

## **APPENDIX J**

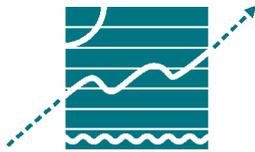
### **SOCIO-ECONOMIC ASSESSMENT**



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## **Snapper Mineral Sands Project Environmental Assessment**

SNAPPER MINERAL SANDS PROJECT  
SOCIO-ECONOMIC ASSESSMENT



PREPARED BY  
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## EXECUTIVE SUMMARY

The Snapper Mineral Sands Project (the Snapper Mine) involves the construction and operation of a mineral sands mine located approximately 10 kilometres (km) to the south-west of the existing Ginkgo Mineral Sands Mine (the Ginkgo Mine) and approximately 170 km south of the Broken Hill Mineral Separation Plant (MSP).

The Snapper Mine requires the preparation of an Environmental Assessment (EA) in accordance with the requirements of the New South Wales (NSW) *Environmental Planning and Assessment Act, 1979* (EP&A Act). A socio-economic assessment is required as part of the EA.

From a socio-economic perspective there are three important aspects of the Snapper Mine:

- the economic efficiency of the Snapper Mine (i.e. consideration of economic benefits and costs of the proposal);
- the regional economic impacts of the Snapper Mine (i.e. the economic stimulus that the Snapper Mine would provide to the regional economy); and
- the distribution of impacts between stakeholder groups (i.e. the equity or social impact considerations) often considered in terms of the impacts on employment, population and community infrastructure.

A benefit cost analysis of the Snapper Mine identified a range of potential economic costs and benefits of the proposal and placed values on most of the production costs and benefits. Possible environmental externalities of the Snapper Mine have been identified but remained unquantified. The analysis indicated that the total net quantified production benefit of the Snapper Mine is likely to be in the order of \$144 million (M). This represents the minimum opportunity cost to Australian society of not proceeding with the proposal. This is a minimum opportunity cost as some of the potential production benefits of the proposal remained unquantified, namely benefits associated with utilising labour that would otherwise remain unemployed.

Put another way, any environmental externalities from the Snapper Mine, after mitigation by BEMAX Resources Limited (BEMAX), would need to be valued at greater than \$144 M to make the Snapper Mine questionable from an economic efficiency perspective.

To put this threshold value in some context, every household in the region of the Far West/Wentworth/Mildura Region would need to be willing to pay in the order of \$4,000 to avoid the identified potential environmental impacts of the Snapper Mine, to make it questionable from an economic efficiency perspective.

A regional economic impact analysis, using input-output analysis, estimated that in total, the average construction phase of the Snapper Mine would contribute the following to the Far West/Wentworth/Mildura economy:

- \$38 M in annual direct and indirect regional output or business turnover;
- \$19 M in annual direct and indirect regional value-added;
- \$11 M in annual household income; and
- 250 direct and indirect jobs.

In the order of 40% of these impacts are likely to occur in the NSW part of the region and would persist for about one year.

The operation of the Snapper Mine is likely to make the following contribution to the Far West/Wentworth/Mildura economy:

- \$91 M in annual direct and indirect regional output or business turnover;
- \$42 M in annual direct and indirect regional value-added;
- \$8 M in annual household income; and
- 142 direct and indirect jobs.

Approximately 50% of these impacts are likely to be felt in the NSW part of the region. These impacts are likely to be felt for 16 years across a range of sectors. The sectors most impacted by output, value-added and income flow-ons are likely to be the *other construction sector; road transport sector; electricity sector; wholesale trade sector; retail trade sector; water supply sector; accommodation, cafes and restaurants and other property services sector*.

Employment impacts are also likely to be felt across a number of sectors including the mining sector, other construction sectors, transport sector, wholesale and retail trade sectors and services sectors (education, health, community services and personal services).

The establishment and operation of the Snapper Mine would stimulate demand in the local and regional economy leading to increased business turnover in a range of sectors and increased employment opportunities. Towns in the vicinity of the Snapper Mine that can provide the inputs to the production process required by BEMAX and/or the products and services required by employees would benefit from the Snapper Mine by way of an increase in economic activity. Such towns may include Broken Hill, Mildura, Pooncarie, Wentworth and Dareton. BEMAX can assist these towns to benefit by adopting, wherever feasible, a local procurement policy.

Changes in the workforce and populations of regions and towns may have implications in relation to access to community infrastructure and human services, which includes, for example, housing, health and education facilities. This may include the number of services that are available to be used and the accessibility of these services.

The direct construction workforce is estimated to average around 200 people for a period of 15 months, with a maximum of 250. It is estimated that the majority (80%) of workers will be sourced from the local area with 20% (i.e. 40 to 50) sourced from outside the region. The construction workforce in the mining industry is generally very mobile and tends not to have accompanying spouses and children. Therefore it is anticipated that the majority of non-local workers would be single or not bring their families into the region. This phase is estimated to result in only a modest increase in population of between 60 and 75 for the region. While there is also expected to be some flow-on employment generated by the Snapper Mine, given the temporary nature of the flow-on effects during construction it is considered unlikely that places would be filled by migration but rather by the local population.

The operation phase of the Snapper Mine would last for approximately 16 years and require a workforce of approximately 110 employees, comprising some 35 mining employees, 45 earthmoving contractors, 15 direct transport contractors and 15 maintenance and other contractors. Again, in the order of 20% of the operation workforce (22 people) is estimated to come from outside the region. Unlike temporary construction workers a normal family size has been assumed for the migrating workers (i.e. 2.6 is the average for NSW). On this basis the population of the region associated with the direct workforce would increase by approximately 57 people.

It is estimated that there would also be flow-on employment of operation of the Snapper Mine of 33 jobs, 25 associated with production induced flow-ons and 8 associated with consumption induced effects. Consistent with the assumptions regarding the direct operational workforce, if 20% of these jobs are filled by non-locals migrating into the region, with normal family characteristics then the population associated with flow-on employment would increase by 17.

The total population influx as a result of the operation phase of the mine is therefore estimated to be in the order of 74 people.

The estimated population changes for Broken Hill and Wentworth Local Government Area (LGA) would help to offset historic population decline. The additional population predicted for the Mildura region would be small in the context of the annual population growth of this town (i.e. in the order of 5% to 6%).

During the construction phase the Snapper Mine is likely to generate demand for short-term accommodation, mainly in Mildura (up to 30 residences), but also in Broken Hill (up to 15 residences) and Wentworth Statistical Local Area (SLA) (up to 5 residences). There is considerable and sufficient short-term accommodation in Mildura (over 7,500 beds), Broken Hill (over 920 beds) and Wentworth (over 680 beds) to accommodate this estimated short-term demand for housing. Furthermore, there is also likely to be considerable opportunity for rental given the size of the potential pool of rental properties in Broken Hill, Wentworth SLA and Mildura Rural City Part A. Potentially available rental properties are likely to have increased over time as a result of the declining population in Broken Hill and Wentworth.

During the operation phase it is estimated that the Snapper Mine is likely to generate demand for in the order of 14 residences at Mildura, 7 residences at Broken Hill, 7 residences across the Wentworth LGA. While initially, short-term accommodation may house these families, the demand would be for longer-term rental accommodation or purchase. This increased demand for housing is largely insignificant in the context of the total housing stock, rental stock and unoccupied dwellings (potential rental stock) as well as the average annual additions to the residential housing stock. For instance, additional demand in Mildura for 14 houses represents 0.08% of the total housing stock and 1.1% of annual housing sales. In Broken Hill, the additional demand for 7 houses represents 0.07% of the total housing stock. In Wentworth LGA, the additional demand for in the order of 6 houses represents 0.2% of the total housing stock.

Even cumulative housing impacts of a range of projects being considered in the Broken Hill area are unlikely to have any significant housing impacts. Indeed, Broken Hill City Council (BHCC) has welcomed the potential job and population growth and is actively “facilitating the identification of available vacant land (both serviced and un-serviced) within the city boundaries to assist potential residential and other developers with investment decisions – based on a yet to be quantified demand for housing”.

BHCC also advise that “the city has underutilised capacity and an untapped resource of serviced vacant land and a range of existing housing stock in poor condition which is suitable for urban renewal as opposed to the costly option of extension of land development on the fringes of the city”.

The Snapper Mine is also likely to place minimal demands on education institutions. Most employee training is likely to be undertaken in-house and on the job. The construction phase of the Snapper Mine is likely to place minimal demands on schools since the majority of incoming workers are expected to be single and unaccompanied. While during operation of the mine there would be some additional demand placed on schools these are insignificant in comparison to current enrolments and the NSW Department of Education and Training (DoET) has confirmed that there is considerable excess capacity in school infrastructure in both Broken Hill and Wentworth SLA, and hence the Snapper Mine would have minimal impact.

There is potential for the Snapper Mine to increase the demand for public health facilities in the region via the anticipated increase in population during both construction and operation phases. However, the anticipated population increase during construction and operation of the Snapper Mine is very small compared to the total populations of each of the affected regions and population centres. Furthermore, Broken Hill and Wentworth SLA may have spare capacity in health service infrastructure given the declining population of these areas. Mildura is a large growing rural centre and any increases in population in this town as a result of the Snapper Mine are expected to be very small in comparison to normal growth in the region.

The proposal also has the potential to indirectly positively impact on public health through the provision of employment opportunities and the reduction in unemployment. Prolonged unemployment can generate a range of personal and social problems including increased drug and alcohol dependency and increased demand for health services (University of NSW, 2006). Providing opportunities to reduce unemployment can be therefore be beneficial.

Cessation of the Snapper Mine after 16 years of operation may lead to a reduction in economic activity. The significance of these cessation impacts will depend on:

- The degree to which any displaced workers and their families remain within the region, even if they remain unemployed. This is because continued expenditure by these people in the regional economy (even at reduced levels) contributes to final demand.
- The economic structure and trends in the regional economy at the time. For example, if cessation of the Snapper Mine takes place in a declining economy the impacts might be felt more greatly than if it takes place in a growing diversified economy.
- Whether other mineral sand developments or other opportunities in the region arise that allow employment of displaced workers.

Given these uncertainties it is not possible to foresee the likely circumstances within which cessation of the Snapper Mine will occur. It is therefore important for regional authorities and leaders to take every advantage from the stimulation to regional economic activity and skills and expertise that the Snapper Mine will bring to the region, to strengthen and broaden the region's economic base.

## **J1 INTRODUCTION**

The Snapper Mineral Sands Project (the Snapper Mine) involves the construction and operation of a mineral sands mine located approximately 10 kilometres (km) to the south-west of the existing Ginkgo Mineral Sands Mine (the Ginkgo Mine) and approximately 170 km south of the Broken Hill Mineral Separation Plant (MSP).

The Snapper Mine would utilise both dry and wet methods of mining. Major ancillary infrastructure for the Snapper Mine comprises extensions/sharing of existing Ginkgo Mine infrastructure.

The Snapper Mine would also share a significant labour workforce component with the Ginkgo Mine including general management, mine planning, geological supervision, environment, safety, catering and major maintenance personnel.

Resource Strategies has been commissioned by BEMAX Resources Limited (BEMAX) to prepare an Environmental Assessment (EA) for the Snapper Mine in accordance with the requirements of the New South Wales (NSW) *Environmental Planning and Assessment Act, 1979* (EP&A Act). A socio-economic assessment is required as part of the EA.

## J2 SOCIO-ECONOMICS

From a socio-economic perspective there are three important aspects of the Snapper Mine:

- the economic efficiency of the Snapper Mine (i.e. consideration of economic benefits and costs of the proposal);
- the regional economic impacts of the Snapper Mine (i.e. the economic stimulus that the Snapper Mine would provide to the regional economy); and
- the distribution of impacts between stakeholder groups (i.e. the equity or social impact considerations).

The draft *Guideline for Economic Effects and Evaluation in EIA*, Planning NSW (2002), identified economic efficiency as the key consideration of economic analysis. Benefit cost analysis (BCA) is the method used to consider the economic efficiency of proposals and is essential to undertaking a proper economic evaluation of proposed developments that are likely to have significant environmental impacts.

The draft guidelines consider that regional economic impact assessment may provide additional information as an adjunct to the economic efficiency analysis. Economic stimulus to the local economy can be estimated using input-output modelling of the regional economy (regional economic impact assessment)

The draft guidelines also identify the need to consider the distribution of benefits and costs in terms of:

- intra-generational equity effects – the incidence of benefits and costs within the present generation; and
- inter-generational equity effects – the distribution of benefits and cost between present and future generations.

These social impacts are often considered in terms of the impacts on employment, population and community infrastructure.

This proposal relates to the preparation of each of these types of analyses:

- a benefit cost analysis (threshold value analysis) of the Snapper Mine;
- a regional economic impact assessment of construction and operation of the Snapper Mine; and
- an employment, population and community infrastructure assessment.

### **J3 BENEFIT COST ANALYSIS OF THE SNAPPER MINE**

#### **J3.1 INTRODUCTION**

For the Snapper Mine to be economically desirable from an Australian community perspective, it must be economically efficient. Technically, a project is economically efficient and desirable on economic grounds if the benefits to society exceed the costs (James and Gillespie, 1997). For mining projects, the main economic benefit is the producer surplus generated by the mine while the main economic costs relate to environmental costs. The main technique that is used to weigh up these benefits and costs is BCA.

BCA involves the following key steps:

- identification of the base case;
- identification of the Snapper Mine and its implications;
- identification and valuation of the incremental benefits and costs;
- consolidation of value estimates;
- sensitivity testing;
- application of decision criteria; and
- consideration of non-quantified benefits and costs.

What follows is a BCA of the Snapper Mine based on financial, technical and environmental advice provided by Resource Strategies Pty Ltd and BEMAX.

#### **J3.2 IDENTIFICATION OF THE BASE CASE AND ALTERNATIVES**

Identification of the “base case” or “without” option is required in order to facilitate the identification and measurement of the incremental economic benefits and costs of the Snapper Mine. In this study, the “without” option involves:

- continuation of the agricultural use of the land (i.e. use of the land primarily for grazing of sheep and areas of remnant and regrowth vegetation);
- continuation of the mining at Ginkgo; and
- expansion of the MSP at Broken Hill to add additional circuits (BEMAX advise that this is to occur regardless of the Snapper Mine).

In contrast to the “base case” the Snapper Mine involves the development and operation of an additional mineral sands mine utilising both dry and wet (dredge) methods of mining, and would include the major mine activities presented below.

Construction of the Snapper Mine would commence approximately between Years 3 to 5 of the Ginkgo Mine life.

- clearance of vegetation and stripping of soils on a campaign basis ahead of the advancing mine operation;
- overburden stripping, slurring and direct placement;
- predominantly dredge mining of ore by a conventional floating bucket wheel dredge located in the dredge pond;
- adjustment of dredge pond levels to maintain dredge access to the ore;

- supply of water from the borefields;
- disposal of water to the water disposal dam when lowering dredge pond levels;
- secondary mining of ore by conventional mobile equipment (i.e. dozers and/or scrapers), depositing ore in front of the dredge;
- ore concentration in the primary gravity concentration unit to produce heavy mineral concentrate (HMC);
- stockpiling of HMC;
- supply of desalinated water from the reverse osmosis (RO) plant for HMC salt washing;
- HMC separation via the Wet High Intensity Magnetic Separators (WHIMS) circuit either at the Snapper Mine or at the MSP, to produce three types of mineral concentrates (i.e. ilmenite-rich, leucoxene-rich and non-magnetic [rutile-rich and zircon-rich] concentrates);
- stockpiling of mineral concentrates;
- transport of HMC and/or mineral concentrates to the MSP;
- placement of wastes from the primary gravity concentration unit (i.e. sand residues) at the rear of the dredge pond as mining advances;
- treatment of process water to remove fines material (i.e. particles less than 53 microns in diameter);
- transport and placement of backloaded process waste from the MSP;
- replacement of overburden on top of sand residues; and
- staged replacement of soils and progressive rehabilitation.

Major ancillary infrastructure for the Snapper Mine comprises extensions to and sharing of existing Ginkgo Mine infrastructure, as outlined below.

- An approximate 10 km long 66 kV electricity transmission line (ETL) from the Ginkgo Mine to the Snapper Mine (i.e. an extension of the existing ETL from the Ginkgo Mine substation).
- Shared use of the existing mineral concentrate transport route. The highway access road (HAR) would be extended by approximately 1 km into the northern extent of the mine site and by approximately 6 km to the eastern side of the mine site.
- Shared use of the accommodation camp at the Ginkgo Mine, which would be expanded to accommodate Snapper Mine workers.

The Snapper Mine area comprises the Snapper Mine Mining Lease Application (MLA) area and the ETL and HAR extensions.

Alternatives to the proponent for the mining and processing of mineral sands are limited. BEMAX has defined the subject resource. It will subsequently enter into agreements with leaseholders regarding mining on the subject land. The Company has not at this stage located, at sufficient levels of certainty, any alternate mineral sand resources and hence at this stage there are no alternative sites considered. However, mining and processing of the mineral sand reserves from the subject land may take a number of forms. This may include different scales, designs, technologies, processes, modes of transport, timing, impact mitigation measures, etc. Therefore a number of alternatives for mining and processing may be possible. However, these may all be considered to be minor variants of the Snapper Mine rather than alternatives. Hence, this analysis focuses on the Snapper Mine compared to the base case identified above.

### J3.3 IDENTIFICATION OF BENEFITS AND COSTS

Relative to the base case or “without” scenario of continued agricultural use of the land, the Snapper Mine may have the following potential incremental economic benefits and costs.

It should be noted that the potential external costs, listed in Table J-1, are only economic costs to the extent that they affect individual and community wellbeing through direct use of resources by individuals or non-use. If the potential impacts are mitigated to the extent where community wellbeing is insignificantly affected, then no external economic costs arise.

**Table J-1  
Economic Benefits and Costs of the Snapper Mine**

<b>Stakeholder</b>	<b>Costs</b>	<b>Benefits</b>
BEMAX	Opportunity cost of mine site land	Sale value of rutile, zircon, ilmenite and altered ilmenite
	Capital costs of establishment and construction including ancillary works	Residual value of capital and land at the cessation of the Snapper Mine
	Operating costs, including administration, mining, mineral processing and transportation, and rehabilitation	
	Rehabilitation costs at cessation of the Snapper Mine	
External	Impacts on air quality	Provision of infrastructure (e.g. roads, communications) in public domain
	Impacts on water quality and quantity of surface, riverine and groundwater resources	
	Impacts of noise	
	Impacts of transportation	
	Visual impacts on the existing view catchment	
	Heritage impacts	
	Risk of accidents and death to mine employees	
	Impacts on flora and fauna	

### J3.4 QUANTIFICATION/VALUATION OF BENEFITS AND COSTS

In accordance with NSW *Treasury Guidelines for Economic Appraisal* (NSW Treasury, 1997), where competitive market prices are available, they have generally been used as an indicator of economic values.

#### J3.4.1 *BEMAX Resources Limited*

##### J3.4.1.1 Economic Costs

###### J3.4.1.1.1 *Opportunity Cost of Land*

There is an opportunity cost associated with using the pastoral land containing the mineral sand resource for mining instead of continued agricultural uses. An indication of the opportunity cost of the land can be gained from the value of foregone agriculture during the Snapper Mine, which is reflected in the required compensation payments made to landholders. This has been included in the analysis.

#### *J3.4.1.1.2 Opportunity Cost of Plant*

Where the mining and processing activity would utilise plant and machinery already owned by the Company there is an opportunity cost associated with utilising this plant rather than selling it or using it elsewhere. However, for the purpose of this analysis it is assumed that all plant and machinery would be newly purchased or leased with the opportunity cost of this plant and machinery captured by its market value or lease value. These values have been included in the analysis.

#### *J3.4.1.1.3 Capital Cost of Mine Establishment and Associated Infrastructure Establishment*

The capital cost of the mine establishment and associated infrastructure is estimated to be approximately \$105 M with the majority expended over the 15 month construction period.

