Landmark, 345 George Street, Sydney NSW 2000, (02) 9262 6833: Blina-Lloyd, Sundown.

Mobil Exploration & Producing Australia Pty Ltd, Level 29, QV1 Building, 250 St George's Terrace, Perth WA 6000, (08) 9424 9200: Wandoo

Phoenix Energy Pty Ltd, 10th Floor, The Griffin Centre, 28 The Esplanade, Perth WA 6000, (08) 9261 2800: Woodada.

Premier Oil Australia Pty Ltd, Level 3, 31 Ventnor Ave, West Perth 6005, (08) 9480 4100: Mt Horner.

West Australian Petroleum Pty Ltd (WAPET), Level 24, QV1 Building, 250 St George's Terrace, Perth WA 6000, (08) 9263 6000: Barrow Island, Crest, Roller-Skate, Saladin.

Woodside Energy Ltd, 1 Adelaide Terrace, Perth WA 6000, (08) 9224 4111: Cossack, Goodwyn, Hermes, North Rankin, Wanaea.

PLATINUM

WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000: Kambalda

PALADIUM

WMC Ltd, 250 St George's Terrace, Perth WA 6000, (08) 9442 2000: Kambalda

SALT

Cargill Salt, North West Coastal Hwy, Port Hedland WA 6721, (08) 9173 0200: Port Hedland.

Dampier Salt (Operations) Pty Ltd, 152-158 St George's Terrace, Perth WA 6000, (08) 9327 2299: Dampier, Lake Macleod.

Shark Bay Salt Joint Venture, 22 Mount Street, Perth WA 6000, (08) 9322 4811: Useless Loop.

WA Salt Koolyanobbing Pty Ltd, Cockburn Road, Hamilton Hill WA 6163, (08) 9430 5495: Lake Deborah East, Pink Lake.

SILICA - SILICA SAND

Silica

Simcoa Operations Pty Ltd, PO Box 1389, Bunbury WA 6231, (08) 9791 2588: Dalaroo.

Silica Sand

Rocla Quarry Products, 1 Newburn Road, Kewdale WA 6105, (08) 9353 3030: Jandakot.

The Readymix Group (WA), 75 Canning Highway, Victoria Park WA 6100, (08) 9472 2000: Jandakot.

TT Sand Pty Ltd, 55 St George's Tce, Perth WA 6000, (08) 9221 2304: Mindijup.

WMC Ltd, 251 St George's Terrace, Perth WA 6000, (08) 9442 2000: Mt Burgess.

TALC

Commercial Minerals Ltd, 26 Tomlinson Rd, Welshpool WA 6106, (08) 9362 1411: Mt Seabrook.

WMC Ltd, PO Box 116, Three Springs WA 6519, (08) 9954 5047: Three Springs.

TIN - TANTALUM - LITHIUM

Spodumene

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

Tantalite - Tin

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

ABBREVIATIONS, REFERENCES, UNITS AND CONVERSION FACTORS

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

ABBREVIATIONS

cons	concentrates	n/a	not applicable
f.o.t.	free on truck	f.o.b.	free on board
f.o.r.	free on rail	¥	Japanese Yen
A\$	Australian Dollar	US\$	United States Dollar
ABS	Australian Bureau of Statistics	GDP	Gross Domestic Product
AFR	<i>Australian Financial Review</i>	BMR	Bureau of Mineral Resources
CSO	Central Selling Organisation	HBI	Hot Briquetted Iron
DRI	Direct Reduced Iron	IMF	International Monetary Fund
RBA	Reserve Bank of Australia		
ABARE	Australian Bureau of Agricultural and Resource Economics		

REFERENCES

- (a) Estimated f.o.b. value.
- (b) Metallic by-product of nickel mining.
- (c) Value based on the average Australian Value of Alumina as published by the ABS.
- (d) Value at works.
- (e) Estimated ex-mine value.
- (f) Value based on monthly production and average gold price of that month as supplied by GoldCorp.
- (g) Estimated f.o.t. value.
- (h) Estimated f.o.r. value.
- (i) Estimated f.o.b. value based on the current price of nickel containing products.
- (j) Delivered value.
- (k) Metallic by-product of copper mining.
- (l) By-products of gold mining
- (r) Revised from previous edition.

UNITS AND CONVERSION FACTORS

	Metric Unit	Symbol	Imperial Unit
Mass	1 gram	(g)	= 0.032151 troy (fine) ounce (oz)
	1 kilogram	(kg)	= 2.204624 pounds (lbs)
	1 tonne	(t)	= 1.10231 United States short ton [1 US short ton = 2,000 lbs]
	1 tonne	(t)	= 0.98421 United Kingdom long ton [1 UK long ton = 2,240 lbs]
Volume	1 kilolitre	(kl)	= 6.28981 barrels (bbls)
	1 cubic metre	(m ³)	= 35.3147 cubic feet (ft ³) [1 kilolitre (kl) = 1 cubic metre (m ³)]
Energy	1 kilojoule	(kj)	= 0.94781 British Thermal Units (Btu)

Energy Content

Coal	19.7 GJ/t
Condensate	32.0 MJ/L
Crude oil	37.0 MJ/L
LNG	25.0 MJ/L
Natural gas	38.2 MJ/m ³
LPG-butane	28.7 MJ/L (1tonne LPG-butane = 1,720 litres)
LPG-propane	25.4 MJ/L (1tonne LPG-propane = 1,960 litres)

Prefix

kilo (k)	10 ³
mega (M)	10 ⁶
giga (G)	10 ⁹
tera (T)	10 ¹²
peta (P)	10 ¹⁵

1998 STATISTICS DIGEST

For further information on the Mineral and Petroleum Resources of Western Australia to compliment this publication please refer to:

- Mineral and Petroleum Exploration and Development
- Atlas of Mineral Deposits and Petroleum Fields



"Our Resources • Our People • Our Future"

Corporate policy, Planning and Finance

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