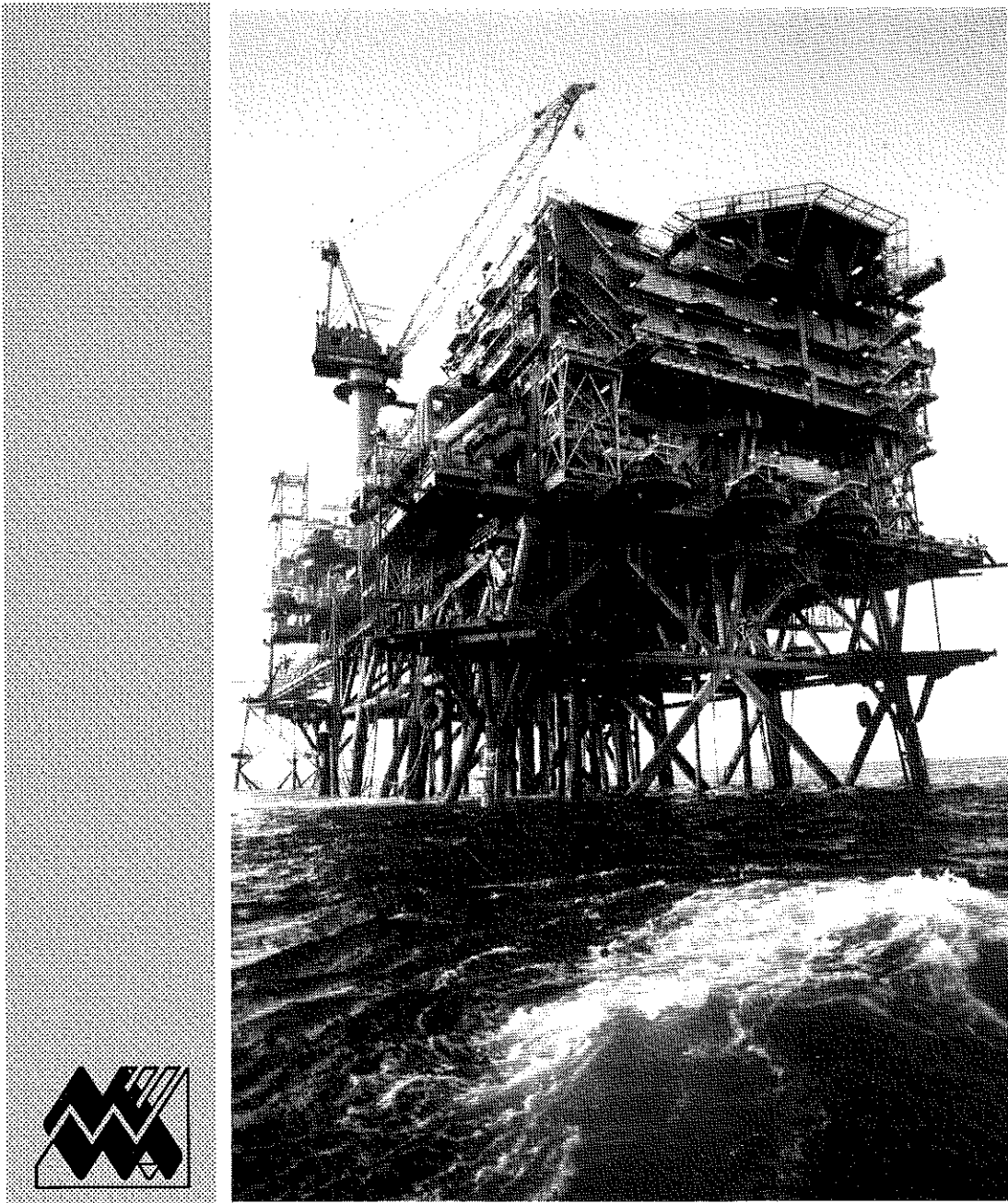


Resource Centre
Policy Branch
Dept. of Minerals & Energy

1992

MINERAL AND PETROLEUM PRODUCTION

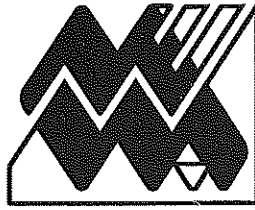
STATISTICAL DIGEST



Royalties and Policy Development Division

DEPARTMENT OF MINERALS AND ENERGY

WESTERN AUSTRALIA



DEPARTMENT OF
MINERALS AND ENERGY
WESTERN AUSTRALIA

**STATISTICAL DIGEST OF MINERAL
AND PETROLEUM PRODUCTION
1992**

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JUNE 1993

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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 by the Australian Bureau of Statistics.
- (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 the Gold Producers' Association.
- (g) Estimated f.o.t value.
- (h) Estimated f.o.b 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	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 (2,240 lbs)	1.016046	0.984207
	tonne	t	short ton (2,000 lbs)	0.907185	1.102311
Volume	kilolitre	kl	barrel (bbl)	6.28981	0.158987
	kilolitre	kl	cubic metre (m ³)	1	
Energy	gigajoule	GJ	million million British Thermal units (mmBTu)	1.055072	0.947803
Prefix	kilo (k)	10 ³	<u>NW Shelf Gas</u> 1 TCF = 1082 petajoules 1 Mt = 54 petajoules		
	mega (M)	10 ⁶			
	giga (G)	10 ⁹			
	tera (T)	10 ¹²			
	peta (P)	10 ¹⁵			

1. OVERVIEW

1.1 Review of the World Economy

The latter half of 1992 was characterised by contrasting news for the world economy. The leading industrialised nations of Japan and Germany began dipping into recession and the United States returned, albeit haltingly, to economic growth. The other main OECD countries experienced significant declines in gross output, with some recording negative growth.

In contrast, the mature and newly industrialised nations of South East Asia generally continued to record high levels of economic growth. This resulted in a significant shift in the focus of world trade and investment to the region.

The United States' economy made solid, if unspectacular, gains during 1992 after a lengthy period of industry restructuring and a program of debt reduction by major companies. The restructuring resulted in higher levels of unemployment as major companies cut costs in an endeavour to become more efficient. There is strong evidence that a jobless recovery is taking place in the United States.

Some early signs of greater trade protectionism emerged from the Clinton Administration, despite the new trade agreement reached between the United States and the EC. The agreement brings renewed hope of a conclusion to the Uruguay round of the ongoing GATT negotiations.

In a significant move away from the previous administration's economic policy, President Clinton proposed a medium term strategy to rein-in the huge US public debt. The US Government deficit is currently \$US 300 billion per annum or 5.5% of GDP. Increases in company and personal taxes are proposed, combined with a new broad based tax on the

energy content of fuels. Substantial cuts to public expenditure are also a component of an attack on the fiscal deficit.

The OECD forecasts GDP growth of 2.4% and unemployment of approximately 7.3% for the US during 1993. Given the proposed cuts to public expenditure, combined with new taxes, these estimates may be optimistic. The sustainability of the US recovery and the administration's trade policy remain important precursors to any significant world economic recovery.

Japan's economy declined noticeably towards the end of 1992. This is the most severe down-turn in the Japanese economy since the 1974 energy crisis. The slump is characterised by a general lack of consumer confidence, initiated by the decline in property values, share prices and export growth. All of this is being exacerbated by high levels of corporate debt and bankruptcy.

With falling domestic demand, new private business investment fell during the year and this resulted in a shake-out in manufacturing employment. Despite the downturn in Japan's domestic economy and the high value of the Yen, a record balance of payments surplus was recorded. Imports of bulk commodities and consumer goods were down reflecting the uncertain state of the domestic economy.

The outlook for the Japanese economy in 1993 is for steady growth of around 2.5%, with the potential of further job losses as companies undergo a period of rationalisation. The Japanese Central Bank eased official interest rates in early 1993 in an effort to revive the economy. A planned fiscal spending package designed to stimulate the domestic economy is progressing, though the emphasis remains on monetary policy.

The beginning of the 1993 calendar year saw the creation of a single market for the EC. This occurred despite the lack of a resolution

on the issues of a central bank and stock exchange for the community.

Germany's decline into recession was brought about by the high costs of reunification and the associated policy of high interest rates pursued by the Bundesbank. The German steel industry declined in 1992 due mainly to a lack of international and domestic demand. The Bundesbank cut official interest rates in early 1993 as part of an effort to stimulate the economy.

The forecasts for the EC in 1993 are pessimistic, with growth of between 1.1% - 1.5%, rising inflation and unemployment.

The Commonwealth of Independent States (CIS) and East European nations continued a period of protracted and painful economic adjustment. This restructuring is being accompanied by widespread political and economic upheaval. Russia experienced hyperinflation and severe currency depreciation in the closing months of 1992. These developments pose serious threats to the success and continuation of reforms in 1993. In a related development, which is having an impact on Western Australian producers, large volumes of CIS sourced minerals and metals are being sold at a discount on Western markets.

While economic malaise continues in Europe, Japan and to a lesser extent North America, the principal industrialised nations of South East Asia recorded growth averaging 6.5% in 1992. The 1993 outlook for these economies and Southern China is optimistic. Wealth creation has been fuelled by rising exports of manufactured goods, intraregional and international trade.

The world economic outlook for 1993 is for weak growth dominated by gloomy forecasts for the European Community (EC) and Japan. The outlook for the United States is for a consolidation of the slow economic recovery

which began showing up during late 1992, although the worsening outlook of its major trading partners may hinder an export orientated recovery. The outlook for the developed nations of South East Asia, and particularly for Southern China, is one of strong optimism with high levels of economic growth expected to continue in the medium term.

The pace and sustainability of Australia's economic recovery remains dependent on growth in the U.S and the degree to which East and North Asian nations expand demand for Australian products.

1.2 Review of the Australian Economy

The national economy continued its protracted and patchy recovery by recording a fifth consecutive quarter of growth in December 1992. The slow rate of economic growth, of approximately 2.1%, is characterised by record post war unemployment and a decline in our terms of trade. The Australian dollar recorded a new five year low of US 67.7c during November 1992. Net foreign debt grew to \$162.8 billion during the period.

Inflation fell to a thirty year low in December, with prices growing at an annual rate of 1.1%. Although the very low inflation rate is good news for the nation's international competitiveness, the significant devaluation of the Australian dollar in 1992 is yet to flow through to increases in the prices of imported goods and services. It is likely that these price increases will flow through over the next year, lifting our under-lying inflation rate to above 3%.

The fall in the Australian dollar was due to a combination of factors, including a decline in commodity prices, a continuation of relatively low interest rates and an erosion of investor confidence. It is expected that the currency should continue to fluctuate in the medium term as a result of commodity price softness

and economic uncertainty.

It appears unlikely that the Government's down-graded economic growth forecast of 2.5% will be achieved by the end of 1992-93. It now appears likely that actual growth will be around 2%, with a forecast rise in output of 3.4% for 1993-94. With only mediocre increases in economic activity, and leading indicators showing slow recovery in business confidence, unemployment is unlikely to be dramatically reduced by the end of 1993.

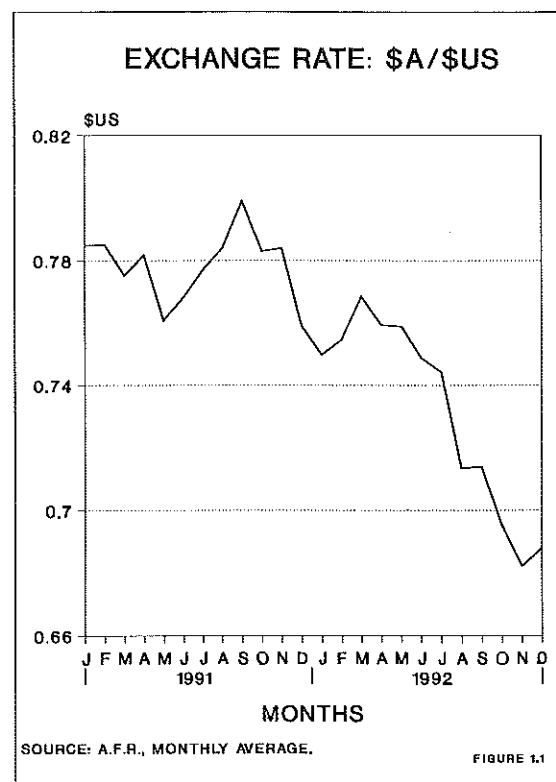
The outlook for the Australian resources sector is uncertain, as most commodity prices remain weak. Any improvement in prices, and hence the fortunes of Australia's primary producers, is dependent on growth in the nation's traditional and developing export markets.

1.3 Economic Factors Affecting the Mining Industry

In the absence of any broad improvement in the international economy, demand for Western Australia's mineral products generally remain low, and commodity prices continue to soften.

As global economic growth stagnated, manufacturing output declined, there is a contraction in the demand for metals, and stocks continue to increase. Mineral prices are also affected by a reluctance on the part of producers to reduce or suspend output levels, or to defer the commissioning of new projects and expansions. Although most sectors of the Western Australian industry are able to sell their output, sales are generally at the prevailing depressed prices. The viability of the minerals and petroleum industry is being significantly maintained by falls in the value of the \$A against major currencies. This development is to some extent offsetting falls in commodity prices and maintaining receipts to producers during a sustained period of downturn.

The adjustment to the value of the Australian dollar is a response to structural changes in the Australian economy over the past two to three years, market sentiment on longer term commodity prices and the gradual easing of interest rates (Figure 1.1).



Although analysts predict that the current low level of the \$A will be only temporary, with an average US 73c expected to prevail during the next financial year, this is unlikely to occur if relative interest rates remain low. Broad Government policy is for interest rates to remain low until the economy begins to gather strength. There are few grounds for believing that this will be soon.

The response of other producing countries to economic growth also strongly affects mineral and energy prices. Several producer countries, most notably the CIS, rely on mineral sales as a source of hard currency, and therefore market more aggressively in adverse conditions. Other mineral developing countries, notably China, also push exports aggressively to fund internal programs aimed at high economic growth. These policies will

contribute to delay any recovery in commodity prices generally.

The year also saw significant changes in foreign ownership in the resources sector. Several long-term players reduced or are planning to reduce their interest in Australia. Where this is occurring, it is usually as part of a policy of rationalising investments in non core areas. Other investors targeted Australia for new investment. These decisions do not materially affect the ability of Australian companies to maintain production, to raise capital, or to invest in new projects.

