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UNITED NATIONS INDUSTRIAL

DEVELOPMENT ORGANISATION

STUDY OF THE NON-FERROUS METALS INDUSTRY 1986

AUSTRALIAN CASE STUDY

ANN HODGKINSON

1986

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A EXPLOITED MINES

A 1 LOCATION AND OWNERSHIP

i) COPPER (See Map 1)

1 Mount Isa, Queensland. Output 136,400 tonnes contained metal 1981.
MIM Holdings Ltd (44% Asarco Inc (USA))

2 Teutonic Bore, Western Australia. Output 6,400 tonnes concentrates 1981, capacity 10,000 tonnes. New Development.
Joint Venture - MIM Holdings Ltd 40%, Seltrust Mining Corporation 60%.

3 Queenstown, Tasmania. Output 17,00 tonnes contained metal 1981, capacity 20,000 tonnes under closure.
Mt Lyell Mining and Railway Co Ltd, subsidiary of Renison Goldfields Consolidated Ltd.

4 Cobar, New South Wales. Capacity 18,000 tonnes contained copper.
Australian Mining and Smelting Ltd (AM&S) subsidiary of CRA Ltd (52.3% Rio Tinto-Zinc Corporation).

5 Woodlawn, New South Wales. Output 10,000 tonnes copper concentrates, 1981.
Originally a joint venture with USA partners, 1985 totally acquired by Australian partner, AM&S (CRA Ltd).

6 Warrego, 106,000 tonnes and Gecko Mines, Tennant Creek, Northern Territory. Currently production is being scaled down.
Mt Morgan and Mt Chalmers Mines, Qld closed 1982.
Peko Wallsend Ltd.

7 Mt Gunson, South Australia. Production 12,360 tonnes 1981.
Mt Gunson Mines Pty Ltd, subsidiary of CSR Ltd.

8 Smaller producers, by-product at Rosebury, Tasmania (EZ Industries Ltd); Burra, South Australia (Adelaide and Wallaroo Fertilizers Ltd).

ii) BAUXITE (See Map 2)

1 Jarradale, Del Park, Huntly, Mt William, Darling Ranges, Western Australia. Total reserves 500 million tonnes. Annual production 15.5 million tonnes.
Alcoa of Australia Ltd (51% Aluminium Company of America USA).

2 Mt Saddleback, Darling Ranges, Western Australia. Total reserves 250 million tonnes. Production 2 million tonnes p.a. commenced 1984.
Worsley Alumina Pty Ltd consortium (40% Reynolds USA, 30% Royal Dutch Shell, 10% Japanese).

3 Weipa, Queensland. Total reserves 3133 million tonnes, annual production 11.25 million tonnes plus 150,000 tonnes calcinated bauxite.
Comalco Ltd (67% CRA Ltd).

4 Gove Peninsula, Northern Territory. Capacity 250 million tonnes, production 5 million tonnes p.a.
Gove Joint Venture (70% Swiss Aluminium Ltd, 15.3% CSR Ltd, 4% Peko-Wallsend Ltd).

iii) SILVER, LEAD, ZINC (See Map 3)

1 Broken Hill, New South Wales - two mines. Annual output 150,000 tonnes lead concentrates, 205,000 tonnes zinc concentrates.
Australian Mining and Smelting Ltd (CRA Ltd).

2 Woodlawn, New South Wales. Annual production 20,000 tonnes lead concentrates, 70,000 tonnes zinc concentrates.
AM&S (CRA Ltd).

3 Cobar, New South Wales. Annual production 4,000 tonnes lead concentrates, 14,000 tonnes zinc concentrates.
AM&S (CRA Ltd).

4 Mt Isa, Queensland. Annual production 150,000 tonnes lead, 450,000 kg silver, 110,000 tonnes zinc.
MIM Holdings Ltd (44% Asarco Ltd).

5 Read-Rosebery, Tasmania. Annual production 70,000 tonnes zinc concentrates, 25,000 lead concentrates.
Electrolytic Zinc Company of Australia

6 Broken Hill, New South Wales. Annual production 55,000 tonnes lead concentrate, 40,000 tonnes zinc concentrates.
North Broken Hill Holdings Ltd.

7 Broken Hill, New South Wales. (Tailing's dump and south mine open cut.) Annual production 10,000 tonnes contained lead, 8,000 tonnes ccntained zinc.
Minerals, Mining and Metallurgy Ltd.

v) NICKEL (See Map 4)

1 Kambalda Mines, Western Australia. Annual capacity 1,650,000 tonnes.
Western Mining Corporation Ltd (WMC).

2 Carnilya Hill, Western Australia. Annual capacity 60,000 tonnes.
Joint venture - 60% WMC, 44% BHP Ltd.

3 Nepean, Western Australia. Annual capacity 100,000 tonnes.
Metals Exploration Ltd.

4 Agnew, Western Australia. Annual capacity 500,000 tonnes.
Joint venture - 60% Seltrust Holdings Ltd, 40% MIM Holdings Ltd.

5 Greenvale, Queensland. Annual capacity 2.75 million tonnes.
Joint venture - 50% Metals Exploration Qld Pty Ltd, 50% Freeport Qld Nickel Inc.

6 Windarra, Western Australia. Annual capacity 1.1 million tonnes. Closed in periods of over-supply.
Joint venture - 50% WMC, 50% Shell.

v) TIN (See Map 5)

1 Renison Bell, Western Tasmania. Capacity 850,000 tonnes ore, production 5,152 tonnes tin concentrates.
Renison Goldfields Consolidated Ltd.

2 Ardlethan, New South Wales. Production 1,500 tonnes tin concentrates.
Aberfoyle Ltd.

3 Luina, Eastern Tasmania. Production 1,260 tonnes tin concentrates.
Aberfoyle Ltd.

4 Mt Garnet, Queensland - three mines; and at Herberton, Queensland. Production 568 tonnes tin concentrates.
Oakbridge Ltd.

5 Greenbushes, Western Australia. Production 568 tonnes tin concentrates.
Greenbushes Tin Ltd.

6 About 200 small producers in Tasmania and Northern Queensland.

A 2 RESERVES - CURRENT 1983

TABLE A.1

ECONOMIC RESERVES OF NON-FERROUS ORES
AUSTRALIA AS AT 31 DECEMBER 1983

ORE (MEASURE)	RESOURCE				PRODUCTION 1983	
	DEMON-STRATED	INFERRED	TOTAL	% WORLD DEMON-STRATED	AUST.	% WORLD
Bauxite ('000 Mt)	2.93	1.39	4.32	13.02%	0.025	35.21%
Copper (Mt, Cu)	13.63	9.45	23.08	2.67%	0.261	3.19%
Gold (t, Au)	728.00	555.00	1283.00	1.81%	30.59	2.30%
Lead, (Mt, Pb)	12.64	-	12.64	9.29%	0.48	14.33%
Ilmenite (Mt)	39.81	0.59	40.40	5.13%	0.91	22.20%
Monazite ('000 t)	216.70	2.30	219.00	3.10%	15.14	79.68%
Rutile (Mt)	7.90	0.23	8.13	6.08%	0.16	47.06%
Zircon (Mt)	11.48	0.22	11.70	26.09%	0.38	55.88%
Nickel (Mt, Ni)	1.92	-	1.92	1.83%	0.08	12.31%
Silver ('ooo t, Ag)	28.30	-	28.30	10.46%	1.03	8.49%
Tin ('000 t, Sn)	227.00	2.00	229.00	2.27%	9.30	5.38%
Zinc (Mt, Zn)	18.24	-	18.24	6.76%	0.69	11.20%

SOURCE: Australian Mineral Industry Quarterly, 37(4) 1984.

Table A.1 provides some indication of the rate at which Australia's reserves of non-ferrous minerals are being consumed. In all cases except silver, Australia accounts for a higher proportion of world production than it contains as a proportion of world economic demonstrated reserves.

A 3 TYPE OF OWNERSHIP

Ownership details of mining leases for exploited mines are provided in Section A 1. Mining leases are granted by the relevant State Government and are for a specified time limit. Royalties are imposed by the Statement Governments, and by the Commonwealth Government in the Northern Territory. In most cases no special conditions are imposed on mining leases apart from environmental controls.

CASE STUDY: "WEIPA AGREEMENT"

Comalco was granted an eighty-four year mining lease, with rights of extension for a further twenty-one years, over bauxite areas equal to 2,590 sq. kms in Cape York Peninsula on 12 December 1957. The provisions of the lease called for the development of a fully integrated aluminium industry within the State of Queensland.

The company was required to establish an alumina refinery in Queensland. This provision led to the establishment of the Queensland Alumina Limited (QAL) refinery at Gladstone by a consortium headed by Comalco in 1963.

The company was also required to investigate and report to the Queensland Government on the feasibility of establishing an aluminium smelter within Queensland. This led to the establishment of the Boyne Island smelter near Gladstone by the Gladstone Aluminium Limited consortium also headed by Comalco, which commenced production in 1984.

A similar strategy was utilised by the Commonwealth Government in relation to the Gove deposit in the Northern Territory leased by Nabalco. A refinery was established at Gove. The feasibility study for a smelter in the Northern Territory was negative due to high fuel costs in that part of Australia.

The Western Australian Government does not impose such conditions on bauxite leases.

Conditions are not imposed on mining leases for other non-ferrous metals.

A 4 ROYALTIES AND TAXATION

BAUXITE

Royalties vary between $0.20 per tonne in Western Australia to not less than $1.00 per tonne in Queensland for exported bauxite, and not less than $0.50 per tonne for domestically consumed bauxite.

Queensland royalties are calculated on a formula:

$R = \frac{4}{10} \times \frac{P_1}{P_2}$ where bauxite is domestically consumed.

P_1 = current African world price for aluminium
P_2 = 1973-74 price.

For exported bauxite the formula is:

$R = \frac{8}{10} \times \frac{P_1}{P_2} < \$1.00$

Companies are subjected to Commonwealth company tax of 46% of profits.

Non-residents are subjected to withholding tax on dividends at the rate of 30%; this is reduced to 15% where double tax agreements operate as in USA, Canada, France and Switzerland. Withholding tax on interest payments to a non-resident company is equal to 10% of interest paid. An Australian branch of a non-resident company is subject to an additional branch profits tax of 5%.

See **Table A 2.** Royalty payments vary between 3% and 5% of turnover.

TABLE A.2

MINERAL ROYALTIES PAID ($'000) 1974/75 - 1983/84

ORE	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Bauxite	8,749	7,969	9,004	8,990	9,337	12,287	16,853	17,119	16,105	18,076
Copper	6,399	6,866	8,723	8,093	10,726	13,910	10,309	10,329	11,425	11,631
Gold	176	110	265	214	343	578	975	519	1,301	1,125
Mineral Sands	4,266	5,527	4,423	3,228	3,636	4,373	4,710	4,512	4,265	4,478
Nickel	-	5,289	6,066	4,055	4,290	6,727	5,371	6,012	6,689	NA
Silver, Lead Zinc	32,602	16,540	22,893	25,054	30,449	82,892	52,481	18,453	20,812	19,876
Tin	206	398	1,062	1,500	2,788	3,913	3,243	2,379	2,179	1,506
Uranium)	NA	1,530	3,291	2,189	2,219	NA	6,483	10,803	NA	NA
Other)						2,246*	2,100	1,706		

* EXCLUDES URANIUM

A 6 LABOUR FORCE

See **Table A 3.**

Non-ferrous ores provides 40% of Australian mining employment. It provides 39% of employment of working proprietors mostly in gold and tin mining by small independent operations. 25% of administrative, technical and mining service's employees are in non-ferrous ore mining. The proportion of these employees in non-ferrous ore mining is similar to the average for all mining. The highest proportion appears to be in nickel, tin and aluminium.

TABLE A.3

TYPE OF EMPLOYMENT, NON-FERROUS ORES, AUSTRALIA 1983-84

	WORKING PROPRIETORS			ADMINISTRATIVE, TECHNICAL AND MINING SERVICES EMPLOYEES			PRODUCTION AND ALL OTHER EMPLOYEES			TOTAL EMPLOYMENT			
DESCRIPTION	MALES	FEMALES	PERSONS	MALES	FEMALES	PERSONS	MALES	FEMALES	PERSONS	MALES	FEMALES	PERSONS	BELOW GROUND
Bauxite	-	-	-	524	131	655	1,486	65	1,551	2,010	196	2,206	-
Copper	2	1	3	757	172	929	2,204	8	2,212	2,963	181	3,144	1,187
Gold	85	8	93	827	160	987	2,879	99	2,978	3,791	267	4,058	1,139
Mineral Sands	-	-	-	351	99	450	900	14	914	1,251	113	1,364	-
Nickel	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Silver, Lead, Zinc	5	1	6	1,527	315	1,842	5,348	29	5,377	6,880	345	7,225	3,131
Tin	105	35	140	316	89	405	962	32	994	1,383	156	1,539	159
Uranium	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Non-ferrous metal ores n.e.c.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
% TOTAL MINING			39.3%			24.9%			25.0%			25.1%	29.6%

SOURCE: ABS Census of Mining Estalbishment, Details of Operations 1983-84

A 7 INTERMEDIARY CONSUMPTION

Major purchases by the non-ferrous ores industry in 1974/75 and 1978/79 were:

	1974/75 $M	% TOTAL	1978/79 $M	% TOTAL
Electricity	29.4	10.6	48.3	10.3
Construction machinery	15.1	5.5	31.1	6.7
Other machinery	27.3	9.9	37.0	7.9
Wholesale purchases	20.8	7.5	33.3	7.1
Petroleum, coal products	12.1	7.6	32.4	6.9
Business seminars	8.7	3.1	24.3	5.2
Mining services	14.3	5.2	18.3	3.9
Basic chemicals	10.2	3.7	23.5	5.0
Road transport	16.6	6.0	22.2	4.7
Iron and Steel	10.8	3.9	11.2	2.4
Welfare services	4.7	1.7	10.5	2.2

Major purchases, transfers in and selected expenses for non-ferrous ore mining industries are listed in **Table A 4.**

TABLE A.4

INTERMEDIARY CONSUMPTION IN NON-FERROUS MINING 1983-84 ($'000)

DESCRIPTION	ELECTRICITY AND FUELS PURCHASED	PURCHASES AND TRANSFERS IN(a)		COMMISSION WORK EXPENSES AND PAYMENTS TO MINING CONTRACTORS (c)	REPAIR AND MAINTENANCE EXPENSES	OUTWARD FREIGHT AND CARTAGE (d)	MOTOR VEHICLE RUNNING EXPENSES	SALES COMMISSION PAYMENTS	RENT LEASING & HIRING EXPENSES			TOTAL PURCHASES TRANSFERS IN AND SELECTED EXPENSES
		STORES MATERIALS ETC (b)	MINERALS AND OTHER GOODS FOR RESALE						LAND BUILDING AND OTHER STRUCTURES	MOTOR VECHICLES	PLANT MACHINERY AND OTHER EQUIPMENT	
Bauxite	17,600	27,941	-	6,214	12,179	8,839	1,084	996	379	5	345	75,580
Copper	6,942	88,777	-	9,748	13,227	7,100	510	100	223	254	4	126,884
Gold	37,982	83,733	2	52,959	17,778	5,301	2,601	35	691	507	5,395	206,985
Mineral sands	18,410	13,921	4,438	12,679	11,427	10,557	1,387	1,063	641	199	2,982	77,703
Nickel	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Silver, Lead, Zinc	34,292	155,517	2,065	27,735	20,112	45,875	1,212	12	223	459	2,839	290,341
Tin	11,559	17,457	1,354	6,347	19,035	2,239	1,453	435	686	273	4,359	65,198
Uranium	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Non-ferrous metal ores n.e.c.	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP

SOURCE: ABS Census of Mining Establishments, Details of Operations

NOTES: (a) Transfers in from other establishments of the same enterprise.
(b) Includes minerals for further processing.
(c) Includes imputed commission charges for work done by other establishments of the same enterprise.
(d) Includes imputed charges for freight carried out by other establishments of the same enterprise.

A 8 EVOLUTION

a) Production - See **Table A 5**

All non-ferrous ores except tin have experienced rising output over the last ten years.

b) Investment - See **Table A 6**

Capital Expenditure fluctuates from year to year. Most ores experienced increased investment in the early 1980's "resources boom" period.

c) Cost of Production - See **Table A 7**

Production costs are generally between 40% and 50% of turnover. Bauxite and silver, lead and zinc were below average while tin was above the norm.

d) Productivity - See **Table A 9**

Productivity has been measured as value added divided by employment. Productivity rose substantially in 1979-80, then declined but varied between ores in the early 1980s. Mineral sands increased throughout the decade.

e) Wages and Salaries - See **table A 10**

Wages and salaries rose slowly as a proportion of turnover over the decade for most ores. Only tin experienced a major increase in proportionate wage payments.

f) Turnover - See **Table A 8**

Consistent rises were experienced for bauxite, gold and mineral sands. Other ores tended to fluctuate depending on market conditions. Tin has experienced declining turnover since 1980.

g) Profits Data only available on a per company basis. Some indication of surplus can be calculated by substracting cost of production plus wages and salaries from turnover.

h) Domestic Use of Production - See Section B, **Table B 1.**

i) Exports - See Section C, **Table C 7.**

j) Prices

Ore and concentrate prices are usually subject to negotiation between producer and buyer and vary according to grade, impurities and size of sale. The high degree of domestic processing by virtually integrated producers limits the development of a domestic market price.

Australian prices of exports are based on world market levels.

TABLE A.5

PRODUCTION OF NON-FERROUS ORES - TONNES

ORE	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Bauxite	21,003,000	24,084,000	26,086,000	24,293,000	27,583,000	27,179,000	25,441,000	23,625,000	24,540,000	32,161,000
Copper	218,961	218,480	221,579	222,111	237,610	243,540	231,339	245,319	260,373	239,584
Gold	16	16	19	20	19	17	18	27	31	39
Lead	407,801	397,403	432,204	400,291	421,158	389,556	388,122	455,338	484,356	443,311
Nickel	75,825	82,532	85,868	82,359	69,709	74,323	74,355	87,552	79,021	76,748
Silver	726	779	856	813	832	767	744	907	1,043	970
Tin	9,507	10,531	10,577	11,817	12,524	11,531	12,233	12,093	9,037	7,488
Ilmenite concentrate	991,433	959,203	1,033,000	1,255,000	1,181,000	1,385,000	1,321,000	1,149,000	896,209	1,097,331
Rutile concentrate	348,350	389,750	325,281	257,075	274,533	311,744	230,817	220,697	158,217	181,805
Zinc	510,035	461,931	491,608	473,293	529,157	495,312	518,297	664,800	703,252	664,657

SOURCE: Australian Mineral Industry Quarterly

TABLE A.6

CAPITAL EXPENDITURE LESS DISPOSALS 1975/76 - 1983/84 ($'000)

INDUSTRY CLASS	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Bauxite	16,232	26,857	16,349	33,008	47,166	34,347	29,340	46,359	31,790	19,624
Copper	44,103	27,185	13,806	8,742	9,773	16,501	61,166	22,502	27,897	48,009
Gold	12,332	9,651	17,155	11,815	13,352	35,514	74,080	73,133	115,291	177,906
Mineral Sands	43,800	34,671	11,513	13,989	4,158	6,140	7,609	10,970	5,281	15,465
Nickel	-	31,910	32,131	67,653	29,684	30,903	50,172	73,104	66,583	NA
Silver, Lead, Zinc	21,536	22,813	24,320	74,118	60,355	43,921	91,048	170,632	92,932	48,692
Tin	9,600	4,742	8,506	8,795	10,546	25,451	21,857	22,648	12,358	10,347
Uranium)	NA	25,459	14,632	23,457	28,311	NA	173,119	55,535	NA	NA
)										
Other)						10,749*	104,016	NA	3,711	NP

* EXCLUDES URANIUM

SOURCE: ABS, Areas of Mining Establishment, Details of Operations

TABLE A.7

COST OF PRODUCTION (EXCL. WAGES) NON-FERROUS MINING 1974/75 - 1983/84 ($'000)

INDUSTRY	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Bauxite	NA	NA	NA	NA	49,156	43,686	54,614	69,880	68,206	75,580
Copper	78,963	75,571	69,575	71,186	76,576	90,221	113,249	130,190	91,300	126,884
Gold	11,758	9,845	19,446	26,645	31,850	50,332	75,955	112,137	146,835	206,985
Mineral Sands	44,453	61,383	69,355	52,385	59,475	72,954	79,609	81,045	74,484	77,703
Nickel	NA	76,613	76,294	62,628	63,260	80,276	104,369	106,935	115,464	NA
Silver, Lead, Zinc	70,591	71,509	84,971	83,275	104,910	134,785	185,811	226,424	194,584	290,341
Tin	24,695	18,695	26,564	28,034	36,831	42,311	53,744	60,283	54,492	65,198
Uranium)	NA	NA	NA	NA	49,648	NA	87,522	54,109	NA	NA
Other)						52,823*	58,747	NA	34,708	NP

* EXCLUDES URANIUM

TABLE A.8

TURNOVER IN NON-FERROUS MINING 1974/75 - 1983/84 ($'000)

INDUSTRY	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Bauxite	NA	NA	NA	NA	203,545	266,316	284,195	292,583	307,032	337,920
Copper	201,679	216,322	202,874	166,347	251,348	324,426	330,835	239,967	293,317	270,973
Gold	48,469	37,427	58,162	91,812	118,619	207,593	216,297	213,148	398,560	488,150
Mineral Sands	144,013	150,611	148,302	118,244	131,826	163,484	162,023	160,083	143,173	166,940
Nickel	-	199,790	211,710	193,766	138,029	226,177	259,621	278,925	251,012	NA
Silver, Lead, Zinc	305,938	262,881	361,481	380,352	556,054	917,698	617,618	610,496	644,513	762,160
Tin	63,254	49,603	85,626	104,309	125,551	150,572	143,440	136,937	116,814	114,823
Uranium)	NA	NA	NA	NA	163,653	NA	225,304	236,035	NA	NA
Other)						150,645	155,279	NA	94,235	NP

TABLE A.9

PRODUCTIVITY OF NON-FERROUS MINING (VALUE ADDED ÷ EMPLOYMENT)($A)

INDUSTRY	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Bauxite	63,833	80,603	79,583	76,119	84,341	110,574	108,967	107,451	115,907	124,360
Copper	18,933	26,268	28,089	21,196	45,337	60,261	47,162	24,993	58,991	43,172
Gold	17,722	18,748	28,075	51,234	61,670	88,298	55,617	42,415	81,838	73,003
Mineral Sands	32,438	30,636	25,972	26,922	34,263	43,282	46,857	49,718	59,660	54,747
Nickel	-	34,872	38,324	43,809	33,508	62,532	62,199	62,145	51,290	NA
Silver, Lead, Zinc	34,674	32,710	42,403	47,297	59,899	112,178	61,671	52,378	67,117	66,640
Tin	23,540	22,634	35,823	52,560	55,301	60,428	45,874	38,762	48,887	35,485
Uranium)	NA	21,089	64,272	53,561	55,324	NA	254,213	240,212	NA	NA
)										
Other)						66,959*	61,222	NA	62,332	NP

