ROYALTIES AND POLICY DEVELOPMENT DIVISION

STATISTICAL DIGEST OF MINERAL AND PETROLEUM PRODUCTION 1989–1990

DEPARTMENT OF MINES
WESTERN AUSTRALIA

STATISTICAL DIGEST OF MINERAL

AND PETROLEUM PRODUCTION

1989/90

ROYALTIES AND POLICY DEVELOPMENT DIVISION

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ABBREVIATIONS, REFERENCES, UNITS AND CONVERSION FACTORS

As the following 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	f.o.t.	free on truck
f.o.b.	free on board	n.a.	not available
f.o.r.	free on rail	n.ap.	not applicable

REFERENCES

N.A.	Not available for publication
(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 Bureau of Mineral Resources in the Australian Mineral Industry Review
(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 Gold Producers' Association
(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

UNITS AND CONVERSION FACTORS

	Metric Unit	Symbol	Imperial Unit	Conversion factors: Multiply Imperial Unit by	Conversion factors: Multiply Metric Unit by
Mass	gram	g	troy (fine) ounce (oz)	31.103522	0.032151
	kilogram	kg	pound (lb)	0.453592	2.204624
	tonne	t	long ton (2240 lbs)	1.016046	0.984207
	tonne	t	short ton (2000 lbs)	0.907185	1.102311
Volume	kilolitre	kl	barrel (bbl)	6.28981	0.158987
	kilolitre	kl	cubic metre (m^3)	1	

Prefix	kilo (k)	10^3
	mega (M)	10^6
	giga (G)	10^9
	tera (T)	10^{12}

OVERVIEW

1.1 REVIEW OF THE WORLD ECONOMY 1989/1990

Among the major economies the first half of 1990 saw a maintaining of the growth trends of 1989. This resulted in a continuation of the divergence in economic performances between OECD member countries which began in 1989.

Growth in Japan and West Germany remained strong. In Japan the economy continued to be driven by domestic demand sourced in private consumption and non residential investment. Policy makers are continuing to attempt a broad restructuring of the economy, while avoiding any trauma to the financial sector or to employment levels. The rapid movement towards union with East Germany gave impetus to West Germany's already robust economic activity. Private consumption expenditure increased in a climate of low inflation and high capacity utilisation. Indirect tax increases in West Germany and Japan, though generating strong political opposition in the latter, resulted in relatively small once off rises in inflation.

In the United States the overall rate of economic growth slowed to 1.5% for the year. The manufacturing and construction sectors bore the brunt of the slow-down and, though services were generally strong, the finance sector continued to reel under the Savings and Loan and Junk Bond market collapses. The inflation rate of 4.5% was roughly in line with the average of the OECD economies.

The economy of the United Kingdom was plagued by slowing growth and sharply rising inflation. Consumer price inflation surged to an annualised rate of approximately 10%.

The newly industrialising economies of East and North Asia grew by an average of about 6.5%, a much higher rate than any of the OECD countries.

Inflation continued to be a major concern in all the industrialised economies and monetary policy, as the generally preferred demand management tool, generally remained firm. A further tightening of monetary growth can be expected in Western Europe as attempts are made to contain any further inflationary pressures emerging as a result of the reunification of Germany.

Although some progress has been made in reducing the major current account imbalances between trading nations, no significant improvements are expected in the medium term. There is hope that a continuation of buoyant domestic demand in Japan, West Germany and the rest of Europe will work to eventually overcome the persistent US trade deficit. The OECD outlook, while forecasting positive, though slowing world economic growth, recognises the substantial uncertainties which continue to surround the major economies.

1.2 REVIEW OF THE AUSTRALIAN ECONOMY

The gradual slowing of the Australian economy, which first became apparent at the end of 1989, continued through the first six months of 1990.

The Government's reliance on a tight monetary policy to restrain domestic demand growth, and inflation, was maintained.

Contrary to general expectations, of an onset of negative economic growth in the March quarter 1990, national output increased strongly Seasonally adjusted gross domestic product, rose by 1.8% during the period. Net exports once again made a positive contribution to economic growth, and domestic expenditure continued to hold up overall. Analysts attributed much of the output rise to increased public sector expenditure and private consumption. Real private investment expenditure continued to fall under the impact of high interest rates.

Rural and non rural exports, and the financial services sector, were the props which held up the Australian economy in 1989/90. In the June quarter agricultural output fell by 2.2%, after adjustment for seasonal factors, while mining industry output rose by 3.1% to carry private sector growth.

Rural commodity prices softened during the first half of 1990. The demand for wool on world markets was much lower in 1989/90 than at any time in the preceding three seasons. Similarly, wheat prices are expected to be eroded in the coming season by a combination of record global production, subsidies and export enhancement.

Despite some weakening in gold and base metal prices, the value of mineral exports rose by 7% in the June quarter. This growth was a significant improvement over the 0.5% increase of the preceding quarter.

1.3 ECONOMIC FACTORS AFFECTING THE MINING INDUSTRY

The prosperity of the Australian Mining Industry continued to be determined by the demand for the major bulk mineral and energy exports. The strength of the Australian dollar and domestic interest rates also influenced returns to producers and, in turn, profitability.

Australia has been fortunate that, while economic growth among its trading partners has slowed overall, the demand for mining industry products has remained fairly strong. The strength of prices during the 1989/90 trading period is evidenced in that the value of the mining sector's exports rose by 16% while total export production increased by a weighted average of 11%. The decline of agricultural sales aggregates, and marginal increases in manufactured goods, meant that the mines based commodities share of national exports rose considerably during the period.

Though returns to minerals exporters would have been greater with a lower exchange rate, the relatively steady trading band of between US 75 cents and US 79 cents to the $A was accommodated by most producers.

Domestic interest rates continued to rise, with prime rates peaking at 22.75%, through late 1989 in response to the Federal Government running a tighter monetary policy. To monetary policy has fallen the twin burdens of achieving internal balance (demand management) and lower rate of inflation over the medium term. The impact on the mining industry of the high interest rates has been ameliorated somewhat by the gradual easing of policy over most of 1990 and by the sustained strength of most commodity prices.

As the major economies continue to contract in 1990/91 the rate of growth in minerals export values is not expected to be as strong. Any value of production increases should come as a result of an expansion of output.

1.4 SOCIAL AND POLITICAL FACTORS AFFECTING THE MINING INDUSTRY

Environmental issues continued to dominate the social and political debate over mining in Australia. A major inquiry by the Industry Commission into mining and minerals processing was completed during the year. Government and industry strategies to improve mine safety were also prominent during the period, particularly in Western Australia.

The Federal Government's decision in December 1989 to defer mining at the Coronation Hill site was a blow to the BHP-led Coronation Hill joint venture, and again focussed attention on the question of secure access to mineral deposits. In a move which the broad industry interpreted as precedent setting, the matter was referred to the newly created Resources Assessment Commission for further consideration.

Since the re-election of the Labor Government in March 1990 there has been a general softening of the tough environmental line. Economic ministers, and their State counterparts, have pushed a subtle policy change in which the value of foregone production is to be more closely evaluated.

The terms of reference for the Industry Commission Inquiry included a report on the institutional, regulatory and other factors which may lead to inefficient resource use. Social and environmental objectives were examined, along with all aspects of operating costs, property rights and technology. A draft report and recommendations is being released during September 1990, in advance of another round of public hearings.

A consultative steering committee, comprised of government, industry and union representatives, was convened in February 1990 to investigate fatalities and the incidence of serious injuries in Western Australian, underground goldmines. A report was submitted to the Minister for Mines in June 1990.

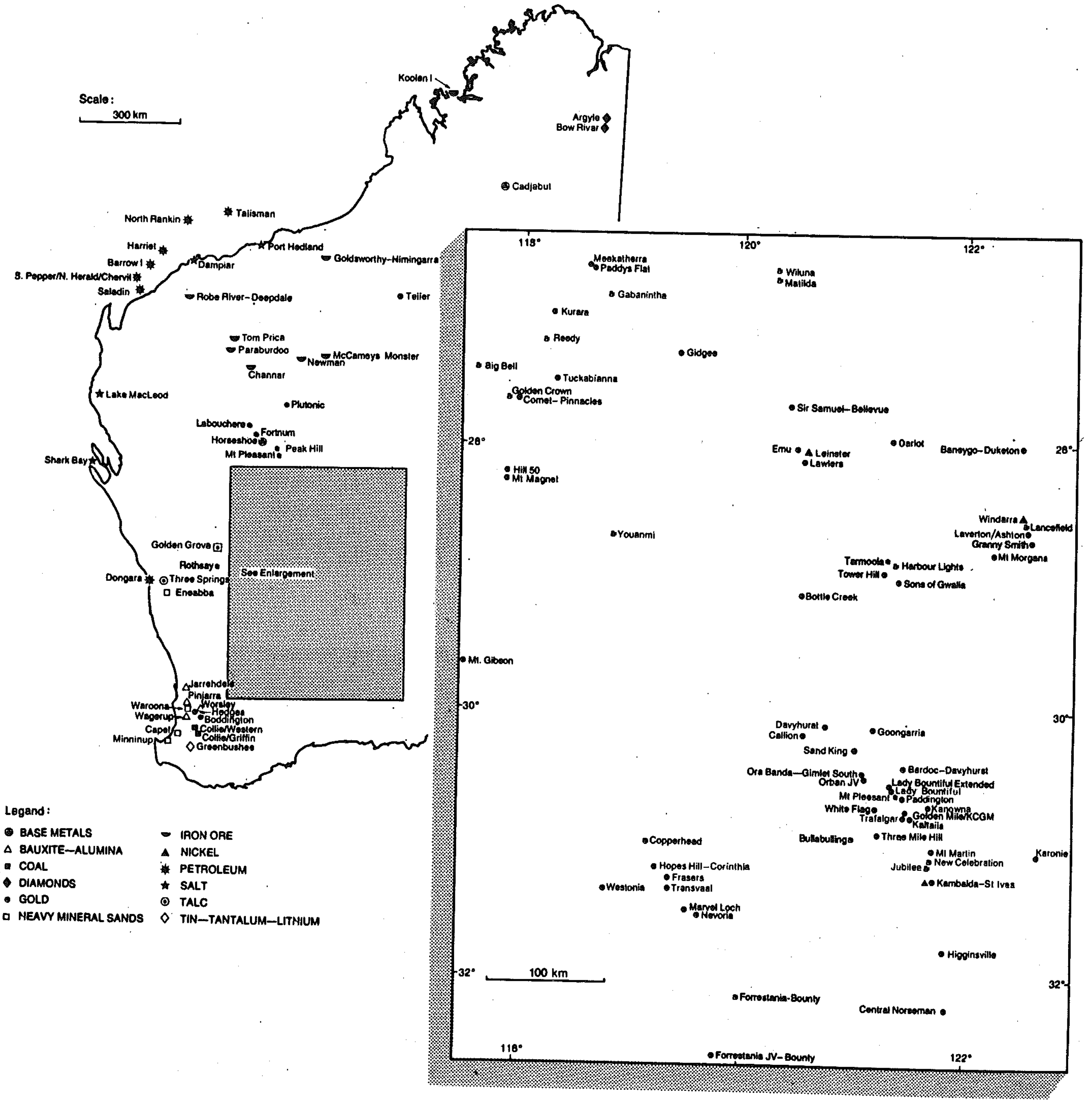
The final recommendations of the Committee emphasised the importance of a co-operative approach to improving mine safety. The components of this co-ordinated method are an enhanced awareness of safe procedures, the rigourous elimination of unsafe practices and the thorough training of all personnel.

As a multifaceted industry which is generating an increasing percentage of the national wealth, mining, and the issues associated with the sector, is set to be even more central in the national debate over the appropriate use of our natural resources.

Fig 1.1

MAJOR MINERAL AND PETROLEUM PROJECTS IN WESTERN AUSTRALIA

with an annual value of production in excess of $10 million



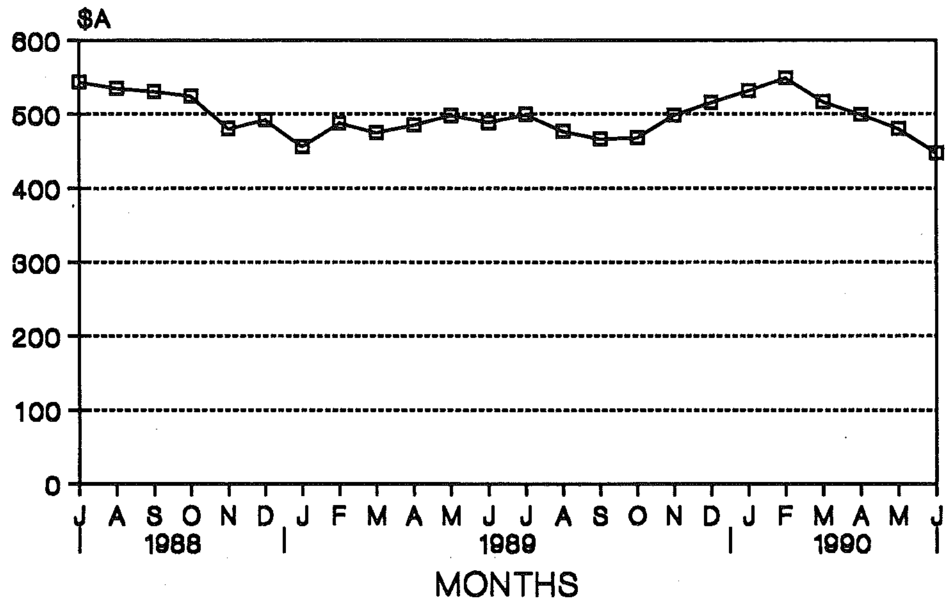
2.1 GOLD

During 1989/90 Western Australian mines and tailings dump operations produced 148.42 tonnes (t) of gold. This record annual outcome represented a 23% increase over that achieved in the preceding financial year. The value of production, based on the monthly average sale price at the Perth Mint, was $2.37 billion (b). Gold was marginally ahead of alumina and iron ore in value of total output during the trading period.

The world price of gold continued to be the main determinant of the Western Australian industry's viability. The sharp rise in bullion value at the end of 1989, and during the first two months of 1990, was not sustained. (Fig 2.1).

FIGURE 2.1

GOLD PRICES: $A/oz.



SOURCE: LONDON GOLD PRICE, MONTHLY AVERAGE OF WEDNESDAY PRICES.

The late 1989 price increase was driven mainly by concerns over the political and economic uncertainty prevailing in Eastern Europe. The financial markets' fears over the inflationary effects of these changes faded somewhat during February, as West Germany assumed a central role in co-ordinating the economic reconstruction of the region. As interest rates in the OECD nations began to rise, gold's traditional role as a store of value was eroded.