#### *J3.4.1.1.4 Annual Operating Costs of the Mine*

The annual operating costs of the Snapper Mine over the 16 years of extraction include those associated with:

- administration;
- camp accommodation costs;
- contract overburden stripping;
- secondary mining of ore by convention mobile equipment;
- dredge operation;
- primary gravity concentration unit;
- road haulage;
- processing at the MSP; and
- freight, port and marketing expenses.

It should be noted that while royalties are a cost to BEMAX they are part of the overall producer surplus benefit of the mining and processing activity that is redistributed by government. Royalties are therefore not included in the calculation of the resource costs of operating the Snapper Mine. Nevertheless, it should be noted that the Snapper Mine would generate total royalties in the order of \$30 M.

Where inputs to the production process would otherwise be employed elsewhere in the economy, the opportunity cost of their use is the price paid for them. For labour, that price is the wage rate and it is this wage rate that has been included in the estimates of operating costs above. However, if an input into a production process, such as labour, would otherwise be unemployed, its opportunity cost is less than the wage rate for labour and hence for an economic analysis the economic cost of employing labour should be reduced. The opportunity cost of employing a worker who would otherwise be unemployed can be considered to be the wage rate less income tax paid on that wage and any foregone social security payments (Bennett, 1996).

For this analysis the estimated operating wages bill has not been adjusted downward to take account of the opportunity cost of that part of the labour force that would otherwise be unemployed. Consequently, the net production benefits identified could be considered a minimum figure.

### J3.4.1.1.5 Rehabilitation Costs

The operating costs referred to above include an allowance for on-going mine rehabilitation. This comprises:

- transport and placement of backloaded process waste from the MSP;
- replacement of overburden on top of sand residues; and
- staged replacement of soils and progressive rehabilitation.

### J3.4.1.2 Economic Benefits

#### J3.4.1.2.1 Sale Value of Rutile, Zircon, Ilmenite, Altered Ilmenite

The provisional production schedule is provided in Table J-2.

**Table J-2  
Provisional Production Schedule\***

Snapper Mine Development Year	Mineral Concentrate Production (kilotonnes [kt])			Mineral Concentrate Transport (kt)
	Ginkgo Mine	Snapper Mine	Total	Total
-	500	0	500	350
-	550	0	550	385
Construction	475	0	475	333
1	375	250	625	444
2	300	350	650	464
3	200	450	650	735
4	200	450	650	735
5	200	450	650	735
6	250	400	650	735
7	250	400	650	735
8	250	400	650	735
9	250	400	650	735
10	200	400	600	685
11	200	375	575	660
12	200	350	550	609
13	200	350	550	550
14	150	275	425	425
15	0	275	275	275
16	0	250	250	250
<b>Total</b>	<b>4,750</b>	<b>5,825</b>	<b>10,575</b>	<b>10,575</b>

\* Production and transport rates are indicative only.

The schedule presented in Table J-2 provides for a conservative transport scenario (i.e. maximum road movements) whilst accounting for the maximum MSP capacity, haulage fleet capacities and travel times.

The Snapper and Ginkgo Mines would transport up to approximately 735,000 tpa of concentrate to the MSP after an initial period of ilmenite-rich concentrate stockpiles. Stockpiled ilmenite-rich concentrate would be transported when appropriate market conditions prevail.

Rutile has a titanium dioxide content of around 95% and is an important feedstock mineral for the titanium dioxide pigment industry. Titanium dioxide is widely used in the manufacture of paint, paper and plastics. Rutile is also used in the manufacture of welding rods and the production of titanium metal. Titanium is light and strong and is used in the aerospace industry, bio-engineering and some sporting goods.

Ilmenite and leucoxene also contain titanium dioxide and are used as feedstock in the titanium dioxide pigment industry. However, as they contain more iron than rutile, they have a relative value that is typically 20-25% of the rutile selling price.

Finely ground zircon is commonly used for glazes in the ceramic industry. These products include kitchen and bathroom tiles, dinnerware and decorative ceramics. Zircon is also widely used in television screens and computer monitors.

Both demand and supply of these minerals influences current and projected prices.

Demand for these minerals is derived demand, i.e. dependent on demand for the end products within which the minerals are used. This fluctuates considerably based on numerous market factors including the price of the end product, the prices of related end product, income of consumers, expected future prices, population, preferences, etc.

World supply fluctuates depending on price of the end product, prices of factors of production, prices of related goods, expected future prices, the number of suppliers, technology, political situation in developing countries where potential deposits are located, etc.

Prices fluctuate considerably and are expected to continue to do so. BEMAX has provided its projection of annual revenue that it expects would be generated from the Snapper Mine and this has been included in the analysis.

#### *J3.4.1.2.2 Residual Value at End of the Evaluation Period*

At the end of the Snapper Mine, purchased capital equipment may have some residual value that could be realised by sale. However, for the purpose of this analysis the residual value has been assumed to be zero.

The majority of the Snapper Mine area would be rehabilitated and returned to agricultural production (Section 5 of the EA). No residual value has been included in the analysis as only the annual compensation value was included as a cost for the life of the mine rather than the capital value of the land.

#### **J3.4.2 Externalities**

BEMAX has considered a range of potential environmental impacts from the mining proposal and potential means of mitigation. Each is briefly considered here from an economic perspective.

**Air quality** – potential air quality impacts include dust generation associated with mining and concentrate transport. However, any potential externality costs would be largely internalised through appropriate dust suppression methods to meet applicable air quality guidelines at private receptors.

Any residual air quality impacts could potentially impact on consumer surpluses of individuals and could potentially be measured through property value effects, costs of illness approach or the contingent valuation method, depending on the specific nature of the impacts.

**Greenhouse Gas Generation** – mineral sands mining results in the emission of carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), and to a lesser extent oxides of nitrogen (NO<sub>x</sub>) during the combustion of diesel fuel used in diesel powered equipment. In addition emissions of CO<sub>2</sub> and NO<sub>x</sub> are released indirectly when electrically-powered equipment is used.

CO<sub>2</sub> emissions can be valued in a variety of ways, including the price of certificates sold under the NSW Greenhouse Gas Abatement Scheme (GGAS) (i.e. \$16.30 per tonne of CO<sub>2</sub>)

**Hydrogeological impacts** – BEMAX would extract water from the saline aquifers at the mine site to make up dredge pond water lost in sand residues and slurried overburden and to raise and lower the dredge pond level, as well as supplying potable and mineral rinsing water by reverse osmosis water treatment. To the extent that this usage results in a loss of water to other users there may be a loss in consumer or producer surplus, depending on the alternative water use (the salinity of the water precludes potable or agricultural use without treatment). Use of this groundwater is not predicted to measurably impact riverine flows.

Any potential externalities associated with erosion and sedimentation associated with overland flow would be largely internalised by management and mitigation of potential impacts through implementation of an integrated erosion and sedimentation measures.

**Noise impacts** – the Snapper Mine site is characterised by low ambient background noise levels in keeping with its predominantly rural setting, however, the truck and light vehicle movements associated with the Ginkgo Mine pass to the immediate north of the MLA area and form a part of the ambient noise environment. There could potentially be increased noise impacts at surrounding properties due primarily to the operation of the mine and road haulage of mineral concentrates. However, modelling indicates that noise levels at properties surrounding the Snapper Mine would not exceed the relevant noise emission criteria.

**Transportation impacts** – there is potential for increased road pavement damage and increased risk of accidents associated with transportation of mine inputs and mineral concentrate between the mine site and the MSP. However, BEMAX has previously upgraded the rural road to the Silver City Highway, substantially increasing the safety and carrying capacity of the roadway for not only the Ginkgo Mine, but also for the local community.

**Visual impacts** – the visual character of the Snapper mine site is predominantly influenced by landuse practices such as grazing. The existing landscape is characterised by leasehold lands supporting light intensity grazing. The nearest residence to the mine (“Manilla”) is some 3.5 km away and views of the Snapper Mine would be limited.

Visual intrusion can potentially impact the consumer surplus of surrounding households (reflected in changes in property values of affected lands).

**Flora and fauna** – the Snapper Mine path, initial sand residue dam and overburden emplacements and vegetated areas within the ETL and HAR extensions are the main areas of vegetation that would be impacted by the Snapper Mine. However, ecological studies indicate that these lands have moderate flora and fauna values and impacts would not be significant. Should there be any significant impacts on aquatic and terrestrial species or communities, these impacts would likely affect the non-use economic values (consumers’ surplus) of individuals and may be interpreted in an economic context via surveys to elicit the community’s willingness to pay to avoid any potential impacts.

**Risk of accidents and death to mine employees** – there is some risk to mine employees associated with mining. This is an economic cost to the extent that individuals are willing to pay to avoid risk or willing to accept compensation to be exposed to risk of death. To the extent that higher wages for mine employees already includes a wage risk premium the economic costs of increased risk of accidents and death have already be internalised into the capital and operating costs of the Snapper Mine.

**Heritage impacts** – the Snapper Mine may potentially disturb Aboriginal and non-Aboriginal heritage sites. Mitigation measures are proposed to either protect or appropriately register and record sites to be disturbed in accordance with relevant regulatory requirements. Any impacts on heritage may impact the consumer surplus of visitors to the sites as well as people’s non-use values. These could potentially be measured through the contingent valuation method or choice modelling.

### **J3.5 CONSOLIDATION OF VALUE ESTIMATES**

Using a 7% discount rate the streams of quantified incremental production benefits and costs over time were converted into a present value. It was found that at a 7% discount rate, the net incremental production benefits of the Snapper Mine would be in the order of \$144 M net present value (NPV).

This net production benefit is distributed amongst a range of stakeholders including:

- company shareholders;
- the NSW Government via royalties; and
- the Commonwealth Government in the form of Company tax.

The NSW Government receives additional benefits in the form of payroll tax and local councils may also benefit through appropriate licensing and permitting contributions.

### **J3.6 SENSITIVITY ANALYSIS**

This NPV is based on a range of assumptions around which there is some level of uncertainty. Uncertainty in a benefit cost analysis can be dealt with through changing the values of critical variables in the analysis (James and Gillespie, 2002) to determine the effect on the NPV. In this analysis, the net production benefit was tested for changes to the following variables:

- opportunity cost of land;
- capital costs;
- operating costs;
- revenues;
- residual values; and
- costs of greenhouse gas emissions.

What this analysis indicated is that the results of the benefit cost analysis are not sensitive to reasonable changes in assumptions regarding any of these variables. While the results are most sensitive to the assumptions regarding operating costs and concentrate revenues, operating costs would need to increase by 40% to result in a negative NPV. Similarly, the value of concentrate would need to reduce to less than 76% of the assumed value for the NPV to be negative.

### **J3.7 APPLICATION OF DECISION CRITERIA AND THRESHOLD VALUE ANALYSIS**

The main decision criterion for assessing the economic desirability of a project to society is usually its NPV. NPV is the sum of the discounted benefits less the sum of the discounted costs. The economic assessment is different to an internal company financial assessment of NPV. A positive NPV indicates that it would be desirable from an economic perspective for society to allocate resources to the Snapper Mine, because the community as a whole would obtain net benefits from the Snapper Mine. In this instance, because some potential environmental impacts of the proposal have not been valued, the NPV of \$144 M represents a threshold value.

This threshold value represents the opportunity cost to society of not proceeding with the Snapper Mine. Interpreted another way, any environmental impacts from the Snapper Mine, after mitigation by BEMAX, would need to be valued at greater than \$144M to make the Snapper Mine questionable from an economic efficiency perspective.

To put this into a regional context, this is equivalent to each household in the Far West/Wentworth/Mildura Region having a willingness to pay of over \$4,000 to avoid any of the residual environmental impacts of the Snapper Mine, after mitigation by BEMAX.

## J4 REGIONAL ECONOMIC IMPACT ASSESSMENT OF THE SNAPPER MINE

### J4.1 INTRODUCTION

Regional economic impact assessment is primarily concerned with the effect of an impacting agent on an economy in terms of a number of specific indicators, such as gross regional output, value-added, income and employment.

These indicators can be defined as follows:

- **Gross regional output** – the gross value of business turnover;
- **Value-added** – the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output;
- **Income** – the wages paid to employees including imputed wages for self employed and business owners; and
- **Employment** – the number of people employed (including full-time and part-time).

An impacting agent may be an existing activity within an economy or may be a change to a local economy (Powell *et al.*, 1985; Jensen and West, 1986). This assessment is concerned with:

- the impact of the construction of the Snapper Mine; and
- the impact of the operation of the Snapper Mine.

The economy on which the impact is measured can range from a township to the entire nation (Powell *et al.*, 1985). In selecting the appropriate economy regard needs to be had to capturing the local expenditure and employment associated with the Snapper Mine but not making the economy so large that the impact of the proposal becomes trivial (Powell and Chalmers, 1995).

For this study, the impacts of the Snapper Mine have been estimated for the Far West/Wentworth/Mildura Region comprising the Statistical Local Areas (SLAs) of Broken Hill, Far West Unincorporated, Wentworth and Mildura Rural City (RC) Part A. While the region straddles the NSW border with Victorian, it is the most sensible region for the regional economic impact analysis since both Broken Hill and Mildura are a major source of labour and inputs to production for the Snapper Mine.

A range of methods that can be used to examine the regional economic impacts of an activity on an economy including economic base theory, Keynesian multipliers, econometric models, mathematical programming models and input-output models (Powell *et al.*, 1985). This study uses input-output analysis.

Input-output analysis essentially involves two steps:

- construction of an appropriate input-output table (regional transaction table) that can be used to identify the economic structure of the region and multipliers for each sector of the economy; and
- identification of the initial impact or stimulus of the Snapper Mine (construction and operation) in a form that is compatible with the input-output equations so that the input-output multipliers and flow-on effects can then be estimated (West, 1993).

## J4.2 INPUT-OUTPUT TABLE AND ECONOMIC STRUCTURE OF THE REGION

For this study, a 2000-01 input-output table of the regional economy was developed by Gillespie Economics using the Generation of Input-Output Tables (GRIT) procedure (Attachment JA). The 2000-2001 input-output data is the latest that is available. Therefore, the table does not reflect the development of the Ginkgo Mine which commenced production in late 2005.

A 106 sector input-output table of the regional economy was aggregated to 30 sectors and 6 sectors for the purpose of describing the economies.

A highly aggregated 2001 input-output table for the regional economy is provided in Table J-3. The rows of the table indicate how the gross regional output of an industry is allocated as sales to other industries, to households, to exports and other final demands (OFD - which includes stock changes, capital expenditure and government expenditure). The corresponding column shows the sources of inputs to produce that gross regional output. These include purchases of intermediate inputs from other industries, the use of labour (household income), the returns to capital or other value-added (OVA - which includes gross operating surplus and depreciation and net indirect taxes and subsidies) and goods and services imported from outside the region. The number of people employed in each industry is also indicated in the final row.

**Table J-3**  
**Aggregated Transactions Table: Regional Economy 2000-01 (\$'000)**

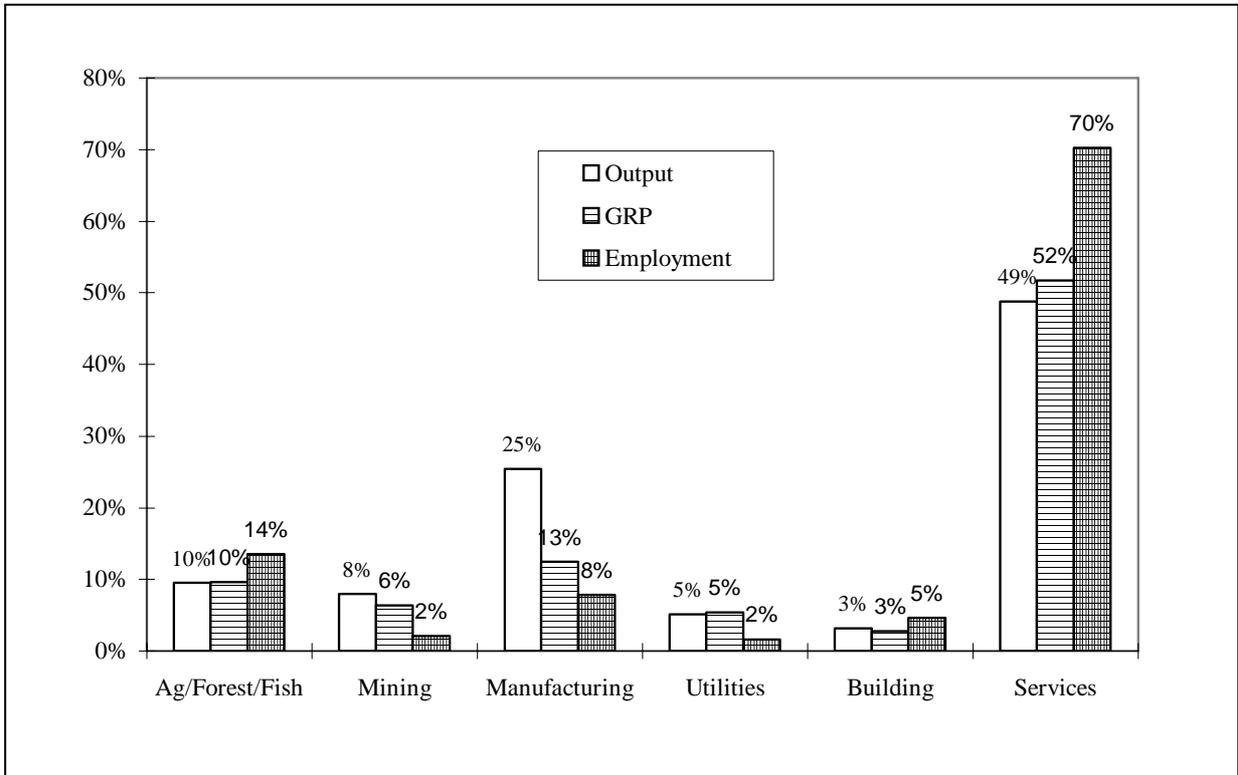
	Agriculture/ Forestry/ Fishing	Mining	Manufact- uring	Utilities	Building	Services	TOTAL	Household Expenditure	OFD	Exports	Total
Agriculture/ Forestry/ Fishing	24,422	56	53,523	9	64	1,370	79,445	5,243	12,416	268,584	<b>365,688</b>
Mining	229	25,161	1,963	205	686	462	28,706	58	-82,984	360,033	<b>305,814</b>
Manufacturing	14,176	17,894	74,284	3,604	10,427	36,982	157,368	52,801	92,616	670,693	<b>973,478</b>
Utilities	2,456	7,697	7,296	16,333	236	17,158	51,174	43,820	94,517	5,741	<b>195,253</b>
Building	611	2,606	44	85	68	3,039	6,454	0	114,273	179	<b>120,905</b>
Services	37,266	30,935	119,831	17,861	15,690	320,216	541,799	495,136	566,747	262,887	<b>1,866,568</b>
<b>TOTAL</b>	<b>79,160</b>	<b>84,349</b>	<b>256,941</b>	<b>38,096</b>	<b>27,171</b>	<b>379,227</b>	<b>864,945</b>	<b>597,058</b>	<b>797,585</b>	<b>1,568,117</b>	<b>3,827,706</b>
Household Income	94,991	33,499	71,237	21,251	41,467	566,059	828,505	0	0		<b>828,505</b>
OVA	101,959	96,800	184,957	89,035	15,853	493,396	981,999	203,236	35,293		<b>1,220,528</b>
Imports	89,578	91,166	460,342	46,870	36,414	427,886	1,152,256	727,302	151,122		<b>2,030,681</b>
<b>TOTAL</b>	<b>365,688</b>	<b>305,814</b>	<b>973,478</b>	<b>195,253</b>	<b>120,905</b>	<b>1,866,568</b>	<b>3,827,706</b>	<b>1,527,597</b>	<b>984,001</b>	<b>1,568,117</b>	<b>7,907,420</b>
<b>Employment</b>	3,551	564	2,053	423	1,221	18,442	26,255				

Gross regional product (GRP) for the regional economy is estimated at \$2,049 M, comprising \$829 M to households as wages and salaries (including payments to self employed persons and employers) and \$1,221 M in OVA.