* EXCLUDES URANIUM

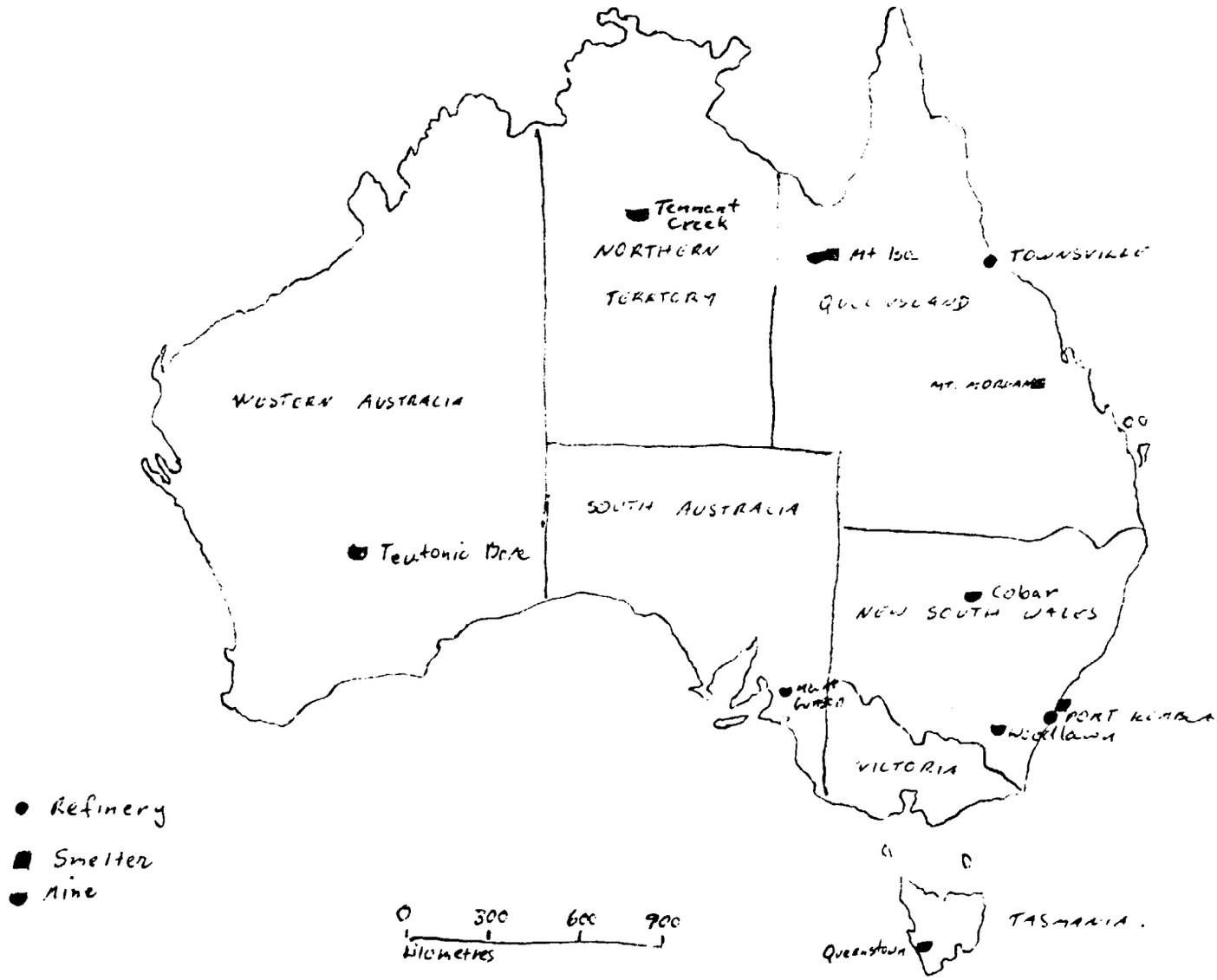
TABLE A.10

WAGES AND SALARIES PAID BY NON-FERROUS MINING ($'000)

INDUSTRY	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Bauxite	17,078	20,092	25,249	27,294	25,905	33,013	40,924	46,688	53,583	53,519
Copper	72,360	70,747	65,734	61,028	59,263	67,862	79,942	92,951	77,343	82,678
Gold	15,379	14,847	15,900	17,104	19,713	29,892	51,823	55,318	69,671	94,553
Mineral Sands	27,450	33,979	37,918	27,588	26,722	29,294	33,012	31,253	27,487	28,465
Nickel	-	37,175	43,215	44,423	34,419	45,785	50,668	74,313	70,336	NA
Silver, Lead, Zinc	69,787	73,334	85,802	97,858	108,888	130,630	131,690	147,459	171,563	176,707
Tin	12,552	12,782	15,114	17,157	19,616	26,078	29,238	34,774	28,705	28,986
Uranium)	NA	16,327	20,866	23,986	30,114	NA	14,355	22,964	NA	NA
Other)						26,644*	31,232	NA	19,818	NP

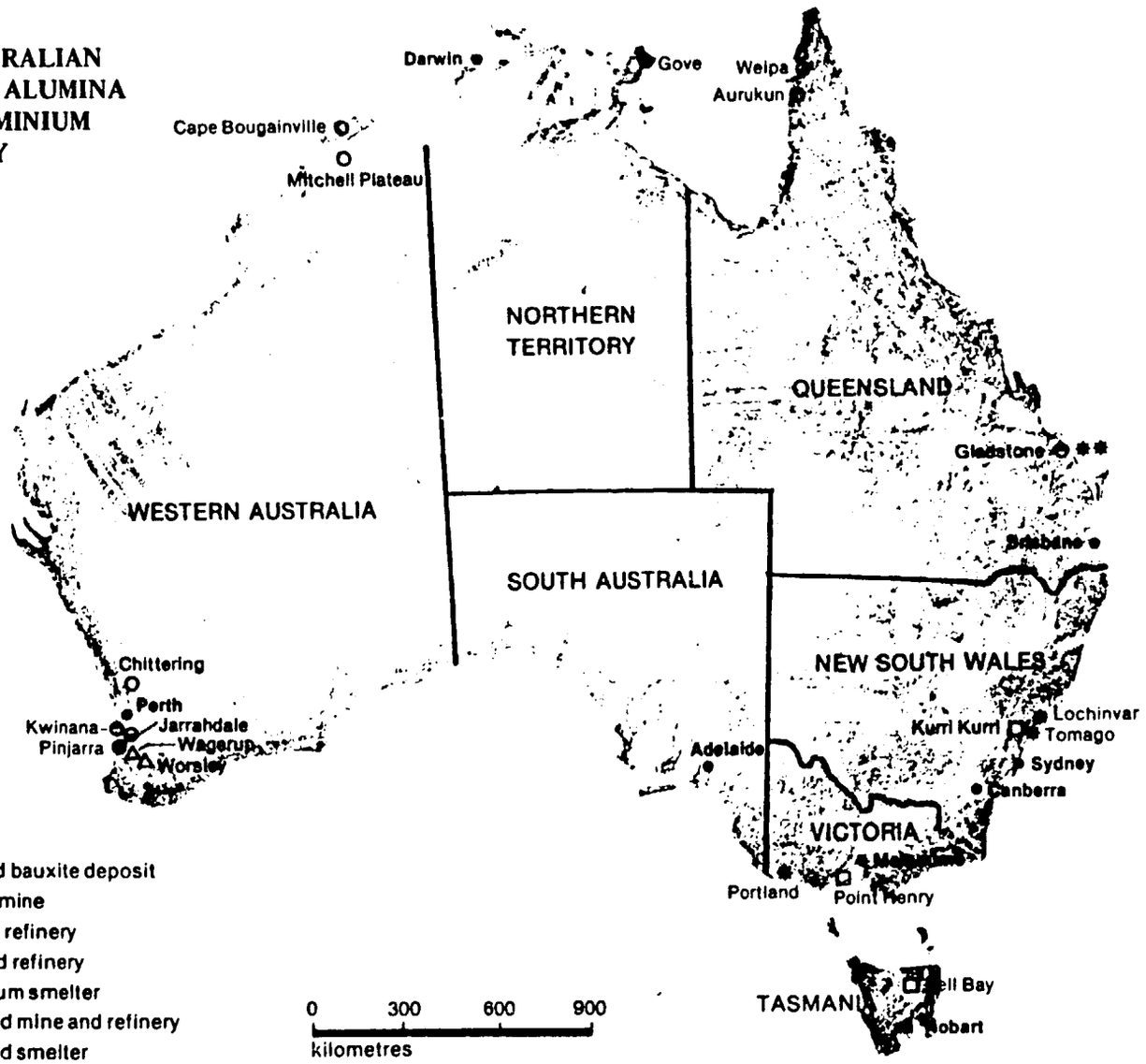
* EXCLUDES URANIUM

MAP 1 COPPER INDUSTRY



MAP 2

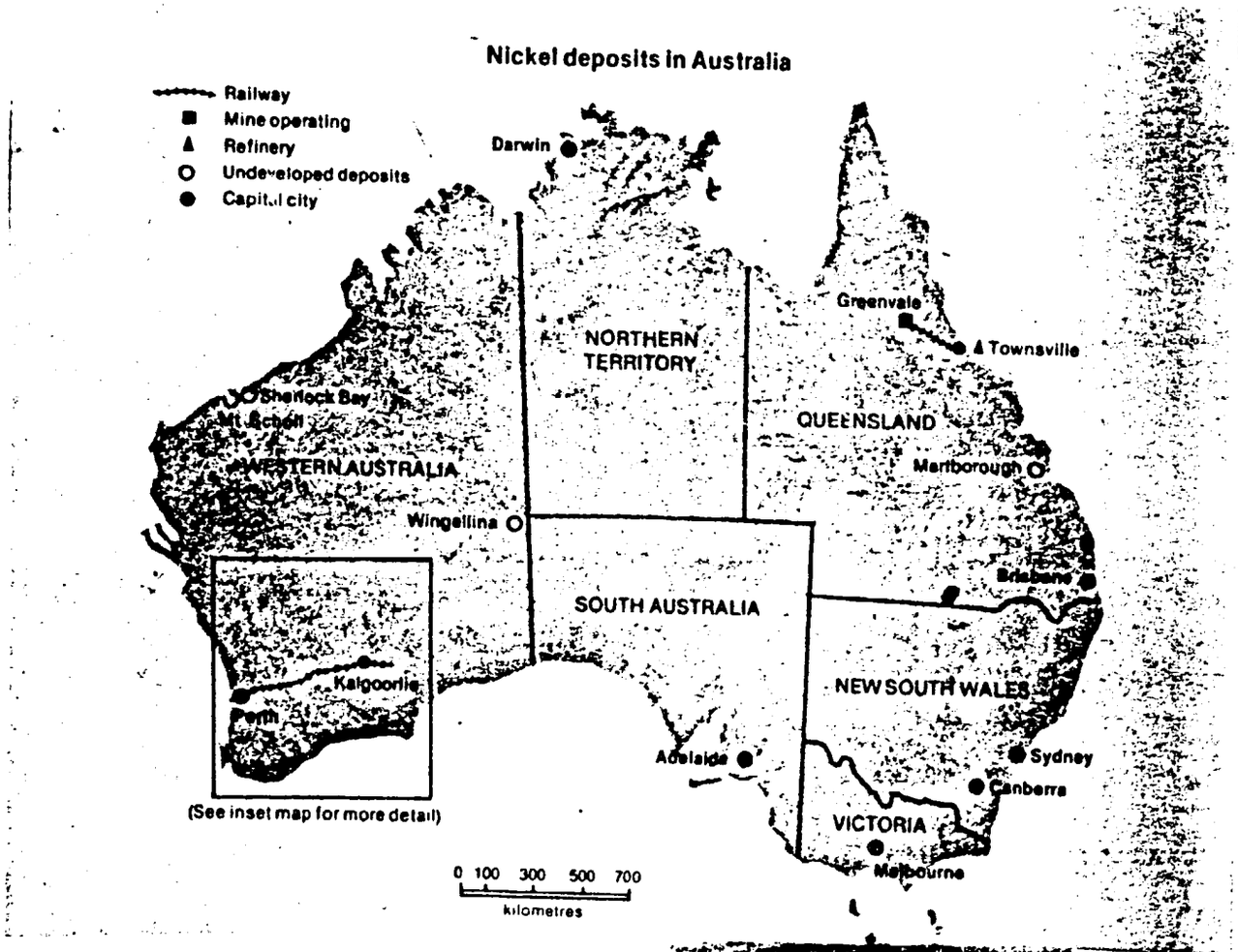
THE AUSTRALIAN BAUXITE, ALUMINA AND ALUMINIUM INDUSTRY

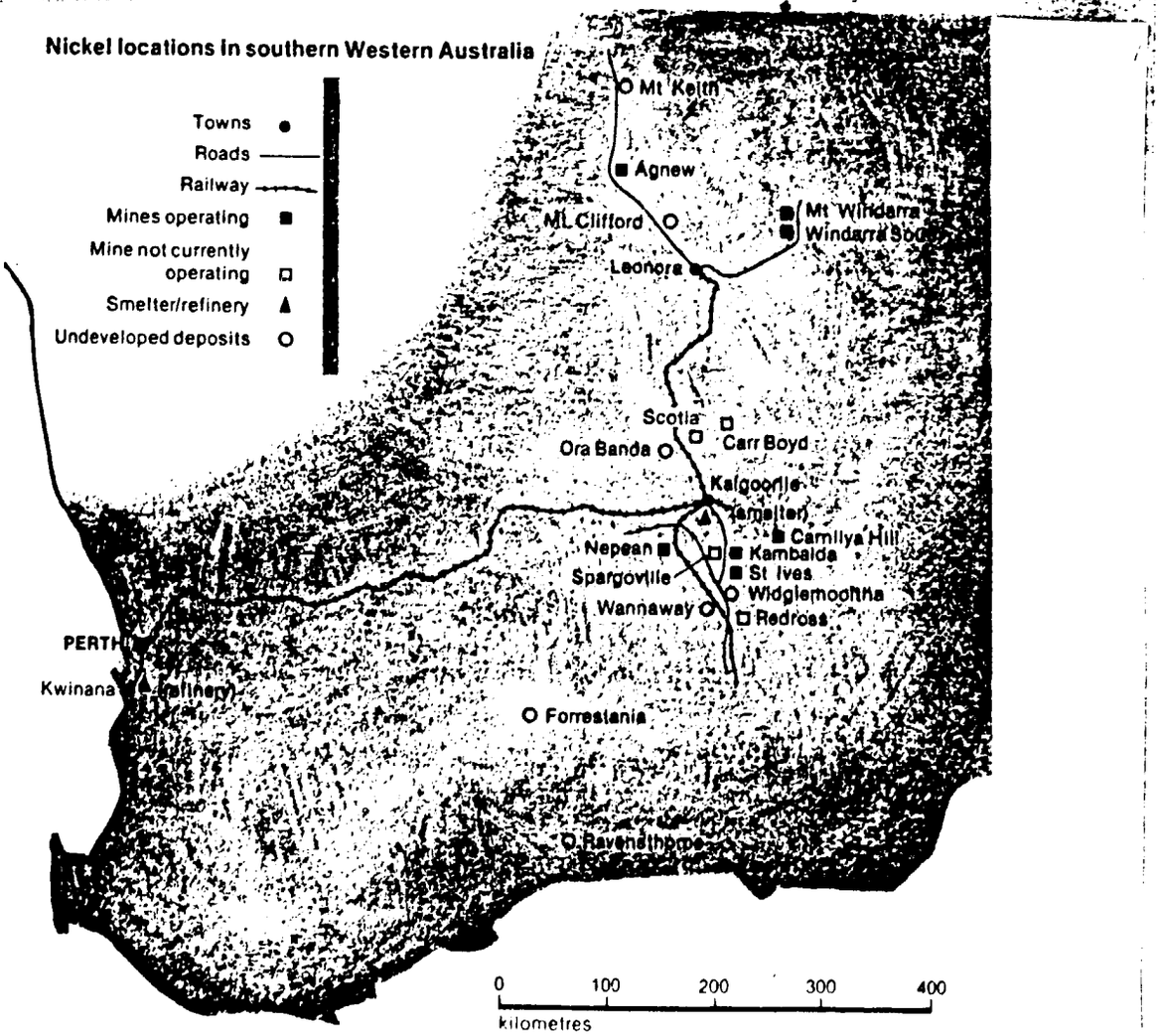


MAP 3

Lead/zinc prospects, mines and treatment plants

MAP 4


Nickel deposits in Australia
Railway
Mine operating
Refinery
Undeveloped deposits
Capital city
Darwin
NORTHERN TERRITORY
Greenvale
Townsville
QUEENSLAND
Sherlock Bay
Mt Keith
WESTERN AUSTRALIA
Marlborough
Wingellina
Brisbane
SOUTH AUSTRALIA
Kalgoorlie
Perth
NEW SOUTH WALES
Adelaide
Sydney
Canberra
(See inset map for more detail)
VICTORIA
Melbourne
0 100 300 500 700
kilometres


Nickel locations in southern Western Australia
Towns
Roads
Railway
Mines operating
Mine not currently operating
Smelter/refinery
Undeveloped deposits
Mt Keith
Agnew
Mt Clifford
Mt Windarra
Windarra South
Leonora
Scotia
Carr Boyd
Ora Banda
Kalgoorlie (smelter)
Camilya Hill
Nepean
Kambalda
St Ives
Spargoville
Widgiemooltha
Wannaway
Redross
PERTH
Kwinana (refinery)
Forrestania
Ravensthorpe
0 100 200 300 400
kilometres

MAP 5


Darwin
Cooktown
Herberton-
Mount Garnet
Kangaroo Hills
Mooiyella
Coogiegong-Eley
NORTHERN
TERRITORY
QUEENSLAND
WESTERN
AUSTRALIA
SOUTH
AUSTRALIA
Brisbane
Stanthorpe-
Wilsons Downfall
Emmaville-
Torrington-
Glen Innes
Tingha-Inverell
NEW SOUTH WALES
Perth
Tallebung
Kikoira (Gibsonvale)
Greenbushes
(Smelter)
Adelaide
Ardlethan
Sydney
(Smelter)
Canberra
Beechworth-Eldorado
Melbourne
VICTORIA
Western
Tasmania
Province
Eastern
Tasmania
Province
Zeehan
Hobart
TASMANIA
AUSTRALIA
Tin Deposits
Major tin-bearing areas
0km 300 600 900 1000

B PROCESSING OPERATIONS

B 1 LOCATION OF FACILITIES

i) COPPER (See Map 1)

1 Port Kembla, New South Wales.
Smelter/Refinery - capacity smelter 35,000 tonnes, refinery 50,000 tonnes (including scrap).
ER&S, subsidiary of Australian Associated Smelters (100% CRA).

2 Mount Isa, Queensland. Smelter (cast anodes).
MIM Holdings Ltd.

3 Townsville, Queensland. Refinery (Copper Refineries Pty Ltd). Cathodes, cake, rod, wire. Capacity 155,000 tonnes.
MIM Holdings Ltd.

4 Mt Morgan, Queensland. Smelter - capacity 6,190 blister copper.
Peko-Wallsend Ltd.

ii) ALUMINA AND ALUMINIUM (See Map 2)

1 Kwinana, Western Australia. Refinery - capacity 1,400,000 tonnes.
Alcoa of Australia (51% Aluminium Co of America).

2 Pinjarra, Western Australia. Refinery - capacity 2,200,000 tonnes.
Alcoa of Australia (51% Alcoa).

3 Wagerup, Western Australia. Refinery - capacity 500,000 tonnes.
Alcoa of Australia (51% Alcoa).

4 Worsley, Western Australia. Refinery - capacity 1,000,000 tonnes.
Alwest (40% Reynolds, 30% Shell Australia).

5 Gladstone, Queensland. Refinery - capacity 2,400,000 tonnes.
Queensland Alumina Ltd (44.5% Comalco, 21.4% Alcan, 20.0% Pechiney, 14.2% AMP Society).

6 Gove, Northern Territory. Refinery - capacity 1,200,000 tonnes.
Gove Joint Venture (70% Alusuisse, 30% Gove Alumina Ltd).

7 Point Henry, Victoria. Smelter - capacity 168,000 tonnes.
Alcoa of Australia (51% Alcoa).

8 Bell Bay, Tasmania. Smelter - capacity 112,000 tonnes.
Comalco (67% CRA Ltd).

9 Kurri Kurri, New South Wales. Smelter - capacity 70,000 tonnes.
Alcan Australia (70% Alcan of Canada).

10 Tomago, New South Wales. Smelter - capacity 220,000 tonnes.
Tomago Aluminium Co Ltd (35% Pechiney, 35% Gove Alumina).

11 Boyne Island, Queensland. Smelter - capacity 206,000 tonnes.
Gladstone Aluminium Ltd (50% Comalco, 50% Japanese).

12 Portland, Victoria. Smelter - capacity 300,000 tonnes (under construction).
Portland Joint Venture (45% Alcoa of Australia, 30% Victorian State Government).

Secondary recovery facilities attached to smelters.

iii) SILVER, LEAD AND ZINC (See Map 3)

1 Port Pirie, South Australia. Smelter and refinery - capacity 230,000 tonnes lead, 40,000 tonnes zinc, 220,000 kg silver.
Broken Hill Associated Smelters (70% AM&S (CRA), 30% North Broken Hill Holdings Ltd).

2 Cockle Creek, New South Wales. Smelter and refinery - capacity 75,000 tonnes zinc, 30,000 tonnes lead-silver bullion.
Sulphate Corporation (100% AM&S (CRA)).

3 Risdon, Tasmania. Refinery - capacity 210,000 tonnes zinc.
Electrolytic Zinc Co of Australasia Ltd.

4 Mt Isa, Queensland. Smelter - silver-lead bullion.
MIM Holdings Ltd.

5 Sydney & Melbourne - secondary recovery of lead, sims metal.
Simsmetal (Peko Wallsend Ltd).

iv) NICKEL (See Map 4)

1 Kalgoorlie, Western Australia. Smelter - 450,000 tonnes matte nickel concentrate.
Western Mining Corporation Holdings Ltd.

2 Kwinana, Western Australia. Refinery - 30,000 tonnes metal nickel as briquettes or powder. By products nickel cobalt sulphate, copper sulphide, ammonium sulphate.
Western Mining Corporation Holdings Ltd.

3 Townsville Yabulu, Queensland. Refinery - 24,000 tonnes metal cobalt nickel sulphide.
Greenvale Joint Venture (50% Metal Exploration Queensland, 50% Freeport Queensland Nickel Inc.).

v) TIN - See Map 5

1 Sydney, New South Wales. Smelter - 7,000 tonnes.
Associated Tin Smelters Pty Ltd.

2 Greenbushes, Western Australia. Smelter - 1,000 tonnes.
Greenbushes Tin Ltd.

vi) SEMI-FABRICATING

Twenty-six facilities in aluminium associated with Alcoa and Comalco located in capital cities and Geelong.

Twenty-one facilities in other metals fabrication located in Sydney, Melbourne and Wollongong. Most owned by major corporations such as Metals Manufactures Ltd (50% BICC(UK)).

2 INFRASTRUCTURE

i) COPPER

Smelter/refineries at Kwinana and Townsville adjacent to ports.

Smelter at Mt Isa linked by rail to refinery at Townsville.

Smelter at Mt Morgan linked by rail to ports at Townsville and Gladstone.

ii) ALUMINA AND ALUMINIUM

Alumina refineries at Gladstone, Gove, Kwinana adjacent to ports. Pinjarra, Wagerup, Worsley output railed to ports at Kwinana and Bunbury.

Aluminium smelters at Point Henry, Bell Bay, Portland, Tomago adjacent to ports. Kurri Kurri alumina road transported from port at Newcastle. Alumina shipped from refineries to smelters.

Gove is the only facility in a remote location, and required special port, harbout, housing and community facilities. Others utilise existing facilities, but port and power extensions required.

iii) SILVER, LEAD AND ZINC

Lead refinery at Port Pirie adjacent to port facilities. Rail link to mine at Broken Hill. Export of lead and zinc.

Zinc refinery at Cockle Creek linked by rail to Broken Hill and Woodlawn mine and Cobar mine. Rail link to port at Newcastle.

Zinc refinery at Risdon adjacent to port facilities. Zinc railed from Broken Hill to Port Pirie and shipped to Risdon.

Townsville refinery adjacent to port facilities. Linked by rail to Mt Isa mine.

iv) NICKEL

Townsville refinery adjacent to port facilities. Specially constructed rail link to Greenvale mine.

Kalgoolie smelter linked to mines by road and rail. Rail link to port at Fremantle (export port) and Kwinana refinery.

v) TIN

Smelters located near port facilities.

B 3 TECHNOLOGY

i) COPPER

Copper Refineries Pty Ltd, Townsville - electrolytic, modernised 1978/9 and relatively up to date.

Smaller refineries have older technology comparable with small overseas facilities.

Technology of secondary recovery outdated in many smaller foundries.

ii) ALUMINA AND ALUMINIUM

Australian refineries and smelters are among the largest and most modern in the world. Technology acquired under license from parent companies with some locally developed improvements.

Secondary recovery technology relatively efficient but lacks economics of scale due to small market size.

iii) SILVER, LEAD AND ZINC

Sulphide Corporation Pty Ltd, Cockle Creek - Imperial smelting process, reflux refinery.

Broken Hill Associated Smelters Pty Ltd, Port Pirie - Electrolytic zinc refinery and world's largest lead refinery.

Electrolytic Zinc Co of Aust. Ltd, Risdon - electrolytic zinc refinery.