The world economy is now not expected to expand significantly before mid 1994, with a major draw-down on inventories and stockpiles likely to be associated with any upturn in demand. The current period of belt tightening is therefore expected to continue. Producers have managed to cut costs to be able to survive a further period of low cash flow, and to be able to maintain both production and sales.

The resources sector is a major beneficiary of some elements of Commonwealth economic policy. A continuation of low exchange rates, low interest rates and low inflation will cushion producers against further falls in commodity prices. The increased emphasis on workplace bargaining based on cost efficient output and productivity growth, as a central plank of the microeconomic reform agenda is also welcomed by resource developers.

The spread of the recession to our major markets reinforces the need for resources producers to expand the sales in growth economies of East Asia and Latin America. There are also limited opportunities to replace the CIS as a commodity supplier to countries in Eastern Europe. The former communist block countries are also markets for expertise in the area of mineral technology, environmental procedures and management consulting services.

For the future of the industry, emphasis must be placed on fostering the investment environment, especially for greenfields projects, and for increased downstream processing. It is important to maintain the microeconomic reform agenda in areas such as transport and energy supply, initiatives in this area are keenly awaited by industry.

1.4 Social and Political Factors Affecting the Mining Industry

The result of the "Mabo Decision" is clearly the most significant development of the year, and perhaps for many years to come. This decision by the High Court established that native title continues in some form unless specifically abrogated by the Crown. The "terra nullius" basis of title as practiced since European settlement, and substantially since federation, is now subject to unspecified revision.

The way in which this decision will impinge on resource exploration and development remains unclear. Federal government policy on the issue is for a series of multi lateral consultations with aboriginal groups combined with the funding of strategic test cases. This process is expected to be protracted. Resource developers face major uncertainty over "sovereign risk" in areas which they can not influence by normal commercial or political processes. The issue is expected to be particularly relevant to operations in the Kimberley.

The Queensland Government, which among the other states is showing most concern over the issue, favours a process of active consultation over a relatively short time frame to clarify the implications of the Mabo judgement with individual interested parties.

On other issues, the states and the Commonwealth have used the ANZMEC forum to coordinate legislation in several resource areas. One is on restrictions to free

intra and interstate trade in natural gas. The major concerns are access to resources and to pipeline facilities free of sectional government constraints. Consensus is being sought through the avenue of comprehensive negotiations.

Another ANZMEC working group is engaged in developing a comprehensive royalty system to be applied to the future exploitation of offshore minerals.

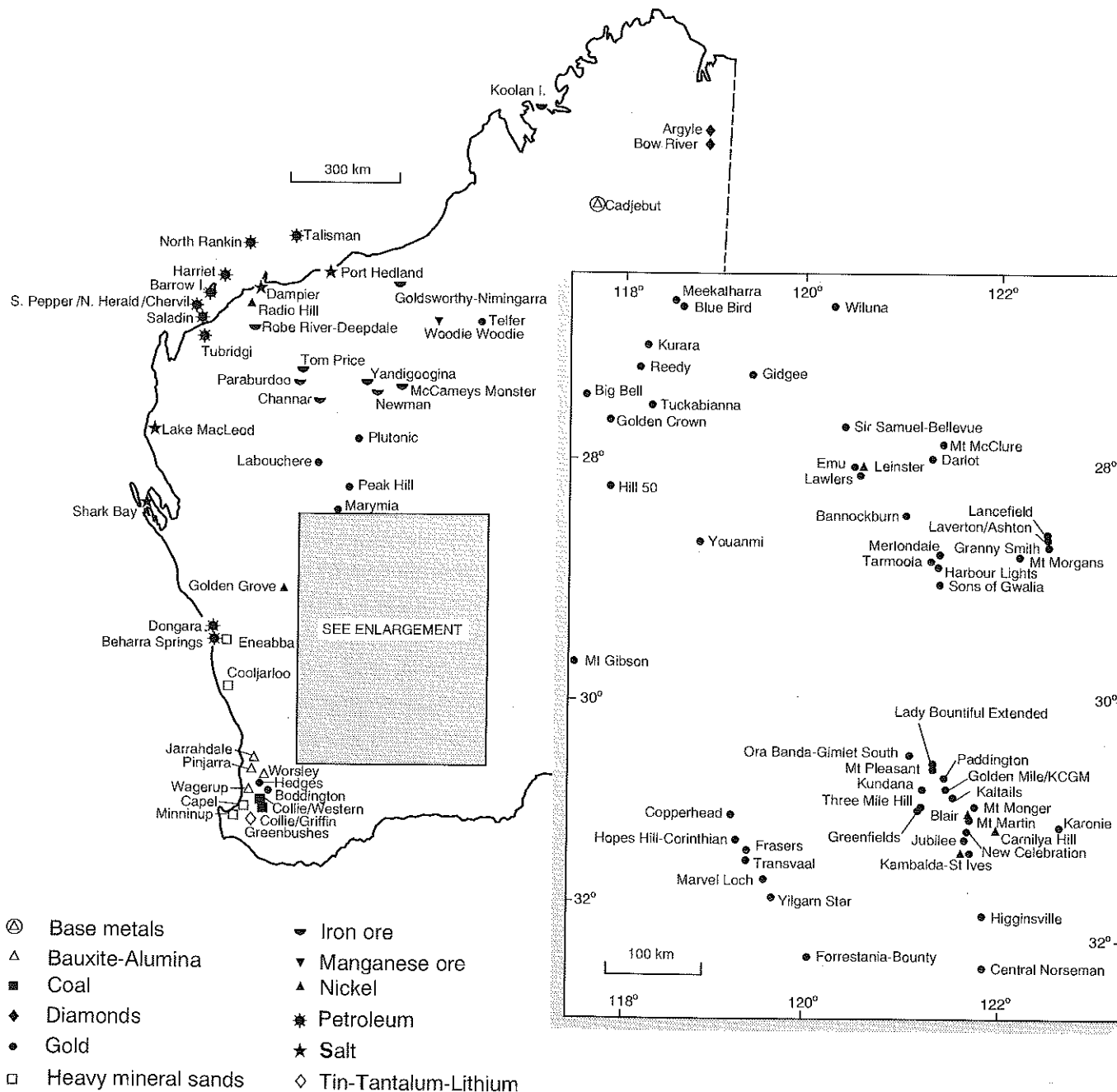
It is becoming increasingly difficult to separate the economic from social and political factors in their overall effect on resources development. This is particularly relevant due to the concern being expressed that many Australian based companies are increasingly targeting offshore locations for exploration and development investment opportunities. The practical application of sections of the Environmental Protection Act and the Aboriginal Heritage Act have been questioned by some members of the mining and petroleum industries. The debate over the appropriate balance between responsible economic development and other social issues is continuing.

Due to our increasingly open economy events and opportunities in other countries are having a large influence on Western Australia's resource sector. Exploration and development are now viable options in previously closed or economically inaccessible countries. It is natural that Australian companies should investigate these opportunities. The problem with these developments is that over the past two to three years exploration offshore has meant a complementary reduction in similar activity on the domestic front. As the level of Western Australian prospectivity is not the problem, the challenge is to look more closely at the other elements of an attractive investment environment.

FIGURE 1.2

MAJOR MINERAL AND PETROLEUM PROJECTS IN WESTERN AUSTRALIA

WITH AN ANNUAL VALUE OF PRODUCTION IN EXCESS OF \$10 MILLION

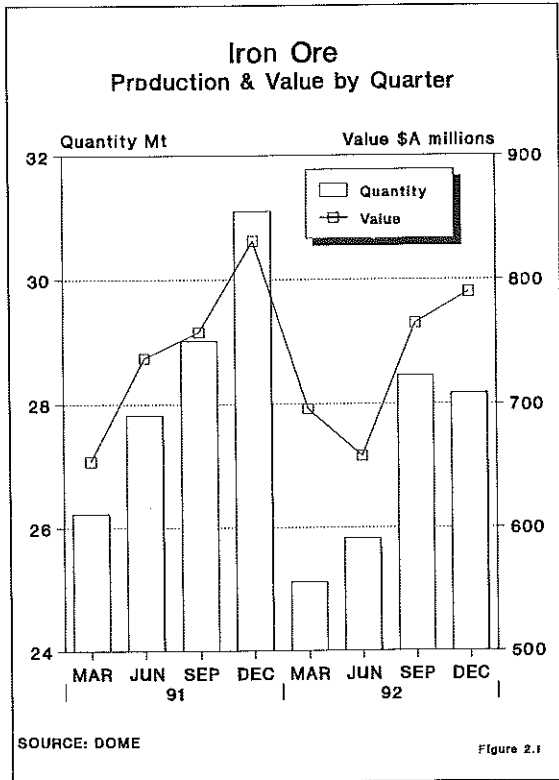


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2. REVIEW OF MAJOR MINERALS AND PETROLEUM

2.1 Iron Ore

The Western Australian iron ore industry performed relatively strongly during 1992. Just over 108 million tonnes was produced during the review period, a slight fall on the 1991 result (Figure 2.1). Export tonnages contracted as the subdued economic conditions affecting the major economies began to be felt in the State's major market, Japan.



SOURCE: DOME

Figure 2.1

Japan's aggregate steel production fell by 10% in 1992. The result was largely offset by strong growth from the regional steel making nations of China, Taiwan and Korea. These are all important present and longer term markets for Western Australian iron ore.

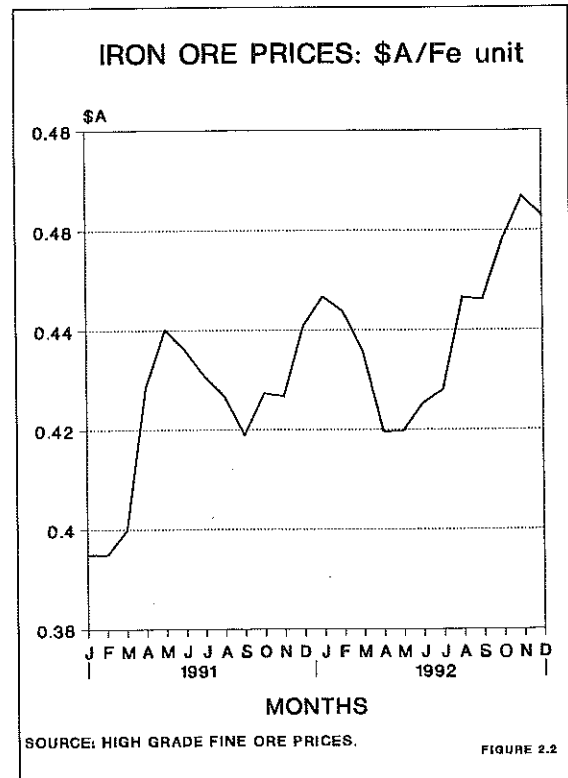
The Western European steel industry remained depressed with stagnating final demand and significant pockets of uneconomic capacity. The entire European regional steel sector will need to undergo further rationalisation before it is able to

aggressively tap the next upswing in economic activity.

It is unfortunate for the State's producers that the general downturn in the demand for iron ore has coincided with a marked increase in production capacity, notably the opening of new mines in Brazil and Peru.

The medium term outlook for Western Australia will include a further weakening in the trade prices of lump and fine ores. On the positive side, current production levels will be maintained, and increase slightly, with receipts rising as a result of a weaker Australian dollar. The steel producing and consuming nations of China, Taiwan and Korea seem set to continue on a robust growth path.

The sharp 11% decline in the Australia-Japan indicator contract price for 1993 was the second consecutive yearly reduction (Figure 2.2). The end of the stock run-down, which should occur during this year, and the fiscal boost which is now feeding through the Japanese economy should see a mild rebound in steel production and the return of demand growth in this crucial market.



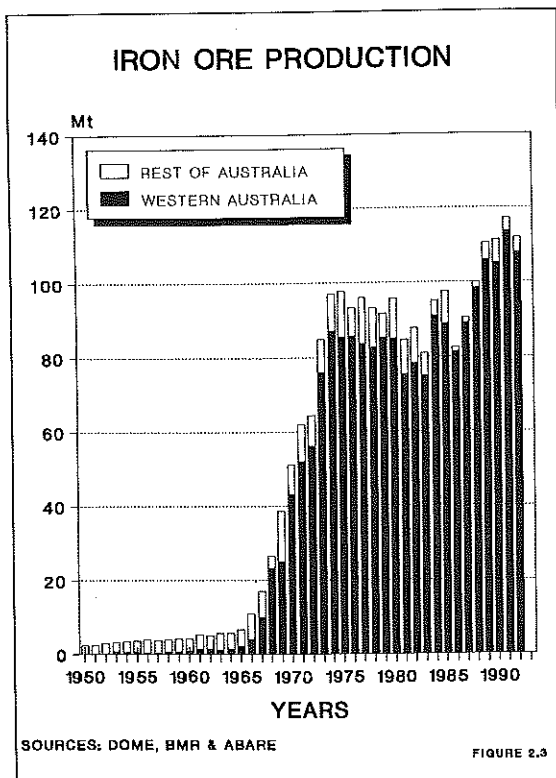
SOURCE: HIGH GRADE FINE ORE PRICES.

FIGURE 2.2

While there will be only limited growth in the global volume of iron ore traded during 1993, local producers are expected to increase output slightly. The Mt Channar mine is set for further expansion, as is production from Yandicoogina and the reopened Koolyanobbing operations. The Yarrie mine, under development in the Goldsworthy region, is scheduled to begin replacing output from Nimingarra and Sunrise Hill by early 1994. Development work on the massive Marandoo project will continue through 1993.

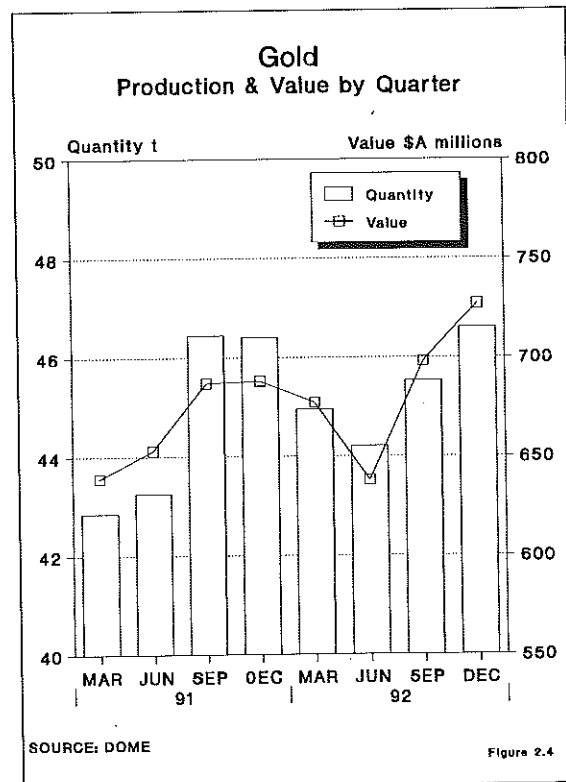
As the economic recovery in Australia gains momentum, domestic sales of iron ore can be expected to trend upwards in 1993/94. Western Australia's comparative advantage in the production of lump and fine ores is set to continue and improve during the outlook period. In addition to the State's proven position as a reliable iron ore exporter, the possibility also exists for the future development of some significant value adding capacity.