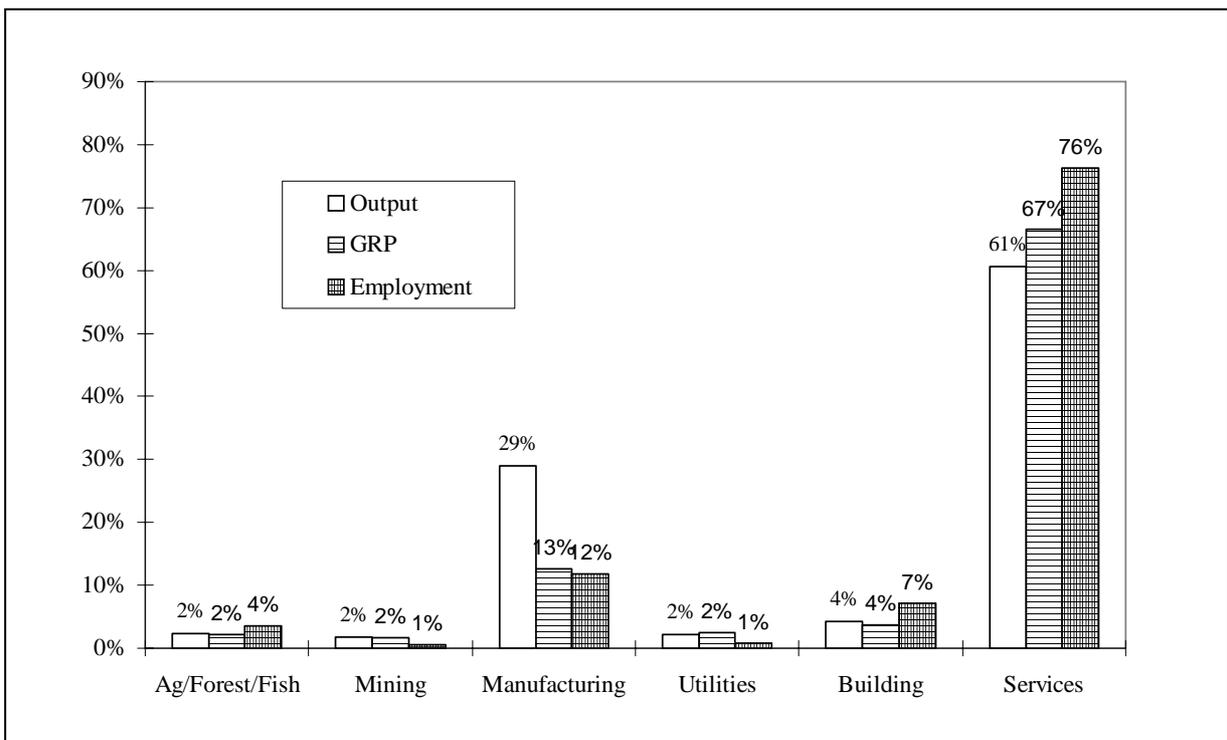
The employment total was 26,255 people.

The economic structure of the regional economy may be compared with that for NSW through a comparison of results from the input-output model (Figures J-1 and J-2). This reveals that the agriculture, forestry and fishing sector, mining sector and utilities in the regional economy are of greater relative importance than they are to the NSW economy. While the manufacturing sector, building sector and services sectors are of less relative importance than they are to the NSW economy.

**Figure J-1**  
**Summary of Aggregated Sectors: Regional Economy (2000-01)**



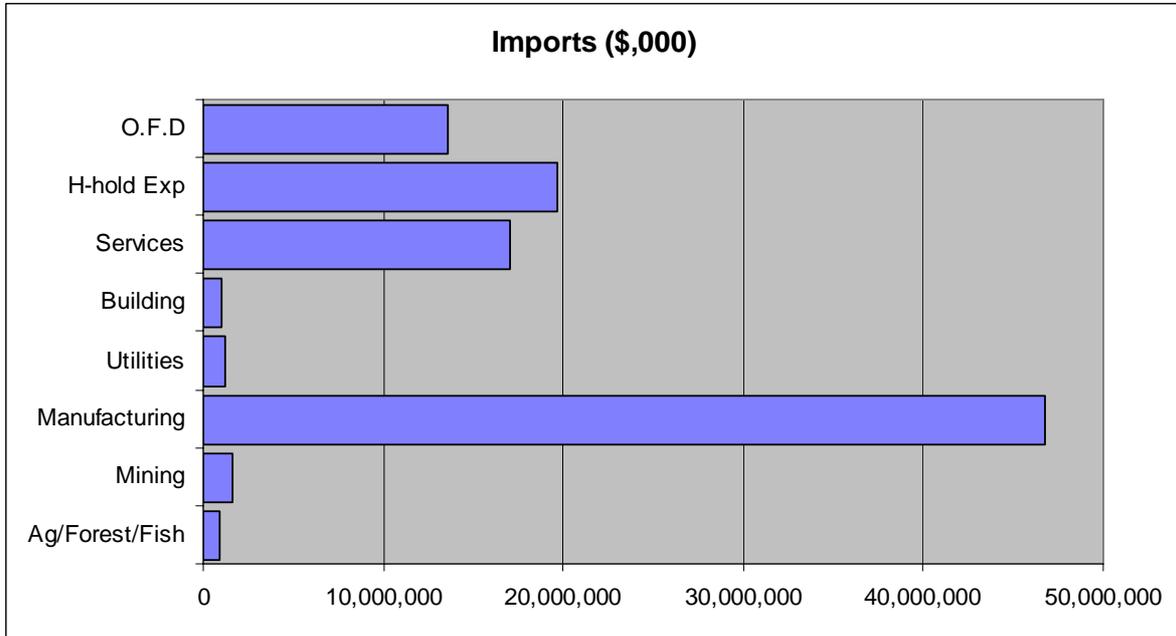
**Figure J-2**  
**Summary of Aggregated Sectors: NSW Economy (2000-01)**



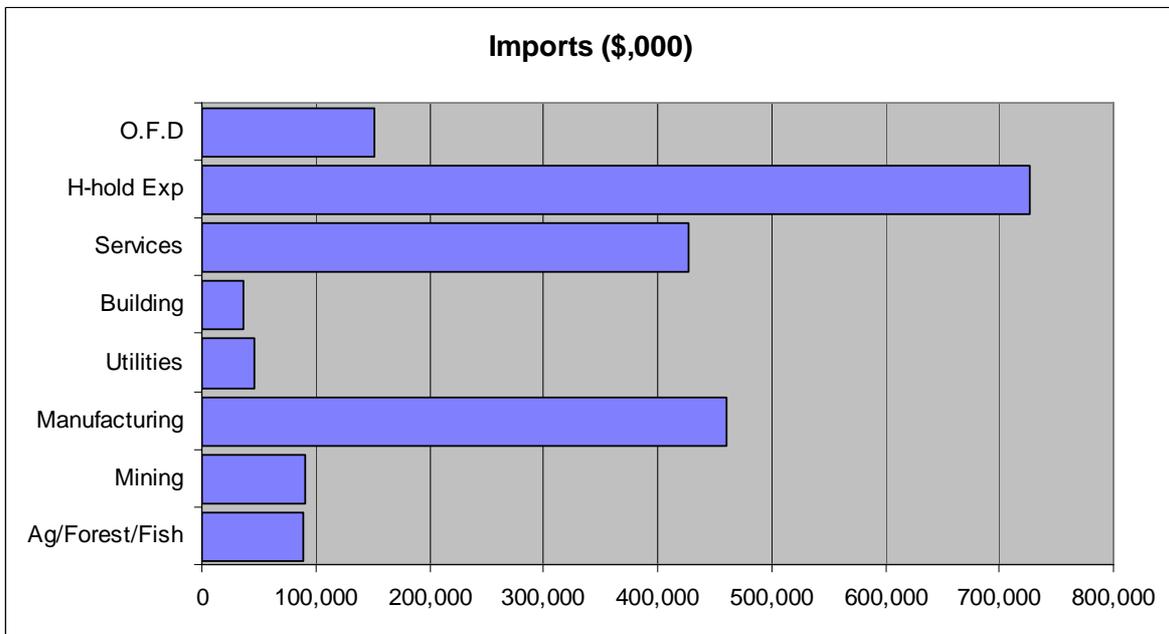
The destination of imports into the respective regions from all sources (overseas, inter-regional and interstate) are shown in aggregate in the results from the input-output model (Figures J-3 and J-4).

For NSW, the intermediate sector of manufacturing has the greatest reliance on imports while for the regional economy households have the greatest reliance on imports followed by the intermediate sectors of manufacturing services, mining and agriculture. This reflects the small size of the economy and hence its inability to supply all the inputs demanded by households and industries.

**Figure J-3  
Regional Economy - Distribution of Imports by Destination Sector**



**Figure J-4  
NSW Economy - Distribution of Imports by Destination Sector**



Figures J-5 to J-7 (results from the input-output model) provide a more expansive sectoral distribution of gross regional output, employment, household income, value-added, exports and imports, and can be used to provide some more detail in the description of the economic structure of the economy.

In terms of gross regional output and value-added the *Food Manufacturing* sector is by far the most significant sector of the regional economy followed by *Other Agriculture and Non Ferrous Metal Ore Mining*. The former two sectors indicate the influence of the southern part of the region (Mildura) while the latter sector reflects the influence of the northern part of the region (Broken Hill). However, reflecting the capital intensive nature of food manufacturing and mining, they are not the most significant sector in terms of employment numbers. The retail trade sector is by far the greatest employer in the region followed by the services sectors (predominantly personal services, education and health services sectors) as well as the Other Agriculture sector. This reflects the labour intensive nature of these sectors. In terms of total wages paid these labour intensive sectors also figure prominently. The *Food Manufacturing* sector, *Non Ferrous Metal Ore Mining* sector and *Other Agriculture* sector are also the major sectors responsible for exports from the region and imports to the region.

### J4.3 MULTIPLIERS

The multipliers for each sector of the economy can also be derived from the input-output table for the regional economy.

The calculation of multipliers from the input-output tables is based on the following underlying assumptions:

- “there is a fixed input structure in each industry, described by fixed technological coefficients;
- all products of an industry are identical or are made in fixed proportions to each other;
- each industry exhibits constant returns to scale in production;
- unlimited labour and capital are available at fixed prices; and
- there are no other constraints, such as the balance of payments or the actions of government, on the response of each industry to a stimulus.” (Australian Bureau of Statistics [ABS], 1995).

Multipliers therefore do not take account of economies of scale, unused capacity or technological change since they describe average effects rather than marginal effects (ABS, 1995).

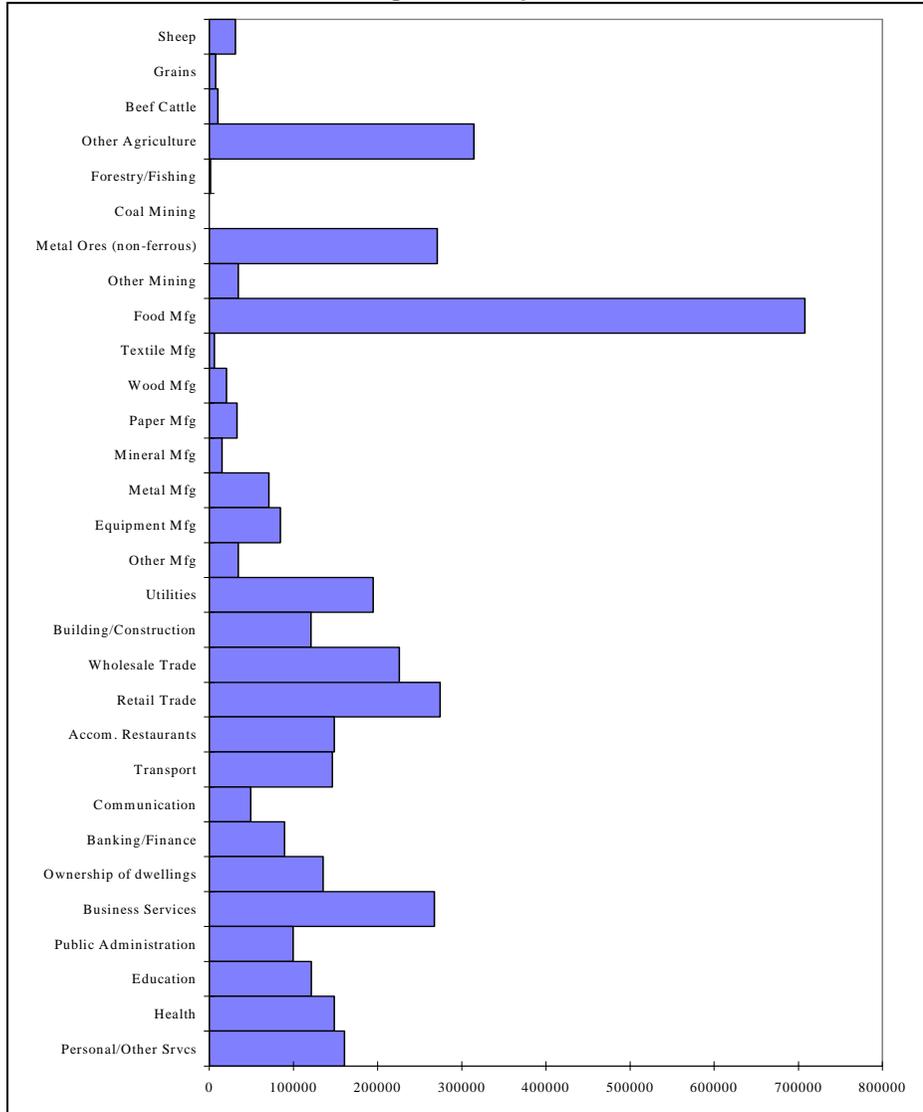
Multipliers indicate the total impact of changes in demand for the output of any one industry on all industries in an economy (ABS, 1995). Conventional gross regional output, employment, GRP and income multipliers show the gross regional output, employment, GRP and income responses to an initial gross regional output stimulus (Jensen and West, 1986).

Components of the conventional gross regional output multiplier are as follows:

- **Initial effect** - which is the initial output stimulus, usually a \$1 change in output from a particular industry (ABS, 1995; Powell and Chalmers, 1995).
- **First round effects** - the amount of output from all intermediate sectors of the economy required to produce the initial \$1 change in output from the particular industry (ABS, 1995; Powell and Chalmers, 1995).
- **Industrial support effects** - the subsequent or induced extra output from intermediate sectors arising from the first round effects (ABS, 1995; Powell and Chalmers, 1995).

Figure J-5 Sectoral Distribution of Gross Regional Output and Value-Added (\$'000)

Gross Regional Output



Gross Value-Added

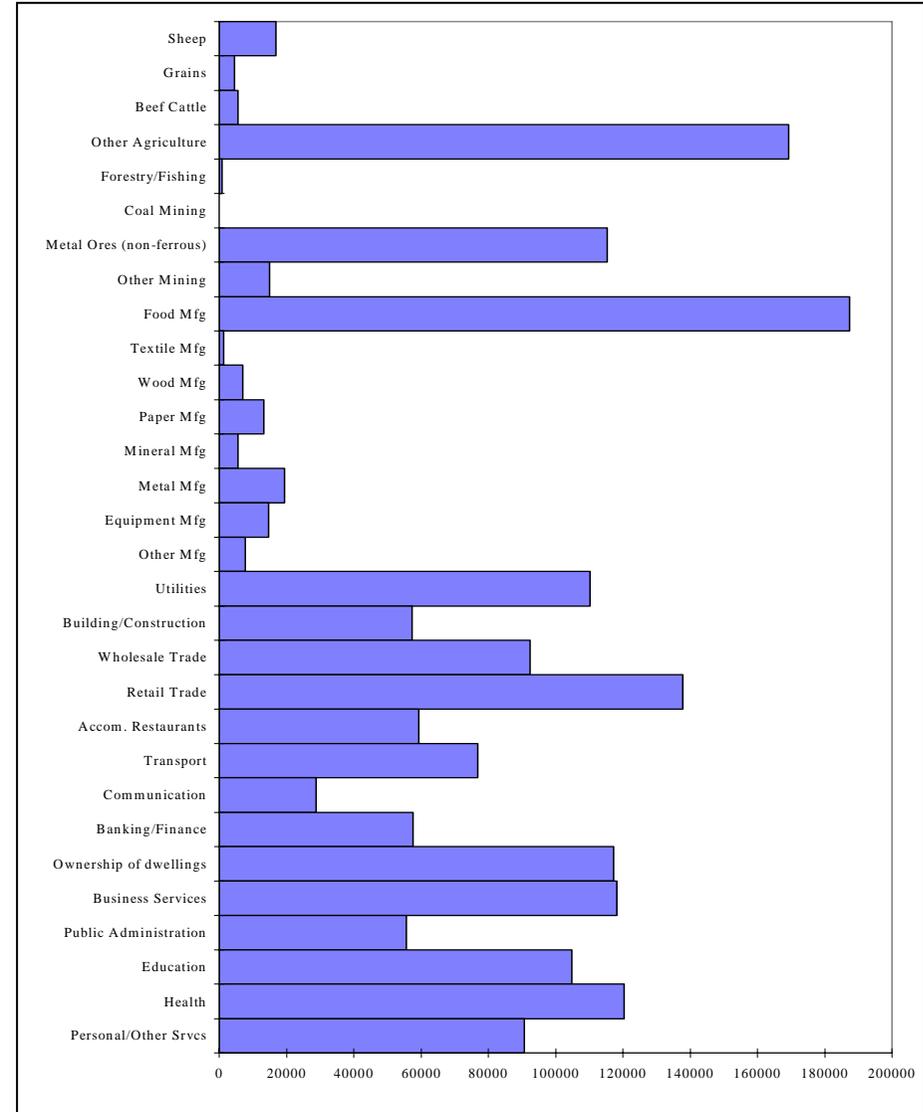


Figure J-6 Sectoral Distribution of Gross Regional Income (\$'000) and Employment (No.)