Technology installed during 1960s or before although up to date technology has been added on to existing plant. No major capital expenditure on new plant. Need to consider use of Kivcet process in near future ($100M).

iv) NICKEL

Yabulu refinery, Townsivlle - amonia - lead process.

Kambalda smelter, Wester Australia - Outokumpa Oy (Finland) process, combination of iron and sulphur.

Kwinana Refinery, Western Australia - ammonia - leach process developed by Sherritt Gordon Mines Ltd of Canada.

v) TIN

No information obtained.

vi) SEMIFABRICATION

Aluminium facilities of modern design and undergoing restructuring of plant to increase efficiency.

Other metals fabrication facilities less efficient wth low rates of capital expenditure with the exception of some copper facilities.

B 5 RAW MATERIALS

Data is provided for the aluminium industry only.

i) ALUMINA REFINERIES

Bauxite - domestic sources. Gibbsite and boehmite intermixed with kaolin, iron oxides, silica as quartz.

Caustic Soda - imported from North America, Europe and Japan, although industry must absorb any excess of local production above usage elsewhere in the local economy.
Consumption 1974 460,000 tonnes, imports 416,000 tonnes.
Consumption 1984 750,000 tonnes, imports 710,000 tonnes. See Appendix A 1 for prices.

ii) ALUMINIUM SMELTING

Alumina - domestic sources as powder (see Appendix A 2 for analysis). Modern facilities use 1.95 tonnes alumina per tonne aluminium.

Petroleum coke - imported from USA as course powder (see Appendix A 2 for analysis). Modern facilities use .4 tonne per tonne aluminium.

Pitch - domestic sources as liquid (see Appendix A 2 for analysis). Modern facilities use .1 tonne per tonne aluminium.

Other raw materials with source and usage per tonne of aluminium in modern facilities:

Aluminium fluoride powder, USA, Japan, 0.018 tonnes
Alloying elements ingots, domestic, 0.014 tonnes
Packing coke, USA, 0.015 tonnes
Refractory bricks, domestic, 0.218 tonnes
Cathode blocks, Japan, 0.009 tonnes
Cathode bars, domestic, 0.006 tonnes
Cast iron ingots, domestic, 0.004 tonnes
Cathade paste, Japan, 0.003 tonnes
Nitrogen liquid, domestic, 0.173 Nm^3
Argon liquid, domestic, 0.309 Nm^3
Chlorine gas, domestic, 0.028 kg
Soluble oil liquid, domestic, 0.341 kg
Lubricating oils liquid, domestic, 0.455 litres
Lubricating grease, domestic, 0.68 kg
Diesel liquid, domestic, 1.364 litres.

B 6 LABOUR FORCE SKILLS

Data supplied for aluminium industry only.

i) ALUMINIUM SMELTING

Professional, technical and supervisory staff	12.9%	
Clerical and service staff	9.4%	
TOTAL ADMINISTRATIVE STAFF		22.4%
Qualified tradespersons	22.4%	
Process workers	55.3%	
TOTAL WAGES EMPLOYEES		77.6%

B 10 PRODUCTION, TURNOVER AND VALUE ADDED

i) COPPER

Production shown on **Table B 1.**

Turnover in constant prices is shown on **Table B 2.** There has been a decline of 7% per annum in turnover over the past decade. Value added declined by 5.2% per annum - see **Table B 2.**

Data for this category is not available after 1982-83.

ii) ALUMINA AND ALUMINIUM

Production shown on **Table B 1.**

Turnover in constant prices is shown on **Table B 3.** This has increased by 6.5% per annum over the past decade, well above the average for manufacturing. Value added rose by 4.7% per annu again above average.

iii) SILVER, LEAD AND ZINC

Production shown on **Table B 1.**

Turnover and Value Added since 1979/80 shown on **Table B 4.** This shows a declining trend.

iv) NICKEL

Production is shown on **Table B 1.**

No commercial data series for nickel is available due to the high concentration in the industry.

v) NON-FERROUS, N.E.C.

Turnover data is shown on **Table B 4** for the past two years. Production of gold and mineral sands is shown on **Table B 1.**

TABLE B.1

PRODUCTION OF NON-FERROUS BASIC METALS - TONNES

METAL	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Alumina	5,128,877	6,205,828	6,659,234	6,775,675	7,414,606	7,246,499	7,079,009	6,630,500	7,231,000	8,433,000
Aluminium	214,191	232,284	247,577	263,361	269,575	303,494	379,427	380,800	478,190	757,798
Copper - blister	180,037	167,353	167,664	164,395	163,192	174,920	172,181	175,536	173,620	179,162
Copper - refined	165,770	160,741	151,955	152,621	138,249	144,828	164,241	160,200	165,492	171,705
Lead - refined	159,793	181,941	181,501	204,022	205,584	200,454	207,669	218,800	195,696	196,199
Lead in bullion	151,520	161,100	156,403	151,964	169,469	160,286	162,564	181,592	182,594	181,960
Tin - refined	5,254	5,603	5,561	5,129	5,423	4,819	4,286	3,105	2,913	2,899
Zinc - refined	193,310	242,635	249,741	290,066	305,394	300,959	295,852	291,400	298,518	301,942
Nickel - refined	22,700	21,800	16,700	18,000	21,900	17,448	23,235	25,338	NA	NA
Silver - refined	279	235	280	299	320	335	335	348	287	276

SOURCE: Australian Mineral Industrial Year Books, Bureau of Mineral Resources, AGPS

TABLE B.2

COPPER SMELTING, REFINING

YEAR	NUMBER OF ESTABLISHMENTS	EMPLOYMENT	VALUE ADDED		TURNOVER		FIXED CAPITAL EXP.		WAGES & SALARIES	
			CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES
		'000	$m	$m	$m	$m	$m	$m	$m	$m
1972-73	3	708	25.7	37.3	167.0	242.3	18.6	27.0	4.8	7.0
1973-74	5	929	29.6	36.7	242.9	301.5	11.6	14.4	7.1	8.8
1974-75	4	992	31.9	31.9	201.7	201.7	-16.3	-16.3	10.1	10.1
1975-76	3	847	32.1	29.9	191.1	178.1	9.2	8.6	9.3	8.7
1976-77	3	774	32.2	24.0	224.5	167.5	10.4	7.8	9.7	7.2
1977-78	3	1,035	34.1	24.2	202.5	143.9	0.6	0.4	12.9	9.2
1978-79	3	998	50.8	31.0	305.0	186.2	4.0	2.4	13.7	8.4
1979-80	3	1,040(e)	50.9	23.6	309.9	143.6	4.2(e)	1.9	16.7	7.7
1980-81	4	1,084(e)	51.0	24.0	314.9	148.5	4.4(e)	2.1	20.4	9.6
1981-82	3	1,125	51.1	23.7	319.6	147.9	4.6	2.1	22.7	10.5
1982-83	4	NA	NA		NA		NA		NA	
Average Annual Growth (%)		4.3		-5.2		-7.0		-27.2		2.3
Total Manufacturing		-1.6	11.3	-0.1	11.3	1.0	12.4		10.7	

(e) ESTIMATE

SOURCE: Basic Metals Industry Council for Australian Manufacturing Council, June 1985

TABLE B.3 ALUMINA & ALUMINIUM SMELTING AND REFINING

YEAR	NUMBER OF ESTABLISHMENTS	EMPLOYMENT	VALUE ADDED		TURNOVER		FIXED CAPITAL EXP.		WAGES & SALARIES	
			CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES
		'000	$m	$m	$m	$m	$m	$m	$m	$m
1972-73	10	5.8	108.1	156.8	245.8	356.6	56.9	82.5	40.3	58.5
1973-74	10	4.8	171.2	212.5	338.1	419.6	45.9	60.0	54.2	67.3
1974-75	9	6.6	235.3	235.3	487.9	487.9	53.6	53.6	67.1	67.1
1975-76	9	6.6	249.9	232.9	578.9	539.5	88.0	82.0	75.7	70.5
1976-77	9	6.8	313.3	233.8	752.7	571.7	24.4	18.2	88.5	66.0
1977-78	9	7.1	335.3	238.2	821.8	583.8	59.9	42.6	102.3	72.7
1978-79	9	7.4	339.3	207.1	896.8	547.4	62.2	38.0	117.2	71.5
1979-80	9	7.8	556.8	258.0	1,222.2	566.2	127.0	58.8	135.2	62.6
1980-81	9	8.0	569.2	268.4	1,329.0	626.6	195.6	92.2	155.7	73.4
1981-82	10	9.1	646.3	299.2	1,595.2	738.4	1,216.5	563.1	195.7	90.6
1982-83	10	9.3	646.4	302.8	1,715.6	803.7	1,149.5	538.5	229.1	107.3
1983-84	12	11.0	805.2	330.9	2,112.2	868.2	692.3	284.6	274.3	112.8
Average Annual Growth (%)		5.4		4.7		6.5			16.2	3.5
Total Manufacturing		-1.6	11.3	-0.1	11.3	1.0	12.4		10.7	

SOURCE: Ibid

TABLE B.4 SILVER, LEAD AND ZINC REFINING AND SMELTING

YEAR	NUMBER OF ESTABLISHMENTS	EMPLOYMENT	VALUE ADDED		TURNOVER		FIXED CAPITAL EXP.		WAGES & SALARIES	
			CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES
			$m	$m	$m	$m	$m	$m	$m	$m
1979-80	6	4,683	192.9	114.6	956.8	568.4	20.2	12.0	60.6	36.0
1980-81	6	4,747	157.2	85.4	903.1	490.4	13.3	7.2	71.3	38.7
1981-82	6	4,791	113.7	55.9	716.4	352.4	10.0	4.9	83.9	41.3
1982-83	6	4,417	181.3	80.2	750.5	331.9	11.5	5.1	87.8	38.8
1983-84	7	4,300	134.9	55.5	774.3	318.3	19.3	7.9	92.2	37.9
			NON-FERROUS, n.e.c. 1982-83 AND 1983-84							
1982-83	5	212	6.5	2.9	69.2	30.6	0.5	0.2	3.7	1.6
1983-84	4	200	6.5	2.7	64.8	26.6	-1.5	-0.6	3.5	1.4

SOURCE: ABS: Manufacturing Establishments, Details of Operations by Industry Class, Australia

vi) SECONDARY RECOVERY AND ALLOYING

Turnover and Value Added data are shown on **Table B 5.** This showed a variable pattern which followed the macro-economic fluctuations in the Australian economy over the decade.

vii) SEMI-FABRICATION

Turnover for aluminium semi-fabrication is shown on **Table B 6** and other non-ferrous products on **Table B 7.** Aluminium products experienced significant growth over the decade with value added growing by 3.8% per annum, and turnover by 5.6% per annum. Semi-fabrication of other metal products showed a slight negative growth trend over the decade.

TABLE B.5 SECONDARY, RECOVERY AND ALLOYING NON-FERROUS METALS

YEAR	NUMBER OF ESTABLISHMENTS	EMPLOYMENT	VALUE ADDED		TURNOVER		FIXED CAPITAL EXP.		WAGES & SALARIES	
			CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES
			$m	$m	$m	$m	$m	$m	$m	$m
1972-73	61	1,888	23.5	31.0	108.7	143.6	0.9	1.2	9.8	12.9
1973-74	56	1,765	28.2	32.9	149.8	174.6	1.2	1.4	11.1	12.9
1974-75	43	1,683	26.4	26.4	133.2	133.2	1.8	1.8	13.2	13.2
1975-76	43	1,540	27.8	24.6	134.7	119.3	2.6	2.3	13.1	11.6
1976-77	43	1,637	35.1	27.2	153.8	119.1	2.1	1.6	15.4	11.9
1977-78	43	1,402	37.8	26.7	144.9	102.2	1.6	1.1	13.4	9.4
1978-79	40	1,403	46.8	30.6	194.2	126.9	1.2	0.8	14.2	9.3
1979-80	41	1,515	65.5	38.9	314.1	186.6	5.8	3.8	18.2	10.8
1980-81	43	1,426	56.4	30.6	302.7	164.4	3.4	1.8	19.1	10.4
1981-82	41	1,306	35.0	17.2	246.1	121.0	3.2	1.6	20.2	9.9
1982-83	39	1,123	40.5	17.9	248.6	109.9	3.6	1.6	19.0	8.4
1983-84	36	1,600	60.6	24.9	368.1	151.3	1.4	0.6	31.0	12.7

SOURCE: ABS: Manufacturing Establishments, Details of Operations by Industry Class, Australia

TABLE B.6 ALUMINIUM ROLLING, DRAWING, EXTRUDING

YEAR	NUMBER OF ESTABLISHMENTS	EMPLOYMENT	VALUE ADDED		TURNOVER		FIXED CAPITAL EXP.		WAGES & SALARIES	
			CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES
		'000	$m	$m	$m	$m	$m	$m	$m	$m
1972-73	21	3.7	47.9	57.4	145.3	174.1	8.6	10.1	21.4	25.6
1973-74	24	4.0	61.6	71.6	176.7	205.4	5.8	6.7	28.6	33.2
1974-75	24	4.0	76.3	76.3	195.8	195.8	10.0	10.0	33.9	33.9
1975-76	22	3.8	69.8	61.4	212.4	186.8	7.2	6.3	35.9	31.6
1976-77	23	4.0	85.9	68.4	262.4	209.1	14.5	11.6	44.2	35.2
1977-78	24	3.9	95.2	69.3	306.7	223.2	13.0	9.5	49.2	22.0
1978-79	23	3.8	130.3	88.5	346.2	235.1	13.2	9.0	50.1	34.0
1979-80	26	4.3	173.2	98.3	483.1	275.7	17.0	9.7	59.5	34.0
1980-81	29	4.9	187.6	94.0	563.3	282.3	20.3	10.2	72.3	36.2
1981-82	27	4.7	206.7	98.5	651.3	310.5	31.9	15.2	84.3	40.2
1982-83	6	4.2	161.4	71.1	657.6	289.3	36.4	16.0	87.2	38.4
1983-84	30	4.4	220.9	90.8	763.1	313.7	43.1	17.7	89.2	36.7
Average Annual Growth (%)		1.9	14.4	3.8	16.2	5.6	16.2	5.0	13.4	2.5
Total Manufacturing		-1.6	11.3	-0.1	11.3	1.0	12.4		10.7	

SOURCE: Basic Metals Industry Council for Australian Manufacturing Council

TABLE B.7 NON-FERROUS METALS, NEC - ROLLING, DRAWING EXTRUDING

YEAR	NUMBER OF ESTABLISHMENTS	EMPLOYMENT	VALUE ADDED		TURNOVER		FIXED CAPITAL EXP.		WAGES & SALARIES	
			CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES
		'000	$m	$m	$m	$m	$m	$m	$m	$m
1972-73	23	4.2	50.2	45.9	195.7	221.8	5.4	7.9	22.6	29.8
1973-74	22	4.3	57.1	48.6	265.1	235.0	5.1	6.3	28.3	32.9
1974-75	21	4.2	57.2	57.2	276.5	276.5	10.5	10.5	32.2	32.2
1975-76	20	3.6	55.6	37.3	192.7	180.3	8.2	7.1	31.2	27.4
1976-77	18	3.5	71.9	41.1	238.3	198.5	6.7	5.2	35.1	26.9
1977-78	21	3.2	72.2	44.6	256.8	215.7	13.7	9.6	32.9	23.1
1978-79	20	3.2	76.6	38.9	270.9	188.8	9.1	5.9	38.3	24.9
1979-80	18	3.1	97.2	42.2	359.4	203.8	5.5	3.3	43.5	25.7
1980-81	22	3.0	99.4	47.6	381.2	230.3	5.3	2.8	45.4	24.6
1981-82	23	3.3	105.3	50.4(e)	409.5	247.4(e)	6.9	3.4	54.5	26.5
1982-83	21	2.4	81.1	44.8	350.9	193.8	7.2	3.1	46.2	25.5
1983-84	18	2.3	81.6	33.5	371.0	152.5	1.8	0.7	46.6	19.1
Average Annual Growth (%)		-4.8		-0.3		-0.7		-11.4		-2.4
Total Manufacturing		1.6		-0.1		1.0	12.4		10.7	

(e) ESTIMATE

SOURCE: Basic Metals Industry Council of Australian Manufacturing Council

B 11 INVESTMENT

i) COPPER (See **Table B 2**)

Capital expenditure has been low in recent years after major investment in the early and mid 1970s. Foreign ownership of the industry is shown on **Table B 8.** MIM has had a relatively high degree of foreign ownership, but is naturalising.

ii) ALUMINA AND ALUMINIUM (See **Table B 3**)

Capital expenditure grew dramatically over the past decade and accounted for a substantial proportion of new investment in manufacturing. Foreign investment has been more significant than in other basic metals sectors. The naturalisation process of CRA is lowering foreign ownership. See **Table B 9** for more detail in this sector.

iii) OTHER NON-FERROUS METALS (See **Table B 10**)

It is not possible to separate this data. Capital expenditure has been very variable from year to year but shows a negative average of -5.2% per annum over the past decade. There is a high degree of Australian ownership in these sectors.

iv) SECONDARY RECOVERY AND ALLOYING (See **table B 5**)

Investment in this sector has been variable with expenditure increasing as aluminium prices rose. Aluminium facilities are technically sophisticated and attached to primary smelting facilities. Copper foundaries have lagged behind technically with the contraction of that industry. Investment in lead recovery has reduced due to current low prices.

v) SEMI-FABRICATION (See **Tables B 6** and **B 7**)

Capital expenditure grew by 5% per annum in real terms in the aluminium semi-fabrication industry over the past decade while other semi-fabrication had a negative trend of -11.4% per annum.

Foreign ownership in aluminium semi-fabrication reflects foreign ownership of the refining and smelting facilities and is thus relatively high. Other non-ferrous semi-fabrication has a higher proportion of Australian ownership.

TABLE B 8

OWNERSHIP AND CONTROL OF NON-FERROUS BASIC METAL PRODUCTS 1982-83

INDUSTRY	NO OF ESTABS.	% FOREIGN CONTROL	% JOINT CONTROL	% NATURAL-ISING	% AUST. CONTROL
Copper smelting	4	25.0%	-	50.0%	25.0%
Silver, lead and zinc	6	33.0%	-	-	67.0%
Alumina	4	100.0%	-	-	-
Aluminium smelting	6	50.0%	-	16.7%	33.3%
Nickel smelting	3	33.0%	-	-	67.0%
Other non-ferrous	5	20.0%	20.0%	-	60.0%
Secondary	39	20.5%	-	-	79.5%
TOTAL BASIC	67	29.9%	1.5%	6.0%	62.4%
Aluminium rolling drawing, extruding	26	30.8%	3.8%	15.4%	50.0%
Other rolling, drawing, extruding	21	23.8%	-	-	76.2%
Metal casting	103	1.9%	1.0%	-	97.1%
TOTAL PRODUCTS	150	10.0%	1.3%	2.7%	86.0%

% UNDER FOREIGN OWNERSHIP OR CONTROL OF

1982-83	EMPLOY-MENT	WAGES & SALARIES	TURNOVER	VALUE ADDED	FINAL CAPITAL EXP.
Basic non-ferrous metals	82.1	85.9	80.9	88.7	99.1
Non-ferrous products	55.8	61.3	71.0	63.2	79.3

SOURCE: ABS No 5322.0 Foreign Ownership and Control of the Manufacturing Industry

TABLE B.9

AUSTRALIAN ALUMINIUM CAPACITY AND RESOURCES REQUIREMENTS

PLANT	DATE	ANNUAL CAPACITY (TON)	ESTIMATED CAPITAL COST MUSD 1979	EMPLOYMENT (NUMBER)	POWER REQ. (MW REQ. AT SMELTER)	ANNUAL ALUMINA REQUIREMENT (TON)	FOREIGN OWNERSHIP FIRST EST. (a) %	FOREIGN OWNERSHIP SECOND EST. (b) (c) %
EXISTING								
Comalco-Bell Bay	1955-77	112,000	99	1,250	400 (e)	220,000	100	43
Alcoa-Geelong	1963-79	100,000	100 (e)	1,772	150	200,000 (e)	51	51
Expansion	1981	68,000	89	200	100	100,000	51	51
Alcan-Kurri Kurri	1939-79	70,000	80	572 (d)	130 (e)	140,000	70	70
TOTAL EXISTING		350,000	368	3,794 (d)	780 (e)	660,000 (e)	38.5	52.2
NEW								
Comalco-Gladstone	1984	206,000	600	1,080	360	400,000	50	71.5
Alcoa-Portland	1986	132,000	363	500	230	240,000	51	51
Pechiney-Tomago	1985	220,000	500	1,798 (d)	360	400,000	50	50
TOTAL EXISTING PLUS NEW		908,000	1,831 (e)	7,172 (d)	1,730	1,700,000	45.7	55.8
PROPOSALS - INDEFINITE OR CANCELLED								
Alumax-Lochinvar		236,000	641	900	420	455,000	65	65
Alcan-Bundaberg		100,000	250	817 (d)	200	200,000	100	100
Nabalco		150,000	500	1,226 (d)	280	300,000	40	40
Alcan-Kurri Kurri Expansion		20,000	40	164 (d)	40	40,000 (e)	70	70
Alcoa-Portland Expansion		396,000	637	677	690	800,000	51	51
Comalco-Gladstone Expansion		206,000	900	620	360	400,000	50	71.5
TOTAL PROPOSALS		2,005,000	4,799	10,966 (d)	3,720	3,895,000	52.2	59.1

SOURCE: Australian Parliamentary Library Service, "Some Implications for Australia of Rapid Development of the Aluminium Industry", 1979-12-05, updated from press reports.

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TABLE B.9 Cont. 2/...

NOTES:

(a) Smelter partnerships divided so that only those partners not registered in Australia are classified as foriegn.
(b) Smelter partnerships where foreign ownership of Australian registered companies are included as foreign. Main effect is that RTZ's 72.6% (1979) ownership of CRA (part-owner of Comalco) is included as foreign.
(c) Ownership of Australian companies is divested in a number of financial institutions or Nominee Companies. It is assumed these are wholly Australian owned.
(d) Employment estimates include only direct employment at the smelter and associated facilities. This would probably increase by additional employment at Head Offices.
(e) Estimated.

SOURCE: Raw Materials Report Vol 2 No 1.

TABLE B.10 SILVER, LEAD, ZINC, NICKEL & NON-FERROUS METALS NEC - SMELTING AND REFINING

YEAR	NUMBER OF ESTABLISHMENTS	EMPLOYMENT	VALUE ADDED		TURNOVER		FIXED CAPITAL EXP.		WAGES & SALARIES	
			CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES	CURRENT PRICES	1974/75 PRICES
		'000	$m	$m	$m	$m	$m	$m	$m	$m
1972-73	8	5.6	75.6	109.7	305.8	443.6	20.4	29.6	31.6	41.6
1973-74	9	5.8	121.4	150.7	435.9	541.0	11.2	13.9	38.7	45.0
1974-75	10	6.4	114.8	114.8	512.8	512.8	43.8	43.8	58.5	58.5
1975-76	9	6.0	147.4	137.4	572.5	533.5	11.2	10.4	61.0	53.5
1976-77	9	6.3	197.4	147.3	729.6	544.5	9.2	6.9	71.0	54.4
1977-78	10	6.3	166.3	118.1	709.7	504.2	25.9	18.4	78.3	54.9
1978-79	12	6.4	281.1	171.6	1,022.4	624.1	66.3	40.5	84.0	54.7
1979-80	12	6.6(e)	313.3(e)	145.1	1,453.7(e)	673.5	37.6(e)	17.4	93.4(e)	55.3
1980-81	14	6.6(e)	220.0(e)	103.7	1,269.1(e)	598.4	17.4(e)	8.2	105.0(e)	56.9
1981-82	14	6.8	192.6	89.2	1,200.8	555.9	35.6	16.5	123.8	60.3
1982-83	14	NA	NA	NA	NA	NA	NA	NA	NA	NA
1983-84	7	4.3	134.9	55.4	774.3	318.3	19.3	7.9	92.2	37.9
Average Annual Growth (%)		2.3	-1.7			2.7		-5.2		
Total Manufacturing		-1.6	11.3	-0.1	11.3	1.0	12.4		10.7	

(e) ESTIMATE

B 12 CONSUMPTION OF ENERGY (See **Table B 14**)

Non-ferrous basic metals are extremely high consumers of energy. On average energy costs were 16% of turnover for this industry but only 2.8% of turnover for Australian manufacturing as a whole. Semfabrication of non-ferrous products were very similar to the manufacturing average.