Western Australia continues to be the source of nearly all of the nation's iron ore production (Figure 2.3).



2.2 Gold

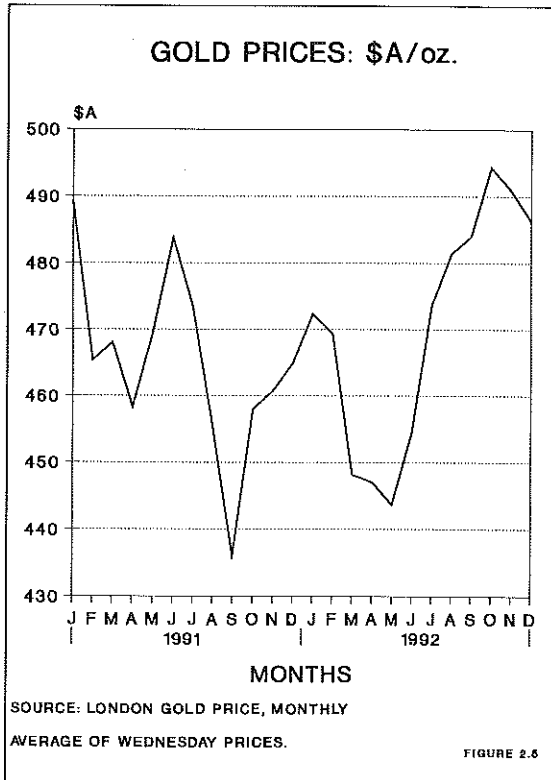
Output from the State's mines and estimated value of sales during 1992 were both up slightly on that recorded in 1991 (Figure 2.4). With total production strong at 181 tonnes the sector is well placed to ride out the current downturn in demand on world markets.



Although the gold price weakened slightly during the year, the effect on producer receipts was offset by a devaluation of the Australian dollar (Figure 2.5). With a rising average sale price for the precious metal, the 1992 total return to Western Australian miners is estimated to have exceeded \$2.7 billion.

The recent world supply growth, generated by stronger than expected mine production and sales by private sector agents, was exacerbated by some central banks liquidating a significant proportion of their stocks. Although fabrication demand remained solid, world economic conditions will need to improve considerably for growth to be sustained. It is estimated that, given a situation of moderate economic expansion, a gap should begin to emerge between the

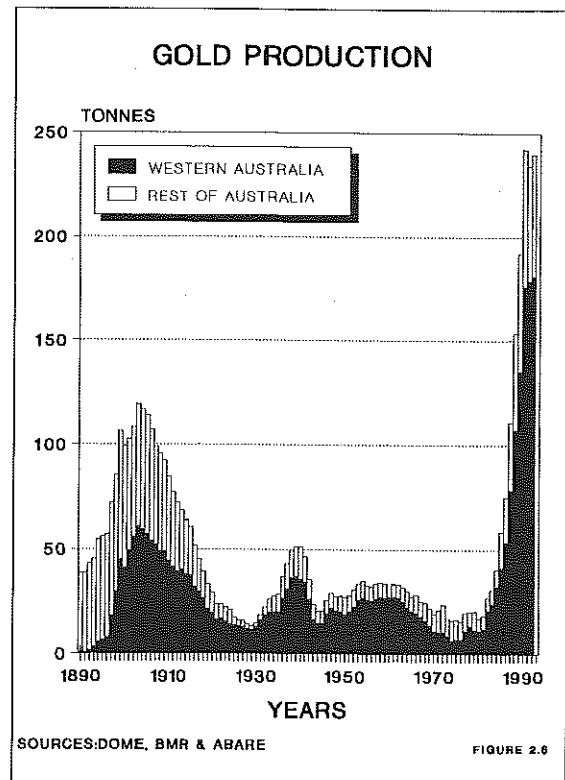
amount of gold demanded for jewellery fabrication and supply from all sources. All sources would in this case, comprise net official sales, disinvestment, scrap and forward sales, in addition to conventional mine production.



Faced with a situation of some market uncertainty, most Western Australian producers are persevering with as strategy of reducing costs and, where possible, consolidating operations. A notable reduction in greenfields exploration activity is an ongoing matter of concern for all industry members.

Despite a less than favourable investment environment four projects were commissioned during the year and at least that many more will come into production during 1993. Having depleted much of their oxide upper ore resources some local producers are making the reluctant transition to underground operations. The accessing of deep-seated sulphide ores from existing open cut workings will involve greater financial planning, new plant to treat refractory material and the potential disruption, at least in the short term, of steady cash flows.

Western Australia's dominance of national production (Figure 2.6) will continue in the medium term, as existing large producers decide between going into mechanised decline operations or expensive cutbacks to allow pits to be deepened. Either way the momentum of the industry will continue, even in the face of some market uncertainty.



2.3 Petroleum

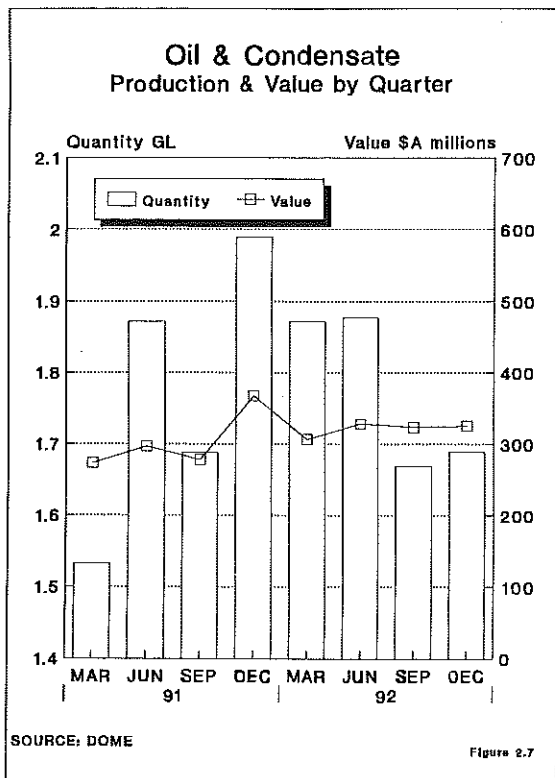
The State's petroleum sector recorded a small overall increase in value of production in 1992. The volume of oil and condensate produced and sold declined moderately in the final two quarters of the year. Because of a mid year devaluation of the Australian dollar, receipts remained fairly stable over the review period. (Figure 2.7).

A steady and continuing rate of growth was evident, with all products showing an improvement in volumes marketed or in receipts. While condensate and crude oil prices rose slightly, those applying to natural gas and LNG suffered some erosion.

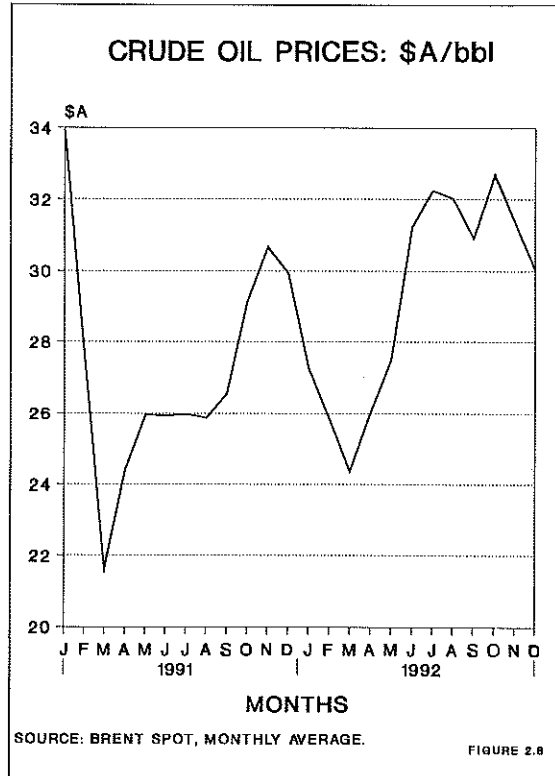
Total value of all petroleum sector output

increased by approximately 3% to just over \$2.6 billion. Total LNG sales were stable at \$970 million, as were natural gas receipts of \$370 million. Crude oil and condensate generated receipts of \$1.3 billion, a 6% increase on the 1991 result. The average trade weighted price of crude oil languished at around US\$ 20/bbl during most of the trading period, falling off slightly during the final two quarters. The effective devaluation of the local currency resulted in an average Australian dollar price of \$30/bbl applying to domestic production during the review period (Figure 2.8).

large volume exports from the Commonwealth of Independent States. Despite some exploration and development activity production, or more importantly exports, from that source are not expected to recover for some years.



Like most other commodities, petroleum sector products are proving very sensitive to general economic conditions. A relatively mild northern winter also militated against any spike in demand during 1992. On the supply side, the OPEC were able to hold crude oil output to just under 24 million barrels per day and thus effectively stabilise the market at that level of output. Given the prevailing weak oil price, there was little incentive for other producers to enter the market or for new projects to be developed. Another stabilising effect on world prices was the cessation of

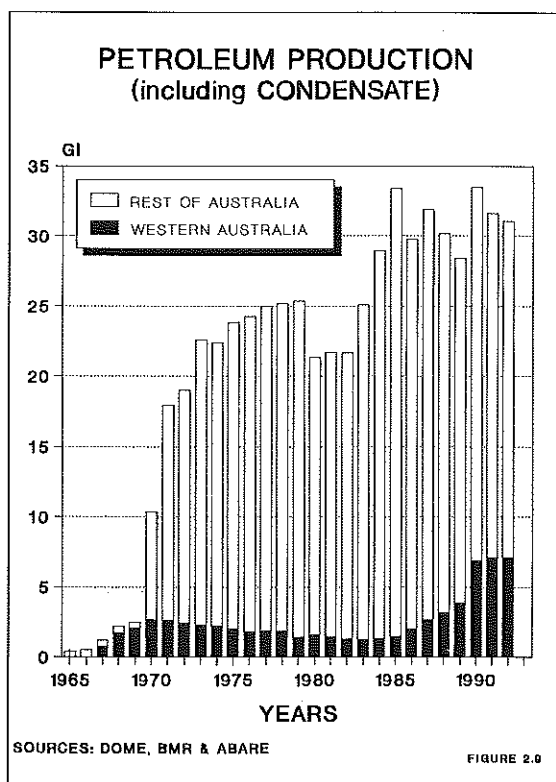


A generally high level of cooperation amongst the OPEC member nations, and the overall paucity of new major developments, should allow the organisation's market power to steadily increase.

The OPEC's market power to push up prices during any increase in general demand will only be circumscribed by the emergence of substitute fuels and by enhanced recovery techniques from existing operations. Because neither of these measures can be effected easily, windfall profits will be generated in the short term. Alternatively, in the absence of any sharp upturn in market demand, a general balance of interest among all producers should see real prices being maintained at current levels in the medium term. Analysts predict that any surge in demand growth will be driven by activity in developing countries. The industrialised nations are expected to

continue to moderate overall rates of consumption.

1992 was a year of mixed results for the North West Shelf project. On the positive side, a third LNG train was commissioned two years ahead of schedule. This new capacity will result in a production boost of 2.3 million tonnes per year. Also announced during the year was the participants intention to commit \$1.1 billion to develop the Cossack and Wanaea oilfields as a combined project.



The Griffin project, which will sell associated gas into the local market, was also given the go ahead during the period. An estimated \$270 million will be invested in the development of a field which contains reserves of over 100 million barrels. The Wandoo discovery, with estimated reserves of approximately 200 million barrels, is the most promising new offshore field. The Hadson gas gathering project came onstream during late 1992 and commenced a long term sales contract with SECWA.

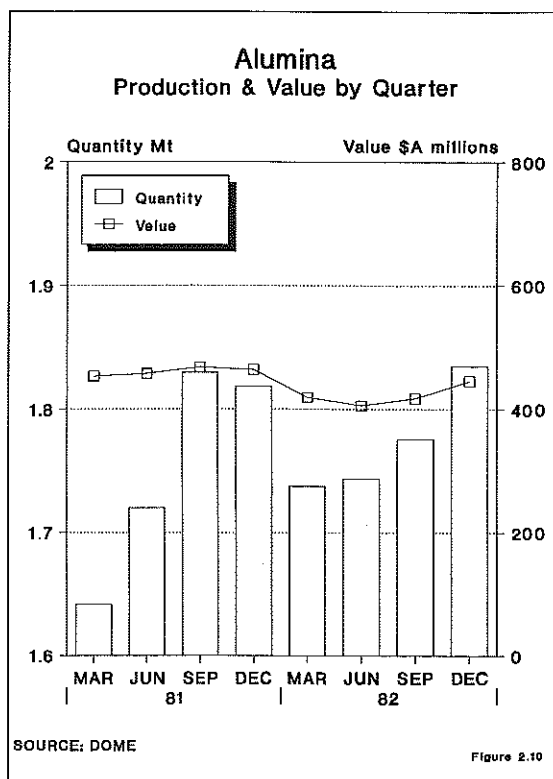
The principal setback to regional development encountered during the period occurred when

the joint venture participants struck problems with the installation of the Goodwyn A platform. It is estimated that it will result in a considerable delay in the commissioning of the platform.

The outlook for the Western Australian petroleum industry is for a steady increase in overall activity. In this, investment, exploration and development should continue to expand along with the State's share of the national output (Figure 2.9).