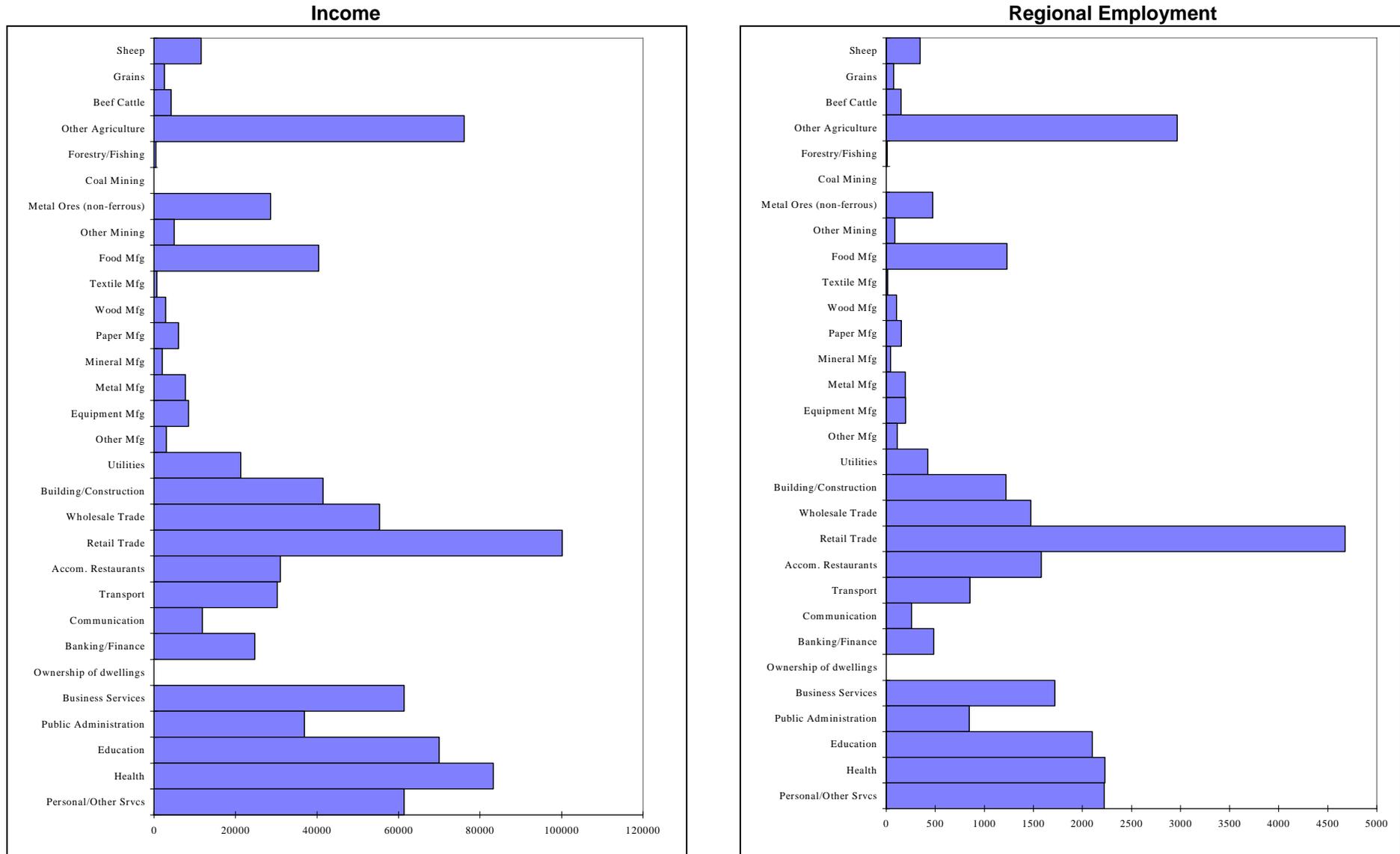
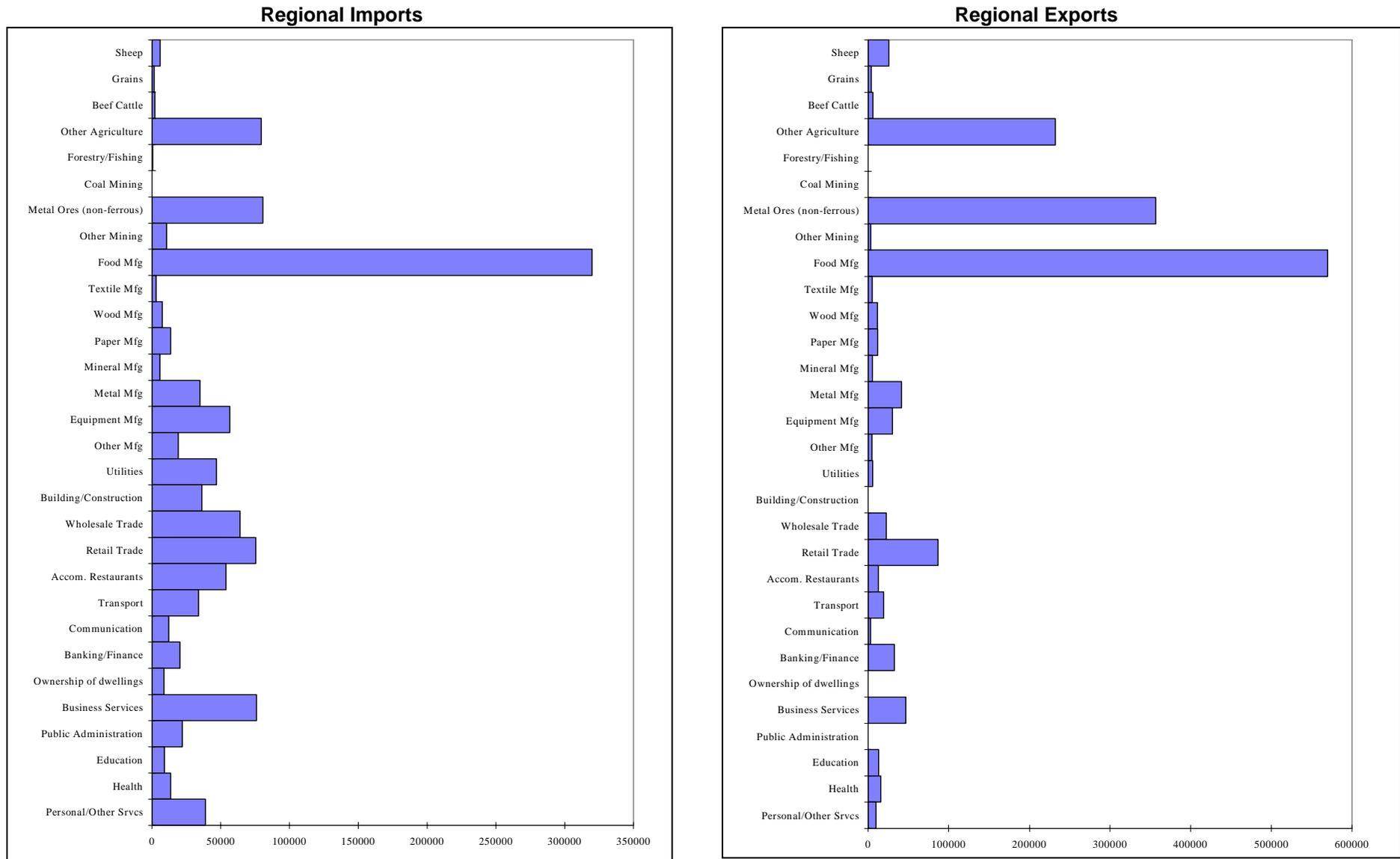


Figure J-7 Sectoral Distribution of Imports and Exports (\$'000)



- **Production induced effects** - the sum of the first round effects and industrial support effects, i.e. the total amount of output from all industries in the economy required to produce the initial \$1 change in output (ABS, 1995; Powell and Chalmers, 1995).
- **Consumption induced effects** - the spending by households of the extra income they derive from the production of the extra \$1 of output and production induced effects. This spending in turn generates further production by industries (ABS, 1995; Powell and Chalmers, 1995).

The *simple multiplier* is the initial effect plus the production induced effects.

The *total multiplier* is the sum of the initial effect plus the production induced effect and consumption induced effect.

Conventional employment, GRP and income multipliers have similar components to the gross regional output multiplier, however, through conversion using the respective coefficients show the employment, GRP and income responses to an initial gross regional output stimulus (Jensen and West, 1986).

For employment, GRP and income it is also possible to derive relationships between the initial or own sector effect and flow-on effects. For example, the flow-on income effects from an initial income effect or the flow-on employment effects from an initial employment effect, etc. These own sector relationships are referred to as ratio multipliers, although they are not technically multipliers because there is no direct line of causation between the elements of the multiplier. For instance, it is not the initial change in income that leads to income flow-on effects, both are the result of an output stimulus (Jensen and West, 1986).

A description of the different ratio multipliers is given below.

Type 1A Ratio Multiplier =  $\frac{\text{Initial} + \text{First Round Effects}}{\text{Initial Effects}}$

Type 1B Ratio Multiplier =  $\frac{\text{Initial} + \text{Production Induced Effects}}{\text{Initial Effects}}$

Type 11A Ratio Multiplier =  $\frac{\text{Initial} + \text{Production Induced} + \text{Consumption Induced Effects}}{\text{Initial Effects}}$

Type 11B Ratio Multiplier =  $\frac{\text{Flow-on Effects}}{\text{Initial Effects}}$

(Centre for Farm Planning and Land Management, 1989)

Type 11A ratio multipliers are used in Section J4.4 to estimate the total regional economic impact of the construction and operation of the Snapper Mine.

## J4.4 ECONOMIC IMPACT OF THE SNAPPER MINE

### J4.4.1 Construction Phase

#### J4.4.1.1 Introduction

Economic activity associated with the Snapper Mine construction phase could essentially occur in two sectors of the economy:

- the other construction sector; and
- the metal/machinery/equipment/other manufacturing sectors.

The former sector includes economic activity in the preparation of mine sites as well as the construction of non-residential buildings, roads, etc. at the mine site. The latter sector refers to that part of the economy engaged in the manufacturing of machinery, equipment and plant that may be used in mine site preparation and mining.

In total, the capital costs of mine preparation and ancillary infrastructure is estimated to be in the order of \$105 M, spread over a 15 month period that spans three financial years (Table J-4).

**Table J-4**  
**Capital Expenditure Profile (\$'000)**

2007	2008	2009
5,150	88,909	11,100

Building and construction expenditure relates to the construction of the mine site and can be quite specialised. Consequently, some of the skill base needed to undertake this work would be brought into the region.

Data obtained from BEMAX indicates that in the peak construction year the Snapper Mine would have an estimated peak workforce of 250 at the mine site, with an average of 200. In the order of 80% of this construction workforce is likely to be sourced from the Far West/Wentworth/Mildura region.

A starting point for consideration of the indicative magnitude of the regional economic impacts associated with this construction activity can be obtained by assuming that:

- the new building and construction sector enterprises that temporarily establish in the region would have the same input-output coefficients and hence regional linkages as the existing building and construction sector in the Far West/Wentworth/Mildura region; and
- the estimated 200 average direct workforce in the peak year of construction would have the same pattern of regional expenditure as a normal workforce within the region.

Under these assumptions 32% of the \$88.9 M construction expenditure in 2008 would need to be spent within the region to result in an average annual direct workforce of 200 people. The direct and indirect regional economic impacts of this level of expenditure in the region in the peak year of the construction phase of the Snapper Mine is provided below.

#### J4.4.1.2 Impacts

The total and disaggregated annual impacts of the construction of the Snapper Mine on the regional economy in terms of output, value-added, income and employment (in 2006 dollars) are shown in Table J-5.

**Table J-5**  
**Unadjusted Regional Economic Impacts of the Construction Phase of the Snapper Mine**

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
<b>OUTPUT (\$'000)</b>	28,648	8,140	6,369	<b>14,508</b>	<b>43,156</b>
<i>Type 11A Ratio</i>	1.00	0.28	0.22	<b>0.51</b>	<b>1.51</b>
<b>INCOME (\$'000)</b>	9,277	1,616	1,777	<b>3,392</b>	<b>12,670</b>
<i>Type 11A Ratio</i>	1.00	0.17	0.19	<b>0.37</b>	<b>1.37</b>
<b>VALUE-ADDED (\$'000)</b>	14,437	3,460	3,115	<b>6,575</b>	<b>21,011</b>
<i>Type 11A Ratio</i>	1.00	0.24	0.22	<b>0.46</b>	<b>1.46</b>
<b>EMPL. (No.)</b>	200	39	55	<b>94</b>	<b>294</b>
<i>Type 11A Ratio</i>	1.00	0.20	0.28	<b>0.47</b>	<b>1.47</b>

The total regional impacts referred to above, separate out the flow-on effects that are associated with firms buying goods and services from each other (production induced effects) and the flow-on effects that are associated with employing people who subsequently buy goods and services as households (consumption induced effects). It is important to separate these two effects as they operate in different ways and have different spatial impacts.

Production induced effects occur in a near-proportional way, whereas the consumption induced flow-on effects would only occur in a proportional way if workers and their families enter or leave the region. The implicit assumption in the impact summary provided in Table J-5, is that all employment generated by the construction phase is sourced from workers outside the region who subsequently migrate into the region. Advice from BEMAX suggests that in the order of 80% of the construction workforce would be sourced from the Far West/Wentworth/Mildura region (Table J-6).

**Table J-6**  
**Source and Residential Location of Construction Workforce**

Workforce - Place of Residence	Percentage of Workforce
<b>Local</b>	<b>80%</b>
<i>Broken Hill</i>	30%
<i>Wentworth SLA</i>	10%
<i>Mildura</i>	60%
<b>Non-local</b>	<b>20%</b>
<i>Broken Hill</i>	30%
<i>Wentworth SLA</i>	10%
<i>Mildura</i>	60%
<b>Total</b>	<b>100%</b>

Hence, a conservative estimate of the consumption induced flow-on effects is to take 20% of those identified in Table J-5. This is conservative since it assumes that the construction workforce who already reside in the Far West/Wentworth/Mildura region earn a similar salary/pension to what they would receive working on the Snapper Mine construction.

Adjusted estimates of regional economic impacts of the construction phase of the Snapper Mine, having regard to the estimated sourcing of labour, are provided in Table J-7.

**Table J-7**  
**Adjusted Annual Regional Economic Impacts of the Construction Phase of the Snapper Mine**

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
<b>OUTPUT (\$'000)</b>	28,648	8,140	1,274	<b>9,413</b>	<b>38,061</b>
<i>Type 11A Ratio</i>	<i>1.00</i>	<i>0.28</i>	<i>0.04</i>	<b>0.33</b>	<b>1.33</b>
<b>INCOME (\$'000)</b>	9,277	1,616	355	<b>1,971</b>	<b>11,248</b>
<i>Type 11A Ratio</i>	<i>1.00</i>	<i>0.17</i>	<i>0.04</i>	<b>0.21</b>	<b>1.21</b>
<b>VALUE-ADDED (\$'000)</b>	14,437	3,460	623	<b>4,083</b>	<b>18,520</b>
<i>Type 11A Ratio</i>	<i>1.00</i>	<i>0.24</i>	<i>0.04</i>	<b>0.28</b>	<b>1.28</b>
<b>EMPL. (No.)</b>	200	39	11	<b>50</b>	<b>250</b>
<i>Type 11A Ratio</i>	<i>1.00</i>	<i>0.20</i>	<i>0.06</i>	<b>0.25</b>	<b>1.25</b>

In total, the construction of the Snapper Mine is estimated to make the following contribution to the regional economy:

- \$38 M in annual direct and indirect regional output or business turnover;
- \$19 M in annual direct and indirect regional value-added;
- \$11 M in annual household income; and
- 250 direct and indirect jobs.

#### J4.4.1.3 Multipliers

The multipliers for any particular sector of a regional economy reflect primarily:

- the magnitude of, and relationship between, the direct effects e.g. labour, income and gross profit to output levels;
- the level of direct intermediate sector expenditures that would be captured within the region; and
- the ability of other sectors in the region to supply production and consumption induced goods and services that are demanded.

The type 11A ratio multipliers for the Snapper Mine are provided in Table J-7 and range from 1.21 to 1.33.

The low multipliers reflect the small size of the region and hence high amount of leakages, as well as the fact that migration into the region during the construction phase is expected to be small, minimizing the potential for consumption induced stimulus to the regional economy.

#### J4.4.1.4 Main Sectors Affected

Flow-on impacts from the construction phase of the Snapper Mine are likely to affect a number of different sectors of the Far West/Wentworth/Mildura economy. The sectors most impacted by output, value-added and income flow-ons are likely to be the:

- retail trade sector;
- wholesale trade sector;
- accommodation, cafes and restaurants;
- structural metal products manufacturing sector;
- other property services sector which includes business involved in renting and leasing assets including machinery, equipment, motor vehicles, real estate, airplanes, etc.;
- road transport sectors; and
- mechanical repairs sector.

Examination of the estimated direct and flow-on employment impacts gives an indication of the sectors in which employment opportunities would be generated (Table J-8).

**Table J-8**  
**Sectoral Distribution of Total Regional Employment Impacts**

Sector	Average Direct Effects	Production Induced	Adjusted Consumption Induced	Total
Primary	0	0	0	<b>0</b>
Mining	0	1	0	<b>1</b>
Manufacturing	0	8	0	<b>8</b>
Utilities	0	0	0	<b>0</b>
Wholesale/Retail	0	8	4	<b>12</b>
Mechanical and other repairs	0	3	0	<b>3</b>
Accommodation, cafes, restaurants	0	2	1	<b>3</b>
Building/Construction	200	0	0	<b>200</b>
Transport	0	5	0	<b>5</b>
Services	0	13	4	<b>17</b>
<b>Total</b>	<b>200</b>	<b>39</b>	<b>11</b>	<b>250</b>

Note: Totals may have minor discrepancies due to rounding.

Table J-8 indicates that direct, production induced and consumption induced incremental employment impacts of the Snapper Mine construction on the regional economy are likely to have different distributions across sectors.

The Snapper Mine construction would directly generate demand for construction employment. Production induced employment impacts would mainly occur in the services sectors (predominantly Other Business Services, Legal, Scientific Research and Other Property Services), manufacturing sectors (predominantly structural metal products manufacturing), wholesale/retail trade sectors and transport sector (predominantly road transport). Consumption induced employment flow-ons would mainly occur in the wholesale and retail trade sectors, the services sectors (education, health, community services and personal services) and accommodation, cafes and restaurants sector.

## J4.4.2 Operation Phase

### J4.4.2.1 Introduction

For the analysis of the operation phase of the Snapper Mine, a new Snapper sector was inserted into the input-output table. For this new sector:

- The estimated average annual gross revenue over the life of the Snapper Mine was estimated from data provided by BEMAX and allocated to the *Output* row.
- A detailed expenditure break down for one typical year (2011) was provided by BEMAX and expenditure items were allocated to appropriate *intermediate sectors*, the *household wages* row, the *other value-added* row and *imports*.
- Location quotients and information on the estimated flow-on employment in the *construction sector* (earthmoving) and *transport sector* were used to adjust intermediate expenditure further between local expenditure and imports.
- The difference between total revenue and total costs was allocated to the *other value-added* row.
- Direct employment by BEMAX was allocated to the *employment* row.

Because employment in earthmoving, road transport, catering and maintenance has been included in the direct workforce calculations by BEMAX, the impact assessment results have been adjusted to include the appropriate income, employment and value-added effects of this workforce as direct effects rather than production induced flow-ons, avoiding any double counting.

### J4.4.2.2 Impacts

The total and disaggregated annual impacts of the operation phase of the Snapper Mine on the Far West/Wentworth/Mildura economy in terms of output, value-added, income and employment (in 2006 dollars) are shown in Table J-9.

**Table J-9**  
**Unadjusted Annual Regional Economic Impacts of the Operation Phase**  
**of the Snapper Mine**

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
<b>OUTPUT (\$'000)</b>	70,926	19,540	4,406	<b>23,946</b>	<b>94,872</b>
<i>Type 11A Ratio</i>	1.00	0.28	0.06	<b>0.34</b>	<b>1.34</b>
<b>INCOME (\$'000)</b>	6,423	1,114	1,229	<b>2,343</b>	<b>8,766</b>
<i>Type 11A Ratio</i>	1.00	0.17	0.19	<b>0.36</b>	<b>1.36</b>
<b>VALUE-ADDED (\$'000)</b>	35,750	5,929	2,155	<b>8,084</b>	<b>43,834</b>
<i>Type 11A Ratio</i>	1.00	0.17	0.06	<b>0.23</b>	<b>1.23</b>
<b>EMPL. (No.)</b>	110	25	38	<b>63</b>	<b>173</b>
<i>Type 11A Ratio</i>	1.00	0.23	0.35	<b>0.57</b>	<b>1.57</b>

The implicit assumption in the impact summary provided in Table J-9 is that all employment generated by the proposal is sourced from workers outside the region who subsequently migrate into the region. BEMAX has advised that in the order of 80% of mining employment would be sourced from the Far-West/Wentworth/Mildura Region (Table J-10).