Electricity was the main energy cost in the industry. Alumina refining was the highest consumer of energy, but a large proportion of this consisted of furnace or fuel oils. The Nabalco refinery at Gove, Northern Teritory is run entirely on fuel oils. The aluminium industry was the largest consumer of electricity. Data for copper and nickel smelting was not available.

B 17 WAGES AND SALARIES AND EMPLOYMENT

i) COPPER (See **Table B 2, B 11, B 12**)

Real wages and salaries grew by an average of 2.3% per annum since 1972-73 and employment grew by 4.3% per annum which was above manufacturing average.

ii) ALUMINA AND ALUMINIUM (See **Tables B 3, B 11, B 12**)

Real wages and salaries grew by an average of 3.5% per annum since 1972-73 and employment grew by 5.4%; both were well above the average for manufacturing.

Table B 12 shows differences in payments to administrative and production empoyees. The alumina sector had above industry average levels while the aluminium sector was close to average.

iii) SILVER, LEAD AND ZINC (See **Tables B 4, B 11, B 12**)

Employment grew steadily until 1981-82, but has since declined.

Payments to employees were below the industry average for production employees, however administrative staff received the third highest remuneration.

iv) OTHER NON-FERROUS (See **Tables B 7, B 11, B 12**)

Employment has been static since 1980-81. Remuneration to employees was below the industry norm in 1983-84, especially for production employees.

v) NICKEL

No specific data is available. Employment is estimated at 1,800 staff with relatively high remuneration.

vi) SECONDARY RECOVERY AND ALLOYING (See **Tables B 8, B 11** and **B 12**)

Employment has shown a decline and then a recovery over the past decade. Salary levels were below the industry average in both categories.

vii) SEMI-FABRICATION (See **Tables B 9, B 10** and **11**)

Employment in aluminium rolling, drawing and extruding grew slowly over the past decade. Wages and salaries paid grew by 2.5% per annum in real terms.

Employment in other metals rolling, etc declined over the decade although metal casting remained stable. Wages and salaries declined by -2.4% per annum in real terms over this period.

TABLE B.11

EMPLOYMENT 1975/76 - 1983/84 - PERSONS, THOUSANDS

INDUSTRY	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Copper smelting, refining[+]	0.8	0.7	1.0	1.0	2.9[+]	n.a.	1.1	n.a.	n.a.
Silver, lead and zinc	6.0*	6.2*	6.3*	6.4*	4.5	4.7	4.8	4.4	4.3
Alumina)	)	)	)	4.8	)	n.a.	)	5.2	5.8
)	6.6)	6.8)	7.1)		7.8)		9.1)		
Aluminium)	)	)	)	2.7	)	3.3	)	4.2	5.2
Nickel [+]*)	n.a.					n.a.	)	n.a.	n.a.
)							2.0)		
Other non-ferrous [+]*)	n.a.					0.2	)	0.2	0.2
Secondary non-ferrous	1.5	1.6	1.4	1.4	1.5	1.4	1.3	1.1	1.6
TOTAL BASIC NON-FERROUS				16.2	17.0	17.8	18.3	18.4	19.6
Aluminium rolling, drawing, extruding	3.8	4.0	3.9	3.8	4.3	4.9	4.7	4.2	4.4
Other, rolling etc	3.6	3.5	3.2	3.2	3.1	3.0	3.3	2.4	2.3
Metal casting	1.9	1.9	1.8	1.9	2.0	1.9	2.3	1.9	2.0
TOTAL NON FERROUS PRODUCTS				8.9	9.4	9.9	10.3	8.5	8.6

TYPE OF EMPLOYMENT - 1975/76 AND 1983/84

INDUSTRY	WORKING PROPRIETORS			ADMINISTRATIVE			PRODUCTION		
	MALE	FEMALE	TOTAL	Male	Female	TOTAL	Male	Female	TOTAL
1975/76									
Total basic non-ferrous	4	3	7	3,612	885	4,497	10,647	113	10,760
Total non-ferrous metal products	42	18	60	1,639	580	2,319	6,748	346	7,440
1983/84									
Total basic non-ferrous	2	1	3	4,233	1,037	5,270	14,634	162	14,796
Total non-ferrous metal products	29	12	41	1,651	603	2,254	6,141	411	6,552

SOURCE: ABS 8203.0 Manufacturing Establishments, Details of Operations by Industry Class.

TABLE B.12

EMPLOYMENT - WAGES AND SALARIES BY EMPLOYEE CLASS 1983-84

SECTOR	ADMINISTRATIVE EMPLOYEES			PRODUCTION & OTHER EMPLOYEES			TOTAL EMPLOYEES		
	PERSONS	WAGES & SALARIES	AVERAGE PAYMENT PER PERSON	PERSONS	WAGES & SALARIES	AVERAGE PAYMENT PER PERSON	PERSONS	WAGES & SALARIES	AVERAGE PAYMENT PER PERSON
		$M			$M			$M	
Silver, Lead, Zinc	1,138	30.0	26,362	3,186	62.1	19,492	4,324	92.2	21,323
Alumina	1,563	54.2	34,677	4,546	98.9	21,755	6,109	153.1	25,061
Aluminium	1,523	39.1	25,673	3,944	82.1	20,816	5,467	121.2	22,169
Copper, Nickel	641	16.8	26,209	1,797	39.6	22,037	2,438	56.3	23,093
Other Non-ferrous	48	1.2	25,000	148	2.3	15,541	196	3.5	17,857
Secondary, etc	357	8.7	24,370	1,175	22.3	18,979	1,535	31.0	20,195
TOTAL	5,270	150.0	28,463	14,796	307.3	20,769	20,069	457.3	22,786

SOURCE: Ibid

B 18 PRODUCTIVITY - VALUE ADDED PER EMPLOYEE

i) COPPER (See **Table B 13**)

Value added fell by -9.5 per annum on average in real terms due to declining turnover, but stable to rising employment.

ii) ALUMINA AND ALUMINIUM (See **Table B 13**)

Value added per employee fell marginally over the decade. A substantial increase occurred at the beginning of the past decade and then declined marginally. New facilities coming on stream will be large scale, modern establishments which should increase sector productivity.

iii) SILVER, LEAD, ZINC, NICKEL & OTHER (See **Table B13**)

Value added per employee was low relative to the copper and alumina-aluminium sectors and showed no growth over the decade.

iv) SEMI-FABRICATION (See **Table B 13**)

Value added per employee in aluminium semi-fabrication rose substantially until 1979-80 but then declined. The industry is currently restructuring its facilities to improve efficiency.

Value added per employee in other metal semi-fabrication rose steadily throughout the decade.

TABLE B.13

VALUE ADDED PER EMPLOYEE IN NON-FERROUS METALS - 1974/75 PRICES ($'000)

METAL	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Copper	52.7	39.6	32.2	35.3	31.1	23.4	31.1	22.7	22.2	21.0	NA
Alumina & Aluminium	27.0	44.3	35.7	35.3	34.4	33.5	28.0	33.1	33.5	32.9	32.6
Silver, Lead, Zinc, Nickel and other Secondary Recovery	18.2	20.2	17.9	20.8	20.4	20.8	19.9	18.6	20.3	17.3	NA
Other metals - semi fabrication	10.9	11.3	13.6	10.4	11.7	13.9	12.2	13.6	15.9	15.3	18.7
Aluminium semi fabrication	15.5	17.9	19.1	16.2	17.1	17.8	23.3	23.0	19.2	21.0	16.9

SOURCE: Ibid

B 21 MARKETING

i) COPPER

Overseas sales based on London Metal Exchange. Domestic prices derived from LME.

Japan takes 90% of blister copper exports. Britain (20%), Netherlands (13%), FR Germany (8%), Saudi Arabia (7%), France (18%) of refined copper exports. Associate member of Intergovernmental Council of Copper Exporting Countries (CIPEC).

ii) ALUMINA AND ALUMINIUM

Three quarters of bauxite is domestically processed through associated refineries and the proportion of domestic refining will increase.

Plans to increase domestic smelting to 25% of alumina.

Exports 6M tonnes per annum of bauxite to Japan and Western Europe. Exports 6.8M tonnes per annum of alumina - largest exporter in world - to North America, Japan, Middle East. Exports of aluminium will rise to 1M tonnes per annum to Japan.

Member of the International Bauxite Association (IBA) but has not been actively involved in minimum price setting activities. Majority of sales are either internal transfers within companies/consortia or on long term contract at set prices.

iii) SILVER, LEAD AND ZINC

Lead prices based on the LME price.
Zinc prices based on the GOB producer price as published in the Metal Bulletin (London).

Founding member of the International Lead and Zinc Study Group (ILZSG).

iv) NICKEL

Majority of production sold under long term contract. Contracts written in US dollars. Prices based on list price for plating-grade nickel published by INCO Ltd of Canada and other major producers.

v) TIN

Domestic price is based on the daily price in Penang. Export concentrate price based on Penang price. Export metal price based on the LME price.

Member of the International Tin Council and International Tin Agreement buffer stock scheme. Member of the Association of Tin Producing Countries (ATPC) to promote use of tin.

vi) SECONDARY METALS

Aluminium scrap prices set at world trade levels. Wide range of alloys produced to meet small domestic market needs. Australia is a net exporter of scrap and secondary ingots.

Copper scrap market is declining due to competitiion from plastics and aluminium. Market restricted to domestic needs.

Lead scrap prices set at world levels, some production is exported and market currently depressed.

vii) SEMI-FABRICATION

Aluminium products sold to domestic building and construction and packaging industries with some export of sheet and plate. Export market growing.

Other metals fabrication products sold predominantly on domestic market and export market declining.

TABLE B.14 CONSUMPTION OF ENERGY BY NON-FERROUS INDUSTRIES ($'000)

	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
COPPER										
Electricity	931	952	1,253	1,528	1,684	*Included	NP		7,129	NP
Total	4,750	5,426	6,186	7,576	8,097	In Other	NP		NP	NP
% Turnover	2.35%	2.84%	2.75%	3.74%	2.65%		NP		NP	NP
SILVER, LEAD, ZINC										
Electricity	6,604	9,194*	11,228*	10,117*	15,445*	13,766	14,080		20,722	27,592
Total	17,770	44,115*	53,927*	53,826*	71,002*	35,836	39,954		54,934	62,389
% Turnover	5.50%	7.70%	7.39%	7.58%	6.94%	3.75%	4.42%		7.32%	8.06%
ALUMINA										
Electricity	33,052)	35,909)	43,165)	48,335)	19,607	61,021)	NP		NP	49,731
Furnace Oil	33,858)	47,508)	66,411)	76,212)	75,590	110,821)	NP		167,892	179,813
Total	88,936)	109,197)	143,027)	161,896)	135,564	219,609)	NP		291,762	342,681
% Turnover	18.23%)	18.86%)	19.00%)	19.70%)	21.61%	17.97%)			25.06%	25.20%
	)	)	)	)		)				
ALUMINIUM	)	)	)	)		)				
Electricity	)	)	)	)	37,806	)	60,173		84,274	120,194
Total	)	)	)	)	40,209	)	67,092		94,673	134,580
% Turnover	)	)	)	)	14.92%	)	15.15%		17.17%	17.89%
								DATA NOT PUBLISHED		
NON-FERROUS NEC										
Electricity	1,447	*Included	*	*	*	5,618*	254		NP	364
Total	9,339	In Silver				78,408*	874		689	884
% Turnover		Lead, Zinc				8.42%	0.95%		1.00%	1.36%
SECONDARY RECOVERY										
Electricity	815	823	967	768	893	1,109	1,194		2,067	3,924
Total	2,354	2,689	3,233	2,069	2,327	3,136	3,329		4,286	10,958
% Turnover	1.77%	2.00%	2,10%	1.43%	1.20%	1.00%	1.10%		1.72%	2.98%
TOTAL NON-FERROUS METALS										
Electricity	110,593	46,878	56,613	60,747	75,435	81,514	113,357		161,334	213,280
Black coal	12,580	15,334	18,663	20,056	22,869	26,120	29,545			60,561
Coke	9,713	9,134	13,221	15,547	17,481	18,969	21,230			28,495
Light oils	1,122	735	735	2,263	2,882	161	2,978		9,098	5,309
Industrial diesel	2,653	3,482	4,230	4,554	7,217	13,126	19,158		17,303	13,585
Furnace oils	44,199	69,420	92,205	97,564	104,962	165,786	240,343		213,516	216,510

	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
TOTAL NON-FERROUS METALS CONT.										
Mains gas	7,847	8,279	12,620	16,157	17,797	20,620	25,901		46,248	80,815
LPG	NP	NP	NP	254	330	501	530		729	1,008
Other gas	NP	NP	NP	193	55	96	638		NP	243
All other fuels	5,461	8,165	8,086	8,033	8,172	10,097	11,704		104,884	21,506
Total	126,211	161,427	206,373	225,368	257,198	336,989	470,883		553,112	641,312
% Turnover	9.52%	10.93%	11.09%	11.99%	10.64%	9.84%	13.08%		15.56%	15.91%
ALUMINIUM SEMI-FABRICATION										
Electricity	3,156	3,137	3,775	4,820	5,064	5,988	6,925		9,893	15,754
Total	5,111	5,502	6,443	7,692	7,604	9,360	11,417		15,044	21,331
% Turnover	2.61%	2.59%	2.46%	2.51%	2.20%	1.94%	2.03%		2.29%	2.80%
OTHER SEMI-FABRICATION										
Electricity	2,987	3,059	3,477	3,680	4,396	4,913	5,553		4,914	6,186
Total	5,542	5,908	6,622	6,969	7,811	9,447	10,532		6,408	8,011
% Turnover	2.00%	3.07%	2.78%	2.71%	2.88%	2.63%	2.76%		1.83%	2.16%
METAL CASTING								DATA NOT PUBLISHED		
Electricity	370	520	624	626	722	835	963		1,834	2,424
Total	958	1,276	1,524	1,460	1,741	2,432	2,499		3,587	4,567
% Turnover	2.56%	2.99%	2.82%	2.71%	2.79%	3.04%	2.79%		3.10%	3.60%
TOTAL SEMI-FABRICATION										
Electricity	6,513	6,716	7,876	9,126	10,182	11,735	13,441		16,641	24,363
Light oils	39	550	498	63	49	66	104		90	95
Industrial diesel	822	696	604	583	591	628	1,006		317	396
Furnace oil	2,757	2,866	2,997	4,037	3,767	4,912	4,554		947	596
Mains gas	509	828	964	1,117	1,435	2,579	3,771		6,725	8,278
LPG	NP	NP	NP	1,055	956	1,210	1,503		282	120
Other gases	NP	NP	NP	5	9	20	56		NP	33
Other fuels	801	1,022	1,598	111	150	68	8		37	26
Total	11,611	12,686	14,589	16,121	17,155	21,239	24,447		25,039	33,909
% Turnover	2.28%	2.83%	2.63%	2.61%	2.52%	2.30%	2.36%		3.61%	2.69%

SOURCE: ABS: Manufacturing Establishment; Details of Operations by Industry Class.

APPENDIX A 1

INDEXED CAUSTIC SODA PRICES TO THE ALUMINA INDUSTRY
(1974 = 100)

YEAR	ICI DOMESTIC PRICE cif[a]	AVERAGE IMPORT PRICE c&f[b]
1974	100	100
1975	c	188
1976	223	206
1977	c	182
1978	247	182
1979	188	188
1980	241	212
1981	365	282
1982	394	306
1983	353	200
1984	235	171

a Cost, Insurance, Freight

b Cost and Freight

c No supply in these years surplus to non-alumina consumption

SOURCE: Industries Assistance Commission, Draft Report on the Chemicals and Plastics Industries, December 1985, p.91.

APPENDIX A 2

RAW MATERIAL ANALYSIS

ALUMINA

	GOVE (N.T.)	Q.A.L.(Qld)	KWINANA (W.A.)
B.E.T. Surface (m^2/g)	49.2	81.5	60.3
Alpha Alumina content (%)	-	20	17
Minus 48 micron (%)	4.0	9	15
Loss on Ignition 300°C (%)	0.4	3.4	2.3
Loss on Ignition 300 - 1000°C (%)	0.5	1.1	0.7
Apparent density	0.97	1.03	1.01
Angle of repose (degrees)	31	28.5	34.5
Sodium (ppm)	4400	2400	4300
Calcium (ppm)	180	90	320
Iron (ppm)	140	310	210
Nickel (ppm)	20	20	20
Magnesium (ppm)	10	5	5
Fluoride (ppm)	310	400	400
Potassium (ppm)	20	10	10

PETROLEUM COKE

Density	2.06
Ash	0.5%
Sulphur	2.5%
Iron	100 ppm
Silicon	100 ppm
Vanadium	250 ppm
Nickel	125 ppm

PITCH

Softening point C/A ASTM 2319	108°C - 115°C
Quinoline Insoluble	12 - 18%
Benzene Insoluble	27% min
Beta resins	15% min
Coking Value	57% min
S.G. at 15.5°C	1.31 min
Distillation 0-360°C	5% max
Ash	0.4% max
Iron	0.05% max
Silicon	0.10% max
Sulphur	0.75% max
Moisture (for pencil form)	1.0 max

C LINKAGES BETWEEN NON-FERROUS METALS SECTOR AND REST OF ECONOMY

C 1 ANALYSIS OF MAIN FLOWS BETWEEN SECTORS

TABLE C.1

NON-FERROUS METAL PRODUCTS

SALES TO OTHER SECTORS - AUSTRALIAN PRODUCTION
$A MILLIONS

INDUSTRY	1974-75	1978-79
Joinery, wood products	9.5	13.8
Commercial and job printing	13.1	2.8
Industrial chemicals	4.0	20.7
Petroleum and coal products	5.0	2.3
Basic iron and steel	57.0	169.0
Non-ferrous metal products	287.0	376.2
Structural metal products	61.5	144.3
Sheet metal products	34.8	61.4
Metal products, n.e.c.	71.9	113.5
Motor vehicles and parts	47.3	81.8
Scientific equipment	9.0	32.7
Electronic equipment	18.1	25.5
Household appliances	33.0	33.3
Electrical machinery	153.0	208.9
Other machinery and equipment	48.7	71.1
Plastic and related products	11.3	10.2
Other manufacturing	10.4	1.3
Residential building	15.9	31.5
Building n.e.c. construction	78.2	87.9
TOTAL INTERMEDIATE SALES	$ 1,007.0	$ 2,068.7

Table C 1 indicates those sectors in the Australian economy which are the main users of non-ferrous metal products. The large production flow within the non-ferrous metals sector itself reflects the degree of further processing (refining or smelting) in Australia.

The main domestic manufacturers and other end users of non-ferrous metal products are as follows:

COPPER

Building and construction (35-40%); motor vehicle industries (.6-8%); telecommunications and electrical machinery and equipment (13-17%). Domestic consumption was about 140,000 tonnes of refined copper in 1981.

NICKEL

Steel industry (stainless steel, construction steel and non-ferrous alloys), electroplating, catalyst in electronics and ceramic industries. Domestic consumption is low at about 4,000 tonnes in 1979.

LEAD

Motor vehicle industry. Domestic consumption was approximately 71,000 tonnes in 1979.

ZINC

Steel industry. Domestic consumption was approximately 99,000 tonnes in 1979.

TIN

Steel industry as tin plate (60%). Domestic consumption was 2,700 tonnes in 1982 plus 4,000 tonnes secondary tin but is declining over time.

ALUMINIUM

Building and construction, packaging, electrical, transport industries. Domestic consumption was 197,000 tonnes primary metal and 49,000 tonnes of secondary metal in 1979 and increasing over time.

C 2 SUPPLY OF INPUTS TO NON-FERROUS METALS INDUSTRY

The main inputs supplied to this industry by Australian producers is shown on **Table C 2.** Imports of inputs is shown on **Table C 3.**

The main inputs are from the metallic minerals and non-ferrous metal products sectors. This reflects the flow of raw materials and further processing through the refining/smelting stages within Australia. The non-ferrous metals industry in Australia has a high degree of vertical integration with the same company being in control of all stages of processing. Flows thus represent inter-company transfers rather than arms-length sales.

Other major inputs are energy sources such as coal and petroleum fuels and products which are supplied by major coal mining and oil companies in Australia and electricity which is drawn from State Government power grids. Alcoa of Australia operates its own power station and electricity generator near its Geelong, Victoria aluminium smelter.

Transport is another important input. The most used form is rail which is provided by State Government networks. Ships are used to transport bauxite and alumina from Queensland and Western Australia to smelters in Victoria and New South Wales. Commercial shipping companies are used.

The non-ferrous metals sector also has a significant impact on services sectors particularly wholesale trade and finance and business services as a result of its administration functions. It is also a major consumer of chemicals which come from a variety of local firms.

The non-ferrous metals industry in Australia is not a major consumer of imports. The major inputs imported are chemicals eg caustic soda and petroleum products such as coke.

Such products are imported either because domestic production is insufficient for industry needs or where the product is highly specialised and the domestic market is too small to justify production. Large scale production in overseas plants has resulted in import prices lower than it is possible to achieve domestically which has prevented domestic supply.

In relation to upstream production, most semi-fabrication occurs in conjunction with metals production. Aluminium rolling, drawing and extruding is undertaken by the major smelting companies - Alcan,

Alcoa and Comalco. Copper is the only other metal produced as semi-fabrications, powders or flakes in Australia to any substantial degree. There are a large number of firms so engaged but these have substantial ownership links with major corporations. Metals Manufactures Limited has a number of bronze foundries. Simsmetal, major processer of non-ferrous scrap and manufacturer of secondary products from lead, aluminium and copper is owned by Peko-Wallsend Limited.

Manufacturing of non-ferrous products involving casting and alloying is conducted by a large number of small, locally-owned businesses. Aluminium and other architectual products (doors, window-frames etc) is conducted by a number of large firms associated with the base-metal companies and a large number of smaller independant firms. Metal containers are produced predominately by a few large firms eg Containers Limited. Metal coating and finishing with aluminium or copper is undertaken in associated with the large semi-fabricators, although a large number of small, specialist firms also exist.

TABLE C.2

NON-FERROUS BASIC METAL

PURCHASES FROM OTHER SECTORS - $ MILLIONS

INDUSTRY	1974/75	1978/79
Other metallic minerals	608.7	1,067.0
Coal and crude petroleum	18.4	37.1
Industrial chemicals	35.1	54.1
Petroleum and coal products	42.6	115.7
Clay products	16.9	12.5
Basic iron and steel	33.8	23.6
Non-ferrous metal products	287.0	376.2
Metal products, n.e.c.	7.7	2.9
Electrical machinery, n.e.c.	5.0	1.0
Other manufacturing	0.1	21.4
Electricity	46.8	74.1
Wholesale trade	45.9	88.3
Road transport	20.0	33.2
Railway transport	31.6	73.6
Water transport	20.7	23.8
Communication	N.A.	6.0
Banking	N.A.	12.3
Non-bank finance	N.A.	7.9
Investment, real estate	5.9	0.7
Business services	N.A.	7.2
Business expenses	48.0	N.A.
TOTAL INTERMEDIATE PURCHASES	1,314.9	2,068.7
Wages and salaries	245.6	354.4
Gross operating surplus	175.1	355.7
Commodity taxes or subsidies	3.0	6.1
Indirect taxes	13.7	14.9
Sales to final buyers	84.6	171.4
Imports c.i.f.	1.0	5.3
TOTAL AUSTRALIAN PRODUCTION	1,838.1	2,976.5
Imports	57.7	72.9
TOTAL INPUTS	$ 1,895.7	$ 3,050.9

TABLE C.3

IMPORTS BY NON-FERROUS BASIC METALS

INDUSTRY	1974/75	1978/79
Non-ferrous metal ores	13.1	5.6
Coal and crude petroleum	0.1	0.1
Other non-metallic	0.7	0.3
Textile products, n.e.c.	0.5	0.3
Sawmill products	0.2	0.2
Pulp, paper and paperboard	0.6	0.2
Publishing and printing	-	0.1
Industrial chemicals	25.7	27.3
Paint, varnishes, lacquers	0.1	-
Chemical products	2.0	0.8
Petroleum and coal products	17.5	39.3
Clay products	1.0	3.7
Non-metallic mineral products	0.8	0.2
Basic iron and steel	3.0	1.0
Other basic metal products	5.0	7.9
Metal products, n.e.c.	10.4	0.7
Electrical machinery, n.e.c.	0.1	0.1
Construction equipment	-	0.4
Other machinery and equipment	0.8	0.5
Plastics and related products	0.1	0.1
Other manufacturing	N.A.	7.7
Electricity	N.A.	0.2
Railway and other transport	N.A.	0.1
Air transport	N.A.	1.7
Insurance	N.A.	0.2
Other business services	N.A.	0.2
TOTAL	$ 72.9	$ 104.5

C 3 TECHNICAL AND SOCIO-ECONOMIC RELATIONSHIPS BETWEEN NON-FERROUS METALS INDUSTRY AND MAIN CUSTOMERS

Table C 4 shows the technical co-efficient multipliers for 1974-75 and 1978-79. Expansion in the electrical machinery, structural metal products and scientific instruments industries will have the largest impact on the non-ferrous metals industry. It is also a major customer for its own products. Structural metal products and scientific instruments had the most significant increase in the use of non-ferrous metals as an input. This indicates a shift away from the use of ferrous metals and wood in their production.