2.4 Alumina

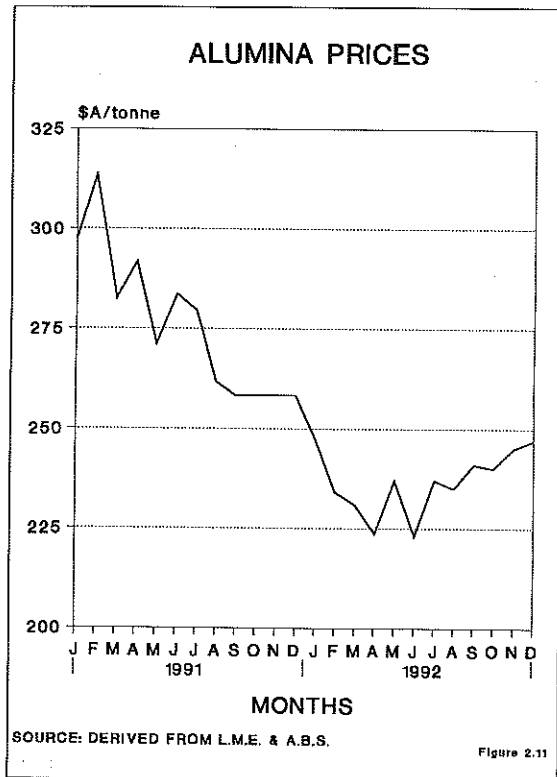
During 1992 the State's alumina producers continued a strategy of stabilising gross returns by increasing overall volume of production. A sustained period of price erosion has been the determining factor in this approach (Figure 2.10).



While the volume of sales increased slightly to 7.0 million tonnes during the year, receipts fell by 8% to \$1.7 billion (Figure 2.11).

In a development which would seem at odds with the usual aluminium-alumina price

relationship, spot price movements diverged significantly during the trading period. A relatively weak aluminium price coincided for the first time with a firming alumina price. The unit price of alumina has since stabilised at around US\$176.

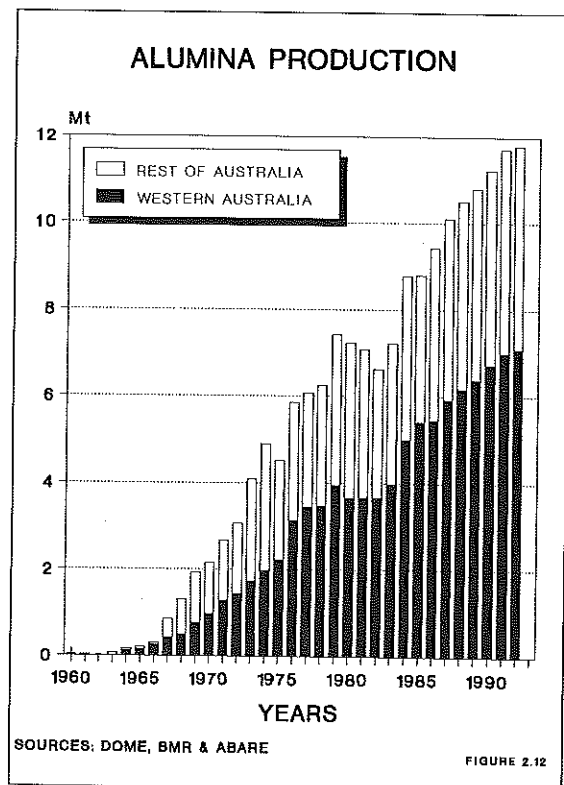


Globally, supply and demand began moving towards a rough equilibrium in the wake of lower utilisation in some major refineries and rising demand from China and the CIS.

The medium term price of alumina will return to being determined largely by the level of aluminium sales. With the primary market forecast to remain weak through most of 1993, Australian export unit values for alumina should rise only slightly in nominal terms. As aluminium producer demand is predicted to strengthen considerably over the next three years, alumina prices should rise by around 50% in real terms during the period. Although alumina refinery capacity will expand somewhat in the medium term, there remains a strong possibility that prices could spike due to intermittent supply shortages. While demand for alumina is forecast to rise, it is paradoxical that Western Australia's share of

world exports is forecast to fall. This will occur as domestic producers take up a greater share as inputs to aluminium manufacture.

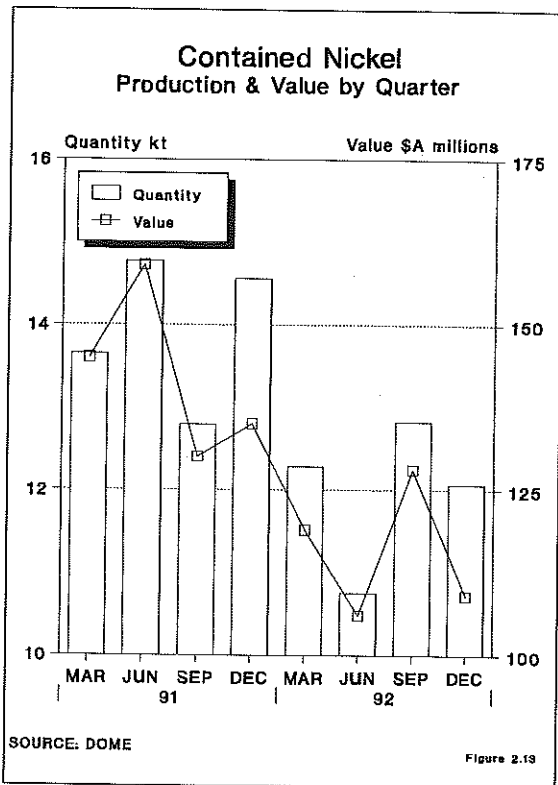
In response to the forecast of a steady improvement in demand from domestic and international refineries ALCOA has doubled capacity at its Wagerup refinery. The new infrastructure was commissioned in late 1992 and is steadily being brought up to full capacity. This and other planned expansions, will cement Western Australia's position as the nation's largest producer (Figure 2.12).



2.5 Nickel

The State's output and value of contained nickel continued to fall during 1992. Despite a steady erosion in the market price of the metal, gross production and sales did show some tentative signs of stability late in the trading period (Figure 2.13).

Total production of contained nickel fell by 14% to just under 48Kt, while the value of the output decreased by 19% to approximately \$462 million.

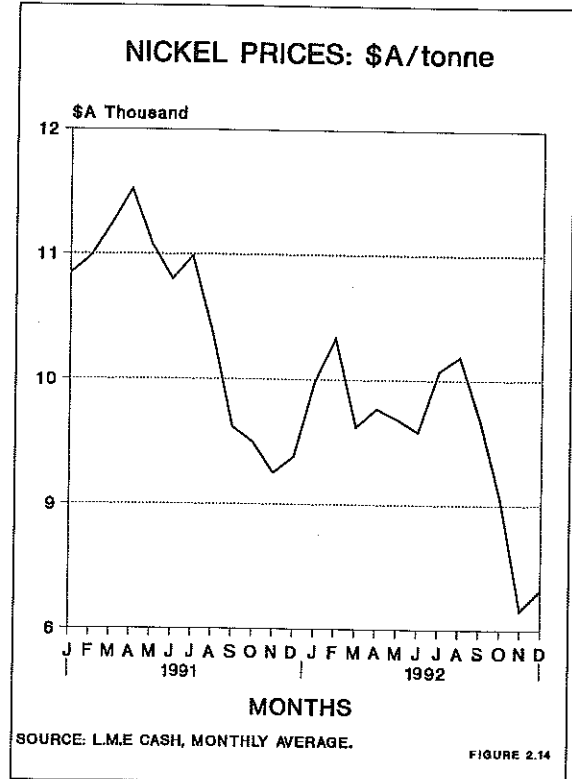


At year's end, the world's primary nickel price continued to bear the brunt of quite a severe supply-demand imbalance. The imbalance is being exacerbated by relatively strong production, which is being maintained in the face of weak demand, and the ready availability of scrap nickel. Average metal exchange prices contracted by approximately 20% in the last quarter of 1992 on the back of strong exports from the CIS (Figure 2.14).

There is, however, some relief in sight as market fundamentals are set to improve in the medium term and prices should begin to trend upwards during late 1993. The relative lack of both developmental greenfields projects and advanced major expansions, will limit supply growth. There is also an emerging decline in the availability of scrap nickel.

The market structure, characterised as it is by long time lags associated with bringing new capacity on stream and a metal price which is very volatile in the face of real or imagined shortages, will also enhance any sound recovery. Sharply increased consumption, associated with world economic recovery, will provide the main boost to the metal price in

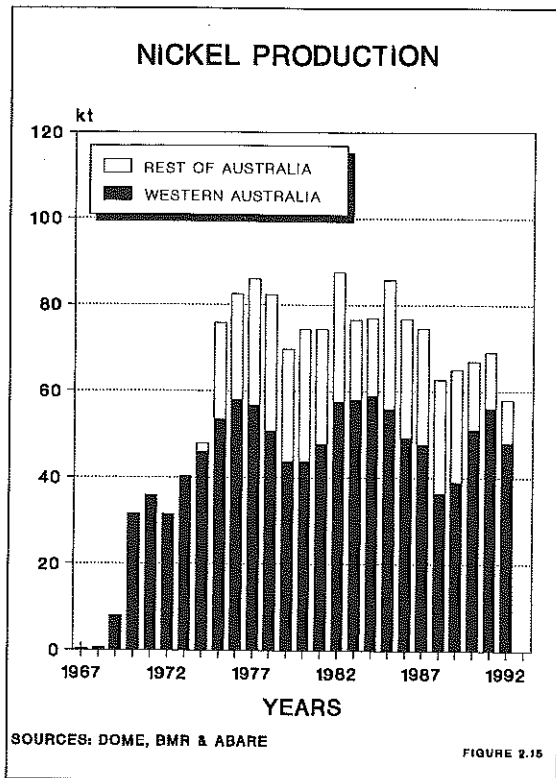
the medium term. The sustained period of low prices, which the industry is currently experiencing, is having the secondary effect of making stainless steel and nickel base alloy prices competitive with substitutes.



Western Australia will further consolidate its position as the nation's premier nickel province through the opening of new mines and the expansion of processing capacities at both Kalgoorlie and Kwinana. The new Forrestania project and proposed mines at Mt Keith and Yakabindie will significantly increase production capacity and allow higher export volumes during a period of steadily increasing real returns to producers. Mt Keith, regarded as the decade's first major greenfields nickel project, is expected to be in production by January 1995. The State's major producer is also focussing on structural unit cost cutting, through upgrading its smelting and refining control processes, and through workplace organisational changes.

Western Australia's nickel export earnings are projected to expand significantly in real terms over the next few years, and will comprise the majority of the national output of \$1.7 billion

per annum by 1997-98 (Figure 2.15).



2.6 Diamonds

The State's two producers experienced record levels of production, quantity of sales and value of sales during 1992. The gross weight of diamonds sold increased 25% to 41 million carats, receipts were about \$565 million. The average value per carat was slightly down on 1991.

The prolonged recession in the main industrialised countries, and the onset of the Japanese downturn, resulted in severely reduced demand for polished stones. The decline in business activity forced the Central Selling Organisation (CSO) to reduce its annual purchases of rough diamonds by 25%. The measure was introduced in the September quarter in order to protect the cost of holding stocks. It has affected both Western Australian producers, who sell almost all their production through the CSO. The alternative point of sale is through the Antwerp open market, another area of diminished activity.

The weakness of the global market was emphasised by concerns over the continued uncontrolled supply of rough diamonds from war ravaged Angola and Zaire. A degree of uncertainty also exists over the amount and type of gems flowing out of the Commonwealth of Independent States. In all cases, economic dislocation and the breakdown of central government authority are the principal factors preventing any effective agreements to control supply in the longer term.

The CSO is continuing to attempt to negotiate meaningful agreements with Angola, Zaire and the CIS which will restrain unauthorised diamond exports.

Argyle has made the decision to increase the capacity of its hard rock processing plant from 6 to 8 million tonnes per year. This move is designed to maintain production levels in the face of the lower grades encountered as mining progresses to deeper levels of the pipe. Although nearing the end of its life, the Normandy Poseidon Bow River operation is expected to maintain production into 1994.

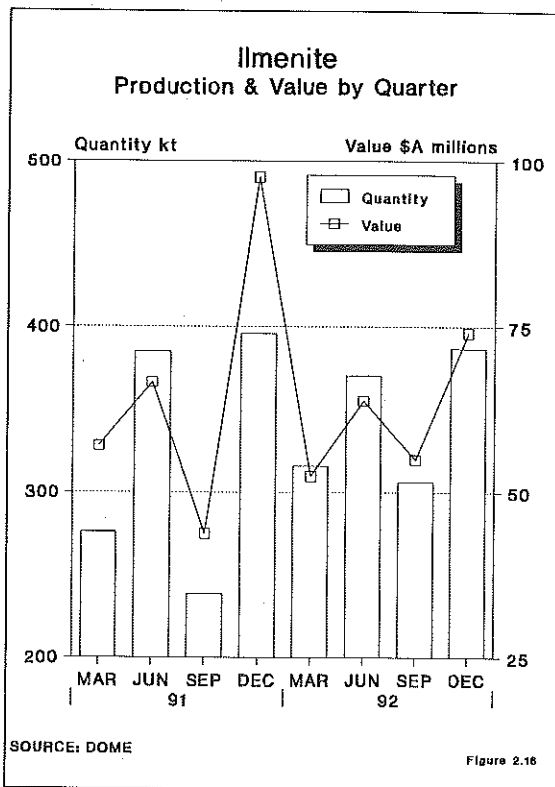
There are some signs that the depressed diamond market is set to rebound, but analysts are unable or unprepared to predict when an upturn may occur. It is expected that demand for diamonds will rise rapidly on recovery of the global economy, but this may not be during 1993.

Exploration for diamonds in Western Australia continues at a high level. Several prospects are expected to reach the advanced feasibility study level during 1993, with the strong possibility of increased future production.

2.7 Heavy Mineral Sands

State production of heavy mineral sands was again buffeted by the general state of market disequilibrium in 1992. Western Australian miners generally followed a strategy of

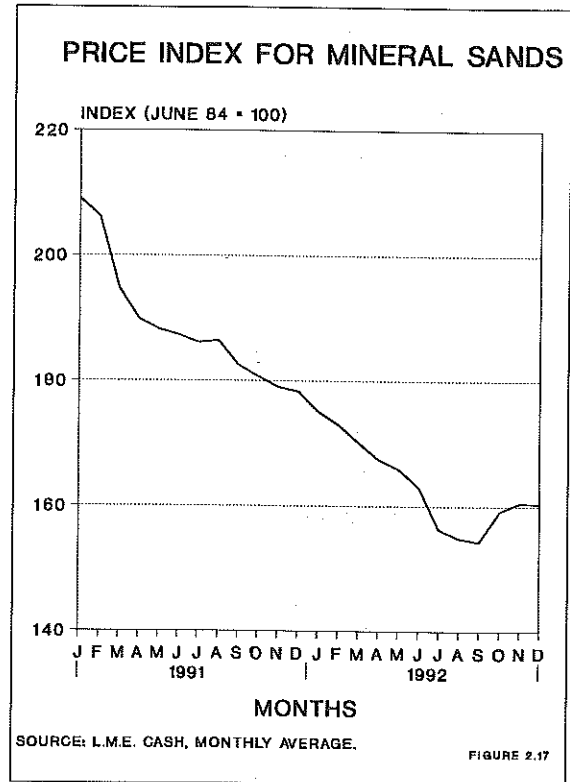
maintaining, or even increasing, ilmenite production levels to offset low prices. As a result, the overall quantity of ilmenite and synthetic rutile produced increased (Figure 2.16), although rutile production declined in response to very depressed prices. Zircon production rose as an effect of increased ilmenite production.