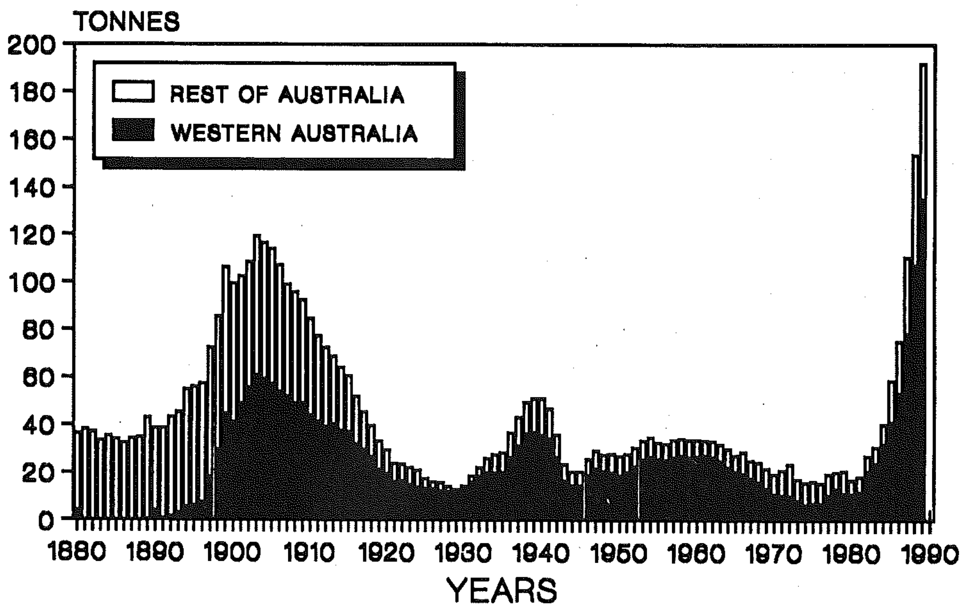
The gold price also came under pressure from a variety of other sources. These included significant speculation by Middle Eastern bullion holders, sales by Japanese corporations intent on covering stock market losses and record bullion trading by some central banks. The latter amounted to over 200 tonnes of net sales during 1989/90, a figure which is expected to diminish in 1990/91.

There are several factors working on world markets which should strengthen the demand for, and price of, gold in the medium term. Demand from jewellery fabricators in Europe, Brazil, the Middle East and Far East remained strong for the second year in a row. There is also evidence of some hoarding of bullion in several of the North and East Asian countries.

Persistent structural factors are limiting medium term output for two of the world's largest producers. The South African industry has continued to be buffeted by a fluctuating price, rising costs, a bouyant Rand and lack of access to capital markets. In the USSR domestic demand has strengthened while production has stagnated. The USSR's commitment to restructure its economy has meant that, failing a catastrophe, its gold reserves will probably be used as collateral for lines of credit, thus effectively quarantining such reserves from bullion markets.

FIGURE 2.2

GOLD PRODUCTION



SOURCES:DEPT OF MINES WESTERN AUSTRALIA,

BMR & ABARE

The medium term outlook for Western Australian goldminers is mixed. In the absence of a major surge in the world price during the next few months, production should peak in the current trading period.

There are two major factors driving the continuing strong output by Western Australian producers. One is the residual effects of the new mine and capacity expansion investment of the late 1980's. Of more significance is the attempt by developers to produce and sell as much gold as possible before the 1 January 1991 lifting of the exemption from company tax on gold operations. It has been estimated that the loss of this concession, coupled with a soft gold price, will result in the shutting down of otherwise marginal mines during 1991.

Another, though unquantifiable, factor maintaining strong production is the need by producers to service gold development loans advanced by bullion banks. A significant number of developers have used this facility for capital raising during the past three years.

While the massive Boddington and Hedges projects continue apace, and the new Granny Smith and Plutonic projects bode well for future production, several of the State's major mines are experiencing problems in maintaining output. This has particularly been the case where the exhaustion of relatively low cost at-surface deposits has necessitated the move to underground mining. As underground operations will involve higher exploration and recovery costs only higher grade deposits will be viable for such development. The giant Telfer mine is developing underground capacity and the Big Bell project, already a high cost mine, is undertaking a feasibility study on an 8 mt underground ore body.

The use of exploration credits and accumulated losses should insulate most of the major companies from company taxation for several years. The removal of the tax free concession will, however, hasten the demise of many junior exploration companies. It will also significantly diminish the amount of funds from retained earnings available for future exploration expenditure. Any diminution of exploration will make the replacement of open pit reserves more difficult, while the alternative development of underground operations will not be an option for many of the smaller companies. After several years of boom conditions the Western Australian gold mining industry is facing a period of some uncertainty. Notwithstanding some contraction in production in the next trading period the sector in this State will continue to dominate national production. (Fig 2.2)

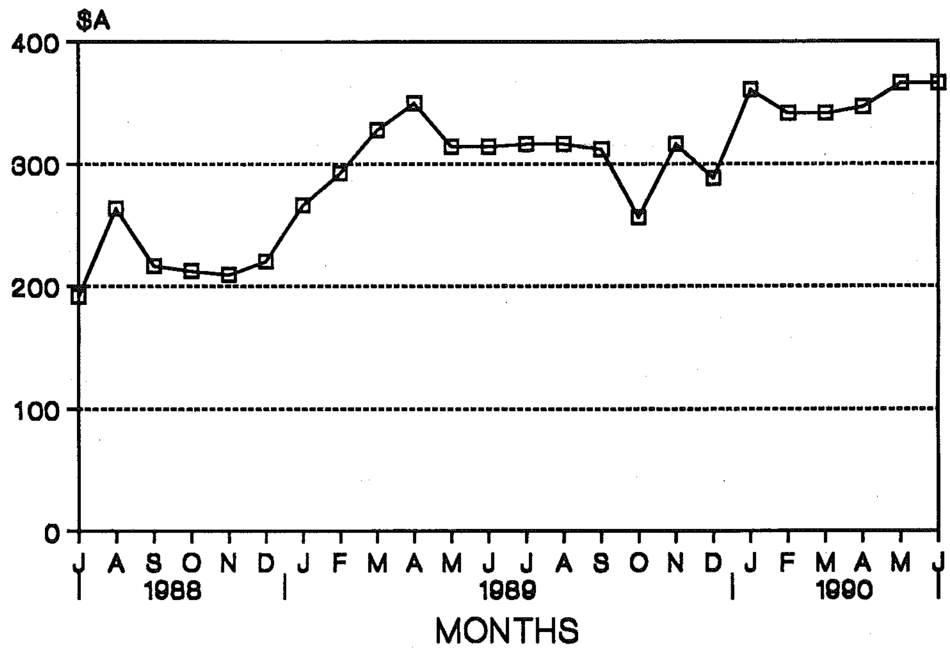
Adequately capitalised and efficient operations will continue to be viable. The medium term outlook is for a higher degree of industry rationalisation and concentration, as developers seek to gain economies of scale and hence lower unit costs.

2. 2 ALUMINA

During 1989-90 output from the two Western Australian producers increased by half a million tonnes to 6.65 mt. The value of production for the period surged by a massive 45% over the preceding financial year to $2.34 billion.

Alumina prices gained ground on world markets during 1990 after softening during the last half of 1989. Low alumina inventory levels have so far outweighed the threat of recession in the US and UK, and prices have continued to strengthen. (Fig 2.3).

FIGURE 2.3 **ALUMINA PRICES: $A/tonne**



SOURCE: DERIVED FROM L.M.E. & A.B.S.

Consumption of primary aluminium is particularly strong in East and North Asia, a trend which is projected to continue in the medium term. Demand for the metal is being driven by capital and social infrastructure expansion and by the production of consumer durables. Japan is expected to consume 2.8 mtpa by 1995 as the aluminium content of locally produced motor vehicles doubles and the steel content falls.

In the medium term Eastern Europe and the USSR should also be growth markets for aluminium as an input to infrastructure reconstruction and the production of consumer goods. The former Eastern Bloc region is doubly burdened, as demand is expanding by 1.5% per annum output from the main producing countries (USSR and Romania) is contracting.

As demand accelerates in 1991/92 a deficit in aluminium production is predicted to emerge in world markets. This

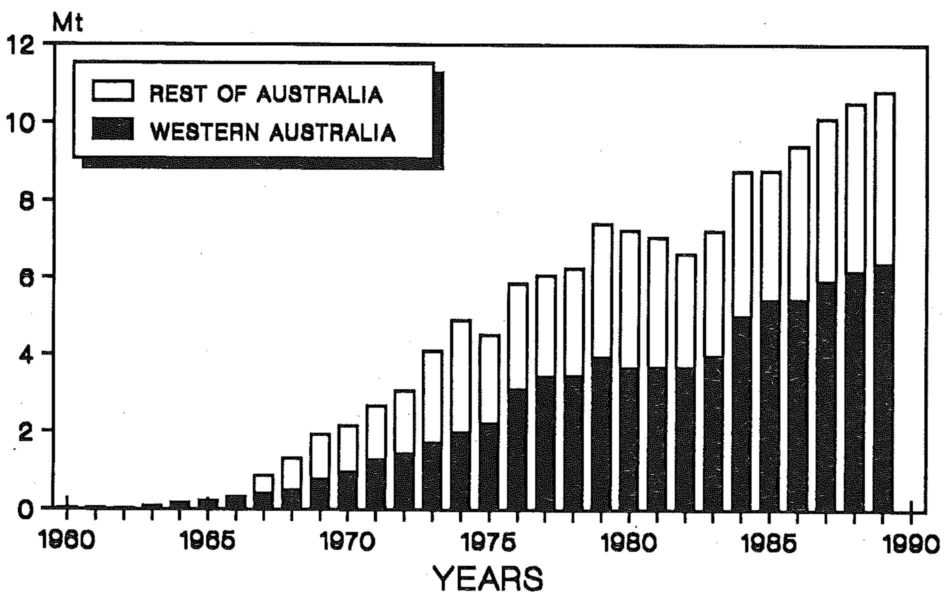
global supply-demand imbalance will come as a result of a lack of new smelting capacity in recent years. A significant proportion of the new smelters commissioned have been concentrated in the Persian Gulf oil states of Dubai and Bahrain.

In May 1990 the Kemerton Aluminium Ltd joint venturers commissioned a feasibility study for a 235,000 tpa aluminium smelter to be located in the North West region of Western Australia. As previous aluminium smelter proposals have foundered on the high cost of power, the project is contingent on the establishment of a regional gas fired power station. The proposal also moves closer the eventual exploitation of the massive low grade Mitchell Plateau bauxite deposit (estimated economic reserves of 235 mt).

Alcoa of Australia, after operating their existing Wagerup plant at near capacity for over 12 months, now looks set to proceed with a $370 million refinery expansion. Through this significant capital investment output will be effectively doubled to 1.48 mtpa. The company's profitability rose considerably during the last trading period, with dividends paid to WMC providing that company with 75% of its pre-tax profits.

Alumina production from Western Australia continued to comprise a significant proportion of the national output (Figure 2.4).

FIGURE 2.4 **ALUMINA PRODUCTION**



SOURCES:DEPT OF MINES WESTERN AUSTRALIA,

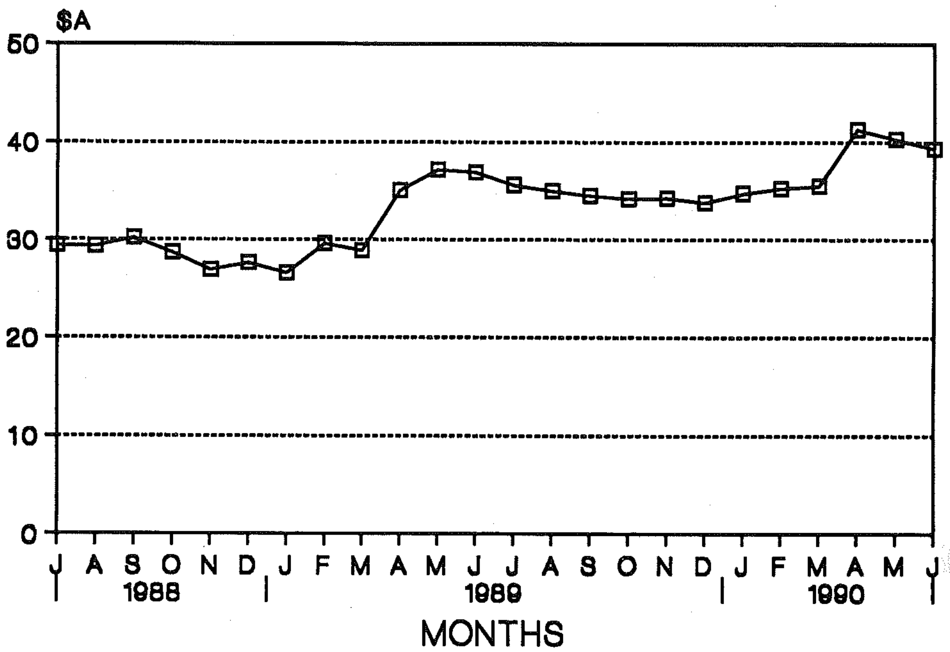
BMR & ABARE.

2.3 IRON ORE

The Western Australian iron ore industry had another bumper year in 1989/90. Total production was 106.3 mt, an increase of 6% over the 1988/89 outcome. The value of production was $2.25 billion, a massive 26% increase over the last financial year.

For the second year in a row the iron ore contract price was increased, this time by approximately 16%. (Fig 2.5).The new price was effective from January 1990 for European shipments and from April 1990 for the Japanese trade.

FIGURE 2.5 **IRON ORE PRICES: $A/tonne**



SOURCE: HIGH GRADE LUMP ORE PRICES.

The medium and long term outlook from Western Australia iron ore producers remains good despite some uncertainty on world steel markets. The uncertainty is being generated by predictions that the growth in consumption of recent years is unsustainable, and by fears of recession in North America and the UK. Demand in Australia's main East and North Asian markets is projected to moderate though still remain strong. The continuing strength of these and other regional producers should insulate Western Australian producers from the effects of any downturn.

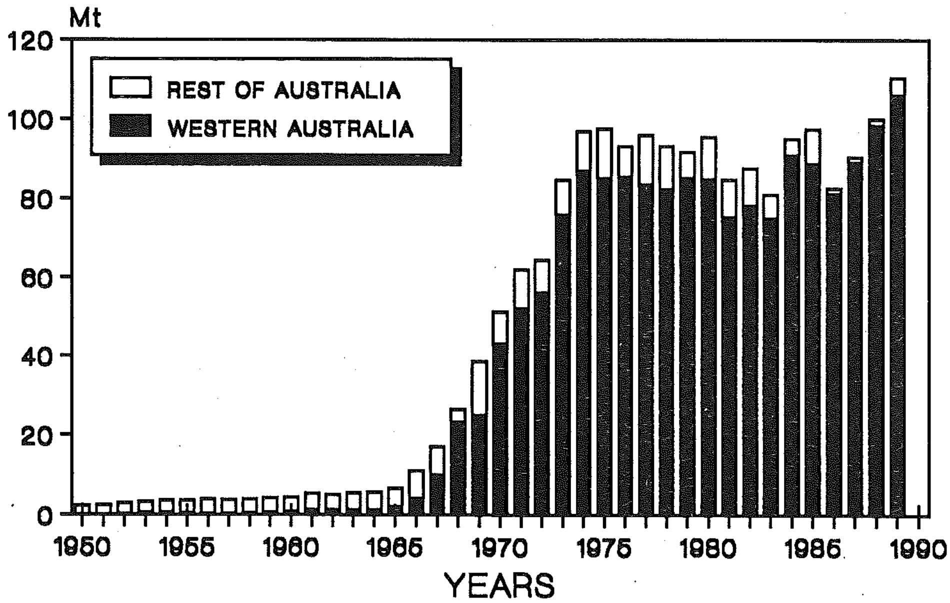
The longer term market for iron ore in Eastern Europe is also being treated with cautious optimism by Western Australian producers. Substantial growth in this market is not expected before the second half of the decade, and will depend on substantial new regional investment in shipping and transport infrastructure.