Basic iron and steel and paints, varnishes and lacquer production also show significant increases in the use of non-ferrous metal products as inputs. This in part reflects the increased production of coated steels, one area where Australia is internationally competitive, and alloying. Agricultural machinery also showed increased usage of non-ferrous metals.

The non-ferrous metals industry itself is highly concentrated showing significant vertical integration through the mining, refining, smelting and semi-fabrication stages. Consortia of companies are being increasingly formed to undertake new large-scale projects, often among firms who nominally compete in the same market. Such joint-venture projects require partners to take output on an agreed ratio. The large alumina refinery at Gladstone is an example of this.

Vertical integration into manufacturing is less common but does occur with some aluminium fabrication. Aluminium producers have tended to establish manufacturing facilities to promote the new product in the market and to then sell to an independent producer. Independent manufacturing firms are often tied into long term supply arrangements with a basic metals producer.

Interlocking directorates and equity holdings across the larger companies is common.

TABLE C.4

TECHNICAL CO-EFFICIENTS BY MAIN USERS

OF NON-FERROUS METAL

INDUSTRY	NON-FERROUS METAL PRODUCTS CO-EFFICIENT	
	1974/75	1978/79
Non-ferrous metal products	119.093	115.280
Electrical machinery	23.122	22.317
Structural metal products	11.800	16.564
Scientific instruments	7.461	13.062
Other metal products	10.819	10.755
Household appliances	10.758	9.283
Sheet metal products	8.467	9.723
Other machinery and equipment	6.903	7.214
Electronic equipment	6.299	6.923
Basic iron and steel	4.483	8.326
Paints, varnishes, lacquers	3.807	6.284
Motor vehicles and parts	5.609	5.467
Agricultural machinery	3.679	5.972
Other building and construction	3.900	4.178
Ship and boat building	4.184	3.757
Construction - machinery	4.061	3.963
Other chemical products	3.225	3.729
Joinery, wood products	3.230	3.251
Locomotives, rolling stock	2.077	3.082
Signs, writing equipment	2.984	3.076

C 4 TECHNICAL AND SOCIO-ECONOMIC RELATIONS BETWEEN NON-FERROUS INDUSTRY AND MAJOR SUPPLIERS

Table C.5

TECHNICAL CO-EFFICIENTS INCLUDING IMPORTS : SUPPLIERS

INDUSTRY	CO-EFFICIENTS 1974/75	1978/79
Non-ferrous metal products	119.093	115.280
Other metallic minerals	39.968	42.001
Business expenses)	7.193	2.908
Finance)	n.a.	3.168
Electricity	6.585	6.858
Wholesale trade	6.369	6.376
Petroleum and coal products	5.401	6.941
Basic iron and steel	5.354	2.847
Industrial chemicals	5.231	4.731
Coal and crude petroleum	5.163	5.854
Road transport	3.093	2.618
Railway transport	3.019	3.467

Expansion of the non-ferrous metal industries has the highest multiplier effect on its own mining and refining industries. A strong stimulus to business services was recorded in 1974-75 but this fell significantly in 1978-79. The stimulus to electricity and wholesale trade remained unchanged, while that to petroleum and coal products rose as did coal and crude petroleum. The impact on basic iron and steel and industrial chemicals fell in 1978-79. The impact on road transport rose and of railway transport fell.

Regardless of these changes, there were no significant technological changes in this industry over this period.

The mining and metal product stages are vertically integrated. Other inputs are supplied by unrelated companies. Electricity and rail transport are supplied by State Governments.

C 5 EFFECTS ON NATIONAL ECONOMY

i) DEGREE OF INTEGRATED DEVELOPMENT, DEVELOPMENT OF RELATED COMPANIES AND TECHNOLOGICAL INNOVATION

These industries in Australia consist of large mining and refining operations serving the international market and small fabricating and manufacturing operations servicing the domestic market. Growth will stimulate downstream activities, however little evidence of domestic structural change exists. Little evidence exists of import substitution occurring downstream.

Current structural changes in the Australian economy are favouring export development and specialised growth rather than integrated development. Fabricating and manufacturing show no signs of developing beyond domestic needs. Technology being employed in new aluminium smelters is close to "state of the art". However, it is being imported under license from parent companies or being purchased overseas and little technological development is occurring within this country beyond adaptation for local conditions.

ii) EMPLOYMENT AND TRAINING

Data on employment levels in processing facilities is provided in Section B 2. Employment in mining is provided in Secton A 3.

In addition to this direct employment in non-ferrous refinery, smelting and semi-fabricating facilities, multiplier co-efficients for new aluminium smelters have been estimated. The accepted calculations for Australia are: Type I (direct plus indirect) employment 3.286; Type II (incl. induced) employment 6.714. Such figures would imply the 5,200 jobs in aluminium smelting are ultimately responsible for approximately 35,000 jobs throughout the economy.

Non-ferrous metal production and mining does not require skills beyond the level usually available in the Australian workforce. All facilities provide apprenticeship training in relevant trades and on-the-job training for process operatives. Opportunities exist for study towards further qualification for administrative, technical and professional staff in line with most large corporations in Australia.

iii) BALANCE OF PAYMENTS

The non-ferrous metals industry in Australia is export orientated. It thus makes a significant contribution towards the debit side of the nation's balance of payments. Agricultural products and mineral ores and concentrates have been the main commodities historically exported. The relative importance of non-ferrous metal products is illustrated for 1983 below:

Alumina traded	=	6,378,000	tonnes	f.o.b.	$1,179,805,000
Aluminium traded	=	267,517	tonnes	f.o.b.	$ 409,371,000
Secondary/scrap aluminium	=	25,358	tonnes	f.o.b.	$ 23,954,000
Refined copper	=	180,270	tonnes	f.o.b.	$ 183,038,000
Copper alloys	=	9,903	tonnes	f.o.b.	$ 9,747,000
Refined gold	=	35.5	tonnes	f.o.b.	$ 269,906,000
Refined lead	=	373,885	tonnes	f.o.b.	$ 110,131,000
Nickel alloys	=	n.a.		f.o.b.	$ 266,000
Refined silver	=	222,480	kg	f.o.b.	$ 96,095,000
Refined and alloy tin	=	96,773	tonnes	f.o.b.	$ 8,099,000
Refined zinc	=	472,112	tonnes	f.o.b.	$ 224,680,000

Bauxite exports are unavailable. See Appendix C 1 for more detail. **Table C 5** compares production, exports and prices in 1984.

Tables C 6 and **C 7** provide data on imports and exports of non-ferrous metals and non-ferrous ores and concentrates over the past decade. This illustrates the export bias in the trade and shows that in 1983/84 the industry provided a favourable trade balance of $1,437,492,000 from metal products and $3,362,915,000 from ores and concentrates. There is only limited trade in semi-fabricated and fabricated metal products.

TABLE C.5

PRODUCTION AND EXPORT OF PRIMARY NON-FERROUS METAL PRODUCTS 1984

PRODUCT	PRODUCTION TONNES	EXPORTS TONNES	IMPORTED fob EXPORT PRICE PER TONNE $A	AVERAGE PRICE $A DECEMBER 1984
Bauxite	32,181,000	na	na	
Alumina	8,433,000	6,861,000	187.63	
Aluminium	757,798	330,848	1,567.44	1,750
Copper (ore)	239,584)			
Copper (blister)	179,162)	145,576	1,542.60	1,584
Copper (refined)	171,705)			
Gold (ore)	39)			
	)	31	1,326,090.90	382 troy oz
Gold (refined)	34)			
Titanium:				
Ilmenite concentrate	1,097,831	1,203,945	33.99	
Rutile concentrate	181,805	189,309	302.58	
Lead (ore)	443,311)			
Lead (refined)	196,199)	492,192	809.89	500
Lead in bullion	181,960)			
Nickel (ore)	76,748	na	na	na
Tin (ore)	7,488)			
	)	6,620	13,120.24	15,987
Tin (refined)	2,899)			
Zinc (ore)	664,657)			
	)	661,032	703.09	1,103
Zinc (refined)	301,942)			

SOURCE: Australian Mineral Industry Quarterly (37)4, 1984

TABLE C.6

IMPORTS AND EXPORTS OF NON-FERROUS METAL PRODUCTS

YEAR	EXPORTS $'000	EXPORTS % OF TOTAL	IMPORTS $'000	IMPORTS % OF TOTAL
1975/76	439,762	4.56	32,558	0.40
1976/77	595,361	5.11	47,221	0.45
1977/78	578,177	4.71	51,229	0.46
1978/79	792,622	5.57	67,461	0.49
1979/80	1,258,694	6.67	95,587	0.59
1980/81	984,129	5.13	109,535	0.58
1981/82	994,490	4.82	136,768	0.59
1982/83	1,251,504	5.67	93,370	0.29
1983/84	1,535,653	6.53	98,161	0.41

SOURCE: ABS 5411.0 Australian Exports and 5414.0 Australian Imports

TABLE C.7

IMPORTS AND EXPORTS OF NON-FERROUS ORES & CONCENTRATES

YEAR	EXPORTS QUANTITY* TONNES	EXPORTS f.o.b. $'000	IMPORTS QUANTITY TONNES	IMPORTS f.o.b. $'000
1975	1,735,968	354,395	182	10,032
1976	2,303,496	424,724	1,123	9,013
1977	2,242,073	462,432	2,423	6,919
1978	2,504,595	496,970	2,963	3,260
1979	2,347,209	596,906	120	4,031
1980	2,673,316	766,318	2,423	15,213
1981	2,250,621	716,255	2,139	6,034
1982	2,278,426	979,002	452	5,556
1983	2,346,386	764,228*	1,007	27,364
1984(e)	2,833,006	922,511*	1,185	31,615

* Excludes bauxite

SOURCE: Australian Mineral Industry Quarterly and Year Books

TABLE C.8

EXPORTS OF NON-FERROUS METAL PRODUCTS BY COUNTRY

REGION & COUNTRY	1975-1976 VALUE $ '000	1975-1976 % OF TOTAL EXPORTS	1983-1984 VALUE $ '000	1983-1984 % OF TOTAL EXPORTS
ASEAN				
Indonesia	15,313	3.48	54,472	3.55
Malaysia	6,570	1.49	27,783	1.81
Philippines	7,170	1.63	13,093	0.85
Singapore	4,793	1.09	27,984	1.82
Thailand	12,707	2.89	43,055	2.80
EEC				
Belgium/Luxembourg	8,159	1.86	14,077	0.92
Denmark	40	0.00	38	0.00
France	12,976	2.95	37,545	2.44
Germany	34,122	7.76	28,657	1.87
Greece	500	0.11	2,681	0.17
Italy	9,029	2.05	1,096	0.01
Netherlands	33,481	7.61	12,546	0.82
United Kingdom	113,561	25.82	309,984	20.19
AMERICAS				
Canada	4,676	1.06	60	0.00
USA	34,186	7.77	48,408	3.15
ASIA				
China	4,549	1.03	39,326	2.56
Taiwan	10,359	2.35	66,007	4.30
Hong Kong	7,565	1.72	33,906	2.21
India	12,161	2.76	22,454	1.46
Japan	53,482	12.16	295,293	19.23
Korea	622	0.14	15,082	0.98
Saudi Arabia	45	0.00	16,976	1.11
USSR	0	0.00	181	0.01
OCEANIA				
Fiji	209	0.00	484	0.03
New Zealand	30,066	6.84	62,499	4.07
Papua-New Guinea	1,032	0.23	1,602	0.10

SOURCE: ABS 5411.0 Australian Exports

Exports of non-ferrous metal products by country are compared for 1975/76 and 1983/84 on **Table C 8.** The U.K. is the major market although Japan has increased significantly as a major customer over the decade. Trade to the USA has declined in relative importance. Although trading patterns have been relatively stable with lesser customers over the decade, some evidence of a shift to a "Pacific Basin Region" strategy is in evidence.

The relative value of metal products in trade is expected to increase in the near future as three new large scale aluminium smelters begin production. All their production in the form of ingots is destined for export, primarily to Japan.

These new smelters have a high level of foreign ownership and a large proportion of the investment funds were borrowed overseas. Thus while the value of exports will rise, outflows related to loan repayments, interest paid overseas and dividends paid overseas will also increase. These payments plus payments for imported inputs (eg pitch) will be about equivalent to 50% of export earnings. Thus although representing higher value added export earnings, the net gain to balance of payments will be lower than anticipated.

Foreign investment in the non-ferrous metals industry over the past decade is shown on **Table C 9.** Although the pattern exhibits wide fluctuations, there has been a significant rise over this period. Much has been directed towards the alumina and aluminium industries. Incomes payable and receivable because of this investment are shown on **Table C 10.** It is anticipated these figures will increase in the future because of the above investments which will increase income payable while overseas investments by Australian companies will increase incomes receivable.

TABLE C.9

FOREIGN INVESTMENT IN BASIC METALS PRODUCTS*
$A MILLIONS

YEAR	DIRECT INVESTMENT			PORTFOLIO	TOTAL
	UNDIST-RIBUTED INCOME	OTHER	TOTAL		
1976/77	54	-11	43	80	123
% of total	5.50%	-2.84%	4.02%	16.84%	7.97%
1977/78	36	-28	8	-42	-35
% of total	5.43%	-7.22%	0.76%	-14.79%	-2.62%
1978/79	64	-26	38	48	85
% of total	7.77%	-4.89%	2.80%	7.74%	4.53%
1979/80	98	-46	53	-81	-26
% of total	8.64%	-8.85%	3.44%	-5.25%	-0.84%
1980/81	59	76	134	389	523
% of total	7.00%	4.87%	5.61%	10.55%	8.62%
1981/82	-18	284	266	1,107	1,373
% of total	-5.03%	15.07%	11.36%	15.36%	16.06%
1982/83	-32	-115	-147	612	464
% of total	-5.57%	-7.80%	-18.38%	7.58%	5.23%
1983/84	30	164	194	683	877
% of total	5.16%	11.31%	9.01%	10.27%	10.09%

SOURCE: ABS 5305.0 Foreign Investment Australia

NOTE: * Data includes the Iron and Steel Industry. However this industry is Australian owned and attracts very little foreign investment. Thus figures relate predominantly to the non-ferrous metals industries.

TABLE C.10

INCOME PAYABLE AND RECEIVED FROM FOREIGN INVESTMENT IN BASIC METAL PRODUCTS+
$A MILLIONS

	INCOME PAYABLE			INCOME RECEIVABLE		
YEAR	UNDISTRIB. INCOME	DISTRIB. DIRECT INVEST.	TOTAL	UNDISTRIB.	DISTRIB.	TOTAL
1978/79	64	39	102	22	2	23
1979/80	98	39	137	12	2	14
1980/81	59	47	106	7	2	9
1981/82	-18	66	48	-4	3	-
1982/83	-32	35	2	-	3	3
1983/84	30	41	71	32	2	34

SOURCE: 5305.0 Foreign Investment, Australia

NOTE: + Basic metal products includes iron and steel as well as non-ferrous metal products. However, the level of foreign investment in the Australian iron and steel industry is very small.

D ANALYSIS OF THE MAIN ACTORS

D 1 GOVERNMENT STRATEGY

(A) FEDERAL GOVERNMENT

i) Foreign Investment

In general, Australian governments encourage foreign investment as a means of augmenting capital resources in order to increase the rate of growth and employment. However, Australians need to be provided with adequate opportunities to participate in the development of industry and resources. All major proposals involving foreign investment must be submitted to the Foreign Investment Review Board.

Specific guidelines apply to new mining projects. To proceed, Australian interests must have a minimum of 50% of equity and of Board control. Minerals processing projects are subjected to consultation to ensure an appropriate level of Australian equity is achieved. However, no specific percentages are specified. Manufacturing projects are encouraged to contain adequate Australian equity unless considerable offsetting advantages to the national economy can be demonstrated.

Foreign companies may acquire 'naturalisation' status by progressively increasing the level of Australian participation in their Australian operations. This allows them credit as Australian equity in new projects. CRA, a major company involved in the non-ferrous metals industry, has acquired naturalisation status. Its Australian equity has increased from 27.4% in 1978 to 47.67% in 1985.

ii) Trade Policy

In the post-war period, the Federal Government actively used tariff protection to encourage local manufacturing. This resulted in small scale establishments orientated to the small domestic market. Many operated as branch plants of multi-national corporations. The degree of local design and technological innovation declined over this period.

The increasing internationalisation of world production in the 1970s and 1980s has led to Australian manufacturing facing increasing import competition. Local plants have had limited success in exporting beyond the basic metals stage. Current trade policy now takes a much stronger stand towards "free trade" and favours export expansion rather than import substitution. Tariffs currently applying to the non-ferrous metal products are shown on **Table D 1.**

Basic products have very limited protection while manufacturers have between 20-25% tariffs. The non-ferrous industries are predominantly exporters and the extent of imports is quite low. Thus changes in trade policy are unlikely to effect the basic industry. A number of the metal fabrication industries face severe import competition, where imports now cover 40-50% of the market. Little exporting occurs. Fabricated metals receive a higher than average effective rate of tariff protection, especially sheet metal products and metal containers.

TABLE D.1

CUSTOM TARIFFS ON NON-FERROUS METAL PRODUCTS

PRODUCT	COPPER	LEAD	ZINC	NICKEL	TIN	ALUMINIUM
Unwrought, waste scrap		2%	free		2%	2%
Matte	2%			2%		
Master alloys	2%					
Wrought bars	10%	2%	2%	2%	2%	15%
Wrought plates	10%	2%	2%	2%	2%	15%
Dust			10%			
Foil	10%	2%			2%	20%
Powders & flakes	2%				2%	15%
Tubes & pipes	10%	2%	free	20%		15%
Tubes, pipe fittings	20%			20%		20%
Stranded wire	5% & $75t					15%
Woven wire	25%					
Expanded metal	20%					20%
Structures						20%
Tanks, vats, etc						20%
Casks, drums, cans						20%
Liquified gas containers						20%
Nails, tools etc	20-25%					
Springs	25%					
Soda syphons etc						2%
Domestic appliances	20-25%					20%
Pewterware					2%	
Pins, crochet hooks	2%					2%
Electroplating anodes			20%	2%		
Other	20%	20%	20%	20%	20%	20%

Manufacturers of base metals, tools, implements, cutlery, etc generally at 20-25%.

SOURCE: Department of Customs, Customs Tariffs.

iii) Industry Policy

Until recently, the Australian Government has not played an active role in industry development aside from the provision of tariff protection to encourage domestic manufacturing. The current government has established a Prices and Income Accord which recognises the need for a more interventionalist role.

Industry development at the federal level is now conducted through tripartite industry councils in order to achieve the objectives of industry modernisation, import replacement and export expansion in selected industries. The established industry councils are:

- Basic metals
- Chemicals and plastics
- Forestry and forest products
- Metal fabrication
- Processed foods
- Paper conversion, printing and publishing
- Textiles, clothing and footwear
- Machinery and metal engineering
- Electrical, electronics and information
- Aerospace.

Non-ferrous metal products are covered by the basic metals and the metal fabrication councils. The only activity to dace by these councils has involved the steel and automotive industries. However, all councils are in the process of developing industrial strategies. The "stocktake" prepared for the non-ferrous metals industries suggests the Australian operations are export orientated and technically modern. Fabrication however is limited to the small domestic market. Australia was rated as among the most efficient world producers of basic metals.

See Part 2 for industry strategies.

(B) STATE GOVERNMENT

The State Governments are the legal owners of natual resources within the Australian constitutional system. Thus they are the level of government most directly involved in negotiations with the corporations in the non-ferrous metals industries.

Most large scale commercial deposits of minerals are located outside the populated areas of the continent. Bauxite is found in the far north of Queensland, the

Northern Territory and Western Australia, gold and nickel in isolated parts of Queensland and Western Australia and tin in western Tasmania and northern Queensland. Copper is widely distributed as is lead and zinc with much currently mined in western New South Wales and Tasmania. A new copper mine is to commence in South Australia. Only Victoria has no large scale non-ferrous mineral deposits.

Mines are leased to companies on long term lease. The level of royalties are generally low to encourage development, and few other charges are made directly against mining operations. In isolated areas the companies must provide their own infrastructure. In sites closer to development the State will frequently provide rail and road access and port facilities.

Queensland has been most innovative in utilising mining activity for State development. "Pioneering" operations, defined as new activity for the State, are given a range of concessions to encourage establishment. However, non-pioneering activity is subjected to relatively high rail freight charges which becomes a defacto resource tax. Lease agreements on deposits frequently contain conditions that refining and or smelting operations be built in the State as soon as feasible. For example, such conditions on the Comalco bauxite lease at Weipa led to the establishment of the Q.A.L. alumina refinery at Gladstone and more recently a smelter at Boyne Island near Gladstone. Similar conditions apply to the Wenlock River deposit held by Alcan Australia Limited.

Although the distribution of mineral deposits is given, that of processing facilities is not. States have utilised their control of leases to influence the location decisions of processing plants as illustrated above. Non-ferrous metals processing is energy-intensive and States are the electricity supply authorities in Australia. Current strategy is to use cheap electricity as an inducement to plant location. Actual State electricity supply costs are shown on Chart A. Actual charges to large scale users can be well below these in many cases inferring a subsidy from other electricity users.

Queensland and Western Australia have been most blatent in the use of cheap electricity deals to attract new activities. Public opinion in New South Wales and Victoria recently forced these States to increase electricity tariffs to aluminium smelters. However, Victoria has found an innovative way of circumventing this pressure as discussed in the next section. Tasmania has a long history of utilising its cheaper hydro-electricity power to attract large scale

refineries. Rising costs are now bringing suggestions that some subsidisation is also occurring in that State.

Such competition between the States makes them particularly vulnerable to shrewd companies attracted to Australia by its mineral and energy wealth, but able to manipulate the States into getting particularly good deals for themselves. There is a need for the Federal Government to co-ordinate these industries to prevent such competitive bidding.

Until very recently, Australian Governments have not taken public equity in mineral processing facilities. The Portland Aluminium Smelter Joint Venture between the Victorian Government (30%), Alcoa of Australia (50%) and other interests is the first departure from this purely free enterprise approach. This venture is discussed in the next section. Alcoa of Australia was caught financially with the collapse of the "resources boom" in 1982 with a new "mothballed" refinery at Wagerup in Western Australia and the partially completed smelter at Portland when the world market collapsed. It suspended construction and was unable to find new partners for the smelter among the Japanese or Koreans. To revive the project, the State Government took equity and developed a flexible electricity tariff.

Industry policy for Australian State Governments has revolved around location policy. The Victorian Government has recently introduced a series of industry policies of a more interventionist stance which in fact preceded the federal development. Although metal fabrication is potentially an area which might be encouraged through these policies, little success in changing these from a domestic to an export market has been achieved to date. A strategy for the development of an alumina ceramics industry in Australia has been produced.

D 2 NATIONAL ENTERPRISES

PORTLAND SMELTER SERVICES PTY LIMITED - Unincorporated joint venture

Each party bears its share of capital and operating costs ie provides its share of inputs
markets its share of aluminium metal
finances its own share of capital expenditure.

		Date signed
Alcoa of Australia	45%	31/7/84
Victorian Government	25%	31/7/84
First National Resources Trust	10%	3/9/85
China International Trust & Investment Corporation (CITIC)	10%	14/10/85
Alcoa/Victorian Government balance	10%	

Government Capital Commitments

Victorian Government's equity vehicle - Portland Smelter Unit Trust - foreign borrowings of $310M.

Entry Price at 25% $40M purchase of existing asset (plus 15% $24M - additional equity 30/6/85).