**Table J-10**  
**Source and Residential Location of Operational Workforce**

<b>Workforce – Place of Residence</b>	<b>Percentage of Workforce</b>
<b>Local</b>	<b>80%</b>
<i>Broken Hill</i>	25%
<i>Wentworth SLA</i>	25%
<i>Mildura</i>	50%
<b>Non-local</b>	<b>20%</b>
<i>Broken Hill</i>	25%
<i>Wentworth SLA</i>	25%
<i>Mildura</i>	50%
<b>Total</b>	<b>100%</b>

Hence, a conservative estimate of the consumption induced flow-on effects is to take 20% of those identified in Table J-9. This is conservative since it assumes that the operation workforce who already reside in the Far West/Wentworth/Mildura region earn a similar salary to what they would receive working on the Snapper Mine construction.

Adjusted estimates of regional economic impacts of the operation phase of the Snapper Mine, having regard to the estimated sourcing of labour, are provided in Table J-11.

**Table J-11**  
**Adjusted Annual Regional Economic Impacts of the Operation Phase of the Snapper Mine**

	<b>Direct Effect</b>	<b>Production Induced</b>	<b>Consumption Induced</b>	<b>Total Flow-on</b>	<b>TOTAL EFFECT</b>
<b>OUTPUT (\$'000)</b>	70,926	19,540	881	<b>20,421</b>	<b>91,347</b>
<i>Type 11A Ratio</i>	1.00	0.28	0.01	<b>0.29</b>	<b>1.29</b>
<b>INCOME (\$'000)</b>	6,423	1,114	246	<b>1,360</b>	<b>7,782</b>
<i>Type 11A Ratio</i>	1.00	0.17	0.04	<b>0.21</b>	<b>1.21</b>
<b>VALUE-ADDED (\$'000)</b>	35,750	5,929	431	<b>6,360</b>	<b>42,110</b>
<i>Type 11A Ratio</i>	1.00	0.17	0.01	<b>0.18</b>	<b>1.18</b>
<b>EMPL. (No.)</b>	110	25	8	<b>32</b>	<b>142</b>
<i>Type 11A Ratio</i>	1.00	0.23	0.07	<b>0.30</b>	<b>1.30</b>

Note: Totals may have minor discrepancies due to rounding.

In total, the operation of the Snapper Mine is estimated to make the following contribution to the regional economy:

- \$91 M in annual direct and indirect regional output or business turnover;
- \$42 M in annual direct and indirect regional value-added;
- \$8 M in annual household income; and
- 142 direct and indirect jobs.

### **J4.4.2.3 Multipliers**

The adjusted Type 11A ratio multipliers for the operation phase of the Snapper Mine range from 1.18 for value-added up to 1.30 for employment.

Capital intensive industries tend to have a high level of linkages with other sectors in an economy thus contributing substantial flow-on employment while at the same time only having a lower level of direct employment (relative to output levels). This tends to lead to relatively high ratio multipliers for employment. Lower ratio multiplier for income (compared to employment) also generally occur as a result of comparatively higher wage levels in the mining sectors compared to incomes in the sectors that would experience flow-on effects from the Snapper Mine. Capital intensive mining projects also typically have a relatively low ratio multiplier for value-added reflecting the relatively high direct value-added for the Snapper Mine compared to that in flow-on sectors.

In this case, there are lower ratio multipliers for income, value-added and employment, reflecting the transfer of what would normally be considered production induced flow-on effects to direct effects thus making flow-ons comprising production induced effects and consumption induced effects, small relative to direct effects. Nevertheless, the total impact remains unchanged.

The low output ratio multiplier largely reflects the high direct output value of the Snapper Mine compared to the sectors that experience flow-on effects from the Snapper Mine.

### **J4.4.2.4 Main Sectors/Towns Affected**

Flow-on impacts from the operation phase of the Snapper Mine are likely to affect a number of different sectors of the Far West/Wentworth economy. The sectors most impacted by output, value-added and income flow-ons are likely to be the:

- other construction sector;
- road transport sector;
- electricity sector;
- wholesale trade sector;
- retail trade sector;
- water supply sector;
- accommodation, cafes and restaurants; and
- other property services sector.

Examination of the estimated direct and flow-on employment impacts gives an indication of the sectors in which employment opportunities would be generated (Table J-12).

**Table J-12  
Sectoral Distribution of Total Regional Employment Impacts**

<b>Sector</b>	<b>Average Direct Effects</b>	<b>Production Induced</b>	<b>Adjusted Consumption Induced</b>	<b>Total</b>
Primary	0	1	0	<b>1</b>
Mining	35	2	0	<b>37</b>
Manufacturing	0	4	0	<b>4</b>
Utilities	0	6	0	<b>6</b>
Wholesale/Retail	0	7	3	<b>10</b>
Mechanical and other repairs	3	0	0	<b>4</b>
Accommodation, cafes, restaurants	2	0	1	<b>3</b>
Building/Construction	45	0	0	<b>45</b>
Transport	19	0	0	<b>19</b>
Services	6	4	3	<b>13</b>
<b>Total</b>	<b>110</b>	<b>25</b>	<b>8</b>	<b>142</b>

Note: Totals may have minor discrepancies due to rounding.

Table J-12 indicates that direct, production induced and consumption induced incremental employment impacts of the Snapper Mine operation on the regional economy are likely to have different distributions across sectors.

The Snapper Mine operation would directly generate a workforce of some 110 employees, comprising 35 mining employees, 45 earthmoving contractors, 15 direct transport contractors, and 15 maintenance and other contractors.

Production induced employment impacts would mainly occur in the wholesale and retail trade sectors, utilities sector, manufacturing sector, mining sector and primary sector.

Consumption induced employment flow-ons are moderated by the small number of direct workforce that are assumed to migrate into the region. Consumption induced employment flow-ons mainly occur in the wholesale and retail trade sectors and the services sectors (education, health, community services and personal services).

Towns in the vicinity of the mine site that can provide the inputs to the production process required by BEMAX and/or the products and services required by employees/contractors would benefit from the proposal by way of an increase in economic activity. Such towns may include Broken Hill, Pooncarie, Wentworth, Dareton and Mildura.

#### **J4.5 CESSATION OF THE SNAPPER MINE**

The establishment and operation of the Snapper Mine would stimulate demand in the local and regional economy leading to increased business turnover in a range of sectors and increased employment opportunities. Conversely, cessation of the mining operation would result in a contraction in regional economic activity.

The magnitude of the regional economic impacts of cessation of the Snapper Mine would depend on a number of interrelated factors including:

- the movements of workers and their families;
- alternative development opportunities; and
- economic structure and trends in the regional economy at the time.

Ignoring all other influences, the impact of cessation of the Snapper Mine would depend on whether the workers and their families affected would leave the region. If it is assumed that some of the workers remain in the region, for example those originally assumed to be sourced from the region, then the impacts of cessation of the Snapper Mine would not be as severe compared to a greater level leaving the region. This is because the consumption induced flow-ons of the decline would be reduced through the continued consumption expenditure of those who stay (Economic and Planning Impact Consultants, 1989). Under this assumption the regional economic impacts of cessation of the Snapper Mine would approximate the total effect identified in Table J-11. However, if additional displaced workers and their families leave the region then impacts would be greater and begin to approximate the total effects in Table J-9.

The decision by workers, on cessation of the Snapper Mine, to move or stay would be affected by a number of factors including the prospects of gaining employment in the local region compared to other regions, the likely loss or gain from homeowners selling, and the extent of "attachment" to the local region (Economic and Planning Impact Consultants, 1989).

To the extent that alternative development opportunities arise in the regional economy, the regional economic impacts associated with mining closure that arise through reduced production and employment expenditure can be substantially ameliorated and absorbed by the growth of the region. One key factor in the growth potential of region is a region's capacity to expand its factors of production by attracting investment and labour from outside the region (BIE, 1994). This in turn can depend on a region's natural endowments. The Far West/Wentworth region is highly prospective with a study indicating that there is a "potential quantity of around 60 million tonnes of coarse grained mineral sands in five main opportunity zones within the broader Murray-Darling Basin Region" (Sinclair Knight Merz, 2000). Other mining developments in the region are also currently being investigated including by Perilya and CBH Resources Limited.

It is therefore likely that over time new mining developments would occur, offering potential to strengthen and broaden the economic base of the region and hence buffer against impacts of the cessation of individual activities.

The regional economic impetus of the Snapper Mine may also stimulate a 'virtuous cycle' of growth. This theory of regional economic growth suggests that places that are able to attract population immigration (e.g. associated with mining and manufacturing proposals) create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen, 1990). Local authorities should endeavour to capitalise on the prosperity of the region during the establishment and operation phase of the Snapper Mine to strengthen and broaden the region's economic base. This could be achieved through some regional development analysis and planning to assess the region's competitive advantages and facilitate the targeting and attraction of complimentary and other business activities and ventures for the region.

Ultimately, the significance of the economic impacts of cessation of the Snapper Mine would depend on the economic structure and trends in the regional economy at the time. For example, if cessation of the Snapper Mine takes place in a declining economy the impacts might be significant. Alternatively, if cessation of the Snapper Mine takes place in a growing diversified economy where there are other development opportunities, the ultimate cessation of the Snapper Mine may not be a cause for concern.

Nevertheless, given the uncertainty about the future complementary mining activity in the region it is not possible to foresee the likely circumstances within which cessation of the Snapper Mine would occur. It is therefore important for regional authorities and leaders to take every advantage from the stimulation to regional economic activity and skills and expertise that the Snapper Mine would bring to the region.

## **J5 COMMUNITY INFRASTRUCTURE ASSESSMENT**

### **J5.1 INTRODUCTION**

Changes in the workforce and populations of regions and towns may well have implications in relation to access to community infrastructure and human services, which includes for example housing, health and education facilities. This may include the number of services that are available to be used and the accessibility of the population to these services.

The objective of this Community Infrastructure Assessment (CIA) is to examine the potential impacts of the Snapper Mine on the existing community infrastructure as a result of employment and population change associated with the construction and operation of the Snapper Mine.

The basic methodology for carrying out the CIA was to:

- analyse the existing socio-economic environment of the region and towns potentially impacted by the Snapper Mine;
- analyse the likely magnitude and distribution of the Snapper Mine workforce and associated population including estimated flow-on employment and population effects;
- consider the impacts of estimated employment and population change on community infrastructure based on ABS data, research and consultations; and
- recommend impact mitigation or management measures for any substantive impacts that are identified.

The geographic scope of the CIA was determined by the location of the Snapper Mine and the main towns that would potentially service the Snapper Mine and its' employees. The Snapper Mine is located in the Wentworth SLA which contains the towns of Pooncarie, Wentworth and Dareton, which are approximately 40 km, 70 km and 70 km from the mine site respectively. While not in the Wentworth SLA, Broken Hill, which is located 170 km north of the mine site is expected to supply some of the labour force due to its long mining history. Also located outside Wentworth SLA but potentially of significance to the Snapper Mine is Mildura, a major regional centre located in Victoria, some 80 km from the mine site.

The assessment draws on a range of consultation with various agencies and bodies, press releases and reports as well as data provided by BEMAX, the ABS Census, and information from Section J4 on the regional economic impacts of the Snapper Mine.

### **J5.2 REGIONS AND TOWNS OF RELEVANCE TO THE SNAPPER MINE**

This section gives a profile of the main regions and towns in proximity and of potential relevance to the Snapper Mine. This provides a context within which the development can be seen and the community infrastructure impacts assessed. This section draws heavily on previous profiling undertaken by CIE (2001), updated and supplemented where necessary.

#### ***J5.2.1 Wentworth Shire***

The Snapper Mine is located within Wentworth Shire. The Shire covers 26,170 square kilometres (km<sup>2</sup>) and its boundaries are the South Australian border on the west, the Murray River on the south, Balranald Shire on the east and Central Darling and the Far West Unincorporated Area to the north.

### **Population Profile**

The total population of Wentworth SLA has been declining over time, while the population aged 65 years and over has been increasing (Table J-13).

**Table J-13  
Wentworth SLA Population Profile**

	1991	1996	2001
Total persons(a)	7,432	7,245	6,984
Aged 15 years and over(a)	5,699	5,534	5,483
Aged 65 years and over(a)	792	895	918
Employed(d)	3,090	3,041	3,048
Unemployed(d)	433	280	171
Not in the labour force(d)	2,006	2,042	1,920
Unemployment rate	12%	8%	5%

Source: ABS (2001)

### **Labour market and industry**

Agriculture — in the form of irrigated horticulture and dry land farming — is the principal industry in the Wentworth Shire. The major products from these activities are grapes, citrus, livestock and crops. While dryland farming occupies the majority of the land area, irrigated agriculture is now the most significant economic sector. Thirty-one percent of the labour force is employed in the agricultural sector. The second largest employer is the retail trade industry followed by the manufacturing sector. Communication services are the smallest industry sector.

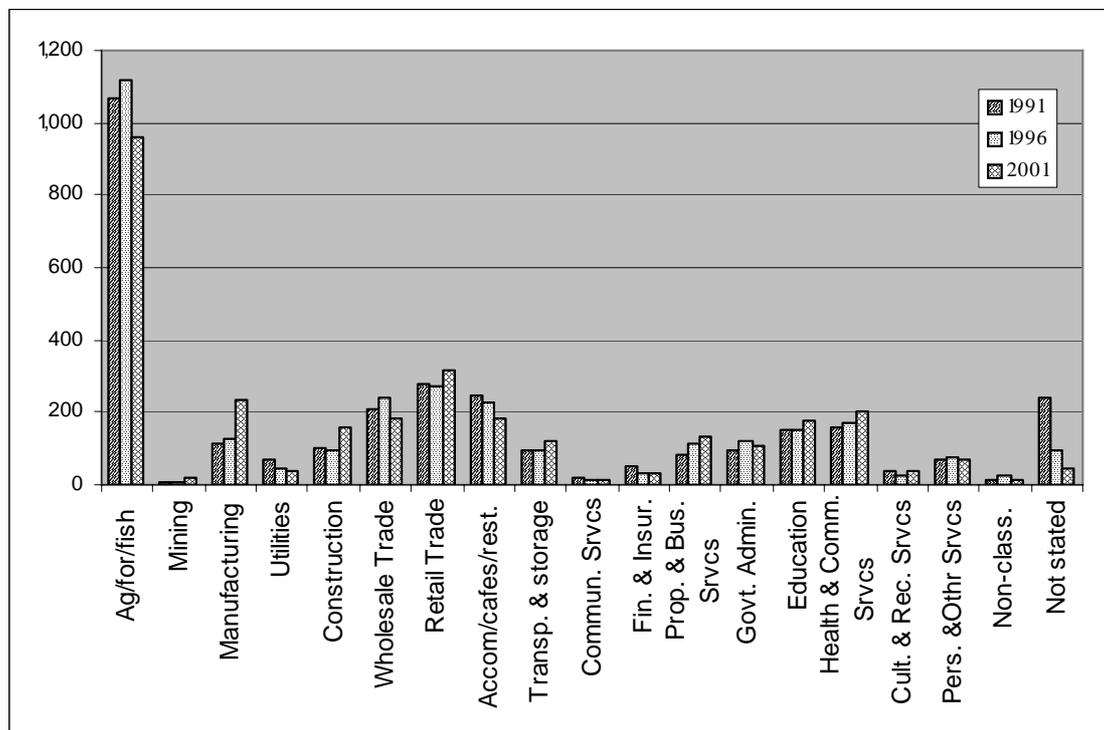
Sectors that have experienced employment growth from 1991 to 2001 include mining, manufacturing (based on wineries and the food industry), construction, retail, transport and storage, property and business services, education, health and community services, cultural and recreation services and personal and other services (Figure J-8). Sectors that have experienced some contraction include agriculture, utilities, wholesale trade, accommodation, cafes and restaurants, communication services, finance and insurance and government administration (Figure J-8).

With a declining population and relatively stable employment levels the unemployment rate for the region has fallen over time from 12% in 1991 down to 5% in 2001.

Latest data from the March 2006 quarter Small Area Labour Markets publication (DEWR, 2006) reports that the unemployment rate is 10.9 % (395 people) which is significantly higher than at the last Census.

A quarter of the labour force are working as managers and administrators and just over 17% are in occupations in the 'labourers and related workers' classification (Table J-14). The manager and administrator category is probably high because of the large number of self-employed people working in agriculture that would have been classified as managers. While these are the major labour force occupations in the region, they have both declined in relative importance over time with increasing importance of professions, associate professions, tradesperson, intermediate clerical, sales and services workers and intermediate production and transport workers.

**Figure J-8**  
**Wentworth SLA Employment by Industry**



Source: ABS (2001)

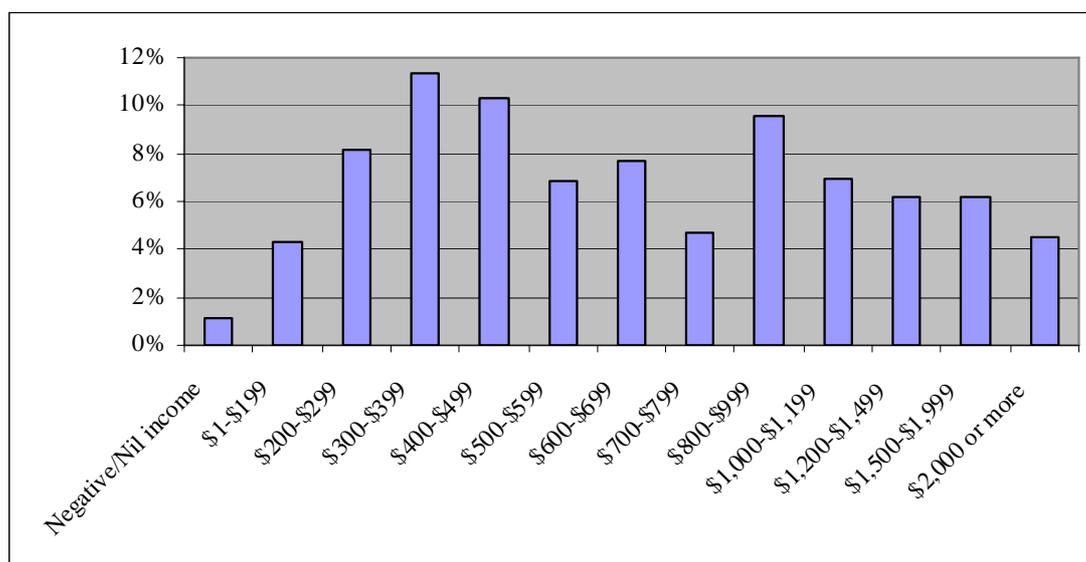
**Table J-14**  
**Occupations in the Wentworth SLA**

	1991	1996	2001
Managers and Administrators	831	770	717
Professionals	231	260	313
Associate Professionals	170	247	262
Tradespersons and Related Workers	308	296	345
Advanced Clerical and Service Workers	99	59	85
Intermediate Clerical, Sales and Service Workers	243	316	336
Intermediate Production and Transport Workers	174	183	203
Elementary Clerical, Sales and Service Workers	224	149	174
Labourers and Related Workers	588	654	531
Inadequately described	18	31	28
Not stated	204	74	54
<b>Total</b>	<b>3,090</b>	<b>3,039</b>	<b>3,048</b>

## Income

Figure J-9 shows that the distribution of weekly household income in the Wentworth Shire is bimodal with 11% of the households receiving \$300-\$399 while 9% of households receive \$800-\$899. 35% earn less than \$500 per week while 24% receive greater than \$1,000 per week.

**Figure J-9**  
**Wentworth SLA Weekly Household Income**



Source: ABS (2001)

## Housing and Short-Term Accommodation

There are around 3,000 dwellings in Wentworth Shire, and 81% of these are separate houses. Most of the Shire's residents either fully own their own home or are in the process of paying for it. 23% of residents rent their home (577 dwellings). 250 dwellings are unoccupied.

The local real estate agents contacted reported that there is a reasonable supply of rental properties currently available, as well as houses for purchase. They indicated capacity in the market to obtain more properties if demand warranted it.