Productivity in the Pilbara operations has improved markedly over the past few years through the reform of work practices and increased investment.

BHP's recent take-over of Goldsworthy Mining's extensive reserves and infrastructure will result in the streamlining of the combined operations and opportunities for expanded production.

Yandicoogina is set to go ahead as BHP's next major iron ore project in the Pilbara. Production from this 1.8 billion tonne deposit is expected to begin in mid 1992 and proceed at a rate of 5 mtpa. Shipments from CRA's Mt Channar joint venture commenced in January 1990, with ongoing production estimated at 3 mtpa. There have been preliminary discussions for another Sino-Australian iron ore joint venture in the Pilbara which will involve the China Metallurgical Import and Export Corporation. As the State's major producer, Hamersley Iron's total output from all operations will exceed 50 mt in the current trading period.
Production from Western Australian mines continues to comprise the vast majority of Australian production (Fig 2.6)

FIGURE 2.6 **IRON ORE PRODUCTION**



SOURCES:DEPT OF MINES WESTERN AUSTRALIA,

BMR & ABARE

2.4 PETROLEUM

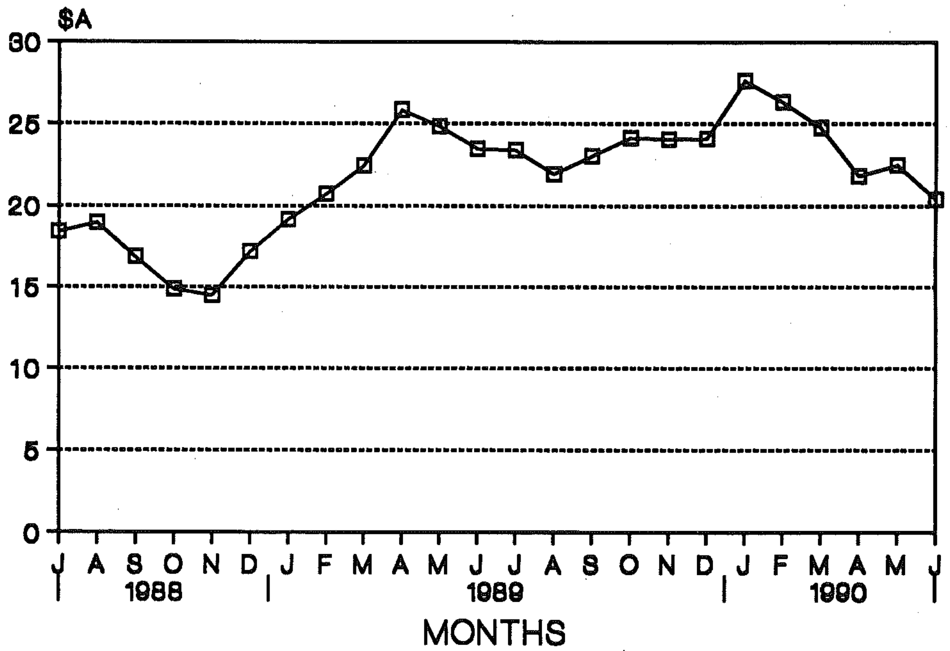
Crude oil production from Western Australian fields rose strongly during 1989/90 to 3.9 gigalitres (GL). This growth represented a massive 75% increase over the 1988/89 output.

The majority of new production was from the Saladin field off Onslow. From start up in November 1989 to the end of June 1990 nearly 1.4 GL was pumped from this field. The Barrow Island, Herald/Pepper, Talisman and Harriet fields produced most of the balance of State output.

The nominal price of crude oil on world markets has been relatively steady during most of 1989/90 (Fig 2.7). The main factors contributing to this result were over-production, quota cheating by OPEC producers and a very mild northern winter.

FIGURE 2.7

CRUDE OIL PRICES: $A/bbl



SOURCE: BRENT SPOT, MONTHLY AVERAGE.

During the past 12 months the Western Australian industry has been characterised by sharply increased exploration expenditure, some exciting off-shore discoveries and the proving up of new fields.

In the last half of 1990 explorers will drill 16-18 wildcat wells and at least 16 appraisal wells in the waters off Western Australia. It has been estimated that over the next two years 50 wildcat wells will be drilled in the Timor Sea. In excess of $50 million has been spent on appraisal wells and seismic activity in the licence areas surrounding the main North West Shelf (NWS) permit areas (WA-28-P, WA-1-P). The drive to find substantial economic gas reserves in the Perth Basin has seen the Beharra Springs field assessed to 10 billion cubic feet and exploration expenditure commitments made for the current period, both onshore and off-shore, of over $30 million.

The Griffin oil field, estimated to contain 80 million barrels of recoverable oil, was discovered in January 1990. Other discoveries in the area, which should be developed within 5 years are Wanaea (est. reserves 200 mbls), and Cossack 1 (est. reserves 60 mbls). The small Cowle and Yammaderry fields (6500 bls per day), and the Skua field (25,000 bbls per day) should begin production during 1991. These discoveries and proven reserves should ensure that the North West Shelf will be the nation's next premier crude oil province.

Three operating fields in the Timor Sea are currently producing 80,000 bbls per day, this output should expand to 200,000 bbls per day by the middle of the decade.

Condensate production, drawn mainly from Woodside's North Rankin field, increased by 0.4 Gl to 1.6 GL in 1989/90. It has been estimated that over the current decade a significant proportion of the increased demand for condensate in East Asia will be satisfied by Western Australian exports.

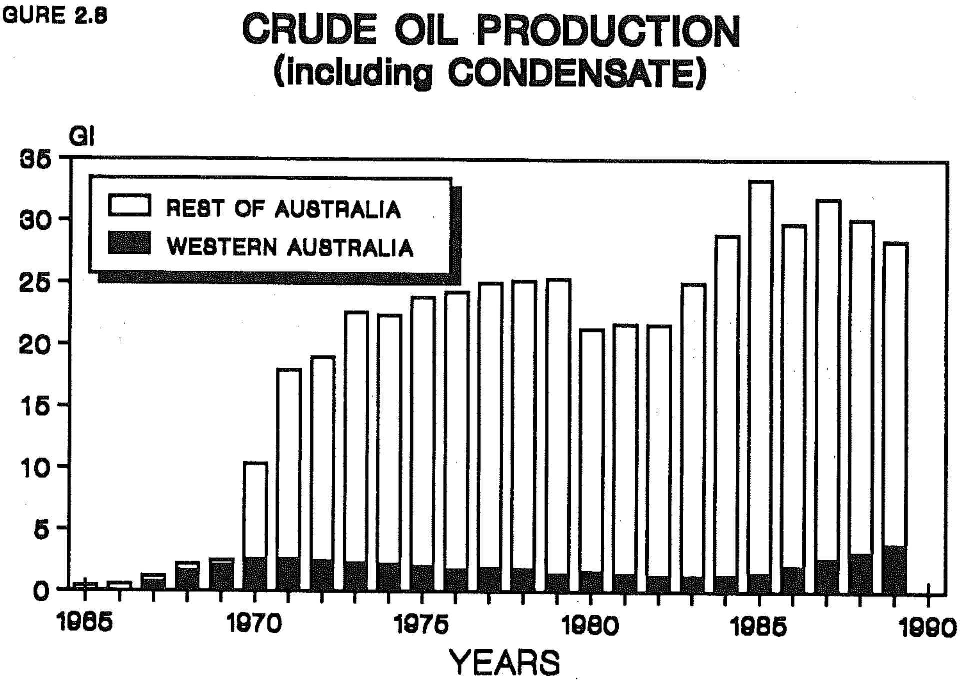
The commencement of LNG shipments to 8 Japanese utilities in late 1989 heralded the beginning of a new era in energy exports from this country. In the current March to March sales year over 50 shipments will be made. During 1989/90 LNG with an energy content of over 104 tera million mm Btu's was exported from the Burrup Peninsular plant. With massive known gas reserves and a commitment to ongoing capital expenditure (contracts worth $2.6 billion, for the new Goodwyn A Platform and third LNG train), Woodside is predicting production in excess of 6 mt of LNG a year by 1995.

In addition to oil related developments, the current strong demand for export LNG and for natural gas in the domestic market offers considerable scope for increased sales.

The level of Commonwealth Excise on oil and condensate has been the major issue for the industry during the past years. Petroleum sector submissions to the Commonwealth Excise Review in early 1990 sought changes to the current regime, so as to stimulate exploration and development. Without incentives such as a reduction of the excise and increased exploration expenditure deductability the industry does not believe that 60% national crude oil self sufficiency can be maintained during the current decade.

The State's crude oil production remains a small, but growing, proportion of the national output (Fig 2.8).

FIGURE 2.8



SOURCES:DEPT OF MINES WESTERN AUSTRALIA

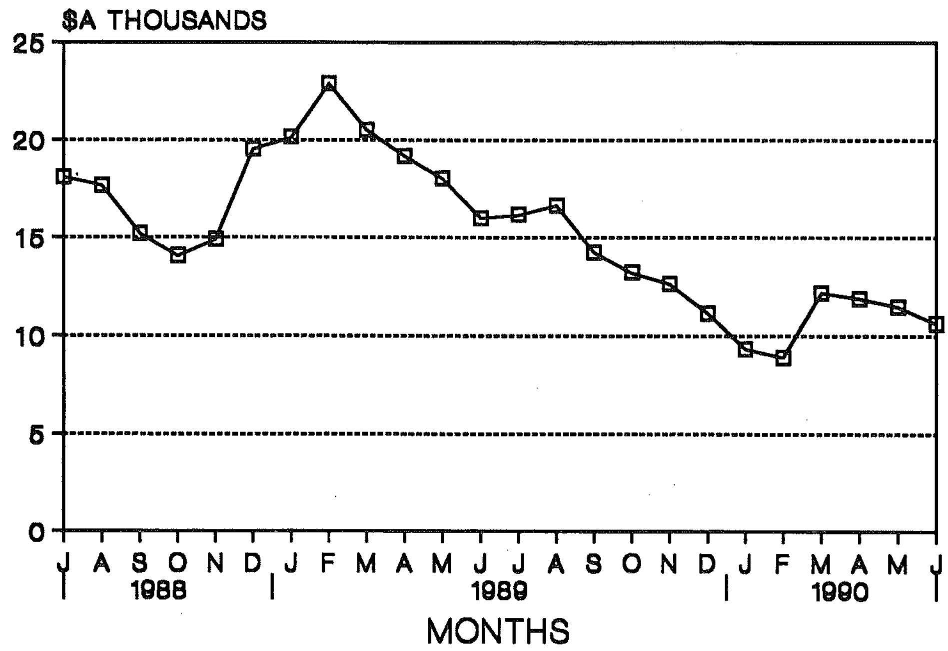
BMR & ABARE

2.5 NICKEL

In 1989/90 the total value of nickel produced from Western Australian concentrates decreased by over 7% to $593.25 million. Concentrate production during the period rose to 446,453 tonnes, a 36% increase on the 1988/89 result of 353,850 tonnes.

The fall in output value was due to the sustained decline in the world market price which began in February 1989 and bottomed out in February 1990 (Fig 2.9). The quoted London Metals Exchange spot and contract prices have gradually recovered, though they have far to go before again testing the highs of early 1988 and 1989. The price improvement through 1990 has been driven by relatively low stainless steel stocks in the US, Europe and Japan. Over 60% of all nickel produced is used in stainless steel production. If the USSR's current nickel production falters demand could again exceed supply in 1991.

FIGURE 2.9 **NICKEL PRICES: $A/tonne**



SOURCE: L.M.E CASH, MONTHLY AVERAGE.

Western Mining Corporation's (WMC) producing mines at Kambalda, Windarra and Leinster recorded mixed outcomes in 1989/90.

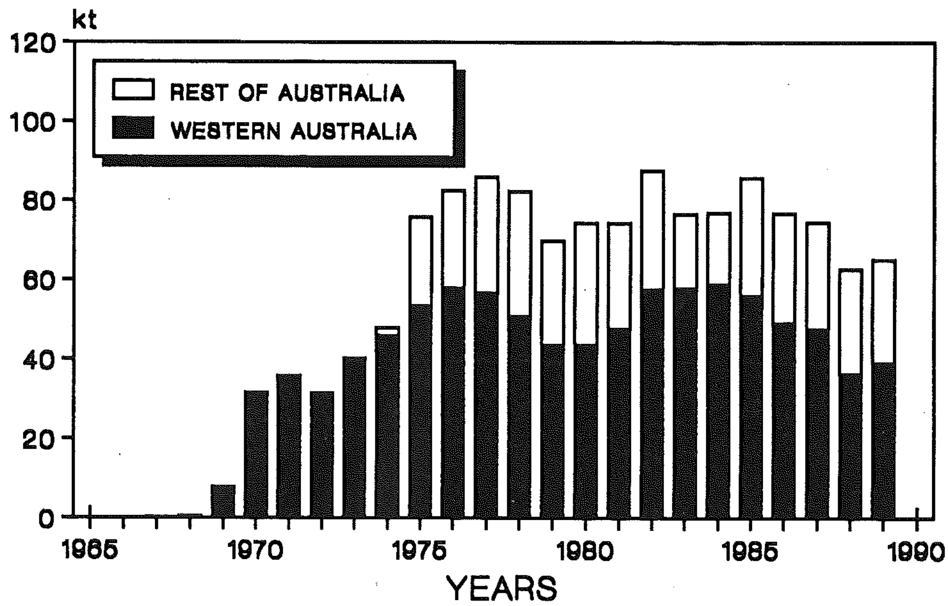
The Kambalda operations did not produce as much as was projected. As more mine development will be required to achieve future production targets, WMC has doubled the financial resources allocated for this work in 1990/91. The relatively high cost Windarra deposit has continued to produce, though it is expected to shut down in early 1991. Mill additions at Leinster have given that operation the capacity to produce approximately 1 mtpa. With reserves of more than 30 million tonnes, Leinster is the focus of a long-term feasibility study which is aimed at expanding WMC's nickel mining and smelting operations in Western Australia.

There are further indications of a sound future for nickel mining in this State. Australian Consolidated Minerals (ACM) and its Finnish partner Outokumpu Oy have arranged the $512 million project finance to develop their Mt Keith nickel deposit. Final feasibility studies for the development are being conducted in Australia and in Finland, where the concentrate will be refined. Outokumpu also has a feasibility study underway to produce nickel concentrate for export from the Digger Rocks deposit on the Yilgarn mineral field.

A major new development is proposed in the Pilbara, where the Radio Hill reserves are to be developed by Agip, an Italian company.