Prices received for titanium feedstock minerals fell by an average of 10% over the year. The price index for industry products showed the general fall in value is being maintained (Figure 2.17). Total industry value of production was \$345 million, an 8% contraction on 1991 receipts. Prices for secondary minerals also continued to drift.

As the gap between supply and demand widened, prices inevitably came under increased pressure. World consumption of titanium dioxide remained steady as new capacity continued to come on stream. The projected steady close down of older sulphate route operations, because of age, environmental constraints or high operating costs, failed to occur. The global production of ilmenite rose steadily as miners attempted to

offset lower prices. Synthetic rutile and zircon output also increased considerably.



Most producers had little success in establishing new markets or in shoring up sales support in existing consuming industries.

The established decline in prices for mineral sands commodities continued and even accelerated during the year.

While the demand for titanium dioxide pigment is expected to improve considerably over the next two years, thus removing a primary cause of low prices, supply will continue to expand. New projects and expansions may increase world production of ilmenite, rutile and zircon by up to 30%. South African production in particular is expected to rise sharply. Similar developments in a range of other countries could result in a supply/demand imbalance for zircon as well as for pigment feedstocks, thereby keeping prices depressed for several years.

In the face of some considerable uncertainty, Western Australian miners are generally taking a cautious approach in their operating

TABLE 3.1

QUANTITY AND VALUE OF MINERALS AND PETROLEUM 1991, 1992

MINERAL	UNIT	1991		1992	
		QUANTITY	VALUE(\$)	QUANTITY	VALUE(\$)
BASE METALS					
Copper Metal	t	11 793	17 918 620	12 093	18 677 215
Lead Metal	t	10 698	4 348 109	20 964	7 429 363
Zinc Metal	t	112 015	94 691 818	141 385	132 984 006
TOTAL BASE METALS			116 958 547		159 090 584
BAUXITE-ALUMINA					
Alumina	t	7 009 184	1 844 032 647	7 082 757	1 689 720 803
CLAYS					
Attapulgit	t	17 245	4 617 226	20 697	6 315 851
Cement Clay	t	32 795	234 039	6 940	74 168
Fire Clay	t	0	0	6 508	7 810
Kaolin	t	3 100	204 400	2 692	172 726
White Clay	t	14 611	160 718	22 575	225 745
TOTAL CLAYS		67751	5 216 383	59412	6 796 300
COAL	t	5 114 267	228 561 597	5 655 459	251 762 799
CONSTRUCTION MATERIALS					
Aggregate	t	133 683	719 267	148 082	898 292
Gravel	t	47 361	244 227	121 884	605 423
Rock	t	44 485	469 114	140 597	428 656
Sand	t	781 523 (r)	4 121 913 (r)	1 060 968	5 415 512
TOTAL CONSTRUCTION MATERIALS			5 554 521		7 347 883
DIAMOND	ct	33 358 098 (r)	456 926 660	41 453 238	565 061 845
DIATOMITE	t	22	160	169	1 300
DIMENSION STONE					
Black Granite	t	1 086	399 869	5 079	1 673 375
Quartz Rock	t	362	16 266	974	43 791
Spongolite	t	437	35 834	254	16 832
TOTAL DIMENSION STONE		1685	451 969	6367	1 733 998
GEM, SEMI-PRECIOUS & ORNAMENTAL STONE					
Agate	kg	0	0	10 260	11 286
Amethyst	kg	24 617	131 426	17 659	127 910
Chrysoprase	kg	1 800	32 500	37 048	1 163 695
Jasper	kg	0	0	8 844	7 499
Tourmaline	kg	0	0	81	15 713
Variscite	kg	0	0	1 143	6 680
TOTAL GEM SEMI-PRECIOUS & ORNAMENTAL STONE			163 926		1 332 783

TABLE 3.1 (cont)		1991		1992	
MINERAL	UNIT	QUANTITY	VALUE(\$)	QUANTITY	VALUE(\$)
GOLD	kg	178 988 (r)	2 666 776 246 (r)	181 286 (e)	2 739 447 394 (e)
GYPSUM	t	75 750	635 499	99 071	993 750
HEAVY MINERAL SANDS					
Gamet	t	30 732	2 880 905	38 140	3 611 274
Ilmenite	t	936 778	81 499 614 (r)	1 044 856	87 296 010
Upgraded Ilmenite (a)	t	317 958 (r)	162 169 871 (r)	334 480	157 877 255
Leucoxene	t	12 944	8 064 715	11 463	5 204 073
Monazite	t	7 173	2 155 801	5 012	1 452 698
Rutile	t	59 134	39 661 379	68 964	39 051 843
Zircon	t	204 332	79 156 923	265 166	51 456 028
TOTAL HEAVY MINERAL SANDS			375 589 208		345 949 181
INDUSTRIAL PEGMATITE MINERALS					
Felspar	t	17 499	715 084	25 800	1 132 516
Mica	t	473	14 839	0	0
TOTAL INDUSTRIAL PEGMATITE MINERALS			729 923		1 132 516
IRON ORE					
Domestic	t	4 773 385	128 740 105	5 638 929	159 029 485
Exported	t	109 394 339	2 849 976 022 (r)	102 508 204	2 762 946 127
TOTAL IRON ORE		114 167 724	2 978 716 127 (r)	108 147 133	2 921 975 612
LIMESAND-LIMESTONE-DOLOMITE					
Dolomite	t	0	0	280	1 120
Limesand-Limestone	t	1 737 984 (r)	9 709 097 (r)	2 083 846	13 055 973
TOTAL LIMESAND-LIMESTONE-DOLOMITE			9 709 097 (r)		13 057 093
MANGANESE ORE	t	209 640	37 774 547	402 844	72 200 142
NICKEL INDUSTRY					
Cobalt by-product	t	288	6 062 266	487	26 384 773
Nickel Concentrate	t	521 511	567 874 813	462 786	457 569 201
Nickel Matte	t	0	0	1 056	2 202 178
Nickel Ore	t	2 318	1 368 276	2 892	1 767 117
Palladium by-product	kg	351	1 260 296	539	1 372 039
Platinum by-product	kg	82 (r)	1 494 173	143	1 249 742
TOTAL NICKEL INDUSTRY			578 059 824		490 545 050
PEAT	t	403	29 974	918	68 315

TABLE 3.1 (cont)		1991		1992	
MINERAL	UNIT	QUANTITY	VALUE(\$)	QUANTITY	VALUE(\$)
PETROLEUM					
Condensate	kl	1 869 768	313 744 896	2 060 353	366 702 321
Crude Oil	kl	5 214 637	901 415 578	5 046 694	917 363 371
LNG	MMBtu	204 799 068	957 953 276	237 642 529	966 473 640
Natural Gas	'000m ³	3 738 455	372 203 226	3 776 068	368 955 578
TOTAL PETROLEUM			2 545 316 976		2 619 494 910
SALT	t	6 827 230	149 355 769	6 671 678	155 392 954
SILICA-SILICA SAND					
Silica	t	76 612	782 017	66 253	697 757
Silica Sand	t	669 384	6 390 188	519 642	4 973 830
TOTAL SILICA-SILICA SAND		745 996	7 172 205	585 895	5 671 587
SILVER	kg	39 306 (r)	5 956 148 (r)	65 929	10 224 887
TALC	t	165 263	11 568 410	166 574	11 712 450
TIN-TANTALUM-LITHIUM					
Spodumene	t	43 281	7 619 341	39 980	8 095 473
Tantalite	t	668	18 726 310	925	29 733 847
Tin	t	272	1 268 035	284	1 472 341
TOTAL TIN-TANTALUM-LITHIUM			27 613 686		39 301 661
VERMICULITE	t	580	103 018	308	54 754
TOTAL VALUE			12 052 973 067 (r)		12 110 070 551 (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

TABLE 4.1 QUANTITY AND VALUE OF MINERALS AND PETROLEUM BY LOCAL GOVERNMENT AREA

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value (\$)	Ref
BASE METALS			Cu Tonnes		
Copper By-Product	Coolgardie		4 658,344	5 506 597	
	Roeboome		<u>201,754</u>	<u>243 887</u>	
			4 860,098	5 750 484	(a) (b)
			Cu %		
Copper Concentrates	Boddington	9 299	30.82	5 720 073	226 5-95
	Meekatharra	8 049	20.14	2 011 350	1621-07
	Yalgoo	<u>13 733</u>	<u>20.00</u>	<u>5 195 308</u>	2746-6
		31 081		12 926 731	(a)
Total Copper				18 677 215	
			Pb %		
Lead	Derby-West Kimberley	26 431	79.31	7 429 363	(a)
			Zn %		
Zinc	Derby-West Kimberley	119 702	56.09	64 562 483	
	Yalgoo	<u>175 457</u>	<u>42.31</u>	<u>68 421 523</u>	
		295 159		132 984 006	(a)
TOTAL BASE METALS				159 090 584	
BAUXITE - ALUMINA					
Alumina	Boddington	1 584 500		403 407 178	
	Harvey	922 873		216 269 177	
	Murray	2 827 815		661 429 273	
	Serpentine-Jarrahdale	<u>1 747 569</u>		<u>408 615 175</u>	
		7 082 757		1 689 720 803	(c)
CLAYS					
Attapulgit	Mullewa	20 697		6 315 851	(a)
Cement Clay	Armadale	6 940		74 168	(d)
Fire Clay	Chittering	6 508		7 810	(d)
Kaolin	Bridegetown-Greenbushes	2 692		172 726	(d)
White Clay	Swan	<u>22 575</u>		<u>225 745</u>	(d)
TOTAL CLAYS		59 412		6 796 300	
COAL	Collie	5 655 459		251 762 799	(e)
CONSTRUCTION MATERIALS					
Aggregate	Derby-West Kimberley	2 564		13 220	
	Kalgoorlie-Boulder	98 260		582 366	
	Port Hedland	35 427		226 978	
	Roeboome	430		7 322	

TABLE 4.1 (cont)		Quantity	Metallic		
Mineral	Local Government Area	tonnes	Content	Value (\$)	Ref
CONSTRUCTION MATERIALS (cont)					
Aggregate (cont)	Wyndham-East Kimberley	<u>11 401</u>		<u>68 406</u>	
Total Aggregate		148 082		898 292	
Gravel	Broome	1 346		2 122	
	Coolgardie	5 170		17 620	
	Kalamunda	24 018		130 833	
	Nannup	18 650		92 348	
	Port Hedland	72 000		360 000	
	Shark Bay	200		1 000	
	Wyndham-East Kimberley	<u>500</u>		<u>1 500</u>	
Total Gravel		121 884		605 423	
Rock	Broome	16 192		206 419	
	Exmouth	5 891		27 470	
	Port Hedland Town	98 950		75 046	
	Roeboume	15 504		111 421	
	Shark Bay	60		300	
	Yilgam	<u>4 000</u>		<u>8 000</u>	
Total Rock		140 597		428 656	
Sand	Ashburton	9 256		47 405	
	Canning	436 207		2 217 360	
	Camarvon	3 682		18 410	
	Cockburn	2 870		11 480	
	Collie	55 065		330 387	
	Coolgardie	69 017		348 545	
	Dandaragan	1 420		8 520	
	Derby-West Kimberley	315		2 197	
	East Pilbara	2 272		13 632	
	Gingin	2 223		13 341	
	Leonora	8 298		49 788	
	Meekatharra	34 844		209 064	
	Menzies	514		2 570	
	Nannup	220		4 400	
	Northam	6 998		24 035	
	Port Hedland	65 478		320 739	
	Roeboume	346 508		1 745 405	

TABLE 4.1 (cont)	Local	Quantity	Metallic		
Mineral	Government Area	tonnes	Content	Value (\$)	Ref
CONSTRUCTION MATERIALS (cont)					
Sand (cont)	Swan	8 779		17 693	
	Wanneroo	238		357	
	Wyndham	1 564		9 384	
	Yilgam	5 200		20 800	
Total Sand		1 060 968		5 415 512	
TOTAL CONSTRUCTION MATERIALS				7 347 883	(d)
DIAMOND					
		Carats			
DIAMOND	Wyndham-East Kimberley	41 453 238		565 061 845	(a)
DIATOMITE					
DIATOMITE	Dandaragan	169		1 300	(d)
DIMENSION STONE					
Black Granite	Derby-West Kimberley	4 575		1 523 475	
	Dundas	504		149 900	
Total Black Granite		5 079		1 673 375	(d)
Quartz Rock	Mukinbudin	974		43 791	(d)
Spongolite	Plantagenet	254		16 832	(e)
TOTAL DIMENSION STONE				1 733 998	
GEM, SEMI-PRECIOUS AND ORNAMENTAL STONE					
		kg			
Agate	East Pilbara	10 260		11 286	
		kg			
Amethyst	Upper Gascoyne	17 659		127 910	
		kg			
Chrysoprase	Laverton	24 943		453 749	
	Menzies	12 105		709 946	
Total Chrysoprase		37 048		1 163 695	
		kg			
Jasper	East Pilbara	8 844		7 499	
		kg			
Toumaline	Yilgam	81		15 713	
		kg			
Variscite	Meekatharra	1 143		6 680	
TOTAL GEM SEMI-PRECIOUS AND ORNAMENTAL STONE				1 332 783	(e)
GOLD					
			Au kg		
GOLD	Ashburton		14.387	217 291	
	Boddington		16 017.535	241 431 189	
	Camarvon		0.486	7 340	
	Coolgardie		15 820.785	239 604 904	