There is a variety of short-term accommodation available in the Shire including hotels/motels, holiday units, houseboats, bed and breakfasts and caravan parks. CIE (2001) estimated that the Wentworth Shire has short-term accommodation capacity for around 960 people.

## Community and Recreational Services

### Education

Dareton, Gol Gol and Wentworth all have kindergartens or pre-schools. There are seven public primary schools and one private primary school spread across all towns in the Shire: Wentworth, Dareton, Buronga, Gol Gol, Pomona, Palinyewah and Pooncarie. However, there is only one high school located in the region, at Dareton. The high school has a roll of around 500 students. There is no bus service to the high school from other towns in the Shire. Mildura is another source of education facilities, high schools, TAFE and Training Agencies, for those in the Shire, particularly those residing in the southern part of the Shire around Wentworth and Dareton. While there is a local campus of La Trobe University at Mildura, access is limited and for some courses, such as nursing, the first year studies are not available locally (French, 2003).

The DoET indicated that the public schools in the Wentworth Shire generally have spare capacity and that staffing can be adjusted based on student numbers.

Education services in the area are shown in Table J-15.

**Table J-15**  
**Location of Education and Training Facilities and Number of Staff (Schools Only)**

Education and Training Facility	Name, Location, Number of Staff (Schools Only)
Pre-Schools	<ul style="list-style-type: none"> <li>Wentworth Preschool, Murray St</li> <li>Dareton Pre-School Centre, Sturt Place</li> <li>Gyndarma Aboriginal Pre-School Inc., Dareton</li> <li>Alcheringa Pre-school, Gol Gol</li> </ul>
Primary Schools NSW Department of Education & Training	<ul style="list-style-type: none"> <li>Wentworth Public School. Staff – 15 full-time, 10 part-time, students 160</li> <li>Dareton Primary School, Matong/School Rd</li> <li>Buronga Primary School, Staff 15</li> <li>Gol Gol Primary School, Staff 10 full-time, 8 part-time</li> <li>Pomona Public School, Staff 2, Students 26</li> <li>Palinyewah Public School, Staff 2, Students 20</li> <li>Pooncarie Public School, Staff 2, Students 20</li> </ul>
Private Schools	<ul style="list-style-type: none"> <li>St. Francis Xavier School, Staff 2, Students 20</li> </ul>
High Schools	<ul style="list-style-type: none"> <li>Coomitalia High School, Silver City Highway, Staff 48 full-time, 2 part-time (approximately), Students, 450</li> <li>Buses to Mildura Schools</li> </ul>
Training agencies	<ul style="list-style-type: none"> <li>MADEC Short courses and Certificate Level</li> <li>Sunraysia Murray Group Training and Skills Centre (Mildura)</li> </ul>
TAFE Colleges	<ul style="list-style-type: none"> <li>Riverina Tafe (commenced 2003), sharing Coomealla High School Campus, Silver City Highway</li> <li>Sunraysia TAFE Campus, Mildura</li> </ul>
University	<ul style="list-style-type: none"> <li>La Trobe – On Campus access, Mildura</li> </ul>

Source: French (2003)

### Health Facilities and Services

The Greater West Area Health Service has a major service centre in Dareton servicing the Wentworth and Balranald Shires. Thirty full-time staff are employed in a range of positions including primary health care. These are supported by visiting specialists and access to Telehealth services. Services are delivered through the Dareton Community Health Centre and the Wentworth Hospital, plus a regular clinic at Buronga and Pooncarie.

The Cooperative Health Aboriginal Centre at Dareton has been replaced with a new building. This would operate in addition to the Far West Area Health Service and have an outreach service to Namatjira. The Far West Area Health Service works under a joint arrangement with Miira Ma Health.

Medical services are available at Dareton and Wentworth and the Flying Doctor has a regular scheduled visit Pooncarie. Wentworth District Hospital has a 24-hour emergency service and also provides acute care, long-term care, palliative care, respite care and diversional therapy and Community Health services. Mildura has a range of medical services available through the Mildura Base Hospital.

A limited ambulance service is based at the Wentworth District Hospital but there are no trained paramedics available. This leaves the Shire very dependent on services based across the Victorian border, adding to response times in an emergency.

#### *Social Services*

The NSW Department of Community Service (DOCS) provides a range of services both directly to clients and through supporting community service organisations as outlined in Table J-16. It is supported in some areas of its work by Mallee Family Care that set up operations in Dareton during 2003.

**Table J-16**  
**Social Services in Wentworth Local Government Area (LGA)**

<b>Social Service</b>	<b>Service Provided</b>
Care Protection Services	<ul style="list-style-type: none"> <li>• Child Protection: to assist in the protection of children from abuse and neglect through education, prevention and investigation.</li> <li>• Substitute Care: to be responsible for the placement and support of children in temporary, long-term and respite foster care.</li> <li>• Adoptions: Family and Adolescent Support including support and counseling including positive parenting programmes, family support services, D.V. court support scheme, A.D.H.D. - self help, Families First and Family Assistance, Adolescent support including living skills, personal development, parenting and supported accommodation.</li> <li>• Youth service.</li> </ul>
Disability Services	<ul style="list-style-type: none"> <li>• Early Intervention Programme: education and therapy services to families with children 0-6 years who are delayed or disabled.</li> <li>• Therapy services: therapists provide therapy and consultative services to people with disabilities in both the community and in government schools.</li> <li>• Community worker: provides family and client support referrals, advocacy, liaison and education with the community.</li> <li>• Residential services.</li> </ul>
Children Services	<ul style="list-style-type: none"> <li>• Support includes preschools, long day care centres, home-based care, family day care services and occasional child care.</li> </ul>
Projects for youth and families receiving support from the DOCS	<ul style="list-style-type: none"> <li>• Mallee Family Care.</li> </ul>

Source: French (2003)

### ***Sporting and Recreation Services***

There are a number of sporting and recreational bodies in the region, including the (CIE, 2001):

- Dareton Rangers;
- Buronga/Gol Gol District Guides;
- Wentworth Rifle Club;
- Alchering Sporting Club;
- Wentworth and District Services Angling Club;
- Wentworth Services Golf Club;
- Wentworth Rowing Club;
- Wentworth and Districts Football Club;
- Delta Scout Group;
- Wentworth Services Tennis Club; and
- Wentworth Warriors Baseball Club.

French (2003) identified a number of social and cultural issues arising from the Sense of Place Community Consultation process:

#### ***Buronga/Gol Gol***

- child care services and vacation care, activities for young people; and
- urgent need for local aged care and respite care facilities.

#### ***Dareton***

- improved community safety and security and implementation of the Crime Prevention Plan;
- improved responses into substance abuse, programmes against domestic violence;
- employment programmes;
- more recreational activities and facilities for young people;
- a community managed facility such as a neighbourhood centre to increase access to information;
- and services, community education programmes and increase community engagement; and
- aged care.

#### ***Pooncarie***

- improved access to community services such as HACC and youth activities.

#### ***Wentworth***

- promote youth development strategy, employment for youth, and local place for youth;
- sport and recreational activities;
- support implementation of the Crime Prevention Plan, more security and safety;
- better access to health services (waiting times), ambulance upgrade; and
- more activities for the elderly.

### J5.2.2 Pooncarie

Pooncarie is the nearest town to the Snapper Mine site and as such may be important to the Snapper Mine in providing accommodation and goods for the Snapper Mine's labour force. The town has been known as 'The Port' by locals since the days when it was a staging place for the riversteamers, which began plying the Darling River in 1858 en route for Menindee and Wilcannia (CIE, 2001). Today the community vision for the town is "a busy and successful little tourism town" taking advantage of its strategic location on the highway from Wentworth to Menindee and roads linking the Lake Mungo National Park and World Heritage area with national parks to the north and north-west (Pooncarie Community Action Team, 2003).

#### Population Profile

The latest population data from the 2001 Census shows that 202 people live in the Pooncarie district. 75% of the population is aged 15 years and over (Table J-17). The statistics show that there were 4 people unemployed at the time of the census. If the unemployment situation is substantially unchanged since 2001 then there is little excess labour from which the Snapper Mine could draw.

**Table J-17**  
**Pooncarie Collector District Population Profile**

	1996	2001
Total persons(a)	181	202
Aged 15 years and over(a)	143	152
Employed(d)	91	82
Unemployed(d)	0	4
Not in the labour force(d)	41	56
Unemployment rate	0	4.7%

Source: ABS (2001)

The town itself has a population of about 84 (About Australia Pty Ltd, 2006).

#### Industry and Employment

Total number of employed persons at the last census was 82. The importance of primary industry to Pooncarie area is evident from the Census. Agriculture, forestry and fishing was recorded as the main industry category — 64% of people employed were involved in this industry. The other industries in Pooncarie are wholesale trade, retail trade, accommodation/cafes and restaurants, transport and storage, government administration and education — each making up 4% of the working population.

Around 50% of the population are managers or administrators. Once again this most likely reflects the high proportion of self employed farmers in the area as well as self employed business owners. The next largest occupation is labourers and related workers (16%) and professionals (11%). Both managers and professionals increased in relative importance in the intercensal period.

Almost 75 % of those employed in Pooncarie work full-time.

## **Income**

Just over 47% of households in Pooncarie receive income less than \$500 each week while 22% receive greater than \$1,000 each week.

### ***Housing and Short-Term Accommodation***

According to the Census results over 50% of Pooncarie district residents live in a home that they fully own. A further 6% were in the process of paying off their homes. Only 4% of the population rent, i.e. 3 of 82 dwellings. The weekly rent for those that were renting was less than \$100.

The home ownership rate in Pooncarie is significantly higher than the NSW rate of just over 41%. The high ownership rate in Pooncarie is most likely due to its stable population over a number of generations.

Most (79%) private dwellings in Pooncarie are separate houses. In the town itself there are in the order of 29 houses (Pooncarie Community Action Team, 2003).

There is little available accommodation to rent, however, the Pooncarie hotel provides short-term accommodation for up to 16 persons (CIE, 2001).

### ***Community and Recreational Services***

Pooncarie's community services stem from those available in the wider Wentworth district. Pooncarie itself has:

- telecentre/Rural Transaction Centre which houses a craft Centre and Gyro-post;
- a hotel and residence;
- a shop and residence;
- a preschool;
- a small primary school and residence;
- an outpatients clinic — the district nurses visits once a week;
- a community hall;
- multipurpose caravan and camping Park;
- a shire council depot;
- sporting facilities including a golf club, tennis courts and race course); and
- a library (Pooncarie Community Action Team, 2003).

Pooncarie also has a town fire brigade and a Progress Association (CIE, 2001).

### ***J5.2.3 Dareton and Wentworth***

Although Pooncarie is the nearest town to the Snapper Mine site, Dareton (70 km) and Wentworth (70 km) are also towns of potential relevance to the Snapper Mine. These towns have a larger population than Pooncarie and as a result have a greater range of accommodation and community services. The Snapper Mine may also draw on the available labour in these towns because of their proximity.

Wentworth township is at the junction of the Murray and Darling rivers and about 10 km further along the Murray is Dareton. Both towns are very close to Mildura (20 and 15 km, respectively).

### **Population Profile**

The 2001 Census reported the population of Wentworth as 1435 (79 less than at the 1996 Census) and Dareton was recorded as having a population of 620 (32 less than at the 1996 Census). Like Pooncarie both towns have an older than average population with only 20 to 22% of the population aged 15 and under.

### **Industry and employment**

As mentioned in the section on Wentworth Shire, agriculture is the most important sector throughout the Shire generally. However, both Dareton and Wentworth — both with 15% - have smaller proportions of their labour forces involved in agricultural than the Shire as a whole (34%), reflecting the service centre role played by these towns. Instead, the retail trade and accommodation, cafes and restaurants sector employs the largest number of people in Dareton and Wentworth (Table J-18). The 2001 ABS data indicated that Dareton had 18 people unemployed with a rate of 9.2%. While, according to the census Wentworth had 32 unemployed — with an unemployment rate of 5.9%

**Table J-18**  
**Dareton and Wentworth Employment by Industry**

Industry	Dareton		Wentworth	
	Count	Percentage	Count	Percentage
Agriculture/Forestry/Fishing	25	15%	78	15%
Mining	0	0%	0	0%
Manufacturing	16	10%	40	8%
Utilities	6	4%	9	2%
Construction	3	2%	36	7%
Wholesale Trade	12	7%	34	6%
Retail Trade	21	13%	63	12%
Accommodation/Cafes/Restaurants	19	12%	51	10%
Transport and Storage	6	4%	22	4%
Communication Services	0	0%	3	1%
Finance and Insurance	0	0%	12	2%
Property and Business Services	0	0%	29	5%
Government Administration	6	4%	26	5%
Education	13	8%	51	10%
Health and Community Services	12	7%	42	8%
Cultural and Recreation Services	9	5%	9	2%
Personal and Other Services	13	8%	12	2%
Non-classified	0	0%	0	0%
Not Stated	3	2%	15	3%
<b>Total</b>	<b>164</b>	<b>100%</b>	<b>532</b>	<b>100%</b>

Source: ABS (2001)

### **Housing and Short-Term Accommodation**

Around 79% of the dwellings in Wentworth and 84% in Dareton are separate houses. Units and flats along with caravans and cabins make up the remaining dwellings. Both houses and flats are available for lease in Dareton and Wentworth, with agencies suggesting that more could be found if demand warranted it. As noted above in the discussion on Wentworth Shire, there are various hotels, motels and on-site cabins and caravans in caravan parks for short-term accommodation in Wentworth and Dareton. Table J-19 shows the types of accommodation available.

**Table J-19**  
**Estimated Short-Term Accommodation in Dareton and Wentworth (No. of Beds)**

	Motels <sup>a</sup>	Holiday Units	Cabins in Caravan Park	Backpackers	Houseboats
Dareton	45	15	24	27	
Wentworth	345	20	90		120

<sup>a</sup> At least half of the beds in the motels would be double or queen.  
 Source: CIE (2001) - Wentworth Shire Visitor Information Centre.

### **Community and Recreational Services**

Wentworth and Dareton have small shopping centres including post offices and supermarkets. Both towns have large service clubs incorporating dining and sporting facilities, including tennis, golf, and bowls. There is also a swimming pool in each town. The other community recreational services in these towns have already been identified in the section on Wentworth Shire (CIE, 2001).

#### **J5.2.4 Broken Hill**

Broken Hill is located 170 km from the Snapper Mine site. Broken Hill was established as a mining town in 1833, following the discovery of silver bearing ore in the area. In 1907 Broken Hill was declared a city and boasted a population of over 30,000. The population stabilized around 30,000 until the 1970s, when it began its present slow decline. The decline was led by the decline in mining. Until the late 1980s mining dominated the economic life of Broken Hill, providing most of the employment. The relatively high pay levels in the mining industry meant that the City enjoyed a high standard of living and infrastructure.

#### **Population Profile**

The following profile (Table J-20), based on data from the ABS 2001 Census, provides a summary of selected characteristics of the Broken Hill population.

**Table J-20**  
**Population Profile of Broken Hill**

	1991	1996	2001
Total persons(a)	23,879	21,356	20,363
Aged 15 years and over(a)	18,485	16,790	16,205
Aged 65 years and over(a)	3,335	3,530	3,611
Employed(d)	8,250	6,985	6,729
Unemployed(d)	1,473	1,163	987
Not in the labour force(d)	8,212	8,150	7,622
Unemployment rate	15%	14%	13%

Source: ABS (2001)

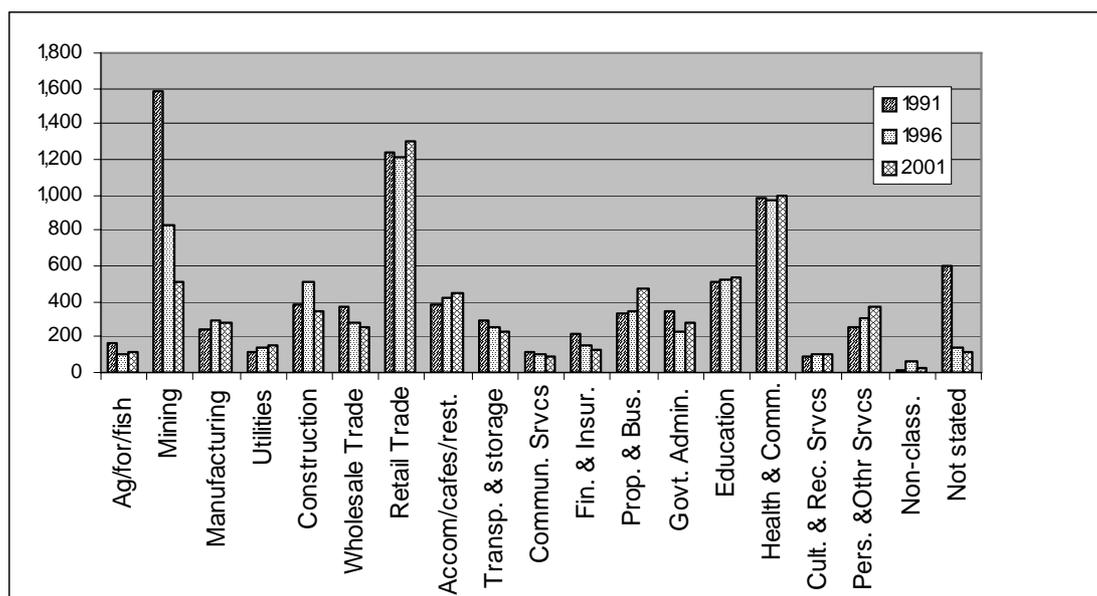
Broken Hill's population has fallen by nearly one third since 1972. Since 1996 the SLA population has slowly declined from 23,879 to 20,363. ABS regional employment statistics suggest a continuing albeit slower decline in population since 2001.

**Industry and Employment**

Broken Hill is the largest regional centre in the western half of NSW. While historically mining was the largest employer, this sector has declined significantly over time – from 19% of the workforce to 7% of the workforce. In 2001 the retail trade sector and health and community services sector were the largest employers at 19% and 15% respectively.

Sectors that have experience employment growth from 1991 to 2001 include manufacturing, utilities, retail trade, accommodation/cafes/restaurants, property and business services, education, health and community services, cultural and recreation services and personal and other services (Figure J-10). Sectors that have experienced contraction include agriculture, mining, wholesale trade, transport and storage, communication services and governmental administration (Figure J-10).

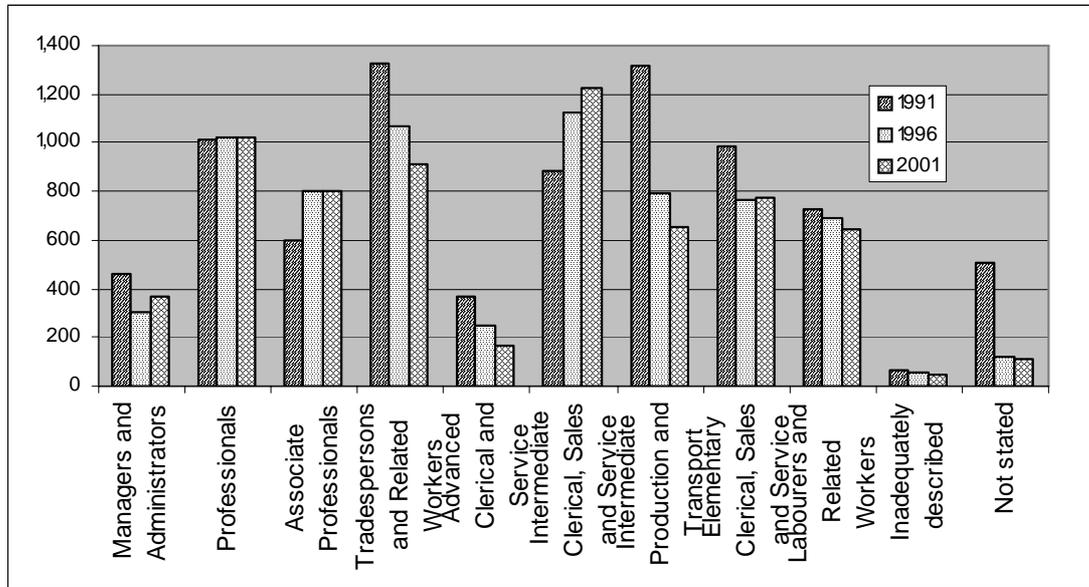
**Figure J-10  
Broken Hill Employment by Industry**



Source: ABS (2001)

Residents of Broken Hill are employed in a range of occupations as shown in Figure J-11. The figure shows that while trades persons and related workers and intermediate production and transport workers were historically the dominant occupations, these have declined significantly over time. Other mining-related occupations such as labourers have also steadily declined. Intermediate clerical sales and service occupations are now the most significant followed by professionals.