FIGURE 2.10

NICKEL PRODUCTION



SOURCES:DEPT OF MINES WESTERN AUSTRALIA,

BMR & ABARE

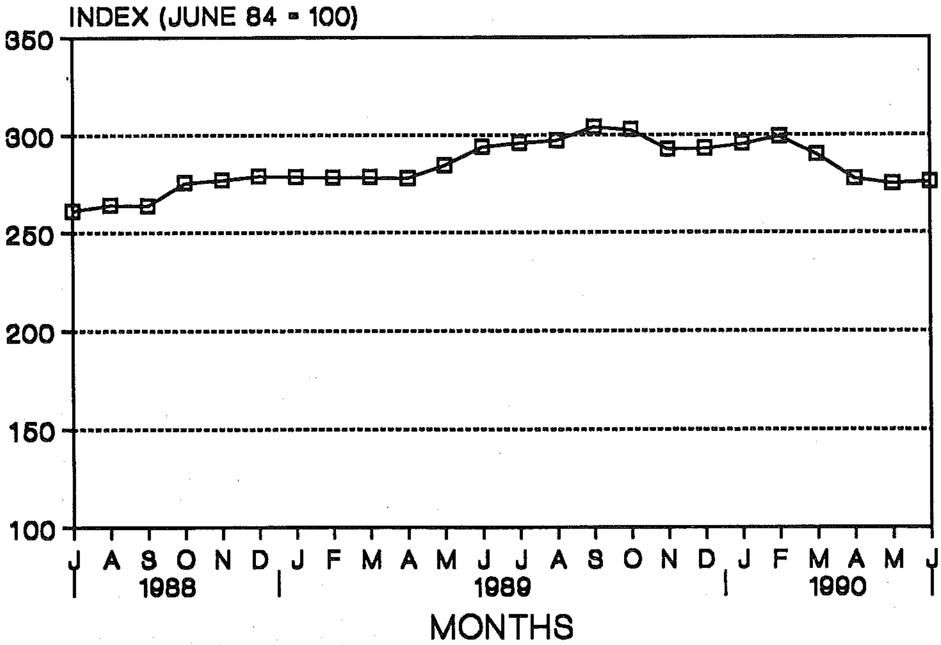
The amount of nickel metal produced by Western Australian mines last financial year, and exported in matte or in fully refined form, made up approximately 60% of a marginally higher national output figure. (Fig 2.10).

2.6 HEAVY MINERAL SANDS

During 1989/90 the State's heavy mineral sands industry continued the strong expansion of the last 5 years. The total value of all extracted minerals was up 20% to $473.23 million. While output tonnages of ilmenite, synthetic rutile and rutile each increased by approximately 20%, production figures for zircon, monazite and leucoxene were all down sharply. Because of strengthening prices, however, all of these commodities except leucoxene posted value of output increases during the trading period.

Western Australian producers' current shares of world production are 40% for zircon and 54% for monazite. Industry analysts predict that the State will be producing 70% of the global supply of synthetic rutile within a few years.

FIGURE 2.11 **PRICE INDEX FOR MINERAL SANDS**



SOURCE: L.M.E. CASH, MONTHLY AVERAGE.

The concentration of sales to specialist industries and the end use of the minerals produced; such as titanium dioxide in paints, zircon for high tech ceramics and monazite for sophisticated electronics; renders the sector sensitive to changes in the world economy. Although the industry registered a good overall result for the year, market demand growth has slowed somewhat during the past 6 months. An easing of global economic growth and the coming on-stream of several large projects around the world, has caused a softening of spot market prices. (Fig 2.11).

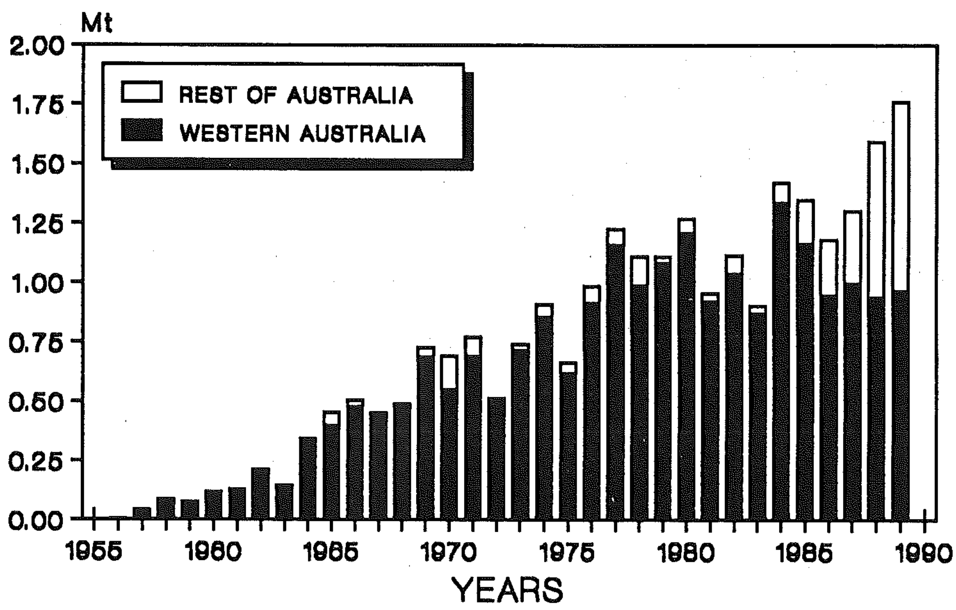
The major Western Australian producers have adopted market strategies to address the fluctuations in world mineral sands prices which have flowed from temporary supply and demand imbalances. The negotiation of long term contracts and investment in downstream processing capacity, mainly synthetic rutile, has allowed developers to engage in forward planning with some certainty.

Western Australia currently maintains a competitive advantage in synthetic rutile production. A 2% per annum demand increase for ilmenite and rutile is predicted for the next decade. Within this period mineral sands mining and processing is set to rank with gold, iron ore and natural gas as Western Australia's major export earners.

As Australia accounts for a significant proportion of world reserves and output, Western Australia is the premier mineral sands producing state (Fig 2.12.).

FIGURE 2.12

ILMENITE PRODUCTION



SOURCES:DEPT OF MINES WESTERN AUSTRALIA,

BMR & ABARE

2.7 DIAMONDS

During 1989/90 the market value of output from the Argyle Diamond and the Bow River projects rose strongly to $413.5 million. The increase was a solid 16.5% gain on the 1988/89 result of $354.7 million. The significant value of production increase came despite a fall in physical output from 36.5 mcts to 33.8 mcts. The sustained rise in value over the past five years has resulted in diamonds now accounting for approximately 4% of Western Australia's mineral production.

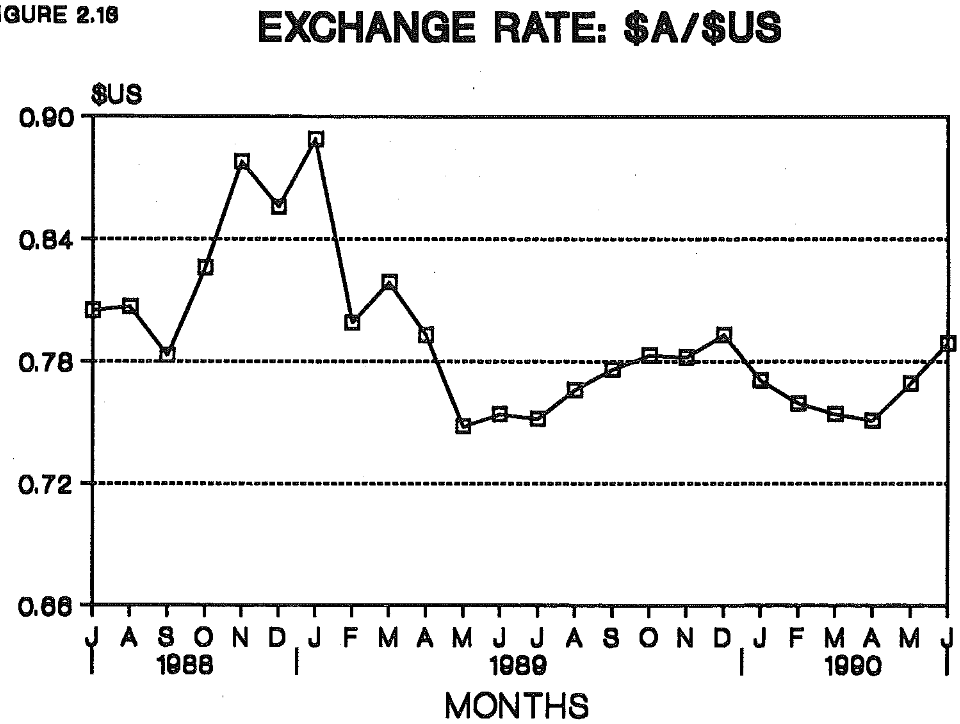
The Argyle Project continued to produce the overwhelming majority of total carats won (33.15 mcts). Poseidon's alluvial Bow River deposit yielded 701,000 cts. While 95% of Argyle's production is below gem quality, the mine's huge output has resulted in it accounting for approximately 10% of the world's annual value.

Because of medium to long term expectations of bouyant market conditions for gem and rough diamonds, the Argyle joint venturers began plans to increase mining rates and treatment plant capacity in 1989. A resource definition completed at the end of 1989 indicated a 153 mt deposit grading 3.1 carats/t and a 50-60 mt deposit grading 3.3 carats/t.

The Bow River Poseidon's project is continuing to yield gem quality diamonds in 20% of output, and a consistent percentage of the more valuable pink diamonds. Western Australia continues to be the focus of the diamond exploration programmes undertaken in Australia. Last year more than $30 million was spent nationally on diamond exploration. The Ellendale project (Ashton Exploration Joint Venture) and the Mt Elizabeth project (Poseidon-Triad Minerals), are the most advanced exploration projects in the Kimberley. While Ellendale has been evaluated positively, and may proceed in late 1990, the Mt Elizabeth deposit is uneconomic in the current market.

The consistent and high level of exploration and capital investment, large proven reserves and buoyant demand for jewellery manufacture, are all good indicators of the long run viability of the diamond mining industry in this State.

FIGURE 2.16



SOURCE: A.F.R., MONTHLY AVERAGE.

2.8 SUMMARY OUTLOOK

The growth of Western Australian mineral and petroleum production which occurred in 1989 was broadly sustained through the first six months of 1990. There was a 32% increase, over the preceding trading period, in the total value of mineral and petroleum production to an estimated record amount of $10.43 billion.

The sectors of gold, iron ore, alumina and petroleum continued to dominate in terms of value of production, generating export receipts in excess of $8 billion. The more than doubling of revenue from petroleum products was due to a marked increase in crude and condensate output, as well as ten months of LNG exports.

Of the other sectors, heavy mineral sands production should continue to expand strongly even though there has been some weakening in the prices of the main component minerals. The discovery, and imminent development, of considerable reserves in the Eastern States (Wimmera) and moderating demand due to recession in the US and UK could make the next twelve months difficult for Western Australian producers.

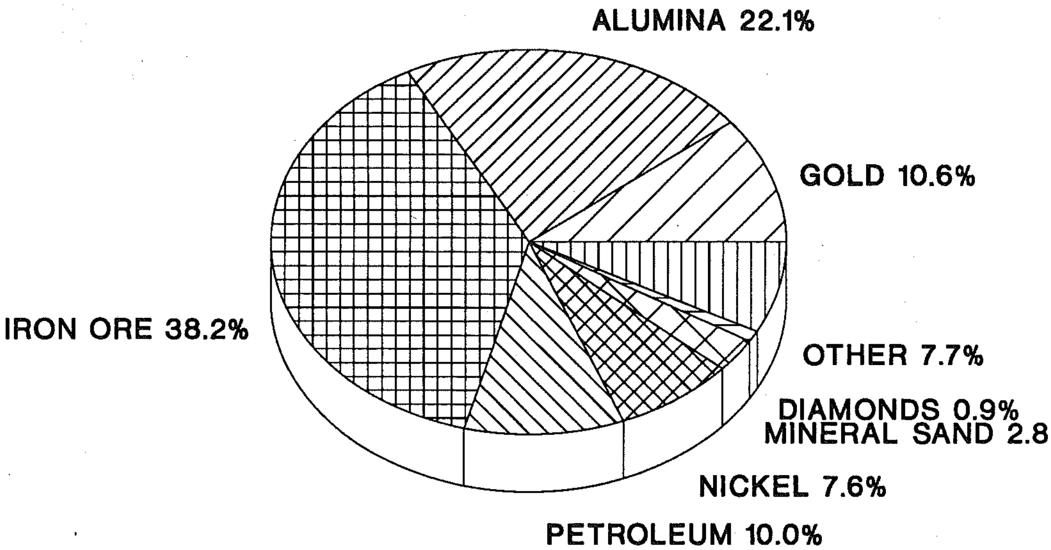
1990/91 is projected to be a year of further steady growth for the Western Australian minerals and energy industry. Most of the growth should come from petroleum products and iron ore, though alumina, nickel and even gold should register moderate growth.

Fig 3.1

COMPARATIVE VALUE OF PRODUCTION

1984-85 VALUE OF PRODUCTION

TOTAL: $ 4,695 MILLION



1989-90 VALUE OF PRODUCTION

TOTAL: $10,347 MILLION (est)