TABLE 4.1 (cont)		Quantity	Metallic		
Mineral	Local Government Area	tonnes	Content	Value (\$)	Ref
GOLD (cont)			Au kg		
	Cue		11 158.449	168 635 221	
	Dundas		1 556.876	23 555 745	
	East Pilbara		12 457.186	188 334 809	
	Kalg.-Boulder		45 844.609	692 236 754	
	Laverton		13 097.064	197 841 133	
	Leonora		18 200.699	275 313 395	
	Meekatharra		17 349.473	262 404 210	
	Menzies		565.056	8 722 369	
	Mt Magnet		5 314.101	80 403 579	
	Roeboume		4.762	71 922	
	Sandstone		3 831.290	57 806 588	
	Wiluna		3 999.315	60 372 990	
	Yalgoo		2 004.261	30 206 901	
	Yilgam		<u>14 049.565</u>	<u>212 281 054</u>	
			181 285.899	2 739 447 394	(f)
GYPSUM					
	Dalwallinu	25 823		420 002	(d)(e)
	Esperance	4 205		24 797	(e)
	Irwin	15 423		242 453	(e)
	Kellerberrin	1 500		10 500	(e)
	Lake Grace	3 943		16 697	(e)
	Merredin	1 055		7 385	(e)
	Nungarin	22 329		133 732	(e)
	Ravensthorpe	2 750		16 500	(e)
	Wyalkatchem	<u>22 043</u>		<u>121 684</u>	(e)
		99 071		993 750	
HEAVY MINERAL SANDS					
Gamet Sand					
	Capel	784		62 482	(g)
	Northampton	<u>37 356</u>		<u>3 548 792</u>	(e)
Total Gamet Sand		38 140		3 611 274	
Ilmenite			TiO ₂ %		
	Capel	635 139	54.81)		
	Camamah	103 473	59.34)		
	Dandaragan	229 443	62.98)		
	Warooka	<u>76 801</u>	<u>54.53)</u>		
Total Ilmenite		1 044 856		87 296 010	

Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value (\$)	Ref
TABLE 4.1 (cont)					
HEAVY MINERAL SANDS (cont)			TiO₂ %		
Upgraded Ilmenite	Capel	173 414	92.00)		
	Camamah	131 415	92.00)		
	Dandaragan	<u>29 651</u>	<u>92.00)</u>		
Total Upgraded Ilmenite		334 480		157 877 255	
TOTAL ILMENITE		1 379 336		245 173 265	(a)
			TiO₂ Tonnes		
Leucoxene	Capel	10 096	9 200	4 745 973	
	Warooka	<u>1 367</u>	<u>1 245</u>	<u>458 100</u>	
Total Leucoxene		11 463	10 445	5 204 073	(a)
			ThO₂ Units		
Monazite	Capel	1 409	9 137	403 715	
	Camamah	<u>3 603</u>	<u>23 419</u>	<u>1 048 983</u>	
Total Monazite		5 012	32 556	1 452 698	(a)
			TiO₂ Tonnes		
Rutile	Camamah	53 438	49 666	31 103 986	
	Dandaragan	<u>15 526</u>	<u>14 905</u>	<u>7 947 857</u>	
Total Rutile		68 964	64 571	39 051 843	(a)
			ZrO₂ Tonnes		
Zircon	Capel	60 779	39 521	12 454 622	
	Camamah	147 072	96 528	28 528 795	
	Dandaragan	52 099	34 385	9 501 081	
	Warooka	<u>5 216</u>	<u>3 394</u>	<u>971 530</u>	
Total Zircon		265 166	173 828	51 456 028	(a)
TOTAL HEAVY MINERAL SANDS				345 949 181	
INDUSTRIAL PEGMATITE MINERALS					
Felspar	Mukinbudin	13 249		607 590	
	Port Hedland	12 551		524 926	
		25 800		1 132 516	(h)
IRON ORE					
			Fe %		
Domestic Ore	Ashburton	669 221	59.69	16 699 699	
	Derby-West Kimberley	1 281 514	64.64	37 243 448	
	East Pilbara	<u>3 688 194</u>	<u>62.77</u>	<u>105 086 338</u>	
Total Domestic Ore		5 638 929		159 029 485	

TABLE 4.1 (cont)	Local	Quantity	Metallic		
Mineral	Government Area	tonnes	Content	Value (\$)	Ref
IRON ORE (cont)			Fe %		
Exported Ore	Ashburton	64 254 376	61.45	1 680 457 807	
	Derby-West Kimberley	2 255 444	64.11	56 103 713	
	East Pilbara	<u>35 998 384</u>	62.90	<u>1 026 384 607</u>	
Total Exported Ore		102 508 204		2 762 946 127	
TOTAL IRON ORE		108 147 133		2 921 975 612	(a)
LIMESAND - LIMESTONE-DOLOMITE					
Dolomite	Westonia	280		1 120	
Limesand - Limestone	Cockburn	1 625 529		8 249 003	
	Dandaragan	2 893		14 445	
	Dundas	112 281		1 021 539	
	Gingin	38 572		889 107	
	Irwin	3 845		17 362	
	Roeboume	<u>69</u>		<u>345</u>	
	Wanneroo	300 657		2 864 172	
TOTAL LIMESAND-LIMESTONE		2 084 126		13 057 093	(d)
MANGANESE ORE			Mn %		
	East Pilbara	402 844	47.26	72 200 142	(a)
NICKEL INDUSTRY			Co Tonnes		
Cobalt By-Product	Coolgardie		485.055	26 242 055	
	Roeboume		<u>2.028</u>	<u>142 718</u>	
Total Cobalt By-Product			487.083	26 384 773	(a) (b)
			Ni %		
Nickel Concentrates	Coolgardie	241 421	10.62	245 884 562	
	Kalgoorlie-Boulder	35 514	10.49	35 813 722	
	Leonora	185 851	9.82	175 870 917	
Total Nickel Concentrates		462 786		457 569 201	
			Ni %		
Nickel Matte	Roeboume	1 056	22.30	2 202 178	
			Ni %		
Nickel Ore	Coolgardie	2 892	6.33	1 767 117	
TOTAL NICKEL PRODUCTION				461 538 496	(i)
			Pd kg		
Palladium By-Product	Coolgardie		537.065	1 365 088	
	Roeboume		<u>1.752</u>	<u>6 951</u>	
Total Palladium By-Product			538.817	1 372 039	(a) (b)

TABLE 4.1 (cont)					
Mineral	Local Government Area	Quantity tonnes	Metallic Content	Value (\$)	Ref
NICKEL INDUSTRY (cont)			Pt kg		
Platinum By-Product	Coolgardie		142.690	1 246 877	
	Roeboume		<u>0.181</u>	<u>2 865</u>	
Total Platinum By-Product			142.871	1 249 742	(a) (b)
PEAT	Manjimup	918		68 315	(d)
PETROLEUM		Kilolitres			
Condensate	Camamah	536		23 585	(d)
	Irwin	1 965		288 342	(d)
	Roeboume	<u>2 057 852</u>		<u>366 390 394</u>	(a)
Total Condensate		2 060 353		366 702 321	
		Kilolitres			
Crude Oil	Derby-West Kimberley	18 711		2 866 360	
	Irwin	33 367		4 789 927	
	Roeboume	<u>4 994 616</u>		<u>909 707 084</u>	
Total Crude Oil		5 046 694		917 363 371	(a)
		MMBtu			
Liquified Natural Gas	Roeboume	237 642 529		966 473 640	(a)
		'000 m3			
Natural Gas	Ashburton	217 027		14 975 426	(j)
	Camamah	62 513		7 077 593	(j)
	Irwin	162 541		19 678 988	(j)
	Roeboume	<u>3 333 987</u>		<u>327 223 571</u>	(d)(j)
Total Natural Gas		3 776 068		368 955 578	
TOTAL PETROLEUM PRODUCTS				2 619 494 910	
SALT	Camarvon	1 257 556		30 224 146	
	Esperance	4 879		122 900	
	Port Hedland	2 176 016		47 436 377	
	Roeboume	2 602 427		62 068 527	
	Shark Bay	538 193		11 845 004	
	Yilgam	<u>92 607</u>		<u>3 696 000</u>	
		6 671 678		155 392 954	(a)
SILICA - SILICA SAND					
Silica	Moora	66 253		697 757	(a)
Silica Sand	Canning	121 094		1 332 030	(a)
	Cockburn	243 095		2 674 045	(a)
	Coolgardie	75 503		184 982	(a)
	Swan	58 989		648 879	(e)

TABLE 4.1 (cont)	Local	Quantity	Metallic		
Mineral	Government Area	tonnes	Content	Value (\$)	Ref
SILICA - SILICA SAND (cont)	Wanneroo	<u>20 961</u>		<u>133 894</u>	(a)
TOTAL SILICA - SILICA SAND		585 895		5 671 587	
		Ag kg			
SILVER: BY-PRODUCT	Boddington	1 925.490		295 261	(a) (l)
	Coolgardie	186.689		30 930	(a) (b)
	Meekatharra	4 680.760		718 216	(a) (k)
	Roeboome	1 260.903		146 367	(a) (b)
	State-Wide	28 444.052		4 416 953	
	Yalgoo	<u>29 431.320</u>		<u>4 617 160</u>	(a) (l)
		65 929.214		10 224 887	
TALC	Meekatharra	29 239		2 046 730	
	Three Springs	<u>137 335</u>		<u>9 665 720</u>	
		166 574		11 712 450	(e)
TIN - TANTALUM - LITHIUM			Li ₂ O%		
Spodumene	Bridegetown-Greenbushes	39 980	5.61	8 095 473	(a)
			Ta ₂ O ₅ kg		
Tantalite	Bridegetown-Greenbushes	706	178 735	17 518 847	
	East Pilbara	<u>219</u>	<u>94 777</u>	<u>12 215 000</u>	
Total Tantalite		925	273 512	29 733 847	(a)
			Sn Tonnes		
Tin	Bridegetown-Greenbushes	284	194	1 458 699	
	East Pilbara		4	13 642	
Total Tin		284	198	1 472 341	(a)
VERMICULITE	Ravensthorpe	308		54 754	(e)
			VALUE OF MINERALS	6 751 128 247	
			VALUE OF PETROLEUM	2 619 494 910	
			VALUE OF GOLD	<u>2 739 447 394</u>	
			TOTAL VALUE	12 110 070 551	

TABLE 5.1

ROYALTY RECEIPTS 1991, 1992

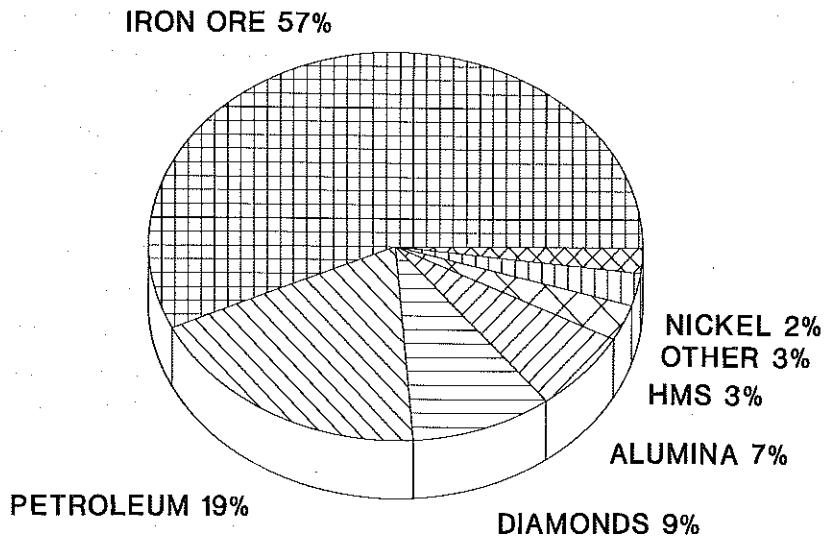
Mineral	1991	1992	Value \$A	%up
	\$A	\$A	Variance	(%down)
BASE METALS				
Copper	967 560.29	578 052.51	(389 507.78)	(40)
Lead	249 837.03	317 505.14	67 668.11	27
Zinc	4 420 146.83	5 144 406.96	724 260.13	16
TOTAL BASE METALS	5 637 544.15	6 039 964.61	402 420.46	7
BAUXITE-ALUMINA				
Alumina	30 697 525.82	28 084 011.51	(2 613 514.31)	(9)
CLAYS	306 728.69	307 685.09	956.40	0
COAL	6 885 678.01	10 905 731.88	4 020 053.87	58
CONSTRUCTION MATERIALS				
Aggregate	23 153.90	32 643.84	9 489.94	41
Gravel	8 422.80	42 337.02	33 914.22	403
Rock	8 658.01	40 921.88	32 263.87	373
Sand	273 612.84	241 167.76	(32 445.08)	(12)
TOTAL CONSTRUCTION MATERIALS	313 847.55	357 070.50	43 222.95	14
DIAMOND	20 363 022.21	42 342 417.43	21 979 395.22	108
DIMENSION STONE	11 166.26	12 453.17	1 286.91	12
GEM, SEMI(PRECIOUS & ORNAMENTAL STONE	9 856.91	151 822.86	141 965.95	1 440
GOLD	284 790.25	212 908.33	(71 881.92)	(25)
GYPSUM	22 413.96	27 188.65	4 774.69	21
HEAVY MINERAL SANDS				
Gamet	123 715.21	174 534.51	50 819.30	41
Ilmenite	4 316 712.89	5 158 819.13	842 106.24	20
Leucoxene	411 202.43	192 234.49	(218 967.94)	(53)
Monazite	192 847.85	133 355.51	(59 492.34)	(31)
Rutile	2 164 976.76	2 191 318.58	26 341.82	1
Zircon	5 107 124.12	2 462 308.99	(2 644 815.13)	(52)
TOTAL HEAVY MINERAL SANDS	12 316 579.26	10 312 571.21	(2 004 008.05)	(16)
INDUSTRIAL PEGMATITE MINERALS				
Felspar	35 949.43	58 558.77	22 609.34	63
Mica	1 380.00	0.00	(1 380.00)	(100)
TOTAL INDUSTRIAL PEGMATITE MINERALS	37 329.43	58 558.77	21 229.34	57