New expenditure at 25% $205M.

Assistance to Alcoa:

Loan to Alcoa $113M, commerical interest repayable 1986/88.
Reimbursement to SECV $162M (on dishonouring take-or-pay electricity supply agreement prior to cessation of construction).

Electricity Supply Arrangement

Political contraversy over the original supply price which was estimated to contain a subsidy to Alcoa, led to the establishment of an innovative new agreement whereby the burden of the payment of the subsidy was transferred from other electricity consumers to the taxpayers.

The tariff has a flexible element which moves over time with a) SECV cost structure
b) world aluminium prices.

The tariff equals:

Base tariff:	2.629c kwh (2.5% above previous price)
Escalation:	index of construction of Loy Yang power station costs scaled to the CPA
Flexible:	actual price deviates from base tariff by 0.2c kwh for every $US100 deviation in the real aluminium spat price around a reference price of $US1700 (June 1982 $).

In theory, the long term price paid should equal the base tariff assurring a long term real average price of $US1,700(198) per tonne. As production from this smelter has not yet commenced, the subsidy is academic. However, as at 10/10/85, the spot price for aluminium was $US1,000 per tonne which would imply a tariff of 1.664c kwh below the base tariff in 1984 $A.

The flexible tariff has also been applied at Alcoa's Point Henry smelter at Geelong. This only relates to a small proportion of that smelter's power requirements at this stage. Alcoa takes power from the state grid when its requirements exceed the capacity of its own on-site power station.

It is planned to expand the flexible power agreement to other large energy-intensive industries coming to the State.

Current predictions from all commentators on the aluminium industry is for prices to remain low due to oversupply situations.

Processing

This Alcoa agreement confers major cost and capital advantages on the company. It contains no requirements for further processing of the base metals with Australia.

Alcoa of Australia has no interest in downstream processing within the domestic market which it regards as unprofitable. However the parent company, the Aluminium Company of America, is currently undertaking a world-wide restructuring of its operations. This involves a reduction in smelting capacity and a shift in emphasis towards high-value added fabricated products in order to avoid pressure on margins in the ingot business.

The opportunity to insist an export orientated large scale fabrication in Victoria as a trade-off for public sector involvement has been foregone.

D 3 ANALYSIS OF TNCs

The term TNC is extremely difficult to apply to the Australian non-ferrous metals industry. In effect there are three types of corporations in the industry which might be classified as TNCs:

- Australian owned companies which are investing overseas and thus operate as TNCs. These include Comalco which has investments in the USA, New Zealand, Italy, Japan and Hong Kong; Western Mining Corporation which has investments in Fiji; CSR Limited which has investments in Indonesia, New Guinea, Hong Kong, Malaysia and Singapore.

- Foreign owned companies which are "naturalising" ie increasing their Australian ownership over time towards a target of 51% and are treated as Australian in relation to foreign investment guidelines. These include CRA which owns 67% of Comalco. It is also investing overseas, owning 53.6% of Bougainville Copper Project in New Guinea and AM&S (Europe) which markets zinc, lead and sulphuric acid as well as smelting zinc in the USA, UK and the Netherlands. MIM Holdings Limited which owns the Mt Isa Mines copper mine and smelter and refinery at Townsville is also naturalising.

- Foreign owned companies operating in Australia. These include Metal Manufacturers Limited which owns a number of bronze foundries and manufacturers of non-ferrrous wires and cables; Alcan Australia Limited (70% Alcan Aluminium Limited Canada) involved in aluminium smelting and fabrication; ICI Australia Limited (62.4% ICI of UK) in tin; and Alcoa of Australia (51% Aluminium Company of America) which is involved in bauxite mining, alumina, aluminium smelting and fabrication. A number of other major TNCs have invested in Australia in joint venture or consortia with each other and Australian companies. The majority of TNC interest is in the aluminium industry.

This part of the report will deal only with the third type of TNC and will concentrate on the aluminium industry.

i) BAUXITE MINING

1 Jarrahdale, Del Park, Huntley, Mount William, Darling Ranges, Western Australia: Mined by Alcoa of Austarlia.

Alcoa of Australia:

51% Aluminium Company of America (USA)
20% Western Mining Corporation (Aust)
13% BH South Limited (Aust)
12% North Broken Hill Limited (Aust)
4% Other.

Technical assistance programs - negligible
Principal products - bauxite
Secondary products - none
Final uses - all output refined locally
Diversification - none
State relationships - relatively low royalties paid ($A0.46c per tonne)
Western Australian State Government has encouraged extractive industries
Local opposition over the impact of expanded mining on nearby Jarrah forests and watertable.

2 Mount Saddleback, Darling Ranges, Western Australia. Mined by Worsley Alumina Pty Limited Joint Venture.

40% Reynolds Metals Company (USA)
30% Royal Dutch Shell (Holland)
20% Broken Hill P.L. (Aust)
10% Kobe Alumina Associates Pty Limited (Japan)
(40% Kobe Steel Ltd, 35% Nissho-Iwai Co Ltd, 25% C Itoh & Co Ltd).

Technical assistance programs - negligible
Principal products - bauxite
Secondary products - nil
Final uses - all output refined locally
Diversification - possibility of establishing smelter in Western Australia
State relationships - as above.

3 Gove Peninsula, Northern Territory. Mined by Gove Joint Venture operating as Nabalco.

70% Swiss Aluminium Limited (Switzerland)
30% Gove Alumina Limited (Aust)
(51% CSR, 13% Peko-Wallsend Ltd, 36% finance companies).

Technical assistance programs - negligible
Principal products - bauxite
Secondary products - none
Final uses - most refined locally, small proportion exported to Europe and Japan

Diversification - interest in new smelter developments
State relationships - contraversy over mining on Aboriginal lands.

ii) ALUMINA REFINING

1 Kwinana, Pinjarra and Wagerup, Western Australia. Operated by Alcoa of Australia, ownership as above.

Technical assistance programs - involvement by CSIRO and WMC to develop technology to refine local bauxite which has a high silica content
Principal product -alumina (see Appendix A 2)
Secondary products - nil
Final uses - over 50% smeltered locally, rest exported to USA, Japan and elsewhere
Diversification - construction of new smelter in Victoria
State relationship - contract to take significant proportion of N.W. Shelf gas output representing State share in that project.

2 Worsley, Western Australia. Operated by Worsley Alumina Pty Limited Joint Venture, ownership as above.

Technical assistance programs - negligible
Principal product - aluminium
Secondary products - nil
Final uses - exported
Diversification - nil
State relationships - normal.

3 Gladstone, Queensland. Operated by Queensland Alumina Limited consortium.

44.5% Comalco Limited (Aust)
21.4% Alcan Aluminium Limited (Can)
20.0% Pechiney Ugine Kuhlmann (France)
14.1% Australian Mutual Provident Society (Aust)

Principal product - alumina
Secondary products - nil
Final uses - taken by partners on a per share basis
Diversification - nil
State relationsip - built as part of Comalco contract in relation to Weipa bauxite lease

which required a refinery to be built in Queensland.

4 Gove Peninsula, Northern Territory. Operated by Nabalco, owned as above.

Technical assistance programs - negligible
Principal product - alumina
Secondary products - nil
Final uses - exported to Europe, USA and Middle East
Diversification - partner in new aluminium smelter
State relationships - contraversy over security of "red mud" disposal pondages. Feasibility study of establishing smelter in Northern Territory negative due to high fuel costs.

iii) ALUMINIUM SMELTERS

1 Portland, Victoria. Joint Venture as per D 2

Principal products - aluminium ingots
Export of output to Alcoa smelters in USA, etc and external sales
No diversification
Relations with State as per D 2.

2 Point Henry, Victoria. Owned by Alcoa of Australia Limited. Ownership as per D 3.

Principal products - aluminium ingots
Secondary products - semi-fabrication, power generation
Domestic usage of output to subsidiary and associated fabricators and external sales
No diversification
Relations with State as per D 2.

3 Kurri-Kurri, New South Wales. Owned by Alcan Australia Limited.

70% Alcan Aluminium Limited (Canada)
30% Public shareholding

Principal products - aluminium ingots, semi-fabrication
Domestic usage of output by subsidiary and associated fabricators and external sales
No diversification
Relations with State normal.

4 Boyne Island via Gladstone, Queensland. Joint Venture by Gladstone Aluminium Limited.

30% Comalco Limited (67% CRA)
20% Kaiser Aluminium & Chemical Corporation (USA)
50% Japanese consortium.

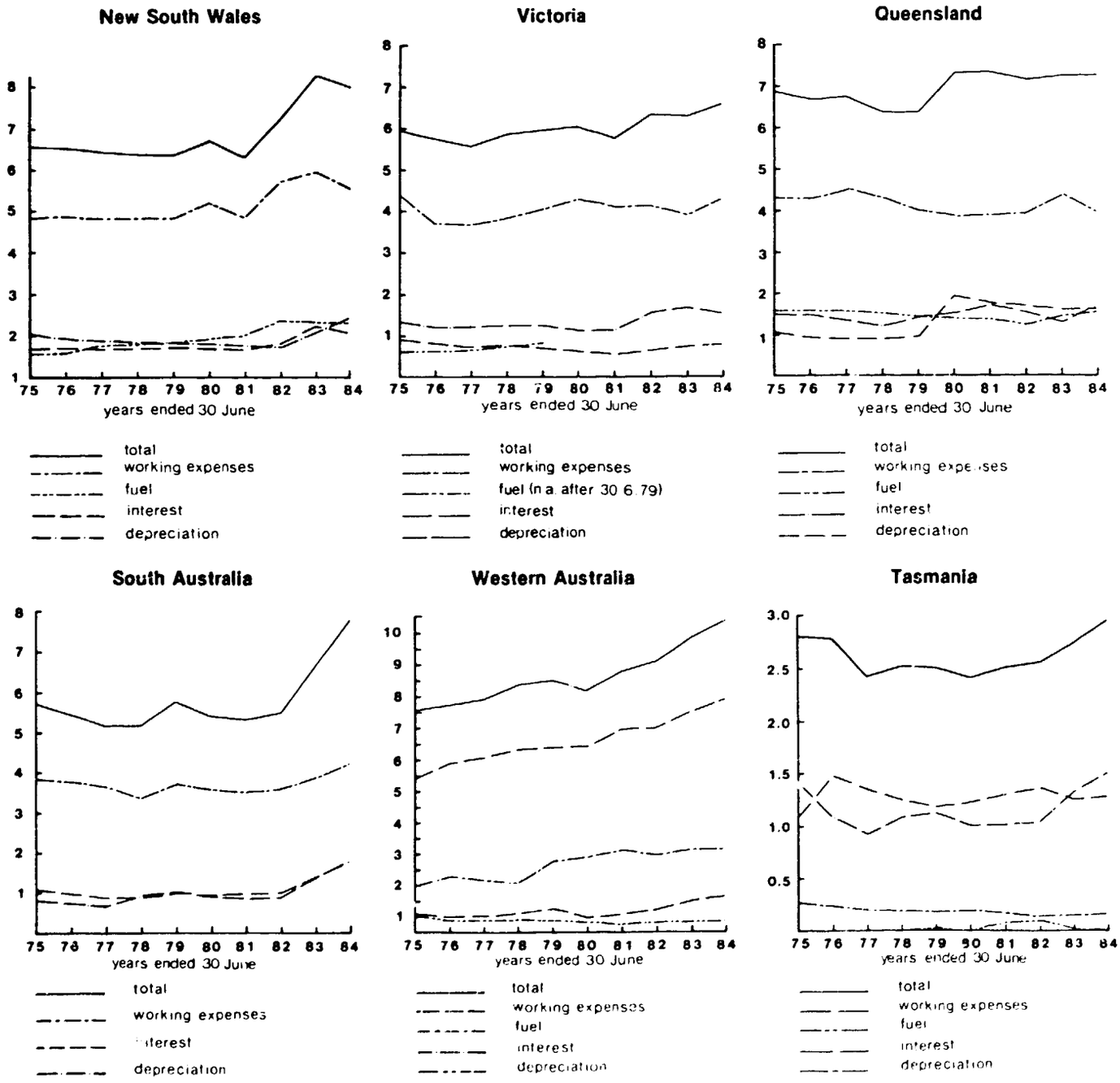
Principal products - aluminium ingots
Production exported to associated companies in Japan and external sales
No diversification
Relations with State normal.

5 Tomago via Newcastle, New South Wales. Joint Venture.

35% Aluminium Pechiney Australia Pty Limited (100% Pechiney, Ugine Kuhlmann (Fr)
35% Gove Aluminium Pty Limited (Aust) see above
15% Australian Mutual Provident Society
12% Vereinigte Aluminium -Webe AG (W Germany)
3% Hunter Douglas Australia Limited (66% Hunter Douglas)

Principal products - aluminium ingots
Production exported to Japan, external sales
No diversification
Relations with State normal.

Chart A Average Cost of Electricity Sold 1974-75 to 1983-84 (Cents per KwH Sold, in 1983-84 Prices)



Source: Electricity Supply Association of Australia, *The Electricity Supply Industry in Australia*, various issues.

E LEGAL AND INSTITUTIONAL ASPECTS

E 1 LEGISLATION

i) TREATMENT OF FOREIGN CAPITAL

A proposal for a new mining business or project involving a total investment of $5 million or more which is not contrary to the national interest will, as a general rule, only be allowed to proceed if it has a minimum 50% Australian equity plus 50% of voting strength on the controlling body. Proposals not meeting these guidelines may proceed if not contrary to the national interest if it can be demonstrated sufficient equity capital is not available. The guidelines should be met within an agreed period.

New projects in uranium must have 75% Australian equity and be Australian controlled. Projects judged as of significant economic benefit to Australia and with 50% Australian equity may be allowed to proceed but must increase Australian equity over an agreed period.

Projects involving minerals processing should seek to have appropriate level of Australian equity participation arrived in consultation with the parties. Due recognition of the large amounts of capital, advanced technology and other special aspects is given. This covers refining, smelting of non-ferrous ores and mineral sands beneficiation.

ii) PROTECTION OF THE ENVIRONMENT

All major projects in Australia are required to prepare an environmental impact statement prior to approval. Most projects come under State legislation although Commonwealth legislation covers the Australian Capital Territory and the Northern Territory, and the State of South Australia does not yet have legislation in place.

Usually the relevant Government Minister will identify a proposal as having potentially significant environmental effect. The proponent will be required to prepare an environmental impact statement in order to supply sufficient information to the public. A draft of the

statement is made available for public comment. If necessary, a public inquiry can be held although this is not usual. After comments have been received, the relevant Minister will consider the draft and may require revisions. The final statement is then considered and the Minister may impose conditions on the project to protect the environment.

Once operating, projects emissions are monitored as part of normal procedures to ensure they come within established environmental standards.

iii) WORKING CONDITIONS AND WAGE LEVELS

Minimum wages and working conditions are established by relevant Commonwealth or State industrial tribunals. Over award wages and conditions may be negotiated between management and the relevent trade unions. Workforces in the non-ferrous mining, metals and fabrication sectors are heavily unionised. Projects in remote locations or involving difficult working conditions are frequently subject to large site allowances which may add considerably to labour costs. A 38 hour week is now common throughout Australia and longer hours incur overtime penalties. Shift work alsc incurs penalty rates as does weekend working.

Australian wages and conditions are currently controlled by the "Accord" incomes policy which limits wage rises to cost of living adjustment and prevents substantial changes in conditions including reduced hours. Limited claims for projectivity rises or changed work value cases may be pursued within the Accord.

iv) HEALTH AND SAFETY

Occupational health and safety policy is currently under review in Australia in order to develop a more comprehensive and consistent approach. Health and safety falls under State Government jurisdiction so variations in standards can exist.

Previously health and safety issues have been covered by a variety of Acts, each relating to different workplaces and situations. This ad hoc approach has been considered unsatisfactory because although it provided protection against immediate hazardous situations, no long term health issues were covered.

State Governments are now moving towards situations where one Occupational Health and Safety Act will cover all aspects of industrial conditions in each State. This Act is administered through a relevant State Government Department which maintains an inspectorate to ensure compliance with standards. Public participation is to be provided through an Advisory Commission and elected work place representatives.

Where a comprehensive Act is not in place, most work places are covered by parts of some Labour and Industry Act. Special Acts will probably cover construction and building and coastal shipping activities.

v) WAGE LEVELS

Wages, penalty rates and special conditions for employees are established legally in industrial awards. Industrial awards in Australia are usually occupational rather than industry or company based. In the non-ferrous industry the major awards are under Federal jurisdiction.

Awards are varied through the creation of industrial disputes which then go before a conciliation and arbitration commission or tribunal for settlement. Such a dispute may consist of strike action although this is not necessarily the case. Award changes are currently restricted by the Prices and Incomes Accord. Over-award wages may be agreed to by workers and management although this is also currently outside Accord guidelines.

E 2 INSTITUTIONAL ORGANISATION

Economic planning at the industrial level is not prevalent in Australia. The Federal Government has commenced a number of industrial councils as outlined in D 1.

Economic co-ordination between industries occurs predominantly through the Commonwealth Department of Industry, Technology and Commerce although it is limited in scope.

At the broad economy level, the Economic Planning Advisory Council (EPAC) provides a mechanism for community input into macro-economic decision-making and to encourage greater co-operation and understanding between the Government and different segments of the community.

The Australian Manufacturing Council (AMC) has been established to deal with matters which impact "horizontally" across the various manufacturing industry sectors represented by the separate industry councils. The AMC provides a forum for consultation and consideration of policies and issues affecting the manufacturing sector, to review conditions in manufacturing, identify major impediments to growth and to advise on policies to realise the sector's growth potential and to monitor the separate industry councils.

The Industries Assistance Commission (IAC) functions predominantly to review tariff protection to Australian industry and to rationalise such assistance. The non-ferrous mining and metals industries are subject to very little tariff protection so the activities of this Commission do not impinge on their future. However, fabricated metal products are receiving above average protection. See Section D 1 for current tariff levels.

Base Metal - exploited Deposits
New South Wales.

COMPANY : MINERALS MINING & METALLURGY LTD

LOCATION : KINTORE LEASE , SOUTH MINE , BROKEN HILL
TYPE OF PROJECT : LEAD , ZINC & SILVER MINE EXPANSION
STAGE OF DEVELOPMENT : INITIAL EXCAVATION ;FEASIBILITY STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : MID 1980S

PROJECT DETAILS : Following the completion of the program of investigation of old records, a diamond drilling program of the area south of the old BHP ore body known as Kintore" was undertaken. The "Kintore" area occurs in the old Central Mine portion of the South Mine leases which old records reveal to be the widest near-surface part of the Broken Hill lode. It was subject to disastrous creeps in the early part of the century as a result of which ores from the surface to the 2 level were left unmined and ores below were only partially mined. The drilling programme was to determine the extent of ores from the surface to the 2 level as old records and physical examination confirm the occurrence of ores from the 2 to the 4 level. Initial excavation of the Kintore area commenced in March 1983 and was completed in June 1983. Due to the broken nature of the ground, diamond drilling proved difficult and expensive and was abandoned in favour of deep costeaning for the extraction of bulk samples. The exploration work in this area is continuing, and subject to economic factors, will be maintained at the planned expenditure level during 1984-85.

COMPANY : MINERALS MINING & METALLURGY LTD

LOCATION : SOUTH MINE (BROKEN HILL)
TYPE OF PROJECT : RETREATMENT OF TAILINGS DUMPS
STAGE OF DEVELOPMENT : DEFERRED UNTIL METAL PRICES IMPROVE

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : MID 1980S

PROJECT DETAILS : A progressive upgrading of plant and equipment continued during the year. Outside consultants were commissioned to investigate the feasibility of re-treating the residue dumps which have resulted from M.M.M's own operations over the past ten years and which comprise some 4 MT. It is technically and metallurgically feasible to produce saleable products from the dumps. The company decided that metal prices would need to be above current levels to warrant expenditure on the necessary plant and to guarantee profitability. The project will be re-examined when more favourable conditions are assured.

COMPANY : TARONGA JOINT VENTURE

LOCATION : TARONGA , EMMAVILLE , 40 KM NW OF GLEN INNES
TYPE OF PROJECT : TIN , COPPER & SILVER PROSPECT
STAGE OF DEVELOPMENT : DEFERRED INDEFINITELY

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : The project involves the potential development of the tin, copper and silver prospect. Metallurgical, engineering and evaluation studies have been undertaken. Because of the low grade of the tin mineralisation the successful exploitation of the resource depends greatly on the operating scale and efficiency of recovery. The project has been deferred indefinitely and put on a care and maintenance basis due to the poor tin market outlook and the imposition of tin export quotas. Newmont Holdings is the manager of the project.

COMPANY : ST. JOE AUSTRALIA PTY LTD

LOCATION : CURRAWANG EAST , 48 KM SE OF GOULBURN
TYPE OF PROJECT : COPPER , LEAD , ZINC & SILVER PROSPECT
STAGE OF DEVELOPMENT : PROJECT SUSPENDED

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : The project would involve the development of copper, lead, zinc and silver deposits. Development has been suspended as indicated reserves and grades are insufficient to justify development at present.

Victoria

COMPANY : BENAMBRA JOINT VENTURE

LOCATION : BENAMBRA , 175 KM SE OF ALBURY
TYPE OF PROJECT : COPPER , ZINC & GOLD PROSPECT
STAGE OF DEVELOPMENT : FURTHER DRILLING AND STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : LATE 1980S

PROJECT DETAILS : Test drilling of ore targets is continuing. Ore reserves in the Wilga prospect are 4 MT grading 3.3% copper, 0.4% lead, 5.4% zinc and 29.6 gms/T of silver. Ore reserves in the Currawong prospect are of a lower grade and drilling of other ore targets is in progress to improve ore reserves. Improvement in metal prices would increase the viability of the project as would higher reserves of ore at today's prices.

QUEENSLAND

COMPANY : MT ISA MINES LTD

LOCATION : HILTON , 20 KM N OF MT ISA
TYPE OF PROJECT : LEAD ZINC AND SILVER PROSPECT STOPING
STAGE OF DEVELOPMENT : TRIAL STOPING ACTIVITIES CONTINUING

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : 80
PRODUCTION EMPLOYMENT : N/A
TIMING : 1980–1985

PROJECT DETAILS : Trial stoping is continuing with a veiw to proceeding to mine development later this decade and initial production to begin between 1992–95. Reserves are 8 MT of secondary ore grading 7.5% lead, 0.3% zinc, 62 gms/T of silver and 37 MT of primary ore grading 7.7% lead, 9.6% zinc and 180 gms/T of silver. A confirmatory drilling program is continuing. Trial cut and fill and sub-level open stoping techniques are also being used.

COMPANY : LADY LORETTA JOINT VENTURE

LOCATION : LADY LORETTA MINE , 135 KM NW OF MT ISA
TYPE OF PROJECT : LEAD , ZINC & SILVER DEPOSIT
STAGE OF DEVELOPMENT : FEASIBILITY STUDY ALMOST COMPLETE

TOTAL COST ($M) : N/A
REMAININC COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : 30
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : Studies based on present knowledge of the deposit, have concluded that feasibility assessment of a mine to be developed requires completion of an underground exploration program through the sinking of a shaft directly involving about 30 new jobs. However, no decision to proceed with this program will be taken until a satisfactory agreement has been reached with the Queensland Government on the royalty applicable and the level of rail freight charges, as well as on firm and realistic conditions for the use of all State infrastructure facilities if a mine is to be developed. To this end, discussions with the Queensland State Government, initiated in December 1982, are still in progressLady Loretta Mining Company Pty Ltd, is the project manager.

COMPANY : THALANGA JOINT VENTURE

LOCATION : THALANGA , 60 KM SW OF CHARTERS TOWERS
TYPE OF PROJECT : ZINC LEAD COPPER SILVER AND GOLD DEPOSIT
STAGE OF DEVELOPMENT : FINAL FEASIBILITY STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : In 1981, following extensive surface drilling programs, an underground exploration program was started and completed in mid May 1982. A 436 m decline, 562 m of drives and cross cuts and underground diamond drilling were undertaken. A bulk sample of ore was obtained for pilot testing at the Amdel facility in Adelaide. Pilot testing has now been completed. A full feasibility study is now in progress. Penarroya (Aust) is the manager.