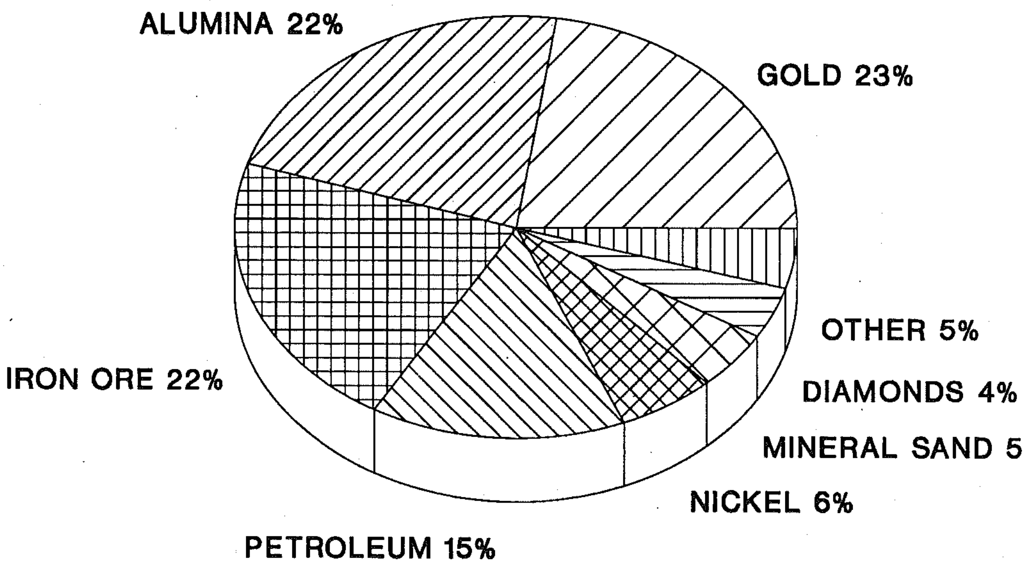


Table 3.1

QUANTITY AND VALUE OF MINERALS 1988-89, 1989-90

MINERAL	UNIT	1988-89 QUANTITY	1988-89 VALUE($A)	1989-90 QUANTITY	1989-90 VALUE($A)
BARYTES	t	0	0	7 521	1 006 603
BASE METALS					
Copper	t	13 083	31 374 188	14 979	23 922 443
Lead	t	2 431	920 073	13 171	7 604 934
Zinc	t	28 799	26 786 585	45 878	59 754 974
TOTAL BASE METALS			59 080 846		91 282 351
BAUXITE-ALUMINA					
Alumina	t	6 171 962	1 619 228 331	6 651 028	2 335 697 184
CLAYS					
Attapulgite	t	44 065	3 527 557	28 137	3 988 107
Cement Clay	t	24 007	60 020	21 952	54 880
Clayshale	t	383	765	0	0
Fire Clay	t	171 189	205 570	279 538	511 780
Kaolin	t	3 706	186 553	7 701	472 291
White Clay	t	1 709	20 503	32 401	324 010
TOTAL CLAYS			4 000 968		5 351 068
COAL	t	3 800 228	161 240 819	4 160 646	183 698 442
CONSTRUCTION MATERIALS					
Aggregate	t	170 838	1 134 173	150 814	754 854
Gravel	t	24 643	114 215	44 981	213 086
Rock	t	180 494	1 672 350	108 198	800 585
Sand	t	757 976	2 142 695	729 863	2 693 633
TOTAL CONSTRUCTION MATERIALS			5 063 433		4 462 158
DIAMOND	ct	36 470 380	354 745 556	33 854 620	413 583 727
DIMENSION STONE					
Black Granite	t	0	0	1 239	1 789 485
Quartz Rock	t	1 088	48 977	994	43 341
Quartzite	t	0	0	59	2 360
Spongolite	t	0	0	2 280	145 354
TOTAL DIMENSION STONE			48 977		1 980 540
GEM, SEMI-PRECIOUS AND ORNAMENTAL STONE					
Amethyst	kg	41 064	198 426	14 594	67 958
Emerald	grams	1 930	2 200	550	2 020
Zebra Rock	kg	1 260	12 600	0	0
TOTAL GEM, SEMI-PRECIOUS AND ORNAMENTAL STONE			213 226		69 978
GOLD	kg	130 565	2 072 691 840	148 420	2 371 725 626
GYPSUM	t	165 967	1 326 387	154 809	995 281
HEAVY MINERAL SANDS					
Garnet	t	26 069	977 265	27 768	1 152 128
Ilmenite	t	874 782	67 183 462	1 071 845	89 606 326
Upgraded Ilmenite (a)	t	227 979	95 474 088	284 109	131 107 248
Leucoxene	t	18 297	7 781 578	15 023	7 902 766
Monazite	t	10 133	7 445 827	13 358	9 731 111
Rutile	t	100 484	62 491 492	82 232	58 541 710
Xenotime	t	20	105 840	0	0
Zircon	t	340 140	151 609 319	300 256	175 190 729
TOTAL HEAVY MINERAL SANDS			393 068 871		473 232 018
INDUSTRIAL PEGMATITE MINERALS					
Felspar	t	18 358	739 627	9 692	437 909
Mica	t	3 513	916 814	0	0
TOTAL INDUSTRIAL PEGMATITE MINERALS			1 656 441		437 909
IRON ORE					
Domestic	t	4 914 588	78 446 430	5 255 037	103 517 251
Exported	t	95 502 782	1 712 003 160	101 017 156	2 142 510 771
TOTAL IRON ORE		100 417 370	1 790 449 590	106 272 193	2 246 028 022

MINERAL	UNIT	1988-89 QUANTITY	1988-89 VALUE($A)	1989-90 QUANTITY	1989-90 VALUE($A)
LIMESAND-LIMESTONE-DOLOMITE					
Dolomite	t	360	7 200	333	6 660
Limesand-Limestone	t	1 739 324	8 325 470	16 98 820	7 868 870
TOTAL LIMESAND-LIMESTONE-DOLOMITE			8 332 670		7 875 530
MANGANESE ORE	t	0	0	273 000	1 200 000
NICKEL					
Cobalt by-product	t	266	3 681 889	268	4 600 916
Nickel Concentrate	t	353 850	633 839 033	446 453	565 370 341
Nickel Ore	t	0	0	37 084	20 598 342
Palladium by-product	kg	280	1 622 806	431	1 631 497
Platinum by-product	kg	70	1 504 088	66	1 049 022
TOTAL NICKEL INDUSTRY			640 647 816		593 250 118
PEAT	t	1 338	78 504	1 111	68 546
PETROLEUM					
Condensate	kl	1 154 116	141 799 395	1 601 163	235 653 383
Crude Oil	kl	2 198 943	269 860 578	3 962 739	601 471 936
LNG	MMBtu	0	0	104 167 480	336 091 222
Natural Gas	'000m3	3 642 292	284 641 291	3 847 731	356 846 939
TOTAL PETROLEUM			696 301 264		1 530 063 480
RARE EARTHS					
Gallium	kg	1 767	60 641	42 986	1 454 998
SALT	t	6 023 426	106 705 667	5 924 943	124 110 422
SILICA-SILICA SAND					
Silica	t	0	0	32 544	325 435
Silica Sand	t	364 453	3 051 841	445 874	3 662 014
TOTAL SILICA-SILICA SAND			3 051 841		3 987 449
SILVER	kg	30 426	4 362 975	34 561	5 621 356
TALC	t	195 307	14 991 613	220 263	15 223 112
TIN-TANTULUM-LITHIUM					
Spodumene	t	32 812	5 742 022	47 428	8 305 325
Tantalite	t	548	13 352 435	439	16 169 644
Tin	t	365	2 253 656	237	1 298 492
TOTAL TIN-TANTULUM-LITHIUM			21 348 113		25 773 461
VERMICULITE	t	651	114 410	105	18 528
TOTAL VALUE			7 958 813 399		10 438 197 907

Note: (a) Also known as synthetic rutile

TABLE 4.1

QUANTITY, VALUE AND METALLIC CONTENT OF MINERAL AND PETROLEUM PRODUCTION BY LOCAL GOVERNMENT AREA

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
BARYTES	East Pilbara √	7 521		1 006 603	(a)
BASE METALS			Cu tonnes		
Copper by-product	Coolgardie		4 047.794	4 549 756	(a) (b)
Copper Concentrates	East Pilbara √	6 258	1 109.720	1 178 062	
	Meekatharra √	26 685	5 488.940	11 272 456	
	Total Copper Concentrates	32 943	6 598.660	12 450 518	(a)
Copper Ore	Meekatharra √	22 484	4 332.050	6 922 169	(a)
	Total Copper		14 978.504	23 922 443	(a)
			Pb tonnes		
Lead	Derby-West Kimberley	18 502	13 171.05	7 604 934	(a)
			Zn Tonnes		
Zinc	Derby-West Kimberley	92 822	45 877.88	59 754 974	(a)
Total Base Metals				91 282 351	
BAUXITE-ALUMINA	Harvey	827 744		295 935 182	
	Murray	2 925 026		1 045 688 747	
	Serpentine-Jarrahdale	1 610 499		575 076 174	
	Boddington	1 287 759		418 997 081	
Total Bauxite-Alumina		6 651 028		2 335 697 184	(c)

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
CLAY					
Attapulgite	Mullewa	28 137		3 988 107	(a)
Cement Clay	Armadale	21 952		54 880	(d)
Fire Clay	Victoria Plains	300		600	
	Chittering	279 238		511 180	
	Total Fire Clay	279 538		511 780	(d)
Kaolin	Greenbushes	7 701		472 291	(a)
White Clay	Swan	32 401		324 010	(d)
Total Clay				5 351 068	
COAL	Collie	4 160 646		183 698 442	(e)
CONSTRUCTION MATERIALS					
Aggregate	Wyndham-East Kimberley	4 657		18 628	
	Port Hedland	24 526		253 242	
	Derby-West Kimberley	3 155		15 232	
	Kalgoorlie-Boulder	118 476		467 752	
	Total Aggregate	150 814		754 854	(d)

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
Gravel	Broome	1 845		9 225	
	Coolgardie	5 727		28 715	
	East Pilbara	1 216		4 081	
	Kalamunda	27 453		137 265	
	Ashburton	1 800		9 000	
	Port Hedland	6 940		24 800	
	Total Gravel	44 981		213 086	(d)
Rock	Roebourne	19 909		175 862	
	Exmouth	20 243		122 488	
	Broome	68 046		502 235	
	Total Rock	108 198		800 585	(d)
Sand	Ashburton	23 053		125 490	
	Broome	240		1 600	
	Canning	338 676		1 223 385	
	Carnarvon	48		192	
	Collie	17 368		34 736	
	Coolgardie	72 756		377 541	
	Dandaragan	4 592		16 563	
	Derby-West Kimberley	950		3 450	
	East Pilbara	478		2 868	
	Gingin	12 891		77 350	
	Leonora	3 020		118 119	
	Meekatharra	25 405		135 294	
	Menzies	2 991		14 953	
	Northam	7 010		14 134	
	Port Hedland	8 789		60 741	
	Roebourne	66 148		367 649	
	Swan	130 858		179 203	
	Wyndham-East Kimberley	14 590		40 365	
	Total Sand	729 863		2 693 633	(d)
Total Construction Materials				4 462 158	(d)

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
		Carats			
DIAMONDS	Wyndham-East Kimberley	33 854 620		413 583 727	(a)
DIMENSION STONE					
Black Granite ✓	Derby-West Kimberley	1 239		1 789 485	(a)
Quartz	Mukinbudin	994		43 341	(d)
Quartzite ✓	Roebourne	59		2 360	(d)
Spongolite	Plantagenet	2 280		145 354	(e)
Total Dimension Stone				1 980 540	
		Kg			
GEM, SEMI-PRECIOUS STONES					
Amethyst	Upper-Gascoyne ✓	14 594		67 958	(e)
		Grams			
Emerald	Menzies	550		2 020	(d)
Total Gem, Semi-Precious Ornamental Stones				69 978	

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
GOLD			Au Kg		
	Ashburton✓		6.106	97 573	
	Boddington		18 674.001	298 407 252	
	Coolgardie		11 219.364	179 283 475	
	Cue ✓		9 995.656	159 728 834	
	Dundas		3 113.044	49 745 898	
	East PIlbara✓		9 414.743	150 445 953	
	Halls Creek ✓		48.807	779 935	
	Kalgoorlie-Boulder		35 880.023	573 356 488	
	Lake Grace		150.968	2 412 442	
	Laverton		5 692.845	90 970 670	
	Leonora		13 041.025	208 393 302	
	Meekatharra✓		9 958.718	159 138 571	
	Menzies		1 410.114	22 533 375	
	Mt Magnet		6 631.742	105 974 077	
	Perenjori		172.835	2 761 871	
	Ravensthorpe		10.114	161 620	
	Roebourne✓		11.489	183 589	
	Sandstone		3 218.347	51 428 614	
	Upper Gascoyne✓		4.680	74 784	
	Westonia✓		1 830.708	29 254 400	
	Wiluna ✓		3 759.647	60 078 497	
	Yalgoo		2 653.623	42 404 425	
	Yilgarn		11 521.402	184 109 981	
Total Gold			148 420.203	2 371 725 626	(f)
GYPSUM	Meredin	3 686		22 116	
	Dalwallinu	40 989		298 644	
	Esperance	14 104		94 769	
	Irwin	741		6 336	
	Kellerberrin	9 200		62 550	
	Lake Grace	8 580		55 700	
	Nungarin	34 050		193 230	
	Wyalkatchem	37 959		239 936	
	Ravensthorpe	5 500		22 000	
Total Gypsum		154 809		995 281	(e)

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
HEAVY MINERAL SANDS					
Garnet Sand	Capel	1 184		62 184	(g)
	Northampton	26 584		1 089 944	(e)
	Total Garnet Sand	27 768		1 152 128	
			TiO2 %		
Ilmenite	Carnamah	189 496	60.00		
	Capel	837 405	54.69		
	Waroona	44 944	55.00		
	Total Ilmenite	1 071 845		89 606 326	(a)
			TiO2 %		
Upgraded Ilmenite	Capel	164 997	92.00		
	Carnamah	119 112	92.00		
	Total Upgraded Ilmenite	284 109		131 107 248	(a)
			TiO2 tonnes		
Leucoxene	Capel	15 023	13 699	7 902 766	(a)
			ThO2 Units		
Monazite	Capel	4 477	29 101	3 398 546	
	Carnamah	8 881	57 729	6 332 565	
	Total Monazite	13 358	86 830	9 731 111	(a)
			TiO2 tonnes		
Rutile	Carnamah	82 232	78 121	58 541 710	(a)

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
			ZrO_2 tonnes		
Zircon	Capel	67 466	43 853	37 561 728	
	Carnamah	230 630	150 484	136 300 349	
	Waroona	2 160	1 404	1 328 652	
	Total Zircon	300 256	195 741	175 190 729	(a)
Total Heavy Mineral Sands				473 232 018	
INDUSTRIAL PEGMATITE MINERALS					
Feldspar	Mukinbudin	9 692		437 909	(h)
IRON ORE					
			Fe%		
Interstate Ore	Derby-West Kimberley	1 464 293	65.78	25 636 277	
	East Pilbara	3 158 735	63.45	69 095 603	
	Ashburton	632 009	57.23	8 785 371	
	Total Interstate Iron Ore	5 255 037		103 517 251	
Export Ore	Derby-West Kimberley	2 012 500	65.10	47 312 972	
	East Pilbara	31 371 440	62.82	728 032 833	
	Ashburton	67 610 231	61.13	1 366 554 702	
	Total Export Iron Ore	100 994 171		2 141 900 507	
			Fe%		
Export Pellets	Ashburton	22 985	63.19	610 264	
Total Iron Ore		106 272 193		2 246 028 022	(a)

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
LIMESAND-LIMESTONE-DOLOMITE					
Dolomite	Lake Grace	333		6 660	(e)
Limesand-Limestone	Cockburn	1 360 453		4 563 367	(d)
	Dandaragan	3 256		21 422	(d)
	Exmouth	2 555		25 550	(d)
	Gingin	25 370		503 501	(d)
	Irwin	980		6 402	(d)
	Manjimup	5 614		56 140	(d)
	Roebourne	239		3 205	(d)
	Wanneroo	300 353		2 689 283	(d)
Total Limesand-Limestone-Dolomite				7 875 530	
MANGANESE ORE	East Pilbara	273 000		1 200 000	(e)
NICKEL by-product Cobalt	Coolgardie		Co. tonnes 267.920	4 600 916	(a)(b)
by-product Palladium	Coolgardie		Pd Kg 431 107	1 631 497	(a)(b)
by-product Platinum	Coolgardie		Pt Kg 65.959	1 049 022	(a)(b)
Nickel Concentrates	Coolgardie	253 683	Ni tonnes 27 905	349 041 945	
	Kalgoorlie-Boulder	23 907	2 971	35 288 188	
	Laverton	57 918	5 101	61 140 258	
	Leonora	110 945	10 072	119 899 950	
	Total Nickel Concentrates	446 453	46 049	565 370 341	(i)

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
			Ni tonnes		
Nickel Ore	Leonora	37 084	1777	20 598 342	
Total Nickel Production				585 968 683	(i)
PEAT	Manjimup	1 111		68 546	(d)
PETROLEUM		Kilolitres			
Condensate	Carnamah	766		44 270	(d)
	Irwin	117		21 468	(d)
	Roebourne	1 600 270		235 587 645	(a)
	Total Condensate	1 601 163		235 653 383	
		Kilolitres			
Crude Oil	Derby-West Kimberley	23 727		3 200 966	
	Irwin	30 649		4 015 984	
	Roebourne	3 908 363		594 254 986	
	Total Crude Oil	3 962 739		601 471 936	(a)
		MM Btu			
L.N.G.	Roebourne	104 167 480		336 091 222	(a)
		'000 m^3			
Natural Gas	Carnamah	86 306		9 045 445	(j)
	Roebourne	3 622 140		14 457 990	(j)
	Irwin	139 285		333 343 504	(d)
	Total Natural Gas	3 847 731		356 846 939	
Total Petroleum				1 530 063 480	