TABLE 5.1 (cont)	1991	1992	Value \$A	%up
Mineral	\$A	\$A	Variance	(%down)
IRON ORE	144 741 902.09	151 445 144.37	6 703 242.28	5
LIMESAND-LIMESTONE-DOLOMITE				
Dolomite	0.00	84.00	84.00	n.ap.
Limesand(Limestone)	79 082.54	168 173.13	89 090.59	113
TOTAL LIMESAND-LIMESTONE-DOLOMITE	79 082.54	168 257.13	89 174.59	113
MANGANESE	3 138 440.83	4 072 364.00	933 923.17	30
NICKEL				
Cobalt by(product)	70 309.07	597 484.96	527 175.89	750
Nickel	10 082 057.87	10 846 182.10	764 124.23	8
Palladium by(product)	21 328.93	30 054.44	8 725.51	41
Platinum by(product)	19 204.60	40 442.19	21 237.59	111
TOTAL NICKEL INDUSTRY	10 192 900.47	11 514 163.69	1 321 263.22	13
PEAT	1 015.28	1 663.34	648.06	64
PETROLEUM				
Condensate	2 892 857.35	3 234 149.45	341 292.10	12
LNG	7 994 621.24	7 979 894.86	(14 726.38)	0
Natural gas	6 059 350.04	5 014 083.88	(1 045 266.16)	(17)
Oil	71 344 950.90	66 634 282.69	(4 710 668.21)	(7)
TOTAL PETROLEUM	88 291 779.53	82 862 410.88	(5 429 368.65)	(6)
SALT	1 313 369.99	1 399 048.10	85 678.11	7
SILICA SAND	335 758.77	341 534.60	5 775.83	2
SILVER	126 323.26	144 368.49	18 045.23	14
TALC	105 300.50	78 213.00	(27 087.50)	(26)
TIN-TANTALUM-LITHIUM				
Spodumene	328 117.34	415 793.00	87 675.66	27
Tantalite	491 799.65	605 907.00	114 107.35	23
Tin	32 144.38	33 089.56	945.18	3
TOTAL TIN-TANTALUM-LITHIUM	852 061.37	1 054 789.56	202 728.19	24
VERMICULITE	2 232.17	1 642.25	(589.92)	(26)
TOTAL ROYALTIES	326 066 649.30	351 895 983.42	25 829 334.12	8

COMPARATIVE ROYALTY RECEIPTS

1987 ROYALTY RECEIPTS

TOTAL : \$156.5 MILLION



1992 ROYALTY RECEIPTS

TOTAL : \$351.9 MILLION

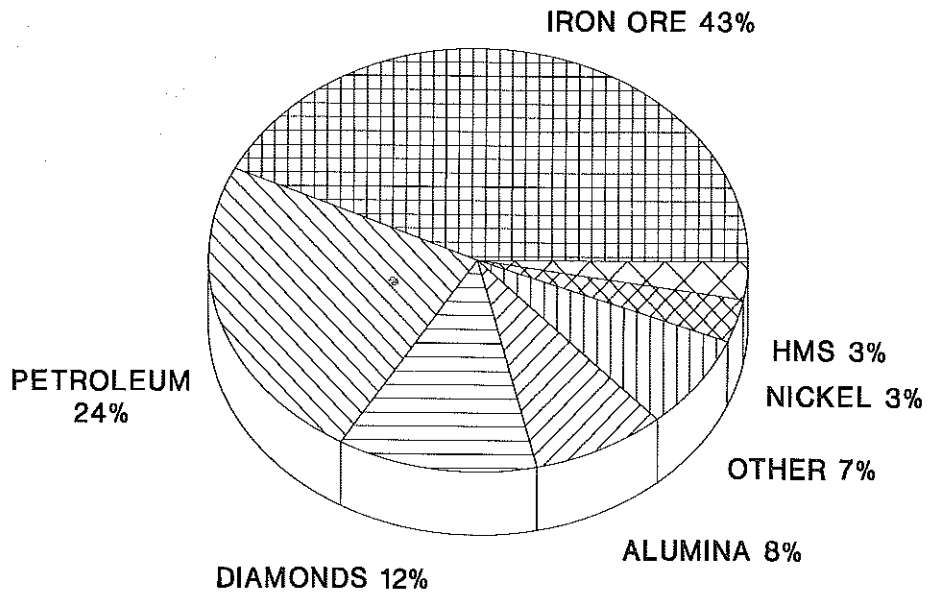


FIGURE 5.1

6.1 Employment in the Minerals and Petroleum Industries

The Western Australian minerals and petroleum sector registered a minor fall in employment during 1992. Statistics compiled from industry returns indicated that year's end employment in the production phase of operations was 34 235. This represented a fall of 1.5 % on year end 1991.

While there were some discreet shifts in employment representing the closure of exhausted operations and the opening of new ones, most sectors reported little change in employee numbers. This suggests that the rationalisation measures which have been underway over the past two years have already contracted employment numbers as far as possible. Further significant cuts in employment in ongoing operations are unlikely.

The major reduction in full time employees was in the iron ore sector. Employment fell due to a winding down of the Goldsworthy operation, and as a result of reduced volume of production at Pannawonica. The commissioning of small developments in 1992 and 1993 will maintain, rather than increase, current production levels. An expansion of sectional employment is unlikely without a large new project being developed.

Of heavy minerals sands, alumina and nickel, the commodities most affected by price falls, only the nickel sector showed significant job losses. This was the result of major restructuring and the cut back of the less profitable operations. Expansions in nickel production foreshadowed for 1993 and 1994, especially in the capacity increases for smelting and refining, will have the longer term potential to improve employment opportunities.

Petroleum is the only sector with significant plans for expansion in 1993. Crude oil, LNG

and gas production will all increase significantly in the medium term. A steady growth in production-based long term employment can be expected in the immediate future.

Developments in nickel and minerals sands highlight the general view that as mining companies are driven by market pressures to expand their downstream processing capacity, most new job growth will be in those areas.

While further aggregate falls in resources industry employment are unlikely, any overall growth is expected to be slow. With the spread of enterprise bargaining agreements, the emphasis on improvements to productivity may limit the taking on of any new workers. Employment in new projects is also expected to be negotiated on a basis of higher productivity. This is consistent with an industry wide emphasis on multi-skilling, general skills development, and a significant investment in training.

Note on statistics.

The statistics reported are based on production sites, and therefore represent employment in the operational side of the mining industry. Figures do not include employees in exploration, general administration or those working on a contract or sub-contract basis.

TABLE 6.1

**NUMBER OF PERSONS EMPLOYED IN THE WESTERN AUSTRALIAN MINERALS & PETROLEUM INDUSTRIES
AS AT DECEMBER 31, 1992**

MINERAL/Company	LOCATION	1991	1992
BASE METALS			
BHP Minerals Ltd	Cadjebut	140	162
Murchison Zinc Co. Pty Ltd	Golden Grove	345	331
Western Mining Corporation Ltd	Nifty	-	71
TOTAL BASE METALS		485	564
BAUXITE - ALUMINA			
Alcoa of Australia Ltd	Del Park-Huntley/Pinjarra	1 885	1 795
	Jarrahdale/Kwinana	1 632	1 640
	Wagerup/Willow Dale	585	703
Australian Fused Materials Pty Ltd	East Rockingham	25	26
Worsley Alumina Pty Ltd	Boddington/Worsley	1 057	1 114
TOTAL BAUXITE - ALUMINA		5 184	5 278
COAL			
Griffin Coal Mining Co. Ltd	Collie	479	473
Western Collieries Ltd	Collie	673	618
TOTAL COAL		1 152	1 091
DIAMOND			
Argyle Diamond Mines Pty Ltd	Lake Argyle	887	982
Poseidon Ltd	Bow River	106	134
TOTAL DIAMOND		993	1 116
GOLD			
Arimco NL	Gidgee	106	128
	Mt McLure	42	124
Asarco Australia Ltd	Wiluna	204	281
Ashton Gold	Cork Tree Well	163	108
Australian Mine Management Pty Ltd	Mt Pleasant	109	88
Aztec Mining Co Ltd	Bounty	162	237
Big Bell Mines Pty Ltd	Big Bell	207	116
Broken Hill Metals NL	Hopes Hill	126	115
Central Norseman Gold Corp. NL	Central Norseman	206	206
Coolgardie Gold NL	Greenfield	114	153
	Bannockburn	105	85
Dominion Mining Ltd	Labourchere/Nathans	64	98
	Meekatharra	291	233
	Mt Morgans	191	195
Goldfan Ltd	Tower Hill	65	-
	Three Mile Hill	144	162

TABLE 6.1 (cont)

MINERAL/Company	LOCATION	1991	1992
GOLD (cont)			
Hampton Australia Ltd	Jubilee	92	108
Harbour Lights Mining	Leonora	143	85
Hedges Gold Pty Ltd	Hedges	129	100
Hill 50 Gold Mine NL	Mt Magnet	281	306
Kalgoorlie Consolidated Gold Mines Pty Ltd	Kalgoorlie	1 174	1 024
Metana Minerals	Reedy	136	127
Mt Gibson Management Pty Ltd	Lawlers	99	104
	Mt Gibson	87	100
Newcrest Mining Ltd	Gimlet South	159	186
	New Celebration	420	450
	Telfer	671	647
	Tuckabianna	122	155
Pancontinental Pty Ltd	Kundana	67	79
	Paddington	175	166
Peko Gold Ltd	Peak Hill	82	77
	Kanowna Belle	-	23
Placer Pacific Pty Ltd	Granny Smith	172	164
Plutonic Operations Ltd	Plutonic	116	195
Poseidon Ltd	Kaltails	95	83
	Karonie	63	-
Reynolds Yilgam Gold Operations Ltd	Yilgam	211	226
Sons of Gwalia NL	Sons of Gwalia	126	108
Spargos Mining Pty Ltd	Bellevue	196	174
St. Barbara Mines Ltd	Meekatharra	186	192
Sundowner Minerals NL	Darlot	119	98
Western Mining Corporation Ltd	Emu	146	142
	Kambalda\St. Ives	238	570
	Lancefield	88	236
Worsley Alumina Pty Ltd	Boddington	410	434
All Other Operators		2 093(r)	1 833
TOTAL GOLD		10 051(r)	10 069
HEAVY MINERAL SANDS			
Cable Sands Pty Ltd	Capel	202	255
ISK Minerals Pty Ltd	Picton	63	50
RGC Mineral Sands Pty Ltd	Capel	171	215
	Eneabba	301	297
	Namgulu	204	298
TiWest Pty Ltd	Cataby/Chandala	264	236
Westralian Sands Ltd	Capel	377	368
All Other Operators		37	22
TOTAL HEAVY MINERAL SANDS		1 619	1 741

TABLE 6.1 (cont)			
MINERAL/Company	LOCATION	1991	1992
IRON ORE			
BHP Iron Ore (Goldsworthy) Ltd	Pilbara/Port Hedland	982	440
BHP Iron Ore Ltd	Newman/Port Hedland	3 415	3 381
	Yandicoogina	30	84
BHP Minerals Ltd	Yampi	302	311
Hamersley Iron Pty Ltd	Tom Price - Paraburdoo/Dampier/Channar	3 134	3 138
Portman Mining Ltd	Ferro Gully	51	53
Robe River Mining Co. Pty Ltd	Pannawonica/Cape Lambert	903	789
TOTAL IRON ORE		8 817	8 196
NICKEL			
Agip Australia Pty Ltd	Radio Hill	89	-
Outokumpu Australia Ltd	Forrestania	-	163
Western Mining Corporation Ltd	Kalgoorlie	408	411
	Blair/Kambalda	1 351	1 325
	Kwinana Refinery	323	402
	Leinster	559	538
	Mt Windarra	247	2
All Other Operators		6	-
TOTAL NICKEL		2 983	2 841
PETROLEUM PRODUCTS			
Hadson Energy Pty Ltd	Harriet/Rosette	130	131
West Australian Petroleum Pty Ltd	Dongara	8	8
	North West Area	236	231
Western Mining Corporation Ltd	North Herald/South Pepper/Chervil	108	28
Woodside Offshore Petroleum Pty Ltd	North Rankin A/Burrup Peninsula	1 577	1 589
All Other Operators		24	22
TOTAL PETROLEUM PRODUCTS		2 083	1 981
SALT			
Dampier Salt Ltd	Dampier	179	171
	Lake MacLeod	116	115
Cargill Salt Co.	Port Hedland	123	122
Shark Bay Salt JV	Useless Loop	73	80
Other		9	10
TOTAL SALT		500	498
ALL OTHER MATERIALS			
(including Rock Quarries)		903	860
TOTAL		34 770(r)	34 235

(SOURCE: AXSTAT REPORTING SYSTEM, MINING ENGINEERING DIVISION)

7.1 PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1992, address, telephone number: minesite.**BASE METALS****Copper**

Murchison Zinc Co. Pty Ltd, c/- Normandy Poseidon Ltd, 100 Hutt St, Adelaide, S.A., (08) 303 1700: Golden Grove.

Newcrest Mining Ltd, 600 St Kilda Rd, Melbourne 3004, (03) 522 5333: New Celebration, Telfer.

Western Mining Corp. Ltd, 191 Great Eastern Hwy, Belmont 6104, (09) 479 0711: Nifty, Kambalda.

Lead - Zinc

BHP Minerals Ltd, 44 Hamersley St, Broome 6725, (091) 91 0222: Cadjebut.

Murchison Zinc Co. Pty Ltd, c/- Normandy Poseidon Ltd, 100 Hutt St, Adelaide, S.A., (08) 303 1700: Golden Grove

BAUXITE - ALUMINA**Alumina**

Alcoa of Australia (WA) Ltd, cnr Davey & Marmion sts Booragoon 6154, (09) 316 5111: Del Park, Jarrahdale, Willowdale.

Worsley Alumina Pty Ltd, PO Box 50, Boddington 6390, (097) 34 8311: Boddington.

CLAY**Attapuligite**

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

Kaolin

Greenbushes Ltd, 16 Parliament Pl, West Perth 6005, (09) 481 1988: 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 Georges Tce, Perth 6000, (09) 321 1668: Port Hedland.

7.1 PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1992, address, telephone number: minesite.**CONSTRUCTION MATERIALS (cont)****Gravel (cont)**

Vinci and Sons Pty Ltd, Lot 3 Pickering Brook Rd, Pickering Brook 6076, (09) 293 8295: Pickering Brook.

Rock

Boral Resources Ltd, 68 Bickley Rd, Cannington 6107, (09) 350 5995: Port Hedland.

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: Learmonth, Mt Regal.

Sand

Amatek Ltd, 1 Newburn Rd, Kewdale 6104, (09) 353 3030: Gnangarra, Jandakot.

Quinton Pty Ltd, Lot 117 Cnr Great Eastern Hwy Coolgardie Rd, Kalgoorlie 6430, (090) 213 961: Coolgardie.

The Readymix Group (WA), 75 Canning Hwy, Victoria Park 6100, (09) 472 2000: Comet Vale, Ethel Creek, Karratha, Newman, Nickol Bay, Pinnacles, Sandy Creek, Sullivan's Creek, Turner River, Warrawanda Creek, Warroora, Widgiemooltha.