**Figure J-11  
Broken Hill Occupation Breakdown**



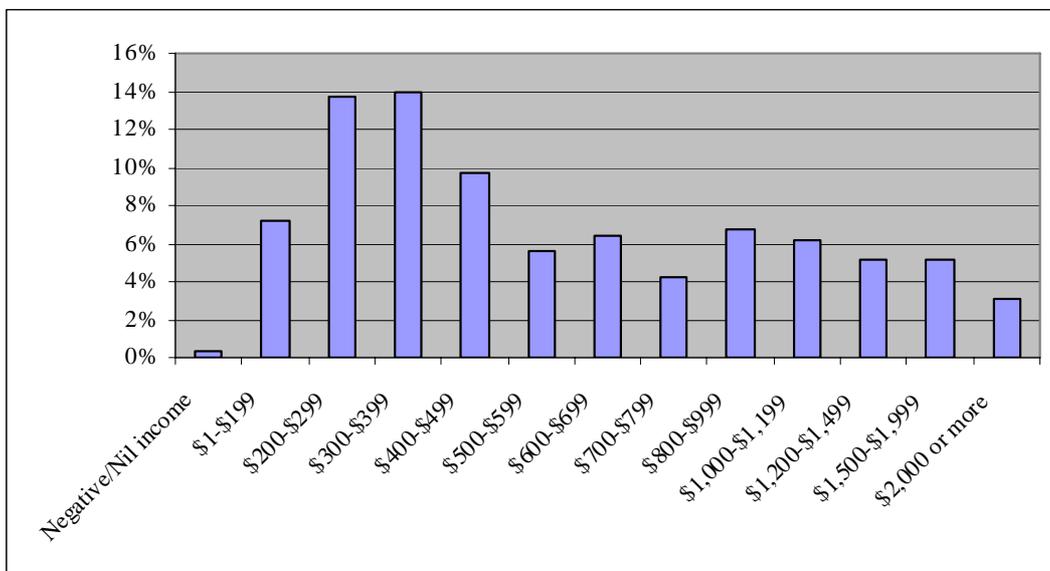
Source: ABS (2001)

The March 2006 quarter of the Small Area Labour Markets publication (DEWR, 2006) reports that there were 749 people unemployed in Broken Hill equating to an unemployment rate of 8.2%. This is higher than the state unemployment rate of 5.2%. However, it is lower than the unemployment rate recorded during the ABS 2001 Census of 12.8%.

**Income**

A large proportion of the households in Broken Hill (45%) earn less than \$500 per week, while 20% earn more than \$1,000 per week (Figure J-12). There are a higher number of people on social security than the average for the State.

**Figure J-12  
Broken Hill Weekly Household Income**



Source: ABS (2001)

### ***Housing and Short-Term Accommodation***

According to the 2001 Census there are 9,752 dwellings in Broken Hill of which 1,307 are unoccupied. Of the occupied dwellings, 58% of are fully owned and a further 17% are being paid off. 17% of occupied dwellings are rented (1,396) and 45% of renters pay less than \$100 per week in rent. House prices are generally lower than in similar regional centres and significantly lower than in metropolitan areas such as Sydney, Melbourne or Adelaide.

The on-going population decline indicates that there is likely to be an oversupply of housing both in the rental and ownership markets. However, supply may not match the location and quality of houses demanded by migrating populations.

There is also a large supply of short-term accommodation in Broken Hill. There are 13 hotels and motels providing 321 rooms and 920 beds. Broken Hill also has two caravan parks and a large number of holiday homes (CIE, 2001). Recently there has been the development of a stock of cottage accommodation for the growing tourism visitation to Broken Hill.

### ***Community and Recreational Services***

Broken Hill has historically had community infrastructure to sustain a population of approximately 30,000 so given its current population of just over 20,000 it is well-resourced in capital infrastructure (CIE, 2001). The ability to maintain that level of infrastructure in the face of any further population decline is a matter of conjecture and possible concern. New regional activities that arrest the population decline may help to sustain community and recreation services (CIE, 2001).

Broken Hill has the only 'base' hospital in the Far West Area and is the referral centre for surrounding communities, receiving patients via road or the Royal Flying Doctor Service. Medical staff are on duty 24 hours, 7 days in the Emergency Department with full-time surgical, medical, anaesthetic, paediatric and obstetric/gynaecological specialists available (CIE, 2001).

The Integrated Care and Allied Health Care Team offer an on-site range of services to inpatients, outpatients and in the community in physiotherapy (with hydrotherapy pool), occupational therapy, domiciliary and palliative care, dietetics, early childhood and school health, social work, specialist clinics, women's health and speech pathology (CIE, 2001).

There are four preschools, six public primary schools, two public high schools to year 12 and one private catholic school from kindergarten to year 10 (CIE, 2001).

The TAFE College focuses on business and computer courses from Statement of Attainment up to diploma level plus trades and general training. The Robinson Adult Education Centre caters for short computer courses, presentation skills, sewing, languages, literacy, community carers and music. A campus of Charles Sturt University offers arts and welfare degrees plus support for students studying externally (CIE, 2001).

The Department of Rural Health, University of Sydney has a campus within the grounds of the Health Service offering remote nursing graduate certificates and masters, Aboriginal Health Worker training at Associate Diploma level and other professional programmes (CIE, 2001).

Broken Hill has a large number of parks and reserves and has over 300 sporting and recreational groups. There is one swimming pool and a number of gymnasiums.

Further afield, the Mutawintji, Kinchega and Sturt National Parks offer bushwalking and camping opportunities. The Menindee Lakes Scheme, one hour by road, provides fishing, sailing, speed boat, skiing and camping facilities (CIE, 2001).

### **J5.2.5 Mildura**

#### **Population Profile**

The town of Mildura is a large regional centre on the Victorian side of the Murray River. It is approximately 80 km to the south of the mine site.

Unlike many rural communities the town of Mildura has been growing steadily over time (Table J-21). The broader region of Mildura Rural City Part A has also grown considerably from 40,644 in 1996 to 44,194 in 2001.

**Table J-21  
Population Profile of Town of Mildura**

	<b>1996</b>	<b>2001</b>
Total persons(a)	24,142	28,062
Aged 15 years and over(a)	18,745	21,696
Employed(d)	9,208	7,353
Unemployed(d)	1,169	952
Not in the labour force(d)	7,910	8,295
Unemployment rate	11.3%	11.5%

Source: ABS (1996; 2001)

#### **Industry and Employment**

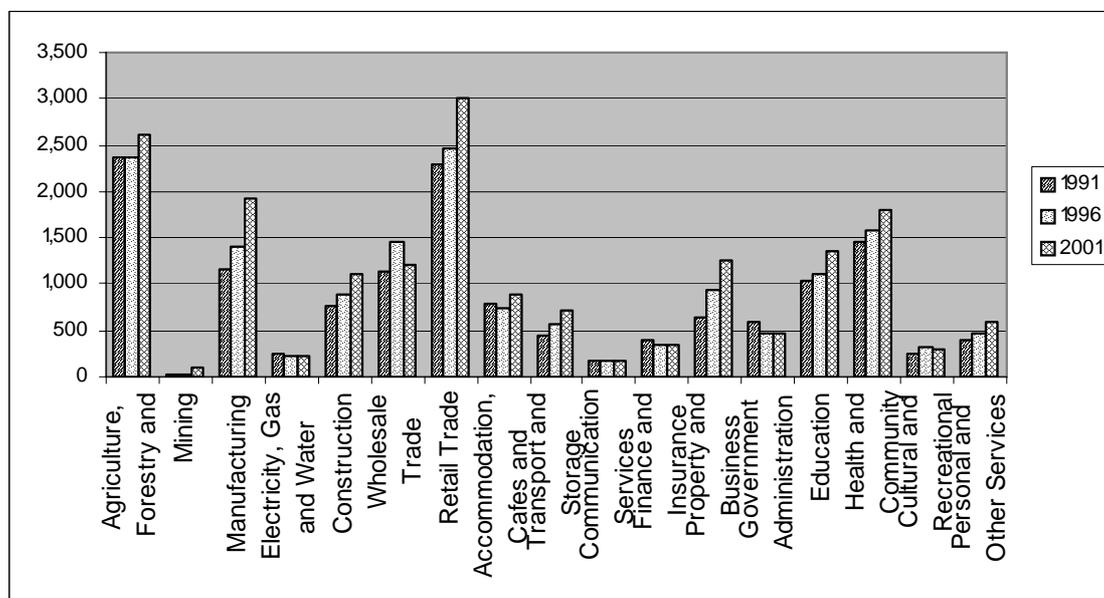
The retail sector is the largest sector in the town of Mildura 18% of employed persons. Health and community services and manufacturing (primarily food and wine) are the next most significant sectors (11% and 10% of employed persons respectively). At the regional level the most significant industry is still retail (16% of employed persons) followed by agriculture (14% of employed persons) and manufacturing (10% of employed persons) (Figure J-13).

The three most significant occupations in the town of Mildura are professionals, intermediate clerical and sales and labourers and related workers. At the regional level the three most significant occupations are labourers and related workers, intermediate clerical and sales and professionals.

At the 2001 Census, the town of Mildura had an unemployment rate of 11.5% (952 people) while the broader region had an unemployment rate of 7.0% (1,391 people).

The Small Area Labour Markets report for the March 2006 quarter estimates an unemployment rate of 8.2% for the wider Mildura Rural City Part A SLA (1,866 people).

**Figure J-13**  
**Mildura Rural City Part A Employment by Industry**



Source: ABS (2001)

### ***Housing and short-term accommodation***

There are 11,669 dwellings in the town of Mildura of which 70% are classified as separate houses and 18% are townhouses, flats, units or apartments. The remainder of dwellings are houseboats, caravans or flats attached to a shop or office. There are 852 unoccupied private dwellings. The rental market is larger in Mildura than in most of the other towns/cities of relevance to the Snapper Mine. This is reflected in the lower home ownership rate compared with the other centres — around 61% of people in Mildura either fully own their own home or are in the process of paying off their home. 3,466 properties are being rented.

There are approximately 150 accommodation and hospitality establishments within the Mildura City Municipality. These establishments have the capacity to accommodate around 7,500 people (CIE, 2001).

### ***Community Services***

Mildura has a base hospital that also services the Wentworth Shire. The hospital has 114 beds and operates a 24-hour emergency facility. The region has a number of support and family welfare organisations such as the Salvation Army and Emmaus house (CIE, 2001).

In Mildura there are numerous primary (23) and secondary schools (10) both public and private. Mildura has a large number of parks and recreation facilities, including two swimming pools and a diving pool. There are a range of sports clubs and recreational groups. Mildura also has an Arts centre complex that includes a gallery, reading room and 800 seat amphitheatre (CIE, 2001).

### J5.3 SNAPPER MINE WORKFORCE AND POPULATION CHANGE

The main drivers for impacts on community infrastructure are changes in employment and population and the spatial location of these changes in employment and population.

Employment that is directly generated by the construction and operation phase of the Snapper Mine may be sourced from:

- the local region either from:
  - the unemployment pool; or
  - workers from other industries;
- in-migration or commuters.

Sourcing labour from the local region has minimal direct impact on local community infrastructure and services since it results in no changes to the regional population and hence demand. It may, however, have an indirect impact on some local community infrastructure and services where changes in employment status or income results in changes in demand for some particular services (e.g. health services).

Whether local labour is sourced from the unemployment pool or from other industries, it can reduce unemployment levels - directly in the case of employing unemployed people and indirectly via the filter effect<sup>1</sup> where labour is sourced from other industries.

The impact of commuter workers would depend on the extent to which they integrate into the regional communities with this integration reduced where on-site mining accommodation is provided.

In-migration resulting in population change is likely to have the greatest potential impact on demand for community services and infrastructure with this impact dependent on the new residential location of the migrating workforce and their families.

As well as direct employment and population changes, the Snapper Mine may also generate indirect labour demand through expenditure by employees in the local region and expenditure by BEMAX in the local region on other inputs to production. This induced demand for labour may also have consequences for population change and demand for community infrastructure and services.

To facilitate consideration of potential community infrastructure impacts this section explores the likely direct and indirect employment and population effects of the Snapper Mine, drawing on the experience of the Ginkgo Mine.

#### J5.3.1 Construction

##### ***Direct Workforce and Population Change***

The construction phase of the Snapper Mine would last for approximately 15 months and require a workforce averaging around 200 people, with a maximum of approximately 250 employees during the peak 2-3 months of construction activity.

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<sup>1</sup> The filter effect refers to the situation where labour is sourced from other industries in the region making jobs available in those industries which are subsequently filled by people either from the unemployment pool or other industries with the latter making jobs available in that industry etc.

Construction generally requires a labour force with highly specialised skills including specialized welders, fitters, electrical contractors, machinery mechanics and construction engineers (CIE, 2001). These types of professions are located in the construction sector, wholesale trade sector (mechanics) and the business service sector. Examination of the employment by industry data in Section J5.2 indicates that Mildura RC Part A has a large and strongly growing construction sector, and business services sector and a relatively large wholesale trade sector. Broken Hill on the other hand has a growing business service sector and a reasonably large but declining construction and wholesale trade sector. The Wentworth SLA also has a small but growing construction and business service sector but a declining wholesale trade sector. Mildura therefore seems to have the greatest capacity to provide construction workforce for the Snapper Mine with some contribution from Broken Hill and to a lesser extent the smaller population base of the Wentworth SLA. This finding is reinforced by Mildura being the largest town in the region and the closest major town to the mine site.

This tends to support the experience with construction of the Ginkgo Mine where it was found that the construction labour force was mainly sourced locally, predominantly from Mildura, Broken Hill and to a lesser extent Wentworth SLA. In the order of 20% of the construction workforce is estimated to have been sourced from outside this region.

Assuming the same pattern occurs with the Snapper Mine Table J-22 summarises the predicted direct construction workforce and population change.

**Table J-22**  
**Predicted Direct Construction Workforce and Population by Location**

Workforce - Place of Residence	Percentage of Workforce	Workforce Numbers		Population Change	
		Average	Peak	Average	Peak
<b>Local</b>	<b>80%</b>	<b>160</b>	<b>200</b>	<b>0</b>	<b>0</b>
<i>Broken Hill</i>	30%	48	60	-	-
<i>Wentworth SLA</i>	10%	16	20	-	-
<i>Mildura</i>	60%	96	120	-	-
<b>Non-local</b>	<b>20%</b>	<b>40</b>	<b>50</b>	<b>60</b>	<b>75</b>
<i>Broken Hill</i>	30%	12	15	18	23
<i>Wentworth SLA</i>	10%	4	5	6	8
<i>Mildura</i>	60%	24	30	36	45
<b>Total</b>	<b>100%</b>	<b>200</b>	<b>250</b>	<b>60</b>	<b>75</b>

The local construction labour force is likely to be mainly local contractors who would have the option of daily commuting or being housed in the accommodation camp, at the Ginkgo Mine (returning to their residences when rostered off), which would be expanded in sufficient time to accommodate the increased requirement for on-site housing.

The majority of the non-local construction workforce would also be accommodated in the accommodation camp, at the Ginkgo Mine. While on leave from the mine site, the non-local construction workforce would be expected to stay mainly in the major regional centres of Mildura or Broken Hill, which offer the best range of accommodation and other community infrastructure and services, and to a lesser extent the smaller towns of Pooncarie, Wentworth and Dareton. Conservatively, at any given time during the average construction period there is likely to be in the order of 40 non-local employees (50 in peak construction) requiring short-term accommodation. This figure would be reduced if the non-local workforce were to decide to commute from their usual place of residence on a “work week” or “work to suit” basis.

It is anticipated that the majority of non-local workers would be single or not bring their families into the region. This reflects the fact that the construction workforce in the mining industry and large infrastructure projects is generally very mobile and tends not to have accompanying spouses and children. However, even if 25% brought a spouse and child to the region only modest increases in population would occur, i.e. between 60 and 75 for the region.

### ***Indirect Workforce and Population Change***

From Section J4.4 (Table J-7) it is evident that there may also be flow-on employment to the Far West/Wentworth/Mildura region associated with the construction phase, in the order of 39 jobs, associated with production induced flow-ons and 11 jobs associated with consumption induced flow-ons.

Consistent with assumptions regarding the direct construction workforce, if 20% of these are filled by non-locals (10 jobs) with normal family characteristics (2.6 people per household) then the population of the Far West/Wentworth/Mildura region associated with flow-ons may increase by 26. However, given the temporary nature of the flow-on effects during construction it is considered unlikely that places would be filled by migration but rather by the local population.

### ***J5.3.2 Operation***

#### ***Direct Workforce and Population Change***

The operation phase of the Snapper Mine would last for in the order of 16 years and require a workforce of some 110 employees, comprising 35 mining employees, 45 earthmoving contractors, 15 direct transport contractors, and 15 maintenance and other contractors.

The operational labour force for the Snapper Mine includes a mix of professionals, managers, administration, trades, plant/equipment operators, labourers and road transport. However, it is likely that the Snapper Mine would share professionals, managers and administration jobs with the existing Ginkgo Mine and hence most of the additional employment would relate to trades, plant/equipment operators (earthmoving contractors), labourers, road transport and repairs and maintenance.

Examination of the employment by industry data in Section J5.2 indicates that Mildura RC Part A has a large and strongly growing transport and storage sector, small and growing mining sector and large but fluctuating wholesale trade sector. It also has a relatively large unemployment pool of in the order of 1,866 people with 950 being in the town of Mildura. Broken Hill also has a relatively large unemployment pool of 990 people (some with mining experience (CIE, 2001), a large but declining mining sector, and modestly sized but declining wholesale trade and transport sectors. The Wentworth SLA is a relative small economy with an unemployment pool of only 171 people and small but increasing transport and mining sectors and a declining trade sector. Overall Mildura would seem to have the greatest potential to fill operation jobs for the Snapper Mine, followed by Broken Hill and to a lesser extent Wentworth LGA.

BEMAX has indicated that for the Ginkgo Mine the operational labour force was mainly sourced locally (in the order of 80%) with a significant proportion of the workforce coming from the surrounding rural area (Wentworth SLA), Mildura and to a lesser extent Broken Hill. It is likely, however, that the available rural workforce would be more limited for the Snapper Mine and that the majority of the local workforce would come from Mildura, and to a lesser extent Broken Hill and Wentworth SLA. Again, in the order of 20% of the operational workforce is estimated to come from outside the region.

The Outback NSW Area Consultative Committee (OACC, 2005) has identified a number of areas of skills shortage in Broken Hill, including construction and mining, which may restrict its ability to provide employment to projects like the Snapper Mine. The predicted direct operational workforce and population change is summarised in Table J-23.