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
RARE EARTHS		Ga Kg			
Gallium	Murray	42 986		1 454 998	(a)
SALT	Carnarvon	1 154 313		25 629 781	(a)
	Lake Grace	500		40 000	(e)
	Port Hedland	1 478 202		27 386 402	(a)
	Roebourne	2 717 208		59 125 573	(a)
	Shark Bay	574 557		11 914 826	(a)
	Wyalkatchem	173		13 840	(e)
Total Salt		5 924 953		124 110 422	
SILICA-SILICA SAND					
Silica	Moora	32 544		325 435	
Silica Sand	Canning	192 873		2 121 603	
	Cockburn	162 577		2 121 603	
	Coolgardie	54 406		157 441	
	Wanneroo	35 622		215 583	
	Total Silca Sand	445 874		3 662 014	
Total Silica-Silica Sand				3 987 449	(a)
SILVER		Ag Kg			
by product copper	East Pilbara	95.855		12 491	(a)(k
by product copper	Meekatharra	14 512.126		2 776 078	(a)(k)
by product nickel	Coolgardie	310.992		68 211	(a)(b)
by product gold	Mining Statewide	19 646.864		2 764 576	(d)
Total Silver		34 565.837		5 621 356	

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value ($)	Ref
TALC	Meekatharra	45 491		4 624 958	
	Three Springs	174 772		10 598 154	
Total Talc		220 263		5 223 112	e)
TIN-TANTALUM-LITHIUM					
Spodumene	Bridgetown-Greenbushes	47 428		8 305 325	(a)
			Ta205 kg		
Tantalite	East Pilbara	40	25 338	1 798 318	
	Bridgetown-Greenbushes	8.74	104 788	14 371 326	
	Total Tantalite	438.74	130 126	16 169 644	(a)
			Sn Tonnes		
Tin	Bridgetown-Greenbushes	237.30	166.09	1 260 292	
	East Pilbara	0.00	5.00	38 200	
	Total Tin	237.30	171.09	1 298 492	(a)
Total Tin-Tantalum-Lithium				25 773 461	
VERMICULITE	Ravensthorpe	105		18 528	(e)
	Total Value of Minerals			6 536 408 801	
	Total Value of Petroleum			1 530 063 480	
	Total Value of Gold			2 371 725 626	
	TOTAL VALUE OF ALL MINERALS & PETROLEUM			10 438 197 907	

TABLE 5.1

QUANTITY, VALUE AND METALLIC CONTENT OF MINERAL AND PETROLEUM PRODUCTION
BY MINERAL FIELD

Mineral	Mineral-field	Quantity tonnes	Metallic Content	Value ($)	Ref
Barytes	Pilbara	7521		1 006 603	(a)
BASE METALS					
Copper by-product	Coolgardie		Cu tonnes 4 047.794	4 549 756	(a)(b)
Copper Concentrates	Pilbara	6 258	1 109.720	1 178 062	(a)
	Peak Hill	26 685	5 488.940	11 272 456	(a)
	Total Copper Concentrates	32 943	6 598.660	12 450 518	
Copper Ore	Peak Hill	22 484	4 332.050	6 922 169	(a)
	Total Copper		14 978.504	23 922 443	
Lead	West Kimberley	18 502	Pb tonnes 13 171.05	7 604 934	(a)
Zinc	West Kimberley	92 822	Zn tonnes 45 877.88	59 754 974	(a)
Total Base Metals				91 282 351	
BAUXITE-ALUMINA Alumina	South West	6 651 028		2 335 697 184	(c)
CLAY Attapulgite	South West	28 137		3 988 107	(a)
Cement Clay	South West	21 952		54 880	(d)
Fire clay	South West	279 538		511 780	(d)
Kaolin	Greenbushes	7 701		472 291	(d)
White Clay	South West	32 401		324 010	(d)
Total Clay				5 351 068	

Mineral	Mineral-field	Quantity tonnes	Metallic Content	Value ($)	Ref
COAL	Collie	4 160 646		183 698 442	(e)
CONSTRUCTION MATERIALS					
Aggregate	Pilbara	24 526		253 242	
	West Kimberley	3 155		15 232	
	Kimberley	4 657		18 628	
	East Coolgardie	118 476		467 752	
	Total Aggregate	150 814		754 854	(d)
Gravel	West Pilbara	1 800		9 000	
	Pilbara	8 156		28 881	
	West Kimberley	1 845		9 225	
	South West	27 453		137 265	
	Coolgardie	5 727		28 715	
	Total Gravel	44 981		213 086	(d)
Rock	West Kimberley	68 046		502 235	
	West Pilbara	19 909		175 862	
	Ashburton	20 243		122 488	
	Total Rock	108 198		800 585	(d)
Sand	West Pilbara	29 079		155 620	
	Peak Hill	23 436		125 607	
	North Coolgardie	2 991		14 953	
	Coolgardie	64 026		331 881	
	West Kimberley	1 190		5 050	
	Mt Margaret	3 020		18 119	
	Kimberley	14 590		40 365	
	South West	520 125		1 591 031	
	Pilbara	9 267		63 609	
	Gascoyne	48		192	
	Roebourne	60 122		337 519	
	East Murchison	1969		9687	
	Total Sand	729 863		2 693 633	(d)
Total Construction Materials				4 462 158	(d)

Mineral	Mineral-field	Quantity tonnes	Metallic Content	Value ($)	Ref
DIAMONDS	Kimberley	Carats 33 854 620		413 583 727	(a)
DIMENSION STONE					
Black Granite	West Kimberley	1 239		1 789 485	(a)
Quartz Rock	South West	994		43 341	(d)
Quartzite	West Pilbara	59		2 360	(d)
Spongolite	West Pilbara	2 280		145 354	(e)
Total Dimension Stone				1 980 540	
GEM, SEMI-PRECIOUS STONES					
		Kg		Value ($)	
Amethyst	Gascoyne	14 594		67 958	(e)
		Grams			
Emerald	North Coolgardie	550		2 020	(d)
Total Gem, Semi-Precious & Ornamental Stone				69 978	
			Au kg		
GOLD	Ashburton		6.106	97 573	
	Broad Arrow		12 770.881	204 076 440	
	Coolgardie		11 219.963	179 277 065	
	Dundas		3 113.044	49 745 891	
	East Coolgardie		21 843.985	349 063 060	
	East Murchison		13 984.028	223 462 317	
	Gascoyne		4.680	74 784	
	Kimberley		48.008	779 937	
	Mt Margaret		13 108.104	209 465 208	
	Murchison		22 006.996	351 667 949	
	North Coolgardie		1 410.114	22 533 375	
	North East Coolgardie		1 065.262	17 022 694	
	Peak Hill		3 541.849	56 598 127	
	Phillips River		10.114	161 620	
	Pilbara		9 414.771	150 446 392	
	South West		18 674.001	298 407 252	
	West Pilbara		11.489	183 590	
	Yalgoo		2 826.466	45 166 428	
	Yilgarn		13 360.342	213 495 925	
Total Gold			148 420.203	2 371 725 626	(f)

Mineral	Mineral-field	Quantity tonnes	Metallic Content	Value ($)	Ref
GYPSUM	South West	104 515		705 442	
	Dundas	14 104		94 769	
	Yilgarn	30 690		173 070	
	Phillips River	5 500		22 000	
Total Gypsum		154 809		995 281	(e)
HEAVY MINERAL SANDS					
Garnet Sand	South West	27 768		1 152 128	(e)
Ilmenite	South West	1 071 845	TiO_2 tonnes 596 372	89 606 326	(a)
Ilmenite Upgraded	South West	284 109	TiO_2 tonnes 261 380	131 107 248	(a)
Leucoxene	South West	15 023	TiO_2 tonnes 13 699	7 902 766	(a)
Monazite	South West	13 358	ThO_2 Units 86 830	9 731 111	(a)
Rutile	South West	82 232	TiO_2 tonnes 78 121	58 541 710	(a)
Zircon	South West	300 256	ZrO_2 tonnes 195 741	175 190 729	(a)
Total Heavy Mineral Sands				473 232 018	

Mineral	Mineral-field	Quantity tonnes	Metallic Content	Value ($)	Ref
INDUSTRIAL PEGMATITE MINERALS					
Feldspar	South West	9 692		437 909	(h)
Total Industrial Pegmatite Minerals		9 692		437 909	
IRON ORE					
			Fe tonnes		
Export Ore	West Pilbara	67 610 231	41 340 606	1 366 554 702	
	West Kimberley	2 012 500	1 310 066	47 312 972	
	Pilbara	6 283 878	3 893 946	135 777 365	
	Peak Hill	25 087 562	15 815 368	592 255 468	
	Total Export Iron Ore	100 994 171	62 359 986	2 141 900 507	
Export Pellets	West Pilbara	22 985	14 524	610 264	
Interstate Ore					
	Peak Hill	2 923 272	1 854 170	63 512 707	
	Pilbara	235 463	150 135	5 582 896	
	West Kimberley	1 464 293	963 154	25 636 277	
	West Pilbara	632 009	361 722	8 785 371	
	Total Interstate Iron Ore	5 255 037	3 329 181	103 517 251	
Total Iron Ore		106 272 193	65 703 692	2 246 028 022	(a)

Mineral	Mineral-field	Quantity tonnes	Metallic Content	Value ($)	Ref
LIMESAND/LIMESTONE/DOLOMITE					
Dolomite	South West	333		6 660	(e)
Limesand-Limestone	Ashburton	2 555		25 550	(d)
	South West	1 696 026		7 840 115	(d)
	West Pilbara	239		3 205	(d)
Total Limesand/ Limestone & Dolomite				7 875 530	
MANGANESE ORE	Pilbara	273 000		1 200 000	(e)
NICKEL by-product Cobalt	Coolgardie		Co tonnes 267.920	4 600 916	(a)(b)
by-product Palladium	Coolgardie		Pd Kg 431.107	1 631 497	(a)(b)
by-product Platinum	Coolgardie		Pt Kg 65.959	1 049 022	(a)(b)
Nickel Concentrates			Ni tonnes		
	East Coolgardie	23 907	2 971	35 288 188	
	Coolgardie	253 683	27 905	349 041 945	
	East Murchison	110 945	10 072	119 899 950	
	Mt. Margaret	57 918	5 101	61 140 258	
	Total Nickel Concentrates	446 453	46 049	565 370 341	(i)
Nickel Ore	East Murchison	37 084	Ni Tonnes 1 777	20 598 342	(i)
Total Nickel Production				585 968 683	(i)

Mineral	Mineral-field	Quantity tonnes	Metallic Content	Value ($)	Ref
PEAT	South West	1 111		68 546	(d)
PETROLEUM	Basin	Kilolitres			
Condensate	Perth	893		65 738	(d)
	Carnarvon	1 600 270		235 587 645	(a)
	Total Condensate	1 601 163		235 653 383	
		Kilolitres			
Crude Oil	Perth	30 649		4 015 984	
	Canning	23 727		3 200 966	
	Carnarvon	3 908 363		594 254 986	
	Total Crude Oil	3 962 739		601 471 936	(a)
		MM Btu			
L.N.G.	Carnarvon	104 167 480		336 091 222	(a)
		000 M^3			
Natural Gas	Carnarvon	3 622 140		333 343 504	(j)
	Perth	225 591		23 503 435	(d)
	Total Natural Gas	3 847 731		356 846 939	
Total Petroleum				1 530 063 480	

Mineral	Mineral-field	Quantity tonnes	Metallic Content	Value ($)	Ref
RARE EARTHS					
Gallium	South West	Ga Kg 42 986		1 454 998	(a)
SALT	Pilbara	1 478 202		27 386 402	(a)
	West Pilbara	2 717 208		59 125 573	(a)
	Gascoyne	1 728 860		37 544 607	(a)
	South West	673		53 840	(e)
Total Salt		5 924 943		124 110 422	
SILICA-SILICA SAND					
Silica	South West	32 544		325 435	
Silica Sand	Coolgardie	54 406		157 441	
	South West	391 468		3 504 573	
	Total Silica Sand	445 874		3 662 014	
Total Silica Silica Sand				3 987 449	(d)
SILVER		Ag Kg			
by product Copper	Peak Hill	14 512.126		2 776 078	(a)(k
by product Copper	Pilbara	95.855		12 491	(a)(k
by product Nickel	Coolgardie	310.992		68 211	(a)(b
by product gold mining	Statewide	19 646.864		2 764 576	(d)
Total Silver		34 565.837		5 621 356	

Mineral	Mineral-field	Quantity tonnes	Metallic Content	Value ($)	Ref
TALC	South West	174 772		10 598 154	
	Peak Hill	45 491		4 624 958	
Total Talc		220 263		15 223 112	(e)
TIN-TANTALUM-LITHIUM					
Spodumene	Greenbushes	47 428		8 305 325	(a)
			Ta 205 kg		
Tantalite	Pilbara	40.00	25 338	1 798 318	
	Greenbushes	398.74	104 788	14 371 326	
	Total Tantalite	438.74	130 126	16 169 644	(a)
			Sn Tonnes		
Tin	Greenbushes	237.30	166.09	1 260 292	
	Pilbara	0.0	5.00	38 200	
	Total Tin	237.30	171.09	1 298 492	(a)
Total Tin - Tantalum Lithium				25 773 461	
VERMICULITE	Phillips River	105		18 528	(e)
	Total Value of Minerals			**6 536 408 801**	
	Total Value of Petroleum			**1 530 063 480**	
	Total Value of Gold			**2 371 725 626**	
	TOTAL VALUE OF ALL MINERALS & PETROLEUM			10 438 197 907	

EMPLOYMENT IN THE MINERALS AND PETROLEUM INDUSTRIES

Direct employment in the mining and petroleum industries continued to grow at a moderate rate during 1989/90. Returns to the Department from onshore and offshore projects showed a 6% rise over the preceding year.

The increase in full time employees to 36,547 was fairly evenly spread across all sectors. Significant rises were, however, apparent in gold mining and, to a lesser extent, in the heavy mineral sands and base metals projects. Job opportunities in the gold mining industry are expected to contract over the next 12 months, because of a continuing price weakness and the commencement of company tax in January 1991. Increased activity in petroleum exploration, development and production bodes well for future employment in that sector.

The already high levels of productivity associated with the Western Australian mining industry continued to strengthen during 1989/90. It is the scale of operations, skills development and general capital intensity of the industry which has allowed this steady growth in productivity. Strong market demand for most mineral resources have complemented rising productivity, and thus encouraged more large scale investment. Investment has been particularly strong in the iron ore industry where several new projects have received a commitment to proceed with development.

An innovative scheme for mining skills training is being undertaken by the project managers of the Golden Grove base metals development. The system involves a comprehensive training programme in which, over a period of 4 years, previously inexperienced workers are multiskilled in a range of mining activities.

The outlook for the coming financial year is for some fall in employment in the gold industry sector, while relatively strong demand for alumina and base metals should maintain growth in those sectors. Regional, and overall State, employment will continue to be underwritten directly and indirectly by the mining industry.