COMPANY : CRA EXPLORATION PTY LTD

LOCATION : DUGALD RIVER , 60 KM NW OF CLONCURRY
TYPE OF PROJECT : LEAD , SILVER & ZINC PROSPECT
STAGE OF DEVELOPMENT : EVALUATION

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : Assessment of reserves is continuing. The resource potential is 60 MT of ore grading 10.5% zinc, 1% lead and 30 gms/T of silver. The project, if it proceeds, will involve an underground mine with ore output at the possible rate of 2 MTPY.

COMPANY : KINGS PLAINS JOINT VENTURE

LOCATION : KINGS PLAINS , 200 KM N OF CAIRNS
TYPE OF PROJECT : TIN PROSPECT
STAGE OF DEVELOPMENT : AWAITING TIN MARKET UPTURN

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : Further drilling, hydrology and feasibility studies were carried out in 1982 at the Kings Plains alluvial tin deposit, previously estimated to contain 100 M cu m of alluvium grading 120 gms/cu m of cassiterite (70% tin) . Upstream testing in 1982–83 indicated possibly 15 M cu m of similar wash grade alluvium but with an increased overburden to wash ratio. Mining lease applications have been made covering the deposit. SEREM (Australia) Pty Ltd, the project operator, is in the process of selling its interest in the project. The project is in abeyance awaiting an upturn in tin market demand and better tin prices.

COMPANY : OTTER EXPLORATION N.L.

LOCATION : SMITHS CREEK , 100 KM SW OF CAIRNS
TYPE OF PROJECT : TIN AND TUNGSTEN PROSPECT
STAGE OF DEVELOPMENT : AWAITING MARKET UPTURN

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : LATE 1980S

PROJECT DETAILS : The project involves the potential development of the tin and tungsten deposit. Exploratory diamond drilling of geophysical anomalies in the vicinity of Smith's Creek tin deposit produced low tin and tungsten values. Additional zones of mineralisation will be difficult to detect at Smith's Creek. The deposit is regarded as a low tonnage but potentially high grade ore body essentially free of treatment problems. Drilling to better define reserves was dependent upon the execution of a satisfactory joint venture. Whilst the agreement was executed, the farm-in operator was unable to meet several of the requirements of the agreement (including the drilling and shaft reclamation) due to problems experienced in the operator's own tin operations in North Queensland. The venture was terminated in 1982. The project has been deferred and the company is awaiting a sustained upturn in market demand and prices.

COMPANY : ANDO GOLD N.L.

LOCATION : IRVINEBANK , HERBERTON , NR CAIRNS
TYPE OF PROJECT : RE-OPENING TIN MINE
STAGE OF DEVELOPMENT : PROJECT DEFERRED

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : The former Vulcan tin mine was a major tin producer before 1930. Records show it produced 180 000 T of oxide ore grading better than 10% tin. Claims to 30.4 hectares have been secured. Barrier Exploration N.L. sold its interest in this project to Ando Gold N.L. in May 1983. No development work has yet proceeded.

COMPANY : GUNPOWDER COPPER LTD

LOCATION : GUNPOWDER , 120 KM N OF MT ISA
TYPE OF PROJECT : COPPER MINE
STAGE OF DEVELOPMENT : BACTERIAL LEACH PILOT PROJECT; CARE & MAINTENANCE

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : LATE 1980S

PROJECT DETAILS : The venturers are continuing to maintain the conventional mining and concentrate production facilities at Gunpowder. Conversion of the mine to a commercial leaching process is also being examined but will depend on copper prices. Conventional underground mining of copper ore and production of copper concentrate ceased at Gunpowder in September 1977 due to low copper prices and high operating costs prevailing at that time. Since then the operation has been on care and maintenance. A pilot plant based on in situ bacterial leaching and the recovery of copper in cement by cementation was commissioned at Gunpowder in November 1979. This operation , which processed available broken ore, demonstrated the amenability of the Gunpowder orebody to bacterial leeching. Its capacity was increased in June 1980. The pilot plant was closed down in September 1982, due to low copper prices. Studies have been completed demonstrating the technical viability of recovering copper from leach liquor by solvent extraction/electro-winning methods. The project is being maintained on a caretaker basis pending a sustained increase in copper prices.

South Australia

COMPANY : NORTHLAND MINERALS LTD

LOCATION : KAPUNDA , 90 KM NNE OF ADELAIDE
TYPE OF PROJECT : COPPER , GOLD PROSPECT
STAGE OF DEVELOPMENT : INITIAL FEASIBILITY STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : MID 1980'S

PROJECT DETAILS : Northland has owned this prospect outright since Utah Development Company withdrew from a joint venture involving the prospect in February 1978. The prospect is covered by a number of mineral leases (3800 to 3822). A revised estimate in April 1973 showed proved ore reserves of 2.74 MT grading 0.94 % copper; probable ore reserves of 2.64 MT of various grades from 0.52% to 0.91% and 3.14 MT grading between 0.52% and 0.94% of possible ore. A cut-off grade of 0.3 % had been used throughout. Sulphide flotation would be likely to yield a recovery of 78 per cent contained copper. Work in 1979 and 1980 concentrated on taking core samples from the prospect to test metallurgical properties of the ore and suitability for beneficiation. The research work, carried out at The Australian Mineral Development Laboratories (AMDEL), showed that the Kapunda copper ores respond well to conventional sulphide flotation treatment - the system the company hopes to use to develop the deposit. The second stage of this research program began in January 1980 and its objective was to design a plant using flotation recovery. Three large diamond drill holes were completed during the June quarter of 1980 to obtain the necessary 1000 kg sample required for this section of the test work carried out in late 1980. The company now holds an exploration licence over an area which covers approximately 737 sq km and encompasses the old mineral leases. Northland is continuing exploration at and around Kapunda. Studies have primarily proceeded on three fronts. Firstly, the detailed second stage report by AMDEL is being closely compared with known in situ and heap leaching techniques in order to determine which method is most suitable for treating the Kapunda orebody. Secondly, re-checking of past results shows that the gold values are extremely variable because of the coarse nature of the gold. Finally, re-examination of existing reports, drill logs etc, to aid in a reinterpretation of the Kapunda copper/gold deposit has been undertaken.

COMPANY : OLYMPIC DAM JOINT VENTURE

LOCATION : OLYMPIC DAM , ROXBY DOWNS STN 500 KM NW OF ADELAIDE
TYPE OF PROJECT : COPPER , URANIUM , GOLD & SILVER MINING
STAGE OF DEVELOPMENT : ENGINEERING FEASIBILITY STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : 3300
PRODUCTION EMPLOYMENT : 2400
TIMING : LATE 1980S

PROJECT DETAILS : The Olympic Dam project on the Roxby Downs Station is being evaluated intensively. The deposit occurs in a large section of SA called the Stuart Shelf" which is prospective for similar deposits. Western Mining Corporation Ltd held extensive exploration licences over the Stuart Shelf" and entered into a different joint venture agreement with the 2 BP companies to explore the shelf. Exploration licences over the rest of the Stuart Shelf have been extended to 1985. After that, Western Mining Corporation Ltd only (following the withdrawl of BP from the larger area) can choose 10 areas of 65 square km for 10 year exploration licences on which a minimum of $5000 per square km (indexed) will need to be spent annually. Roxby Management Services Pty Ltd (RMS) (a 100% subsidiary of Western Mining Corporation Holdings Ltd) is the project manager. An exploration and preliminary feasibility study funded by BP and carried out by RMS, was completed in early 1984. Exploration and development work has established within the mineralised area a probable 450 MT of higher grade ore averaging 2.5% copper, 0.8 kg/T uranium oxide, 0.6 gms/T gold and 6 gms/T silver. A feasible study will be undertaken by an engineering contracting company in conjunction with RMS to be completed in early 1985. At present 198 people are employed on this project with a number of contractors. A decision on the scale of operation should be made by December, 1984. An exploration shaft, the Whenan Shaft, to allow underground exploration and to extract ore for mining studies and metallurgical testing has been sunk to 500 metres, driving off the shaft is continuing, and surface facilities have been installed. A pilot plant to evaluate proposed processing methods is in operation. These methods include production of copper concentrate for smelting to produce blister copper. Gold and silver would be contained in the blister copper. The flotation residues would be treated by solution methods to recover uranium oxide. An indenture agreement has been ratified by the SA Parliament and a draft environmental impact statement has been approved. If a decision to proceed is taken, infrastructure constructed would include a company funded water pipeline from The Great Artesian Basin to Olympic Dam; a new road from Pimba; an airstrip; power supplies from Port Augusta; a new town for 7000–9000 people 10 km S of the mine with Government funded schools, hospital, police station and recreation facilities. Feasibility studies are continuing.

COMPANY : NORTH FLINDERS MINES LTD

LOCATION : PARABARANA , 120 KM NE OF LEIGH CREEK
TYPE OF PROJECT : COPPER PROSPECT
STAGE OF DEVELOPMENT : LIMITED DRILLING AND EVALUATION

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : LATE 1980S

PROJECT DETAILS : The Parabarana copper prospect lies along the Parabarana–Mt Adams Fault system some 6 km north–east of the Gunsight Prospect. Percussion and diamond drilling conducted to date has been directed largely toward the testing of an outcropping mineralised lens. The best intersection was 30 m true width of 1.1% copper, including 6.7 m true width of 2.2% copper. An increase in width and grade of mineralisation with depth is noted. Further drilling is planned. The potential exists for the location of further copper mineralisation south–westward along the 1800 m strike length of the favourable mineralised thrust zone, toward the Gunsight Prospect which favours further drilling along the strike. Indicated reserves so far are of the order of 2 MT. Limited drilling and evaluation are proceeding.

Western Australia

COMPANY : FORRESTANIA JOINT VENTURE

LOCATION : FORRESTANIA , 130 KM S OF SOUTHERN CROSS
TYPE OF PROJECT : NICKEL MINE & CONCENTRATOR
STAGE OF DEVELOPMENT : ONGOING STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : This project encompasses 3 prospects; prospects 1 and 2 (Flying Fox and Cosmic Boy) owned 51:49 by Metals Exploration Ltd and Amoco, and prospect 3 (Digger Rocks) owned 35:35:30 by Metals Exploration, Amoco and Endeavour. The tenements cover 213 sq km of highly prospective country in which 5 main sulphide deposits have been outlined. New Morning is estimated to contain 500 000 T of ore grading 3.1% nickel; Flying Fox, 400 000 T of ore grading 5.3% nickel; Cosmic Boy, 6 MT of ore grading 2.6% nickel ; Digger Rocks, 1.6 MT of ore grading 1.7% nickel and Digger Rocks South, 3.2 MT of ore grading 1.5% nickel. The project is dependent on world prices and demand and initial scheduling is for production of 38 000 – 50 000 TPY of nickel concentrates. When lower grade ores are included, total reserves are 27 MT grading 1.55% nickel. Metals Exploration Ltd is the manager. Evaluation studies are continuing.

COMPANY : GOLDEN GROVE JOINT VENTURE

LOCATION : GOLDEN GROVE PROSPECT , YALGOO , 225 KM E OF GERALDTON
TYPE OF PROJECT : COPPER , LEAD , ZINC , GOLD & SILVER PROSPECT
STAGE OF DEVELOPMENT : PRELIMINARY STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : EARLY 1990S

PROJECT DETAILS : Two mineralized deposits have been delineated approximately 4 km apart. Gossan Hill has mainly copper mineralisation and Scuddles is a zinc, lead, copper, gold and silver deposit. Combined ore resources total approximately 36 MT. An underground evaluation program is being carried out on the Scuddles deposit. This will include sinking a shaft to obtain further geological, geotechnical and metallurgical information. The Electrolytic Zinc Co of Australasia Ltd is the operator.

COMPANY : FERROVANADIUM CORPORATION N.L.

LOCATION : BARRAMBIE , 450 KM E OF GERALDTON
TYPE OF PROJECT : VANADIUM , TITANIUM & IRON ORE PROSPECT
STAGE OF DEVELOPMENT : EVALUATION

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : The Barrambie deposit is still undergoing exploration and evaluation. The deposit is known to extend over a strike length of 6700 ft and to persist to a possible depth of 770 ft. A local consulting firm calculated proven ore reserves, from work to a depth of 160 ft and over a strike length of 6700 ft, of 37 MT grading 0.46% vanadium pentoxide with possible reserves of 415 MT grading 0.46% vanadium pentoxide. An independent overseas consulting firm using different parameters calculated indicated ore reserves as 27 MT averaging 0.7% vanadium pentoxide assuming selective mining. Indicated ore reserves averaging 0.4% vanadium pentoxide are 40 MT assuming non-selective mining. The deposit is also estimated to contain 6 MT of ore containing titanium, grade unknown as well as unproven reserves of iron ore. A recent project survey review of early exploration data, to evaluate the project's economic feasibility, indicates that a titanium emphasis is now the key to the deposit's ultimate exploration. The optimal mining, processing, concentrating and marketing strategies were investigated. Exploration is continuing. Current work is focusing on worldwide distribution of the Barrambie project study specifically projected toward securing joint venture finance. Based on recommendations contained in the project study, the company commissioned Control Data Pty Ltd during 1983-84 to computerise past drilling data to help determine optimum drilling patterns to evaluate the remaining undrilled section of the orebody. This work was completed in early April 1984 with a cummulative total of 2 758.5 metres drilled. Evaluation of results from this program are continuing.

COMPANY : MITCHELL PLATEAU BAUXITE CO PTY LTD

LOCATION : MUCHEA , 80 KM N OF PERTH
TYPE OF PROJECT : BAUXITE DEPOSIT
STAGE OF DEVELOPMENT : INITIAL STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : 1990S

PROJECT DETAILS : It is possible that the bauxite reserves covered by the lease could be used as feedstock for existing or proposed refineries. Mitchell Plateau Bauxite Co Pty Ltd purchased the shares formerly held by Hancock and Wright and Metals Miniere.

COMPANY : MT KEITH / CHARTERHALL & ASSOCIATES JOINT VENTURE

LOCATION : MT KEITH , 400 KM NNW OF KALGOORLIE
TYPE OF PROJECT : NICKEL SULPHIDE PROSPECT
STAGE OF DEVELOPMENT : DEFERRED INDEFINITELY

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : 1990S

PROJECT DETAILS : Inferred reserves have been reported to the joint venture partners as 2.5 MT grading 2.7% nickel. Drilling undertaken in 1981 encountered sulphide intersections varying from 0.2 m to 4.5 m with rapid variation along strike and down plunge. Mineralization is thought to be concentrated in an embayment in the footwall metasediments. Development and further exploratory work has been deferred indefinitely until there is a sustained improvement in world nickel prices and demand. Cliffs West Australian Mining Company is the operator.

Tasmania

COMPANY : MT BISCHOFF JOINT VENTURE

LOCATION : MT BISCHOFF , WARATAH , 80 KM SSW OF BURNIE
TYPE OF PROJECT : TIN MINE
STAGE OF DEVELOPMENT : EVALUATION

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : LATE 1980S

PROJECT DETAILS : The project involves the potential commercial development of the tin deposit. Metals Exploration Ltd was responsible for the management of this project until CRA Ltd farmed into the prospect the early 1980s. Metals Exploration Ltd resumed management following the withdrawal of CRA from the project with Metals Exploration's interest increased to 85% from 1 April, 1983. A preliminary feasibility study was completed in mid 1982. Current proven and probable geological ore reserves are reported as: dolomite sulphide lode (0.3% tin nominal cut off) with probable reserves of 1.23 MT grading 1.06% tin; porphyry ore (0.2% tin nominal cut off) probable reserves 3.5 MT grading 0.43% tin. A recovery rate of 65% can be expected from both ore types. The reserves relate to the main dolomite horizon and the Stanhope-White Face porphyry dykes. Development approval is dependant upon the availability of a suitable mine despatch quota for tin.

COMPANY : ZEEHAN JOINT VENTURE

LOCATION : QUEEN HILL/ SEVERN/ MONTANA DEPOSITS
TYPE OF PROJECT : TIN PROSPECTS
STAGE OF DEVELOPMENT : INITIAL STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : Nine diamond drill holes were completed in 1982 to further delineate the Montana, Severn and Golf Course mineralised bodies in which a total of about 6 MT of ore grading 0.7% tin has previously been inferred. Included in the 6MT are 3 MT of ore grading more than 1% tin. Data compilation, resource estimation and mining studies are in progress. Four separate bodies of mineralisation have been identified. Two of the bodies are still open.

Northern Territory

COMPANY : CUPREX LTD

LOCATION : TENNANT CREEK
TYPE OF PROJECT : GOLD , COPPER & BISMUTH PROSPECT
STAGE OF DEVELOPMENT : ~~N/A~~ COMMITTED

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : A feasibility study of the mining of 30 000 TPY of ore grading 40 gms/T of gold has been completed. The orebody, which is close to Tennant Creek airport, is to be mined over 4 years. Mining is to commence at the end of 1984. Norseman Gold Mines N.L. is the manager of the project.

COMPANY : RUM JUNGLE BASE METALS JOINT VENTURE

LOCATION : RUM JUNGLE , S OF DARWIN
TYPE OF PROJECT : LEAD , ZINC AND SILVER MINE
STAGE OF DEVELOPMENT : ~~N/A~~ FINAL FEASIBILITY

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : The project involves the development of an open cut mine and treatment plant. Mineable resources are estimated to be 1.0 MT of ore.

COMPANY : MIMETS DEVELOPMENT PTY LTD

LOCATION : MCARTHUR RIVER , 600 KM SE OF DARWIN
TYPE OF PROJECT : LEAD , ZINC & SILVER MINE
STAGE OF DEVELOPMENT : SUBJECT TO RESOLVING METALLUGICAL PROBLEMS

TOTAL COST ($M) : 1000.0
REMAINING COST ($M) : 1000.0
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : 1990'S

PROJECT DETAILS : If the deposit is mined the method would probably be by open-cut operations. A pilot plant was constructed and operated with a view to determine the technology of mining and treatment to be employed. This plant has been put on a care and maintenance basis whilst metallurgical research continues. The ore is of a fine grain and would require special metallurgical techniques. The deposit has a strike length of 1.65 km and a maximum width of 1.05 km. Estimated ore reserves are 227 MT grading 9.2% zinc, 4.1% lead and 41 gms/T of silver. If developed the project would require a deep water port, probably on the Sir Edward Pellew Islands.

URANIUM DEPOSITS.

Queensland.

COMPANY : TOTAL MINING AUSTRALIA PTY LTD

LOCATION : BEN LOMOND , 60 KM W OF TOWNSVILLE
TYPE OF PROJECT : URANIUM & MOLYBDENUM MINE
STAGE OF DEVELOPMENT : FEASIBILITY STUDIES COMPLETED

TOTAL COST ($M) : 120.0
REMAINING COST ($M) : 100.0
CONSTRUCTION EMPLOYMENT : 200
PRODUCTION EMPLOYMENT : 280
TIMING : 1981-1986

PROJECT DETAILS : Mineable reserves proven are in the range of 4 000 T of contained uranium, at a grade of approximately 0.2% and 3 000 T of molybdenum. Extensions of thes reserves are expected and geophysical surveys and deep drilling are continuing. The project involves development of a combined open cut and underground acid leach uranium mine and treatment plant producing uranium oxide and molybdenum. A draft environment impact statement was published in 1983 and a second mining lease was granted covering the area required for mine infrastructure. The deposit has an estimated production lifespan of 10 years with present known reserves.

South Australia

COMPANY : HONEYMOON JOINT VENTURE

LOCATION : HONEYMOON , 75 KM WNW OF BROKEN HILL
TYPE OF PROJECT : URANIUM MINE PILOT PLANT
STAGE OF DEVELOPMENT : ON STANDBY: STOPPED BY S.A. GOVT. ACTION

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : 36
TIMING : N/A

PROJECT DETAILS : Mines Administration Pty Ltd (a CSR subsidiary) is the manager of the project. A pilot plant with capacity of 110 TPY of uranium oxide has been constructed to test in situ leaching techniques. Construction of the pilot plant comprising a 25 L/second processing plant, wellfield, camp installation, air strip and other facilities was completed in early December, 1982. Following the SA Government's decision not to grant mining leases for the Honeymoon prospect, the pilot plant has been placed on care and maintenance.

Western Australia

COMPANY : MANYINGEE JOINT VENTURE

LOCATION : MINDAROO , 40 KM S OF ONSLOW
TYPE OF PROJECT : URANIUM PROSPECT
STAGE OF DEVELOPMENT : TESTING AND EXPLORATORY STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : LATE 1980S

PROJECT DETAILS : The venturers have discovered a small, low grade uranium occurrence which may be amenable to in situ leaching techniques. The first laboratory tests conducted on core indicate the uranium is recoverable through alkaline leaching. A "Five Spot" in situ leaching test is planned in the future to study all the technical parameters of the in situ process. Environmental monitorings are underway in order to define the general state of environment (aquifers, air, flora, fauna) before any major disturbance created by in situ tests. The uranium concentration lies at a depth of 75-105 m and is still open. The prospect area covers 75 sq km. Total Mining Australia Pty Ltd is the operator.

COMPANY : YEELIRRIE JOINT VENTURE

LOCATION : YEELIRRIE , 450 KM NNW OF KALGOORLIE
TYPE OF PROJECT : URANIUM MINE & MILL (STAGE 2)
STAGE OF DEVELOPMENT : DEFERRED

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : The project would have involved the establishment of an uranium mine and mill. A pilot plant to produce yellow cake from trial ore samples was commissioned and testing was completed in 1984. Development would have involved building a mine, mill and a new town and associated infrastructure at Yeelirrie. A final feasibility study was completed and work had shown that a number of metallurgical processes were available to produce yellowcake. As a result of Commonwealth Government uranium policy the project has been deferred. The research plant is being dismantled and the mine site put on a care and maintenance basis. Yeelirrie Management Services Pty Ltd is the operator.

Northern Territory

COMPANY : JABILUKA JOINT VENTURE

LOCATION : JABILUKA , 200 KM E OF DARWIN
TYPE OF PROJECT : URANIUM AND GOLD MINE & MILL
STAGE OF DEVELOPMENT : AWAITING COMMONWEALTH GOVT APPROVAL

TOTAL COST ($M) : 636.6
REMAINING COST ($M) : 602.5
CONSTRUCTION EMPLOYMENT : 1050
PRODUCTION EMPLOYMENT : 540
TIMING : N/A

PROJECT DETAILS : The project involved the establishment of a major underground uranium and gold mine, together with appropriate treatment facilities. On July 10 1984 the Australian Labor Party, at its Bi-ennial Conference, passed a resolution which effectively deferred indefinitely the development of the Jabuluka uranium and gold project. Initial production of 3000 TPY of yellowcake had been proposed, with provision to increase production as market conditions improved. Gold production was to commence ioperating year one at an expected rate of 15 000 ozs PY. Estimated reservess are 207 400 T of uranium oxide contained in 53.3 T of ore grading 0.39% uranium and 12 000 Kg of gold contained in 1.1 T of ore grading 10.7 gms/T of gold in Jabilula I and Jabiluka II deposits. A formal agreement with Aboriginal traditional owners for mining of the deposit was signed on July 21 1982. Federal Governmen[illegible]al approvals and sales determinations were granted on July 26 1982, authorising Pancontinental amd Getty, the two joint venturers, to make offers covering the supply of Jabiluka uranium. Following receipt of the determinations, Pancontinental reached commercial agreement with buyers in Britian and France involving a further 9000 T of yellowcake and Getty made significant progress in its negotiations involving some 19 000 T of yellowcake destined for the American market. A mineral lease MLN1 was issued by the Northern Territory Government on August 12 1982 for a term of 42 years. On March 17 1983, the joint venturers were advised by the Federal Government that the determinations had lapsed. With the lapsing of the sales determinations no further detailed marketing efforts were possible. However, the joint venturers maintained close contact with the market and were encouraged by the response of potential buyers. Many buyers showed a distinct preference for uranium from Jabiluka and it is anticipated that this preference will remain despite the current situation. Uncertainty surrounding the development of the Jabiluka project will prevent benefits flowing to the Aboriginal people as earlier anticipated. A requirement of the agreement between the Jabiluka project and the Northern Land Council was that an Aboriginal business opportunity plan should be prepared to facilitate the involvement of Aboriginal people in providing goods and services to the Aboriginal people in providing goods and sevicns to the project. The required plan was drawn up and published in November 1982. The plan was intended to assist Aboriginal people or companies to identify and utilise opportunities which would be available during the construction and operation phase of the project. As required by the joint venturers agreement with the Northern Land Council, Pancontinental produced a document in two volumes dated October 1982 and entitled 'Jabiluka Project Aboriginal Employment and Contract Plan'. This document detailed proposals for the provision of employment for Aboriginals and the involvement of Pancontinental in the educating and training of Aboriginal people. It also provided a description of all jobs likely to be available to Aboriginals in connection with the project. Pancontinental Mining Ltd is the project operator. The project remains at the final feasibility stage awaiting Commonwealth Government approval.