DIAMOND

Argyle Diamond Mines, 2 Kings Park Rd, West Perth 6005, (09) 482 1166: Argyle.

Poseidon Bow River Diamond Mines Ltd, 100 Hutt St, Adelaide, S.A., (08) 236 1700: Bow River.

DIMENSION STONE**Black Granite**

De Biasi D, P.O Box 351, Broome 6725, (091) 935 562: 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**Agate**

Bennett, JSC, PO Box 677, Subiaco 6008, (09) 368 1764: Marillana Station

Amethyst

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

Chrysoprase

Aplo Pty Ltd, 132 Broome St, Cottesloe 6011, (09) 383 2551: Marshall Creek.

WA Gem Explorers, 326 Hay St, Perth 6000, (09) 325 4988: Boyce Creek.

7.1 PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1992, address, telephone number: minesite.**GEM, SEMI-PRECIOUS & ORNAMENTAL STONE (cont)****Jasper**

The Gemstone Factory, Lot 325 Dale Pl, Orange Grove 6109, (09) 459 4878: Divide Creek.

Variscite

Bennett, JSC, PO Box 677, Subiaco 6008, (09) 368 1764: Milgun Station.

GOLD

Asarco Australia Ltd, 10 Ord St West Perth 6005, (09) 481 2050: Jundee, Wiluna.

Ashton Mining Ltd, 24 Outram St, West Perth 6005, (09) 482 4444: Banyego-Duketon, Bardoc-Davyhurst, Harbour Lights, Laverton, Nambi.

Australian Resources & Mining Co. NL, 20 Berry St, North Sydney, NSW 2060, (02) 955 1722: Gidgee, Mt McClure.

Aztec Mining Company Ltd, 99 Shepperton Rd, Victoria Park 6100, (09) 470 1444: Forrestania-Bounty.

Bellevue Project, C/- Forsayth NL, 221 St Georges Tce, Perth 6000, (09) 322 7211: Sir Samuel-Bellevue

Big Bell Mines Ltd, PO Box 2135, Geraldton 6530, (099) 63 1144: Big Bell.

Broken Hill Metals Ltd, 28 The Esplanade, Perth 6000, (09) 324 1370: Hopes Hill-Corinthia.

Burmine Ltd, Copperhead Mine, Bullfinch 6484, (090) 49 5066: Frasers, Copperhead.

Centaur Mining and Exploration Ltd, 580 St Kilda Rd, Melbourne Vic. 3004, (03) 276 7888: Lady Bountiful Extended.

Central Norseman Gold Corp. NL, PO Box 56, Norseman 6443, (090) 39 1101: Central Norseman.

Coolgardie Gold NL, 56b Bayley St, Coolgardie 6429, (090) 26 6132: Bayley's Reward-Greenfields.

Croesus Mining NL, 39 Porter St, Kalgoorlie 6430, (090) 91 2222: Mystery Mint.

Dominion Mining Ltd, 10 Richardson St, West Perth 6005, (09) 426 6400: Bannockburn, Beatons Creek, Gabanintha, Labouchere, Meekatharra, Mt Morgans, Tower Hill.

Eltin Minerals Pty Ltd, PMB 31, Kalgoorlie 6430, (090) 21 4844: Grosmont.

Forsayth Pty Ltd, 221 St George's Tce, Perth 6000, (09) 322 7211: Cox's, Lawlers, McCafferys.

Golden Kilometre Mines JV, 4/100 Hay St, Subiaco 6008, (09) 382 3300: Mt Pleasant, Lady Bountiful South, Racetrack.

Hampton Australia Ltd, C/- Poseidon Gold Ltd, 100 Hutt St, Adelaide, S.A., (08) 236 1700: Jubilee.

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: Brilliant-Tindals, Gum Creek-Montague, Sandstone, Three Mile Hill.

Hill 50 Gold Mine NL, PO Box 83, Mt Magnet 6638, (09) 63 4104: Mt Magnet.

Kalgoorlie Consolidated Gold Mines Pty Ltd, Fimiston, Kalgoorlie 6430, (090) 22 1100: Super Pit, Fimiston, Mt Charlotte, Mt Percy.

Kitchener Mining NL, Suite 21, Piccadilly Sq, cnr Short St & Nash St, Perth 6000, (09) 325 4997: Bamboo Creek, Normay.

Metall Mining Aust. Pty Ltd, cnr Throssell & Forrest Sts. Kalgoorlie 6430, (090) 21 1766: Broad Arrow, Callion, Round Dam, West Black Flag-Broads Dam.

Metana Minerals, 161 Great Eastern Hwy, Belmont 6104, (09) 479 0222: Reedy, Youanmi.

7.1 PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1992, address, telephone number: minesite.**GOLD (cont)**

- Mt Edon Gold Mines (Aust) NL, 30 Ledger Rd, Balcatta 6021, (09) 345 1588: Kookynie, Tarmoola-King Of The Hills.
- Mt Gibson Management Pty Ltd, 28 The Esplanade, Perth 6000, (09) 322 2313: Mt Gibson.
- Mt Martin Gold Mines NL, 9 Bowman St, South Perth 6151, (09) 368 2011: Mt Martin.
- Newcrest Mining Ltd, 179 Gt Eastern Hwy, Belmont 6401, (09) 270 7070: Comet-Pinnacles, New Celebration, Ora Banda-Gimlet South, Orban JV, Telfer, Tuckabianna, Wildcatters.
- North Broken Hill-Peko Ltd, 476 St Kilda Rd, Melbourne Vic 3004, (03) 829 0000: Kanowna, Peak Hill.
- Orion Resources NL, 42 Ardross St, Applecross 6153, (09) 364 8355: Burbidge-Great Victoria, Yilgarn Star.
- Pancontinental Gold (Operations) Pty Ltd, PO Box 1161, Kalgoorlie 6430, (090) 24 2000: Paddington, White Flag-Kundana.
- Placer (Granny Smith) Pty Ltd, PO Box 33, Laverton WA 6440, (090) 31 3111: Granny Smith.
- Plutonic Resources Ltd, PMB 46 Meekatharra 6642, (09) 370 8201: Plutonic.
- Poseidon Gold Ltd, 100 Hutt St, Adelaide S.A., (08) 236 1700: Golden Crown, Kaltails, Karonie.
- Ramsgate Resources Ltd, 229 Stirling Highway, Claremont 6010, (09) 383 4321: Grace Darling, Mt Monger.
- Resolute Resources Ltd, 28 The Esplanade, Perth 6000, (09) 321 4011: Marymia Hill.
- Reynolds Yilgarn Gold Operations Ltd, 28 The Esplanade, Perth 6000, (09) 322 2313: Marvel Loch-Southern Cross.
- St Barbara Mines Ltd, Gt Northern Highway, Meekatharra 6642, (099) 81 8111: Bluebird, Nannine, South Junction.
- Samantha Gold NL, 28 The Esplanade, Perth 6000, (09) 481 5288: Higginsville.
- Sons of Gwalia NL, 16 Parliament Pl, West Perth 6005, (09) 481 1988: Barnicoat, Sons of Gwalia.
- Southern Goldfields Ltd, 35 Outram St, West Perth 6005, (09) 321 5115: Nevorla.
- Sundowner Minerals NL, 221 St George's Tce, Perth 6000, (09) 322 7211: Darlot.
- Western Mining Corp. Ltd, 191 Great Eastern Hwy, Belmont 6104, (09) 479 0711: Emu, Kambalda-St Ives, Lancefield.
- Worsley Alumina Pty Ltd, PO Box 48, Boddington 6390, (098) 83 8260: Boddington.

GYPSUM

- Framel Pty Ltd, PO Box 2148, Geraldton 6530: Dongara.
- H.B. Brady & Co. Pty Ltd, PO Box 42, Bayswater 6053, (09) 279 4422: Lake Brown.
- Lake Hillman Mining Pty Ltd, 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 Armstrong Rd, Applecross 6153, (09) 364 4951: Wyalkatchem

HEAVY MINERAL SANDS**Garnet Sand**

- Target Minerals NL, PO Box 188, Geraldton 6530, (099) 23 3644: Port Gregory.

Ilmenite, Rutile, Zircon, Leucoxene & Monazite

- Cable Sands (WA) Pty Ltd, PO Box 133, Bunbury 6230, (097) 21 4111: Capel.

7.1 PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1992, address, telephone number: minesite.**HEAVY MINERAL SANDS (cont)****Ilmenite, Rutile, Zircon, Leucoxene & Monazite (cont)**

ISK Minerals Pty Ltd, PO Picton 6229, (097) 25 4899: Waroona.

RGC Mineral Sands, 45 Stirling Hwy, Nedlands 6009, (09) 389 1222: Capel, Eneabba North, Eneabba South

TiWest Pty Ltd, 1 Brodie Hall Dve, Bentley 6102, (09) 365 1390: Cooljarloo.

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, Pippingarra.

IRON ORE

BHP Iron Ore (Goldsworthy) Ltd, 200 St George's Tce, Perth 6000, (09) 320 4444: Shay Gap.

BHP Iron Ore (Jimblebar) Ltd, 200 St George's Tce, Perth 6000, (09) 320 4444: McCamey's.

BHP Iron Ore Ltd, 200 St George's Tce, Perth 6000, (09) 320 4444: Newman, Yandi.

BHP Minerals Ltd, P.O Koolan Island 6733, (091) 910 575: Koolan Island.

Channar Mining Pty Ltd, 191 St George's Tce, Perth 6000, (09) 327 2327: Channar.

Hamersley Iron Pty Ltd, 191 St George's Tce, Perth 6000, (09) 327 2327: Tom Price, Paraburdoo, Brockman.

Robe River Iron Associates, 12 St George's Tce, Perth 6000, (09) 421 4747: Pannawonica.

LIMESAND - LIMESTONE

Cockburn Cement Ltd, Russell Rd, South Coogee 6166, (09) 410 1988: Cockburn Sound, Coogee.

Limestone Building Blocks Co. Pty Ltd, 41 Spearwood Ave, Bibra Lake 6163, (09) 418 4440: Nowerup.

Loongana Lime Pty Ltd, PO Box 808, Kalgoorlie 6430, (090) 21 8055: Loongana.

Swan Portland Cement Ltd, Burswood Rd, Rivervale 6103, (09) 361 8822: Wanneroo.

Westdeen Holdings Pty Ltd, 7 Armstrong Rd, Applecross 6153, (09) 364 4951: Dandaragan, Gingin, Irwin, Yanchee.

MANGANESE ORE

Portman Mining Ltd, Level 13, 256 Adelaide Tce, Perth 6000, (09) 268 3333: Woodie Woodie.

NICKEL

Spargoville Nickel Pty Ltd, c/- Alameda Pty Ltd, PO Box 449, Kalgoorlie 6430, (090) 21 8311: Spargoville.

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

PEAT

Peat Resources of Australia Pty Ltd, P.O Box 203, Bentley 6102, (09) 453 3388: Manjimup.

7.1 PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1992, address, telephone number: minesite.**PETROLEUM**

Arrow Petroleum Ltd, 99 Shepparton Rd, Victoria Park 6010, (09) 470 0400: Mt Horner
 Consolidated Gas Pty Ltd, 174 Hamden Rd, Nedlands 6009, (09) 389 8344: Woodada.
 Doral Resources, 31 Ventnor Ave, West Perth 6005, (09) 481 5866: Tubridgi.
 Hadson Energy Ltd, 35 Ventnor Ave, West Perth 6005, (09) 481 8555: Harriet
 Marathon Petroleum Aust. Ltd, 239 Adelaide Tce, Perth 6000, (09) 325 1988: Talisman.
 Petroleum Securities Energy Ltd, Ozco Pty Ltd, 15 Wheelk Place, Mullaloo 6025, (09) 307 1345: Blina,
 Lloyd, Sundown/West Terrace.
 Sagasco Holdings Ltd, 60 Hindmarsh Sq, Adelaide SA 5000, (08) 235 3700: Beharra Springs.
 West Aust. Petroleum Pty Ltd (WAPET), QV1, 250 St Georges Tce, Perth 6000, (09) 263 6000: Barrow
 Island, Dongara, Saladin.
 Western Mining Corp. Ltd, 28 Ventnor Ave, West Perth 6005, (09) 482 2444: Airlie Island.
 Woodside Offshore Pet. Pty Ltd, 1 Adelaide Tce, Perth 6000, (09) 224 4111: North Rankin.

SALT

Cargill Australia Ltd, 225 St George's Tce, Perth 6000, (09) 325 4888: Port Hedland.
 Dampier Salt (Operations) Pty Ltd, 177A St George's Tce, Perth 6000, (09) 327 2299: Dampier, Lake
 Macleod.
 Shark Bay Salt Joint Venture, 22 Mount St, Perth 6000, (09) 322 4811: Useless Loop.
 WA Salt Koolyanobbing Pty Ltd, Cockburn Rd, Hamilton Hill 6163, (09) 430 5495: Lake Deborah East, Pink
 Lake.

SILICA - SILICA SAND**Silica**

Simoca Operations Pty Ltd, P.O Box 1389, Bunbury 6230, (097) 912 588: Dalaroo.

Silica Sand

ACI Operations Pty Ltd, 35 Baille Rd, Canning Vale 6155, (09) 455 1111: Lake Gngangara.
 Amatek Ltd, 1 Newburn Rd, Kewdale 6104, (09) 353 3030: Jandakot, Gngangara.
 Boral Resources WA Ltd, 136-138 Gt Eastern Hwy, South 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, 16 Parliament Pl, West Perth 6005, (09) 481 1988: Mt Seabrook.
 Western Mining Corp. Ltd, PO Box 116, Three Springs 6519, (099) 54 5047: Three Springs.

TIN - TANTALUM - LITHIUM**Spodumene**

Lithium Australia Ltd, 16 Parliament Pl, West Perth 6005, (09) 481 1988: Greenbushes.

7.1 PRINCIPAL MINERAL & PETROLEUM PRODUCERS 1992, address, telephone number: minesite.**TIN - TANTALUM - LITHIUM (cont)****Tantalite - Tin**

Goldrim Mining Australia Ltd, 317 Hunter St, Newcastle NSW 2300, (049) 29 2433: Wodgina.

Greenbushes Ltd, 16 Parliament Place, West Perth 6005, (09) 481 1988: Greenbushes.

Pan West Tantalum Pty Ltd, Gateway, 1 Macquarie Place, Sydney NSW 2000, (02) 256 2000: Wodgina.

VERMICULITE

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