TABLE 6.1 **NUMBER OF PERSONS EMPLOYED IN THE WESTERN AUSTRALIAN MINING & PETROLEUM INDUSTRIES AS AT JUNE 30 1990**

MINERAL Company	LOCATION	1988-89	1989-90
BASE METALS			
BHP Minerals Ltd	Cadjebut	154	186
Murchison Zinc Co. Pty Ltd	Golden Grove	99	284
		253	**470**
BAUXITE - ALUMINA			
Alcoa of Australia Ltd	Del Park-Huntley/Pinjarra	1 780	1 853
	Jarrahdale/Kwinana	2 006	1 620
	Wagerup/Willow Dale	644	558
Worsley Alumina Pty Ltd	Boddington/Worsley	963	1 110
		5 393	**5 141**
COAL			
Griffin Coal Mining Co. Ltd	Collie	552	558
Western Collieries Ltd	Collie	719	748
		1 271	**1 306**
DIAMOND			
Argyle Diamond Mines Pty Ltd	Lake Argyle	729	828
Poseidon Ltd	Bow River	95	119
		824	**947**
GOLD			
Ashton Gold	Cork Tree Well	102	124
Australian Consolidated Minerals Ltd	Golden Crown	75	91
	Westonia	120	60
	Mt Pleasant	111	119
Australian Mine Management Pty Ltd	Racetrack/Royal Standard	-	11
Aztec Mining Co. Ltd	Bounty	95	108
Barrack Mine Management	Horseshoe Lights	140	63
	Wiluna	124	184
BHP Minerals Ltd	Gimlet South/Orban JV	85	111
Big Bell Mines Pty Ltd	Big Bell	232	275
Broken Hill Metals NL	Hopes Hill	151	144
Central Norseman Gold Corp. NL	Central Norseman	384	399
Coolgardie Gold NL	Greenfield	89	101
Dominion Mining Ltd	Labourchere/Nathans	-	70
	Meekatharra	298	297
	Mt Morgans	97	163
	Tower Hill	77	81
East Murchison Mining Pty Ltd	Gidgee	97	139
Forsayth Pty Ltd	Lawlers	95	90
	Mt Gibson	143	277
Hedges Gold Pty Ltd	Hedges	114	113
Hill 50 Gold Mine NL	Mt Magnet	233	233
Kalgoorlie Consolidated Gold Mines Pty Ltd	Kalgoorlie	1 369	1 507
Mawson Pacific Ltd	Edwards Find	21	27
	Marvel Loch	110	138
	Transvaal	74	56
Metana Minerals	Mt Magnet	145	138
	Reedy	117	144
	Rothsay	51	77
Newmont Holdings Pty Ltd	New Celebration	216	310
	Telfer	492	525
Pancontinental Goldmining Areas Pty Ltd	Paddington	211	184
Placer (Granny Smith) Pty Ltd	Granny Smith	-	157
Poseidon Ltd	Kaltails	56	289
	Karonie	52	60
Ross Atkins Mining	Ingliston	129	141
Sons of Gwalia NL	Sons of Gwalia	103	152

MINERAL Company	LOCATION	1988-89	1989-90
GOLD - continued			
Spargos Mining Pty Ltd	Bellevue	219	178
Western Mining Corporation Ltd	Emu	111	120
	Kambalda	182	190
	Lancefield	111	115
	Sand King	50	-
Worsley Alumina Pty Ltd	Boddington	496	402
All Other Operators		2 738	2 669
		9 915	**10 832**
HEAVY MINERAL SANDS			
Allied Eneabba Pty Ltd	Eneabba	112	131
Associated Minerals Consolidated Ltd	Capel	195	237
	Eneabba/Narngulu	483	610
Cable Sands Pty Ltd	Capel	236	243
Northern Metals and Oil Pty Ltd	Picton	60	69
Target Minerals NL	Port Gregory/Narngulu	15	17
TiWest Pty Ltd	Cooljarloo/Cataby	-	178
Westralian Sands Ltd	Capel	477	530
		1 578	**2 015**
IRON ORE			
BHP Minerals Ltd	Yampi	432	422
Goldsworthy Mining Ltd	Pilbara/Port Hedland	865	906
Hamersley Iron Pty Ltd	Tom Price - Paraburdoo/Dampier	2 906	3 168
Hancock Mining Ltd	McCamey's	37	56
Mt Newman Mining Co. Ltd	Newman/Port Hedland	3 585	3 657
Robe River Mining Co. Pty Ltd	Pannawonica/Cape Lambert	1 024	981
		8 849	**9 190**
NICKEL			
Western Mining Corporation Ltd	Kalgoorlie	371	384
	Kambalda	1 806	1 810
	Kwinana Refinery	326	338
	Leinster	336	551
	Mt Windarra	432	344
All Other Operators		-	18
		3 271	**3 445**
PETROLEUM PRODUCTS			
Barrack Energy Ltd	Mt Horner	3	3
Consolidated Gas Pty ltd	Woodada	6	6
Eromanga Energy Ltd	Blina/Sundown/Lloyd	2	2
Hadson Energy Pty Ltd	Harriet/Rosette	80	74
Marathon Petroleum Australia Ltd	Talisman	-	4
Oil Company of Australia NL	West Kora	-	4
West Australian Petroleum Pty Ltd	Barrow Island	165	179
	Dongara	10	8
	Saladin	-	28
Western Mining Corporation Ltd	North Herald/South Pepper	27	157
Woodside Offshore Petroleum Pty Ltd	North Rankin A/Burrup Peninsula	1 381	1 404
		1 674	**1 869**
SALT			
Dampier Salt Ltd	Dampier	179	178
	Lake MacLeod	99	114
Leslie Salt Co.	Port Hedland	112	120
Shark Bay Salt JV	Useless Loop	92	86
		482	**498**
ALL OTHER MATERIALS (including Rock Quarries)		**866**	**841**
TOTAL		**34 376**	**36 554**

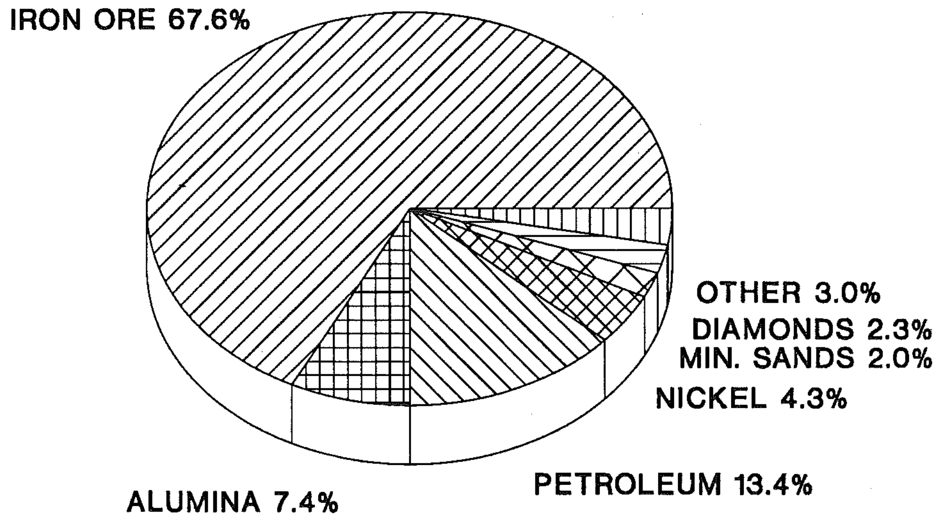
(SOURCE: AXTAT REPORTING SYSTEM, MINING ENGINEERING DIVISION)

Fig 7.1

COMPARATIVE ROYALTY RECEIPTS

1984-85 ROYALTY RECEIPTS

TOTAL : $ 131.0 MILLION



1989-90 ROYALTY RECEIPTS

TOTAL : $ 264.2 MILLION

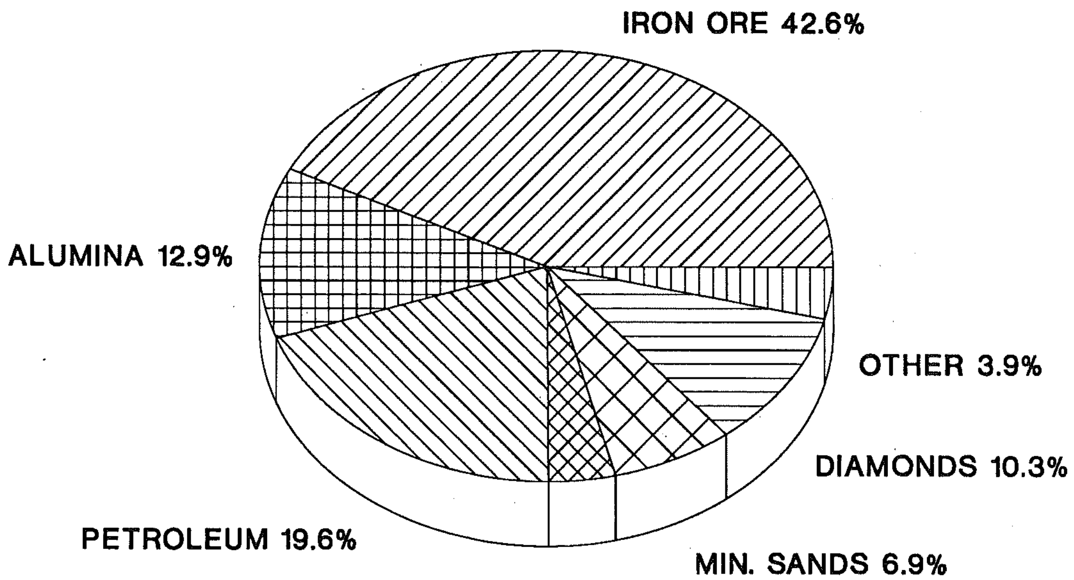


Table 7.1

ROYALTY RECEIPTS 1988-89, 1989-90

Mineral	1988-89 $A	1989-90 $A	Value $A Variance	%up (%down)
BASE METALS				
Copper	1 466 901.31	1 116 113.23	(350 788.08)	(24)
Lead	0.00	227 916.33	227 916.33	n.ap.
Zinc	1 105 668.33	2 974 086.58	1 868 418.25	169
BAUXITE-ALUMINA				
Alumina	20 797 429.97	34 072 745.00	13 275 315.03	64
CLAYS	124 514.20	185 929.14	61 414.94	49
COAL	1 683 307.75	2 148 206.66	464 898.91	27
CONSTRUCTION MATERIALS				
Aggregate	61 439.70	50 214.90	(11224.80)	(18)
Gravel	7 537.80	11 843.75	4 305.95	57
Rock	60 591.46	32 548.66	(28 042.80)	(46)
Sand	196 408.42	239 062.06	42 653.64	21
DIAMOND	12 055 670.43	27 202 475.86	15 146 805.43	125
DIMENSION STONE	432.94	782.86	349.92	80
GEM, SEMI-PRECIOUS AND ORNAMENTAL STONE	22 139.41	6 996.00	(15 143.41)	(68)
GOLD	219 610.41	199 362.36	(20 248.05)	(9)
GYPSUM	44 948.55	49 867.89	4 919.34	11
HEAVY MINERAL SANDS				
Garnet	45 270.22	52 912.63	7 642.41	17
Ilmenite	3 505 728.24	4 678 380.34	1 172 652.10	33
Leucoxene	152 358.84	500 469.64	348 110.80	228
Monazite	350 230.95	516 417.37	166 186.42	47
Rutile	2 622 307.52	3 101 789.38	479 481.86	18
Xenotime	0.00	5292.00	5292.00	n.ap.
Zircon	6 324 381.30	9 490 837.53	3 166 456.23	50
TOTAL HEAVY MINERAL SANDS	13 000 277.07	18 346 098.89	5 345 821.82	41
INDUSTRIAL PEGMATITE MINERALS	58 257.74	39 427.66	(18 830.08)	(32)
IRON ORE	92 722 782.67	112 532 211.41	19 809 428.74	21
LIMESAND-LIMESTONE-DOLOMITE				
Dolomite	39.00	99.90	60.90	156
Limesand-Limestone	103 808.71	139 160.12	35 351.41	34
MANGANESE	0.00	90 000.00	90 000.00	n.ap.
NICKEL				
Cobalt by-product	73 857.83	82 543.36	8 685.53	12
Nickel	9 523 120.87	9 978 061.91	454 941.04	5
Palladium by-product	18 248.10	27 351.53	9 103.43	50
Platinum by-product	18 248.10	26 651.04	8 402.94	46
PEAT	2535.02	2602.21	67.19	3
PETROLEUM				
Condensate	1 126 652.24	2 068 390.85	941 738.61	84
LNG	0.00	2 265 012.95	2 265 012.95	n.ap.
Natural gas	3 143 794.05	5 204 344.62	2 060 550.57	66
Oil	16 309 160.89	42 239 570.30	25 930 409.41	159
TOTAL PETROLEUM	20 579 607.18	51 777 318.72	31 197 711.54	152
RARE EARTHS				
Gallium	0.00	276 769.61	276 769.61	n.ap.
SALT	1 057 214.07	1 075 787.77	18 573.70	2
SILICA SAND	208 488.68	216 768.32	8 279.64	4
SILVER	144 965.78	145 976.57	1 010.79	1
TALC	94 048.21	100 002.00	5 953.79	7
TIN-TANTALUM-LITHIUM				
Spodumene	355 611.41	341 091.87	(14 519.54)	(4)
Tantalite	166 197.13	444 982.14	278 785.01	168
Tin	53 080.01	50 242.60	(2837.41)	(5)
VERMICULITE	16 534.07	10 696.95	(5 837.12)	(35)
Total Value	176 043 522.33	264 221 995.86	88 178 473.53	50

Note: **All Royalty Receipts above are only those paid to Consolidated Revenue Fund**

PRINCIPAL MINERAL PRODUCERS 1989-90 Head office postal address, telephone number:minesite.

BARYTES

Dresser Minerals International Inc., 251 Adelaide Tce, Perth 6000,(09) 3254822: North Pole

BASE METALS

Copper

Horseshoe Lights Gold Pty Ltd, 614 Newcastle St, Leederville 6007, (09) 427 6222: Horseshoe.
Newmont Australia Ltd, Level 18 AMP Tower, 535 Bourke St, Melbourne Victoria 3000, (03) 629 5191: Telfer.
Western Mining Corp. Ltd, 191 Great Eastern Hwy, Belmont 6104, (09) 478 0711: Kambalda.

Lead - Zinc

BHP Minerals Ltd, 44 Hamersley St, Broome 6725, (091) 92 2006: Cadjebut.

BAUXITE - ALUMINA

Alumina

Alcoa of Australia (WA) Ltd, PO Box 252, Applecross 6153, (09) 364 0111: Del Park, Jarrahdale, Willowdale.
Worsley Alumina Pty Ltd, PO Box 344, Collie 6225, (097) 34 3022: Boddington.

CLAY

Attapulgite

Mallina Holdings Ltd, 249 Stirling Hwy, Claremont 6010, (09) 384 7077: Lake Nerramyne.

Cement Clay

Bell Basic Industries Ltd, 136 Great Eastern Hwy, South Guildford 6055, (09) 279 0000: Armadale.

Fire Clay

Midland Brick Co. Pty Ltd, Bassett Rd, Middle Swan 6056, (09) 274 5522: Bullsbrook.

Kaolin

Greenbushes Ltd, 91 Kensington St, East Perth 6004, (09) 325 1966: Greenbushes.

White Clay

Pilsley Investments Pty Ltd, Military Rd, Midland 6056, (09) 250 2111: Middle Swan

COAL

Griffin Coal Mining Co. Ltd, 28 The Esplanade, Perth 6000, (09) 325 8155: Collie
Western Collieries Ltd, 40 The Esplanade, Perth 6000, (09) 327 4511: Collie.

CONSTRUCTION MATERIALS

Aggregate

The Readymix Group (WA), 75 Canning Hwy, Victoria Park 6100, (09) 472 2000: Boodarrie, Boulder, Oscar Range.