COMPANY : KOONGARRA MINES PTY LTD

LOCATION : KOONGARRA , 225 KM E OF DARWIN
TYPE OF PROJECT : URANIUM MINE & CONCENTRATOR
STAGE OF DEVELOPMENT : NEGOTIATIONS WITH GOVERNMENT

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : 600
PRODUCTION EMPLOYMENT : 110
TIMING : 1985-1986

PROJECT DETAILS : The project involves construction of a 500 TPD concentrator. The ore will be rapidly mined by open cut methods and tored on the surface for treatment to reduce environmental impact.

Abandoned Projects
South Australia

COMPANY : NORTH FLINDERS MINES LTD

LOCATION : MANNAHILL , 150 KM NE OF PORT PIRIE
TYPE OF PROJECT : URANIUM PROSPECT
STAGE OF DEVELOPMENT : PROJECT ABANDONED

TOTAL COST ($M) : 5.0
REMAINING COST ($M) : 0.0
CONSTRUCTION EMPLOYMENT : 50
PRODUCTION EMPLOYMENT : 25
TIMING : N/A

PROJECT DETAILS : Total mineable ore reserves were estimated at 66 000 T with grades ranging from 3.0 to 3.3 kg of uranium oxide /T. This project was subject to government approval and acceptable uranium prices. Both factors ruled the project unviable and the project has been abandoned.

B (b) Transformation Projects

New South Wales.

COMPANY : ELECTROLYTIC REFINING & SMELTING CO LTD

LOCATION : PORT KEMBLA
TYPE OF PROJECT : COPPER SMELTER EXPANSION
STAGE OF DEVELOPMENT : PROJECT ABANDONED

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : LATE 1980'S

PROJECT DETAILS : The project involved the construction of a new copper smelter, or alternatively, a significant expansion of the existing smelter's capacity. A preliminary feasibility study was completed, due to the unfavourable economics of the proposal under existing economic conditions, the project has been abandoned.

COMPANY : ALCAN AUSTRALIA LTD

LOCATION : GRANVILLE (SYDNEY) AND OTHER PLANTS IN QLD AND VIC
TYPE OF PROJECT : ALUMINIUM FABRICATION PLANT EXPANSION
STAGE OF DEVELOPMENT : IMPLEMENTATION

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : 1980–1986

PROJECT DETAILS : The project involves the modernisation and expansion of fabrication facilities including ingot preparation, coil handling, remelt, homogenising equipment, gravure press and other facilities at the company's major manufacturing plant in NSW, one at Eagle Farm in Queensland and two in Victoria. Development work commenced in 1980 and is expected to be completed in late 1986. Output to be produced includes alumimium sheet, foil and extruded products.

Queensland

COMPANY : AURUKUN ASSOCIATES

LOCATION : AURUKUN , 50 KM S OF WEIPA
TYPE OF PROJECT : BAUXITE MINE , ALUMINA REFINERY & ALUMINIUM SMELTER
STAGE OF DEVELOPMENT : INITIAL STUDIES

TOTAL COST ($M) : 1000.0
REMAINING COST ($M) : 1000.0
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : A special bauxite mining lease has been granted to the associates for a period of 42 years from 1975. Reserves within the lease are between 300–700 MT. A feasibility report covering the establishment of an alumina refinery based on this resource was prepared in 1982 and furnished to the Queensland Government early in 1983.

South Australia

COMPANY : THE BROKEN HILL ASSOCIATED SMELTERS PTY LTD

LOCATION : PORT PIRIE
TYPE OF PROJECT : COPPER RECOVERY PLANT
STAGE OF DEVELOPMENT : IMPLEMENTATION

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : 1982–1984

PROJECT DETAILS : The project involves the construction of a copper recovery plant.

Western Australia

COMPANY : WORSLEY JOINT VENTURE

LOCATION : BODDINGTON & MT SADDLEBACK MINES/WORSLEY REFINERY
TYPE OF PROJECT : BAUXITE MINES & ALUMINA REFINERY (STAGE 1)
STAGE OF DEVELOPMENT : WELL ADVANCED

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : 4124
PRODUCTION EMPLOYMENT : 755
TIMING : 1980–1984

PROJECT DETAILS : The project involves the development of the Boddington and Mt Saddleback bauxite mines and the construction of the first stage of the Worsley alumina refinery. Development work at the site began in 1980. Initial output is 1.0 MTPY, which was on stream in May 1984. The initial mining operation, to produce approximately 3.5 MTPY of bauxite to produce the 1 MTPY of alumina, will centre on reserves in the Saddleback Timber Reserve near Boddington. The refinery includes units for grinding, desilication, digestion, clarification, filtration, precipitation and calcination. Output will be railed to Bunbury. Development work on the project is well advanced. The company managing the joint venture is Worsley Alumina Pty Ltd.

COMPANY : AGNEW CLOUGH LTD

LOCATION : WUNDOWIE , 65 KM FROM PERTH
TYPE OF PROJECT : SILICON METAL PLANT
STAGE OF DEVELOPMENT : FEASIBILITY STUDIES

TOTAL COST ($M) : 61.0
REMAINING COST ($M) : 49.0
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : 1985–1987

PROJECT DETAILS : The project involves the establishment of a modern silicon metal production facility. Small scale pilot smelting has been successfully completed producing a final product of high purity silicon metal. Development plans call for a plant with capacity of 22 000 TPY from two electric furnaces to be built. Proving of adequate reserves in the Proterozoic Age orebody of quartzite raw material has been completed. Equipment costing and the final feasibility study has been completed. The project is envisaged to commence in 1985 and be completed in 1987.

COMPANY : BUNBURY SMELTER JOINT VENTURE

LOCATION : BUNBURY
TYPE OF PROJECT : ALUMINIUM SMELTER
STAGE OF DEVELOPMENT : WA GOVT. STUDIES

TOTAL COST ($M) : 800.0
REMAINING COST ($M) : 800.0
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : 600
TIMING : 1984–1987

PROJECT DETAILS : The project involves the construction of a two potline aluminium smelter in conjunction with construction of a major new power station, Bunbury Stage C, at Bunbury. Originally, the smelter was to be operated by Alcoa of Australia Ltd but the company has withdrawn from the project. The power station was planned to be built by an international group headed by International Construction Co Ltd of South Korea. ICC may also become an equity partner in the smelter. In June 1982 a preliminary agreement between the State Energy Commission and ICC for the construction of a $450 M power station at Bunbury was signed. The agreemment was conditional on the proposed aluminium smelter proceeding. Detailed engineering, environmental and financial planning studies by the WA Government commenced in 1983 and are continuing. The first two 300 MW coal fired generating units of Bunbury C may be privately financed and owned but will be operated by the SECWA and connected to SECWA's grid system. The smelter will have a capacity of 220 000 TPY of metal requiring approximately 450 000 TPY of alumina and 500–600 MW of power. South Korea was originally to purchase the smelter output as it required an assured supply of aluminium. The WA Government has invited interest partners to discuss the viability of the project. To date Reynolds Metal Corporation, Griffin Coal Mining and ICC have been given intentions of interest to the WA Government.

COMPANY : MITCHELL PLATEAU JOINT VENTURE

LOCATION : MITCHELL PLATEAU , 350KM BY AIR ENE OF DERBY
TYPE OF PROJECT : BAUXITE MINE & ALUMINA REFINERY
STAGE OF DEVELOPMENT : FEASIBILITY STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : 1990S

PROJECT DETAILS : The project involves the establishment of a major bauxite mine and alumina refinery. Capacity of Stage 1 of the alumina refinery is to be between 0.5 and 1 MTPY. Two possible future expansions of equal size are also being studied. Proven reserves are 225 MT grading 47–50% aluminium oxide, with estimated reserves are 400 MT grading 44% aluminium oxide located at Mitchell Plateau. Timing for commitment to the mine and alumina refinery is uncertain given the current depressed state of the aluminium industry and a continuing surplus in alumina production capacity.

COMPANY : CAPE BOUGAINVILLE JOINT VENTURE

LOCATION : CAPE BOUGAINVILLE , 450 KM BY AIR N OF DERBY
TYPE OF PROJECT : BAUXITE MINE & ALUMINA REFINERY
STAGE OF DEVELOPMENT : INITIAL STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : LATE 1990S

PROJECT DETAILS : Bauxite reserves are approximately 900 MT. Initial studies have begun to investigate the viability of establishing a bauxite mine and alumina refinery. This project is unlikely to proceed until after the Mitchell Plateau project has been significantly developed.

COMPANY : BOND CORPORATION PTY LTD

LOCATION : CANNING VALE (PERTH)
TYPE OF PROJECT : ALUMINIUM CAN PRODUCTION PLANT
STAGE OF DEVELOPMENT : BUILDING DESIGN , EQUIPMENT ORDERING

TOTAL COST ($M) : 15.4
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : 1984–1985

PROJECT DETAILS : The project involves the establishment of a new aluminium can production facility. The plant will use the most modern technology available. It will supply the requirements of both the brewing and soft drink industries in Western Australia.

Tasmania

COMPANY : RENISON LTD

LOCATION : RENISON BELL , 40 KM N OF QUEENSTOWN
TYPE OF PROJECT : THERMAL UPGRADING TIN PLANT
STAGE OF DEVELOPMENT : DEFERRED UNTIL TIN PRICE IMPROVES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : 80
PRODUCTION EMPLOYMENT : 40
TIMING : N/A

PROJECT DETAILS : Detailed feasibility studies have been carried out for the construction of a thermal upgrading plant to treat low grade tin concentrates allowing significant increases in tin recovery and the production of tin fume and higher grade tin concentrates. Both the fume and the high grade concentrates would then be suitable for tin smelting. The company has purchased East German technology for use in the plant. Planned output is to be 3 000 TPY of contained tin . The RGC board decided to defer the project, after reviewing the feasibility study, until tin prices improve and production restrictions are removed.

COMPANY : SILICON METAL JOINT VENTURE

LOCATION : NEAR HOBART
TYPE OF PROJECT : SILICON METAL & CARBON PRODUCTS PLANT
STAGE OF DEVELOPMENT : FINAL FEASIBILITY STUDIES

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : The project involves the establishment of a high technology silicon metal products manufacturing facility. Output is planned to be 10 000 TPY of silicon metal. Markets are principally export with some local sales possible. Up to 20 megawatts of electricity per annum may be required to allow the project to proceed. No committment has yet been given to proceed and intensive evaluation of the project is continuing.

COMPANY : TASMANIAN ELECTRO METALLURGICAL CO PTY LTD

LOCATION : BELL BAY OR ANOTHER UNDECIDED SITE
TYPE OF PROJECT : FERRO ALLOY PLANT
STAGE OF DEVELOPMENT : DEFERRED INDEFINITELY

TOTAL COST ($M) : N/A
REMAINING COST ($M) : N/A
CONSTRUCTION EMPLOYMENT : N/A
PRODUCTION EMPLOYMENT : N/A
TIMING : N/A

PROJECT DETAILS : The project calls for the expansion of existing product lines and the diversification of related manganese products. A furnace, operations and processing plant and port facilities are to be built. Project timing depends primarily upon market availability. Due to the downturn in business activity, this project may continue to be deferred.

B(c) THE ECONOMICS OF NON-FERROUS METALS

Local consumption of non-ferrous ores and concentrates and metals is shown in Table **B 1.** A significant proportion of the bauxite, gold, lead, manganese, nickel and silver ores are processed locally. Copper, tin, mineral sands, uranium and zinc are predominantly exported as ores or concentrates.

The majority of the metal produced in Australia is exported. Only with blister copper, silver and tin is the majority consumed locally.

Very little non-ferrous metal products are imported in Australia. A certain amount of bauxite, alumina and aluminium are imported, although this relates to special grades and products not produced in Australia. Only with manganese and gold ores do imports exceed exports suggesting insufficient local supplies.

MINING

The Australian mining industry is highly integrated with the world market and exposed to overseas developments. Control over prices by Australian based companies is minimal. Overall the industry is internationally competitive due to national comparative advantages in the extraction of minerals and the high quality of deposits.

Profitability in mining varies significantly with world economic conditions as shown on the following table. Low returns in the 1980s related to low world prices and rising input and wages costs. This had led to the deferrment of a number of mining projects as listed in Section B(a).

RETURNS IN THE AUSTRALIAN MINING INDUSTRY

	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85
Net profit return on average shareholders funds (%)	21.5	10.9	2.2	4.1	4.4	5.7
Effective after tax return on funds employed (%)	13.3	8.5	3.4	4.3	4.4	5.5

SOURCE: Australian Mining Industry Council - Minerals Industry Survey

METALS

Australia is internationally competitive in most non-ferrous metals produced due to natural advantages from the availability of raw materials and abundant and relatively low cost energy. Australia only supplies a small percentage of total world output of processed raw materials. In recent years, more processing has been occurring locally although the bulk of new investment has been in aluminium smelting.

In terms of output per employee, Australia has ranked amongst the highest in the world although this productivity has been affected by recent falls in world demand and metal prices. As seen in Section B(b), only limited investment in transformation projects has been planned and the majority of this was in the aluminium industry. A number of the proposed projects in other non-ferrous areas have been deferred due to the market downturn.

SEMI-FABRICATION

The majority of semi-fabrication occurs in aluminium and copper products and is for the domestic market. The lack of economies of scale particularly in the copper and tin semi-fabrication facilities due to the small domestic market has led to unit production costs being above that of overseas competition.

Technology in aluminium semi-fabrication is of world standard although productivity per employee is a little below world standards. However, energy efficiency is equal to best available standards. Technology and productivity in other semi-fabrication is below world standard although recent plant modernisation has occurred at some sites. Improved markets are likely to induce further modernisation in the future.

METAL FABRICATION

Metal fabrication in Australia is predominantly dependent on the domestic market where a variety of products are produced by small scale jobbing and batch work production lines. Most sectors are experiencing competition from imports which often have 40-50% of the market. Little exporting is occurring.

Profitability is generally quite low although marginally above the manufacturing average. Little productivity increases have been achieved and cost structures are generally above those of overseas competitors. Little capital investment has occurred over the past decade although new technology is now being introduced in some firms.

TABLE B 1

LOCAL CONSUMPTION, EXPORTS AND IMPORTS - TONNES

PRODUCT	1983 PRODUCTION	1983 EXPORTS	1983 % LOCAL CONSUMPTION	1983 IMPORTS	1984 PRODUCTION	1984 EXPORTS	1984 % LOCAL CONSUMPTION	1984 IMPORTS
ORES								
Bauxite	24,372,000	n.a.	n.a.	4,859	32,181,000	n.a.	n.a.	1,423
Copper	261,030	248,265	4.89%	4,430	235,825	202,190	14.26%	1
Gold	30.591	2.872	90.61%	3.091	39.081	1.071	97.26%	3.467
Lead	480,626	91,227	81.02%	-	440,293	150,687	65.78%	-
Manganese	677,253	-	100%	1,004	868,528	-	100%	1,299
Nickel	76,625	-	100%	-	76,889	-	100%	-
Silver	1,032.548	221.581	78.54%	-	969.899	194.244	79.97%	-
Tin	9,037	6,222	31.15%	-	7,822	6,150	21.38%	-
Ilmenite	892,570	816,933	8.47%	-	1,143,854	1,172,986	0%	-
Leucoxene	13,358	9,276	30.56%	-	15,902	30,959	0%	1,149
Rutile	163,374	217,662	0%	740	181,481	191,507	0%	-
Uranium	3,786	3,273	13.55%	-	5,176	3,308	36.09%	-
Zinc	1,243,395	767,437	38.28%	-	1,164,287	824,526	29.18%	-
Zircon	382,005	379,975	0.53%	-	454,591	437,770	3.70%	-
METAL								
Alumina	7,231,000	6,378,000	11.80%	3,824	8,433,000	6,905,000	18.12%	4,730
Aluminium	478,190	234,562	50.95%	5,225	757,798	336,126	55.64%	709
Copper (blister)	173,620	8,413	95.15%	-	179,162	5,350	97.01%	-
Copper (refined)	165,492	77,632	53.09%	-	171,705	75,452	56.06%	6
Gold	30.297	17.742	41.44%	.07	36.360	30.461	16.22%	-
Lead (refined)	195,696	180,636	7.70%	-	196,199	147,309	24.92%	-
Lead (bullion)	182,594	161,624	11.48%	-	181,960	205,216	0%	-
Silver (refined)	287.226	23.385	91.86%	.510	276.050	3.662	98.67%	1.467
Tin (refined)	2,913	470	83.87%	103	2,899	428	85.24%	105
Zinc (refined)	298,518	232,651	22.06%	-	301,942	220,953	26.82%	-
Nickel	n.a.	n.a.	n.a.	110	n.a.	n.a.	n.a.	919

B(d) Alternative Strategies

Non-ferrous mineral resources including both exploited and unexploited deposits are under lease to private companies. The level of foreign ownership in non-ferrous minerals is lower than the national average in mining although a concentration of foreign ownership occurs in bauxite. There are currently no public moves to reduce the level of foreign ownership in mining outside the foreign investment guidelines. The 'naturalization' of several major companies and the purchase of foreign equity by Australian partners in a number of ventures has increased the level of Australian ownership in recent years.

The non-ferrous mineral market is currently oversupplied with a number of projects deferred due to poor markets and prices. Market recovery will lead to the reassessment of these projects. Thus opportunities for developing new projects are limited.

Australia only processes a small proportion of non-ferrous metals from its natural resources despite significant comparative advantages in this area. However most metals, except special grades, consumed locally are locally processed so opportunities for import substitution are limited. Most metals processed in Australia are exported. Expansion of metal processing will depend on either the development of new export markets or increased domestic consumption of metals by Australian manufacturing, or both.

The world metals market is currently experiencing low demand and prices so opportunities for new export projects are limited in the short-term. When the market recovers opportunities for metal processing will reoccurr. Australia is seen as having a role as a supplier of basic materials to the Pacific Basin region. However, in the non-ferrous area, this predominantly means Japan and then only energy-intensive metals such as aluminium as many other countries in this region also have non-ferrous metals capabilities. Thus traditional markets in Europe and North America need to be encouraged. Australian producers have generally been able to maintain production levels better than competitors in other developed countries during the current recession.

Where other countries with no resources internally and dependant on metals imports would wish to establish processing facilities in Australia in conjunction with Australian partners, raw materials could be purchased from existing mines. The majority of processing locally is by vertically-integrated concerns who are established in the world distribution system. Thus a new venture would need to ensure adequate markets were available before commencing investment. Wages and other costs besides raw materials and energy are relatively high in Australia and so new ventures need to be large scale and technologically advanced in order to be able to produce competitively.

Australian semi-fabrication and metal manufacturing facilities are primarily geared to the small domestic markets. This market is declining due to import competition. Expansion of the domestic market for non-ferrous metals requires either the establishment of new factories able to compete effectively with imports for the domestic market (import substitution) or able to compete in the world market so expanding Australian exports, or both. Many Australian metals manufacturers complain of high metal input prices, although this is more the case with steel than non-ferrous metals. However an expanded domestic market would allow semi-fabrications to achieve economics of scale and thus reduce domestic metal prices. At the moment many metals producers sell exports

at world market (LME prices but sell to domestic producers at list prices which are often above the export price.

Investment in Australian non-ferrous metal fabrication requires a careful assessment of the viability of such a project. Although Australian metal manufacturing is still relatively highly protected with an overall effective rate of tariff protection of 34% well above the average of 26%, Government policy is to reduce such protection. Thus new manufacturing projects need to be able to compete with imports in the domestic market if they are to have long-term viability. To keep costs low, products generally require large production runs of a standardized product. Given the small size of the domestic market this would probably require the development of an export market to sell all the output. It is argued that new CAD/CAM technology would faciliate re-tooling of production lines and so assist small production runs as required by the Australian market to become more cost effective.

It is argued by the Australian Manufacturing Council that the following products could have the potential for expansion of export markets:

- Architectural Aluminium Products (doors, gates, window frames, complete windows, shower screens etc,
- Cutlery and land tools (inc spades, forks, hoes, razor blades, metal cutting tools, files, spanners, saws, hammers)
- Metal coating and finishing inc. engraving, polishing, heat treating, plating, galvanising, anodising, colouring, etc) large scale operations are usually integrated with semi-fabrication activity.
- Steam, Gas and Water Fittings (incl. pipes and tube fittings, valves and parts).
- Transport equipment (incl. bicycles, golf buggies, land trucks and wheelbarrows).

A detailed industry strategy for the metal fabrication industries is currently being developed by the Federal Government.

Basic Metals Industry Strategy

The Australian industry is internationally competitive, export orientated, technologically efficient, with sound long term prospects. However, demand has been relatively slow in recent times. The industry is a price take on world markets and with international supply exceeding international demand, prices have been low. This has effected the short term profitability of Australian companies although most have maintained production at close to capacity.

The key emphasis of the industry strategy is to improve international competitiveness through containment of costs, improved productivity and the use and development of new technology. These are to be pursued primarily through a 'self-help' approach.

The following areas were targetted as significant cost problems: labour on costs, coastal and international shipping costs, excise duties on fuel, and public utility. A review of the impact of government regulations on costs is also recommended.

The large amounts of capital required to establish new facilities were emphasised as an impediment to growth. To reduce capital costs it is recommended linkages between the basic metals industry and the Australian heavy engineering industry to increase the potential for 'offsite fabrication'. This may also necessitate improvements to transport infrastructure. Changes to depreciation allowances were also recommended to allow taxation concession to commence at the time of installation rather than at completion of the project.

Improvements in research and development were recommended through the establishment of an industry research database and an improvement in management attitudes. These are to form the basis of a research and development strategy.

A number of measures were recommended to improve the skills of the workforce to improve workforce flexibility, productivity and job satisfaction. Improvements in the working environment were recommended to mitigate the effects of repetitious work and the hazardous environment. Improved industrial relations through more effective employer/employee communication and consultative processes are recommended.

More small and medium firms need to develop their export awareness and to improve the standard of their product to export standard production of basic metals is falling in the USA, the EEC and Japan which are becoming markets for Australian exports. Concern was expressed at the number of new entrants into the world market not tied into traditional distribution networks from developing countries which were heavily subsidized by their Governments in order to earn foreign exhange and generate employment. It is felt this type of non-economic production will reduce the future prospects of the Australian industry.

Metal Fabrication Industry Strategy

Metal fabrication in Australia is fragmented and dependant on the domestic market. It is facing increasing pressure from imports and there is urgent need for revitalization in order to increase competitiveness and thus market size.

The preferred strategy is based on measures to make the Australian industry more competitive and export orientated, as well as improving its domestic market. The major elements of the strategy include:

1) Market identification and market plans on behalf of individual firms and co-operative industry plans in relation to market penetration strategies, quality standards, productive differentiation, innovative products. Industry associations may need consolidating before effective self-help programmes can be developed.

2) Management performance improvements through education and skills training covering areas such as operational efficiency, corporate strategic planning; market development, product development, etc. Innovative education programmes to meet the needs of small business need to be developed.

3) Industrial Relations at the individual firm and industry level to cover issues such as changing work practices, redeployment of labour, union demarcation disputes, industrial democracy.

4) Industry co-operation to overcome the effects of fragmentation by increasing intra-industry self-help and co-operation. This could include merger or cross-supply arrangements, joint export marketing arrangements, joint research activities. Basic metals account for half of production costs and co-operation is required to reduce domestic prices for metals closer to export prices.

5) Improve the domestic business climate to encourage investment and product development through Government policies on depreciation allowances, regulation, and anti-dumping provisions. The Government will also consider levels of tariff protection (currently relatively high) and nationalizing developing country preferences.

6) Technology and research and development needs to be encouraged to increase firms' awareness of available technology, the benefits of product and process innovation, methods of introducing new technology and access to government assistance programmes. Greater co-operation between research agencies and industry is required.

7) Training and re-training in order to overcome the high level of wasteage of trade skills and to improve skill levels in conjunction with new technology. Professional and technical skills education need to include the specific characteristics of these industries. Much of this needs to be supplemented by improved 'in house' training.

8) The image of industry in the community needs to be improved to increase awareness of its capabilities and acceptance of the domestic product.