Gravel

Leslie Salt Company (Inc), 225 St George's Tce, Perth 6000, (09) 325 4888: Pippingarra.
Vinci and Sons Pty Ltd, Lot 3 Pickering Brook Rd,Pickering Brook 6076, (09) 293 8295: Pickering Brook.
Ivanjah Pty Ltd, PO Box 159, Kalgoorlie 6430,(090) 21 3961: Grosmont

Rock

County B.S., C/- Specified Services, 123 Burswood Rd, Victoria Park 6100, (09) 362 1100: Yeeda Station.
Specified Services Pty Ltd, 123 Burswood Rd, Victoria Park 6100, (09) 362 1100: Mt Regal.

Sand

Amatek Ltd, 1 Newburn Rd, Kewdale 6104, (09) 353 3030: Jandakot.
Bebich M, P & Y, 167 East Rd, Wanneroo 6055: Gnangarra.
The Readymix Group (WA), 75 Canning Hwy, Victoria Park 6100, (09) 472 2000: Boodarrie Station, Christmas Creek, Comet Vale, Karratha, Newman, Rocklea, Sullivan's Creek, Turner River, Warrawanda Creek, Widgiemooltha.
Tirad Pty Ltd, PO Box 126, Boulder 6432: Coolgardie.

PRINCIPAL MINERAL PRODUCERS 1989-90 Head office postal address, telephone number:minesite.

DIAMOND

Argyle Diamond Mines, 2 Kings Park Rd, West Perth 6005, (09) 482 1188: Argyle.
Poseidon Ltd, 8 Kings Park Rd, West Perth 6005, (09) 480 3232: Lissadell.

DIMENSION STONE

Black Granite

City West Holdings Ltd, C/- 102 Railway Pde, West Perth 6005, (09) 481 5760: Lennard.

Quartz rock

Commercial Minerals Ltd, 26 Tomlinson Rd, Welshpool 6106, (09) 362 1411: Mukinbudin.

Spongolite

Woodbridge Investments Pty Ltd, PO Box 591, South Perth 6151: Mt Barker

GEM, SEMI-PRECIOUS & ORNAMENTAL STONE

Amethyst

Soklich F, Lot 326 Dale Pl, Orange Grove 6109, (09) 459 1449: Gascoyne.

Emerald

Mackay N.J., 91 Thomas St, Nedlands 6009, (09) 386 6206: Wonder Well.

GOLD

Arimco NL, 19-29 Martin Pl, Sydney NSW 2000 (02) 235 3644: Gidgee.
Ashton Mining Ltd, 441 St Kilda Rd, Melbourne Vic 3004, (03) 267 5500: Bardoc - Davyhurst, Laverton.
Australian Consolidated Minerals Ltd, 233 Adelaide Tce, Perth 6000, (09) 325 7755: Golden Crown, Westonia.
Australmin Holdings Ltd, 44 St Geordc's Tce Perth 6000, (09) 325 6955: Tuckabianna.
Aztec Mining Company Ltd, 99 Shepperton Rd, Victoria Park 6100,(09) 470 1444: Bounty.
Barrack Mine Management, 183 Great Eastern Hwy, Belmont 6104, (09) 479 9799: Horseshoe Lights, Wiluna.
BHP Minerals Ltd, 240 Hay St, Kalgoorlie 6430, (090) 24 2060: Ora Banda - Gimlet South, Orban JV, Ora Banda Tailings.
Big Bell Mines Ltd, PO Box 2135, Geraldton 6530, (099) 64 1366: Big Bell.
Broken Hill Metals Ltd, 44 St George's Tce, Perth 6000, (09) 221 3032: Hopes Hill - Corinthia.
Burmine Ltd, Copperhead Mine, Bullfinch 6484, (090) 49 5066: Copperhead.
Carr Boyd Minerals Ltd, 24 Outram St West Perth 6005,(09) 481 3466: Harbour Lights, Mertondale.
Centaur Mining and Exploration Ltd, 468 St Kilda Rd, Melbourne Vic 3004, (03) 267 6633: Lady Bountiful Extended.
Central Norseman Gold Corp. NL, PO Box 56, Norseman 6443, (090) 39 1101: Central Norseman.
Clogau (Australia) Ltd, Cnr Throssell and Forrests Sts Kalgoorlie 6430, (090) 21 1766: Callion.
Consolidated Exploration Ltd, 47 Colin St, West Perth 6005,(09) 481 5870: Davyhurst, Lady Bountiful.
Dominion Mining Ltd, 10 Ord St, West Perth 6005, (09) 322 4617: Labourchere, Meekatharra, Mt Morgans, Tower Hill.
Forsayth Pty Ltd, 221 St George's Tce, Perth 6000, (09) 322 7211: Lawlers, Mt Gibson.
Golden Kilometre Mines JV, 4/100 Hay St, Subiaco 6008, (09) 382 3300: Mt Pleasant, Racetrack/Royal Standard.
Golden Valley Mines NL, 174 Hampden Rd, Nedlands 6009, (09) 389 1999: Frasers.
Hampton Australia Ltd, 120 Hutt St, Adelaide SA 5000 (08) 223 7438: Jubilee.
Hannans Gold Ltd, 49 Stirling Hwy, Nedlands 6009, (09) 389 1311: Comet - Pinnacles.
Hedges Gold Pty Ltd, Cnr Davy and Marmion Sts, Booragoon 6153, (09) 364 0111: Hedges.
Herald Resources Ltd, 45 Richardson St, West Perth 6005, (09) 322 2788: Sandstone, Three Mile Hill.
Hill 50 Gold Mine NL, PO Box 83, Mt Magnet 6638, (09) 63 4104: Mt Magnet.
Homestake Gold of Australia Ltd, 191 Fullarton Rd, Dulwich SA 5065, (08) 332 7811: Fortnum.
Kalgoorlie Cons. Gold Mines Pty Ltd, Boulder Block Rd, Boulder 6432, (090) 93 1000: Kalgoorlie/Boulder.
Mawson Pacific Ltd, 11 Ventnor Ave, West Perth 6005, (09) 321 8778: Edwards Find, Marvel Loch, Transvaal.
Metana Minerals, 191 Great Eastern Hwy, Belmont 6104, (09) 277 9944: Mt Magnet, Reedy, Rothsay, Youanmi.
Mt Martin Gold Mines NL, 9 Bowman St, South Perth 6151, (09) 368 2011: Mt Martin.
Newmont Holdings Pty Ltd, 535 Bourke St, Melbourne 3000, (03) 62 5191: New Celebration, Telfer.
Nord Australex Nominees Pty Ltd, c\- 55 Macquarie St, Sydney NSW 2000, (02) 27 1341: Kurara.
North Broken Hill - Peko Ltd, 476 St Kilda Rd, Melbourne Vic 3004, (03)829 0000: Bottle Creek, Kanowna, Peak Hill.
Pancontinental Goldmining Areas Pty Ltd, PO Box 1161, Kalgoorlie 6430, (090) 24 2000: Paddington, White Flag.
Poseidon Ltd, PO Box 1143, West Perth 6005, (09) 384 5155: Kaltails, Karonie.
Ross Atkins Mining c\- PO Meekatharra 6642, (099) 81 1064: Paddy's Flat.
Sandhurst Mining NL, c\- 15 William St, Perth 6000, (09) 327 5777: Trafalgar.

PRINCIPAL MINERAL PRODUCERS 1989-90 Head office postal address, telephone number:minesite.

Gold (continued)

Samantha Gold NL, 28 The Esplanade, Perth 6000, (09) 481 5288: Higginsville, Sir Samuel - Bellevue.
Sons of Gwalia NL, 38 Parliament Pl, West Perth 6005, (09) 481 1988: Sons of Gwalia.
Southern Goldfields Ltd, 50 Colin St, West Perth 6005, (09)321 3277: Nevoria.
Sundowner Minerals NL, c\- Forsayth Pty Ltd, 221 St George's Tce, Perth 6000, (09) 322 7211: Darlot.
Western Mining Corp. Ltd, 191 Great Eastern Hwy, Belmont 6104, (09) 478 0711: Emu, Kambalda, Lancefield, Sand King - Goongarrie, Thiel Well.
Worsley Alumina Pty Ltd, PO Box 48, Boddington 6390, (098) 83 8260: Boddington.

GYPSUM

H.B. Brady & Co. Pty Ltd, PO Box 42, Bayswater 6053, (09) 279 4422: Lake Brown.
Hillerman W, Wandel N, Sime K & A, PO Box 165, Esperance 6450: Esperance.
Nixon P.F. & R.S., PO Box 49, Kalannie 6468, (096) 66 2045: Lake Hillman.
Swan Portland Cement Ltd, Burswood Rd, Rivervale 6103, (09) 361 8822: Lake Hillman.
Westdeen Holdings Pty Ltd, 7 Armstromg Rd, Applecross 6153, (09) 364 4951: Wyalkatchem

HEAVY MINERAL SANDS

Allied Eneabba Pty Ltd, 45 Stirling Hwy, Nedlands 6009, (09) 389 1222: Eneabba.
Associated Minerals Cons. Ltd, 45 Stirling Hwy, Nedlands 6009, (09) 389 1222: Capel, Eneabba.
Cable Sands (WA) Pty Ltd, PO Box 133, Bunbury 6230, (097) 21 4111: Capel.
Northern Metals & Oil Pty Ltd, PO Picton 6229, (097) 25 4899: Waroona.
Target Minerals NL, PO Box 188, Geraldton 6530, (099) 23 3644: Port Gregory.
Westralian Sands Ltd, PO Box 96, Capel 6271, (097) 27 2002: Yoganup.

INDUSTRIAL PEGMATITE MINERALS

Felspar

Commercial Minerals Ltd, 26 Tomlinson Rd, Welshpool 6106, (09) 362 1411: Mukinbudin.

Mica

Pilbara Mica Corporation Pty Ltd, PO Box 301, Bridgetown 6255: Pippingarra.

IRON ORE

BHP Minerals Ltd, 200 St George's Tce, Perth 6000, (09) 320 4444: Koolan Island.
Channar Mining Pty Ltd, 191 St George's Tce, Perth 6000, (09) 327 2327: Channar
Goldsworthy Mining Ltd, 197 St George's Tce, Perth 6000, (09) 322 1788: Shay Gap.
Hamersley Iron Pty Ltd, 191 St George's Tce, Perth 6000, (09) 327 2327: Tom Price.
Hancock Mining Ltd, 28 Ventnor Ave, West Perth 6005, (09) 481 3888: McCameys.
Mt Newman Mining Co. Ltd, 200 St George's Tce, Perth 6000, (09) 320 4666: Newman.
Robe River Mining Co. Pty Ltd, 12 St George's Tce, Perth 6000, (09) 421 4747: Pannawonica.

LIMESAND - LIMESTONE - DOLOMITE

Dolomite

Green K & P, PO Box 31, Newdegate 6355, (098)71 1547: Lake Magenta.

Limesand - Limestone

Chelmsford Pty Ltd, 3/104 Erindale Rd, Balcatta 6018, (09) 3453009: Wanneroo.
Cockburn Cement Ltd, Russell Rd, South Coogee 6166, (09) 410 1988: Cockburn Sound, Coogee.
Henderson Nominees Pty Ltd, 19 Rangeview Road, Lansdale 6065, (09) 342 9988: Moore River.
Limestone Building Blocks Co. Pty Ltd, 41 Spearwood Ave, Bibra Lake 6163, (09) 418 4440: Nowerup.
Swan Portland Cement Ltd, Burswood Rd, Rivervale 6103, (09) 361 8822: Wanneroo.
Westdeen Holdings Pty Ltd, 7 Armstromg Rd, Applecross 6153, (09) 364 4951:Dandaragan, Dongara, Gingin, Irwin, Yanchep.

MANGANESE ORE

Mount Sydney Manganese Pty Ltd, C/- 124 Parry St, East Perth 6004, (09) 328 2622: Woodie Woodie.

PRINCIPAL MINERAL PRODUCERS 1989-90 Head office postal address, telephone number:minesite.

NICKEL

Western Mining Corp. Ltd, 191 Great Eastern Hwy, Belmont 6104, (09) 478 0711: Carnilya Hill, Kambalda, Leinster, Windarra.

PEAT

Magnet Industries Pty Ltd, 665 Welshpool Rd, Wattle Grove 6107, (09) 453 6777: Manjimup.

PETROLEUM

Barrack Energy Ltd, 30 Ord St, West Perth 6005, (09) 320 1777: Mt Horner.
Consolidated Gas Pty Ltd, 174 Hamden Rd, Nedlands 6009, (09) 389 8344: Woodada.
Eromanga Pty Ltd, PO Box R204, Royal Exchange NSW 2000, (02) 2474605: Blina, Lloyd, Sundown/W Terrace.
Hadson Energy Ltd, 35 Ventnor Ave, West Perth 6008, (09) 481 8555: Harriet
Marathon Petroleum Aust. Ltd, PO Box 6192, East Perth 6004, (09) 325 1988: Talisman.
Oil Company of Australia NL, GPO Box 148, Brisbane Qld 4001, (07) 858 0600: West Kora
West Aust. Petroleum Pty Ltd, 233 Adelaide Tce, Perth 6000, (09) 325 0181: Barrow Island, Dongara, Saladin.
Western Mining Corp. Ltd, 28 Ventnor Ave, West Perth 6005, (09) 482 2444: Herald/Pepper.
Woodside Offshore Pet. Pty Ltd, 1 Adelaide Tce, Perth 6000, (09) 244 4111: North Rankin.

RARE EARTHS

Gallium

Rhone Poulenc Chimie Aust. Pty Ltd, 200 Adelaide Tce, Perth 6000, (09) 325 8500: Del Park.

SALT

Dampier Salt (Operations) Pty Ltd, 177A St George's Tce, Perth 6000, (09) 327 2299: Dampier, Lake Macleod.
Leslie Salt Company (Inc), 225 St George's Tce, Perth 6000, (09) 325 4888: Port Hedland.
Shark Bay Salt Joint Venture, 22 Mount St, Perth 6000, (09) 322 4811: Useless Loop.

SILICA - SILICA SAND

Silica

Barrack Silicon Pty Ltd, 262 St George's Tce, Perth 6000, (09) 322 2288: Dalaroo.

Silica Sand

Amatek Ltd, 1 Newburn Rd, Kewdale 6104, (09) 353 3030: Jandakot.
Australian Glass Manufacturing Co., 35 Baille Rd, Canning Vale 6155, (09) 455 1111: Lake Gnangara.
Bell Basic Industries Ltd, 136 Great Eastern Hwy, Guildford 6055, (09) 279 0000: Jandakot.
The Readymix Group (WA), 75 Canning Hwy, Victoria Park 6100, (09) 472 2000: Jandakot.
Western Mining Corp. Ltd, 191 Great Eastern Hwy, Belmont 6104, (09) 478 0711: Mt Burgess.

TALC

Gwalia Minerals NL, 38 Parliament Pl, West Perth 6005, (09) 481 0023: Mt Seabrook.
Western Mining Corp. Ltd, PO Box 116, Three Springs 6519, (099) 54 5047: Three Springs.

TIN - TANTALUM - LITHIUM

Spodumene

Lithium Australia Ltd, 91 Kensington St, East Perth 6004, (09) 325 1966: Greenbushes.

Tantalite - Tin

Goldrim Mining Australia Ltd, 317 Hunter St, Newcastle NSW 2300, (049) 29 2433: Wodgina.
Greenbushes Ltd, 91 Kensington St, East Perth 6004, (09) 325 1966: Greenbushes.

VERMICULITE

Vermiculite Industries Pty Ltd, 15 Spencer St, Jandakot 6164, (09) 417 9900: Young River.