**Table J-23  
Predicted Direct Operational Workforce and Population by Location**

<b>Workforce – Place of Residence</b>	<b>Percentage of Workforce</b>	<b>Workforce</b>	<b>Population</b>
<b>Local</b>	<b>80%</b>	<b>88</b>	<b>0</b>
<i>Broken Hill</i>	25%	22	-
<i>Wentworth SLA</i>	25%	22	-
<i>Mildura</i>	50%	44	
<b>Non-local</b>	<b>20%</b>	<b>22</b>	<b>57</b>
<i>Broken Hill</i>	25%	6	14
<i>Wentworth SLA</i>	25%	6	14
<i>Mildura</i>	50%	11	29
<b>Total</b>	<b>100%</b>	<b>110</b>	<b>57</b>

The local operational workforce would also have the option of daily commuting or being housed in the accommodation camp, at the Ginkgo Mine (returning to their residences when rostered off).

The non-local operational workforce would also be accommodated in the accommodation camp at the Ginkgo Mine. While on leave from the mine site the non-local operational workforce would be expected to stay mainly in the major regional centres of Mildura or Broken Hill, which offer the best range of accommodation and other community infrastructure and services, and to a lesser extent the smaller towns of Pooncarie, Wentworth and Dareton. Based on the assumptions in Table J-23 there is estimated to be in the order of 22 non-local workers who migrate into the Far West/ Wentworth/Mildura region.

Unlike temporary construction workers a normal family size has been assumed for the migrating workers, i.e. 2.6 is the average for NSW. On this basis the population of the region associated with the direct workforce would increase by approximately 57 people.

#### ***Indirect Workforce and Population Change***

From Section J4.4 (Table J-11) it is estimated that there would be flow-on employment to the region of in the order of 33 jobs, 25 associated with production induced flow-ons and 8 associated with consumption induced effects.

Consistent with the assumption regarding the direct operational workforce, if 20% of these jobs are filled by non-locals migrating into the region, with normal family characteristics (2.6 people per household) and with a similar spatial distribution to that assumed for the direct operational workforce, then the population of the region associated with flow-on employment would increase by 17 (Table J-24).

**Table J-24**  
**Predicted Flow-on Operational Workforce and Population by Location**

<b>Workforce – Place of Residence</b>	<b>Percentage of Workforce</b>	<b>Workforce</b>	<b>Population</b>
<b>Local Workforce</b>	<b>80%</b>	<b>26</b>	<b>0</b>
<i>Broken Hill</i>	25%	7	-
<i>Wentworth SLA</i>	25%	7	-
<i>Mildura</i>	50%	13	
<b>Non-local</b>	<b>20%</b>	<b>7</b>	<b>17</b>
<i>Broken Hill</i>	25%	2	4
<i>Wentworth SLA</i>	25%	2	4
<i>Mildura</i>	50%	3	9
<b>Total</b>	<b>100%</b>	<b>33</b>	<b>17</b>

#### **J5.4 COMMUNITY INFRASTRUCTURE IMPACT ASSESSMENT**

##### **J5.4.1 Context of Population Change**

To understand the likely impact of the Snapper Mine on community infrastructure and services it necessary to consider the predicted population change within the context of the recent intercensal population change of the region and towns.

From Table J-25 it is evident that for both Broken Hill and Wentworth LGA the additional population during construction and operation of the mine would help to offset historic population decline. The additional population predicted for the Mildura region would be small in the context of the annual population growth of this town (i.e. in the order of 5% to 6%).

**Table J-25**  
**Predicted Population Impact of the Snapper Mine in Context of Annual Population Growth**

	<b>Annual Population Growth</b>	<b>Direct Construction Population Increase (Peak)</b>	<b>Total Operation Population Increase</b>
Broken Hill SLA	-199	23	<b>19</b>
Wentworth SLA	-52	9	<b>19</b>
Mildura RC Part A	710	42	<b>37</b>

### J5.4.2 Housing Impacts

#### Construction Phase

The current accommodation camp at the Ginkgo Mine would be expanded in sufficient time to accommodate the increased requirement for on-site housing during construction. As identified above, the majority of the non-local construction workforce would be accommodated in the accommodation camp at the Ginkgo Mine. While rostered-off they are likely to generate demand for short-term accommodation mainly in Mildura (up to 30 residences) but also in Broken Hill (up to 15 residences) and Wentworth SLA (up to 5 residences).

From Section J5.2 it is evident that there is considerable and sufficient short-term accommodation in Mildura (over 7,500 beds), Broken Hill (over 920 beds) and Wentworth (over 680 beds) to accommodate this estimated short-term demand for housing. Furthermore, from Table J-26 it can be seen that there is also likely to be considerable opportunity for rental given the size of the potential pool of rental properties in Broken Hill, Wentworth SLA and Mildura RC Part A. Potentially available rental properties are likely to have increased as a result of the declining population in Broken Hill and Wentworth.

**Table J-26  
Demand for Accommodation\***

Demand for Housing							
	Direct Construction (Peak)	Total Operation	Average Annual Building Approvals - Total Dwellings 2000-2004	Total Housing Stock 2001	Occupied Rental Properties 2001	Unoccupied Residential Properties 2001	Residential Sales in 2005**
Broken Hill SLA	15	7	11	9,749	1,398	1,304	
Wentworth SLA	5	7	40	2,900	577	250	
Mildura RC Part A	30	14	414	17,748	11,044	1,250	1,254

\* Not all data is available at the Locality Level

\*\* This data is only available in Victoria

There may be some demand from the non-local construction workforce to be located at Pooncarie, the closest town to the Snapper Mine. Where this demand cannot be met it is likely to spill over to other towns and available accommodation in the region.

The construction phase of the Snapper Mine is considered unlikely to have any direct effect on the owner/occupied residential land market since most non-locals are likely to be housed in short-term accommodation and the existing rental market for houses and units rather than through purchase of properties.

However, this means that there is some potential for short-term accommodation that would otherwise be used for tourism to be occupied by the construction workforce, potentially squeezing out tourists if occupancy rates at the time were very high. However, given the small number of Snapper construction workforce likely to require short-term accommodation, the likelihood of the Snapper Mine resulting in this impact is low.

There is also some potential for the increased demand for rental accommodation to drive rental prices up potentially disadvantaging existing renters (particularly the elderly and unemployed on fixed incomes), in the short-term. However, again given the small number of the Snapper Mine construction workforce likely to require short-term accommodation, the likelihood of the Snapper Mine resulting in this impact is low. Furthermore, whenever impacts arise on rental prices this sends a signal to the market about the attractiveness of renting properties and is likely to lead to an increase in properties becoming available in the medium term resulting in a decline in rents.

#### *Operation Phase*

During operation of the Snapper Mine, demand is likely to be generated in the order of 14 residences at Mildura, 7 residences at Broken Hill, 7 residences across the Wentworth LGA. While initially, short-term accommodation may house these families, the demand would be for longer-term rental accommodation or purchase.

From the Table J-26 it can be seen that this increased demand for housing is largely insignificant in the context of the total housing stock, rental stock and unoccupied dwellings (potential rental stock) as well as the average annual additions to the residential housing stock. For instance additional demand in Mildura for 14 houses represents 0.08% of the total housing stock and 1.1% of annual housing sales. In Broken Hill the additional demand for 7 houses represents 0.07% of the total housing stock. In Wentworth SLA, the additional demand for in the order of 7 houses represents 0.2% of the total housing stock.

Nevertheless, because of higher relative wages in the mining sector, the demand for rental accommodation and to purchase is likely to be at the higher end of the market where supply is more limited. If places like Broken Hill and Wentworth Shire are to capture the increased workforce associated with the Snapper Mine and other projects they would need a supply of sufficient standard accommodation.

While the Snapper Mine on its own is unlikely to have any housing impacts, combined with a range of other projects being considered in the region, e.g. BEMAX's extension to the MSP, a proposed new Abattoir, mining projects by Perilya, CBH, Havilah Resources etc, it may have greater consequences.

However, BHCC has welcomed the potential job and population growth and is actively "facilitating the identification of available vacant land (both serviced and un-serviced) within the city boundaries to assist potential residential and other developers with investment decisions – based on a yet to be quantified demand for housing".

BHCC also advise that "the city has underutilized capacity and an untapped resource of serviced vacant land and a range of existing housing stock in poor condition which is suitable for urban renewal as opposed to the costly option of extension of land development on the fringes of the city".

### J5.4.3 Education and Training

#### *Snapper Mine Workforce*

The Snapper Mine workforce employed from within the region and outside the region would have varying skills and experience on which to draw in undertaking their job at the Snapper Mine. Many are likely to have experience in the mining sector while some may not. BEMAX have a full-time Training and Development Officer and would continue its Barkindji Training Education and Employment Programme, offer apprenticeships and traineeships and train all officers in Certificate 2 in Extractive Industry. Nevertheless, most required training is likely to be undertaken in-house and on the job. The workforce is therefore not expected to place any significant demands on tertiary education institutions in the region.

#### *Workers Children*

During the construction phase the majority of incoming workers are expected to be single and unaccompanied. No significant effects upon schools in the region would be expected during this phase.

During operation of the mine incoming workers (both direct and indirect) are expected to exhibit average family structures and hence would be associated with some children creating some increased demand for education facilities within the region. Assuming that the incoming population exhibits the same characteristics as the NSW population, Table J-27 summarises the likely demand for pre-school, infants/primary and high school places.

**Table J-27  
Demand for Children's Schooling**

<b>School Type</b>	<b>Broken Hill</b>	<b>Wentworth</b>	<b>Mildura</b>
Pre-school	1	1	2
Infants/Primary	2	2	4
High school	2	2	3

These demands can be compared to the enrollments at the last Census and growth/decline in enrollments between 1996 and 2001 across the region (Table J-28). In this context, it is evident that the increased demand for schooling could be considered to be insignificant.

The DoET has confirmed that there is considerable excess capacity in school infrastructure in both Broken Hill and Wentworth SLA and hence the Snapper Mine would have minimal impact.

Cumulative impacts of the Snapper Mine together with other potential developments in the region may also be insignificant given the substantial excess capacity in school infrastructure. For instance, one primary school with capacity for 900 children currently has enrolments of around 300 children. A similar situation applies to high schools.

**Table J-28**  
**Attendance at Educational Establishments**

	Broken Hill		Wentworth		Mildura RC Part A	
	1996	2001	1996	2001	1996	2001
Pre-school	321	350	128	107	593	802
Infants/Primary:						
Government	1,948	1,590	648	549	3,165	3,396
Catholic	180	170	87	87	719	823
Other Non-Government	31	13	28	33	307	431
<i>Total</i>	<i>2,159</i>	<i>1,773</i>	<i>763</i>	<i>669</i>	<i>4,191</i>	<i>4,650</i>
Secondary:						
Government	1,303	1,306	460	418	2,234	2,372
Catholic	35	81	64	65	587	692
Other Non-Government	7	9	6	13	61	145
<i>Total</i>	<i>1,345</i>	<i>1,396</i>	<i>530</i>	<i>496</i>	<i>2,882</i>	<i>3,209</i>
<b>TOTAL CHILD EDUCATION</b>	<b>3,825</b>	<b>3,519</b>	<b>1,421</b>	<b>1,272</b>	<b>7,666</b>	<b>8,661</b>
Technical or Further Educational Institution:						
Full-time	68	254	28	51	350	330
Part-time	447	528	79	98	444	683
Not stated(a)	10	6	0	0	6	4
<i>Total</i>	<i>525</i>	<i>788</i>	<i>107</i>	<i>149</i>	<i>800</i>	<i>1,017</i>
University or other Tertiary Institution:						
Full-time	25	36	9	16	93	187
Part-time	190	206	36	41	252	327
Not stated(a)	0	3	0	0	3	0
<i>Total</i>	<i>215</i>	<i>245</i>	<i>45</i>	<i>57</i>	<i>348</i>	<i>514</i>
<b>TOTAL ADULT EDUCATION</b>	<b>740</b>	<b>1,033</b>	<b>152</b>	<b>206</b>	<b>1,148</b>	<b>1,531</b>
Other:						
Full-time	21	23	3	3	38	68
Part-time	47	105	11	30	80	165
Not stated(a)	3	3	3	3	8	8
<i>Total</i>	<i>71</i>	<i>131</i>	<i>17</i>	<i>36</i>	<i>126</i>	<i>241</i>
<b>TOTAL EDUCATION</b>	<b>4,636</b>	<b>4,683</b>	<b>1,590</b>	<b>1,514</b>	<b>8,940</b>	<b>10,433</b>

#### **J5.4.4 Health**

There is potential for the Snapper Mine to increase the demand for public health facilities in the region such as for hospitals, General Practitioner (GP) Medical Services, Dental, Physiotherapy, Chiropractors, Optometrists, etc. via the anticipated increase in population during both construction and operation phase of the Snapper Mine.

However, the anticipated population increase during construction and operation of the Snapper Mine is very small compared to the total populations of each of the affected regions and population centres. Furthermore, Broken Hill and Wentworth SLA may have spare capacity in health service infrastructure given the declining population of these areas. Mildura is a large growing rural centre and any increases in population in this town as a result of the Snapper Mine are expected to be very small in comparison to normal growth in the region.

The Snapper Mine may also increase demand for public health facilities in the region – ambulance, hospital and GP - because it would increase the proportion of the population employed in the mining sector. BEMAX propose to employ all the occupational health and safety measures that it employs at the Ginkgo mine with a view to minimising, as far as possible, incidents at the mine.

The proposal also has the potential to indirectly positively impact on public health through the provision of employment opportunities and the reduction in unemployment. Prolonged unemployment can generate a range of personal and social problems including increased drug and alcohol dependency and increased demand for health services (University of NSW, 2006). Providing opportunities to reduce unemployment can be therefore be beneficial.

#### **J5.4.5 Community Services and Facilities**

Demand for additional investment in community services such as child care, aged care and community care services, by Local, State and Commonwealth Governments can arise from increases in the population. However, as indicated in Table J-24 and Table J-25 the expected increases in population are very small, and for Broken Hill and Wentworth SLA are contributing towards arresting a general population decline. In these areas, rather than imposing additional demand on community services and facilities that may require additional investment by governments, the population increase would simply replace some of the declining demand arising from the population decline. No additional investment in community services and facilities infrastructure would therefore be anticipated and the population increases may help avoid threshold levels for provision of services falling below critical levels.

In Mildura, the anticipated population increase would add the general population growth of the region, adding to demand for community services and facilities. However, the expected one-off permanent population growth is in the order of 5% of the average annual population growth the region while the temporary population growth associated with construction would be in the order of 6% of average annual population growth. The increased demand for community services and facilities in Mildura is therefore likely to be minor.

#### **J5.4.6 General Community Impacts**

Regardless of any possible migration, the Snapper Mine would have an impact on the small town of Pooncarie. The proximity to the Snapper Mine site means that the hotel and local store would experience increased demand for their goods and services. The increase in the surrounding population may also have some impact on the social fabric of the town. The social fabric of Pooncarie comes from the very small population of the town and the Snapper Mine is likely to result in a larger number of people joining in the social and recreational activities of the town. For example, the Pooncarie hotel is likely to become more crowded. The Snapper Mine is likely to impact on Broken Hill and Wentworth in a different way. It would increase employment and therefore stimulate economic growth or help to arrest decline in Broken Hill's case.

Towns like Broken Hill see projects like the Snapper Mine as "offering wonderful opportunities and great challenges for businesses in Broken Hill. Now it is important that we marshal our resources to take advantage..." (OACC, 2006).

According to Mrs Keady of the Outback Development Forum "All of the economic and community development organisations in the region have agreed to work together to plan and manage our response to ensure that we fully exploit the business opportunities that are presented.' (OACC, 2006).

BHCC in its' press release identified that it would "continue to work in partnerships with all of the economic and community development organizations in the region to ensure that the benefits of the projected economic growth in the region is maximized and impacts minimized".

## J6 CONCLUSION

The Snapper Mine is estimated to generate net production benefits of in the order of \$144 M. While environmental externalities of the Snapper Mine have not been valued in dollar terms (apart from greenhouse gas emissions), they would need to be valued at greater than \$144 M to make the Snapper Mine questionable from an economic efficiency perspective.

To put this threshold value in some context, every household in the region of the Far West/Wentworth/Mildura Region would need to be willing to pay in the order of \$4,000 to avoid the identified potential environmental impacts of the Snapper Mine, to make it questionable from an economic efficiency perspective.

The Snapper Mine would also stimulate regional economic activity during both the construction and operation phases. During the average construction phase the Snapper Mine is estimated to contribute:

- \$38 M in annual direct and indirect regional output or business turnover;
- \$19 M in annual direct and indirect regional value-added;
- \$11 M in annual household income; and
- 250 direct and indirect jobs.

In the order of 40% of these impacts are likely to occur in NSW part of the region and would persist for about one year.

The operation of the Snapper Mine is likely to contribute in the order of:

- \$91 M in annual direct and indirect regional output or business turnover;
- \$42 M in annual direct and indirect regional value-added;
- \$8 M in annual household income; and
- 142 direct and indirect jobs.

Approximately 50% of these impacts are likely to be felt in the NSW part of the region. These impacts are likely to be felt for 16 years across a range of sectors. The sectors most impacted by output, value-added and income flow-ons are likely to be the *other construction sector; road transport sector; electricity sector; wholesale trade sector; retail trade sector; water supply sector; accommodation, cafes and restaurants and other property services sector*.

Employment impacts are also likely to be felt across a number of sectors including the mining sector, other construction sector, transport sector, wholesale and retail trade sectors and services sectors (education, health, community services and personal services).

Towns in the vicinity of the Snapper Mine that can provide the inputs to the production process required by BEMAX and/or the products and services required by employees would benefit from the proposal by way of an increase in economic activity. Such towns may include Broken Hill, Mildura, Pooncarie, Wentworth and Dareton. BEMAX can assist these towns to benefit by adopting, wherever feasible, a local procurement policy.

Changes in the workforce and populations of regions and towns can have implications in relation to access to community infrastructure and human services, which includes for example housing, health and education facilities. This may include the number of services that are available to be used and the accessibility of the population to these services.

The direct construction workforce is estimated to average around 200 people for a period of 15 months, with a maximum of 250, and a resulting population increase for the region of between 60 and 75 for the region. While there is also expected to be some flow-on employment generated by the Snapper Mine, given the temporary nature of the flow-on effects during construction it is considered unlikely that places would be filled by migration but rather by the local population.

The operation phase of the Snapper Mine would last in the order of 16 years and require a direct workforce of some 110 employees, with a resulting population increase for the region in the order of 57 people. It is estimated that there would also be flow-on employment from operation of the Snapper Mine of 33 jobs, resulting in an additional population increase of approximately 17. The total population influx as a result of the operation phase of the mine is therefore estimated to be in the order of 74 people.

These population changes are small in the context of the inter-censal population changes. The estimated population changes for Broken Hill and Wentworth LGA would help to offset historic population decline. While the additional population predicted for the Mildura region would be small in the context of the annual population growth of this town (i.e. in the order of 5% to 6%).

While the construction phase of the Snapper Mine would generate some demand for short-term accommodation across the region there is considerable and sufficient short-term accommodation to meet this estimated short-term demand for housing.

During the operation phase it is estimated that the Snapper Mine is likely to generate demand for in the order of 14 residences at Mildura, 7 residences at Broken Hill, 7 residences across the Wentworth LGA. While the operation phase is likely to initially generate demand for short-term accommodation followed by longer-term rental accommodation or purchase the estimated increased demand for housing is largely insignificant in the context of the total housing stock, rental stock and unoccupied dwellings (potential rental stock) as well as the average annual additions to the residential housing stock.

Even cumulative housing impacts of a range of projects being considered in the Broken Hill area are unlikely to have any significant housing impacts. Indeed, BHCC has welcomed the potential job and population growth and is actively “facilitating the identification of available vacant land (both serviced and un-serviced) within the city boundaries to assist potential residential and other developers with investment decisions – based on a yet to be quantified demand for housing”. BHCC also advise that “the city has underutilised capacity and an untapped resource of serviced vacant land and a range of existing housing stock in poor condition which is suitable for urban renewal as opposed to the costly option of extension of land development on the fringes of the city”.

The Snapper Mine is also likely to place minimal demands on education institutions. Most employee training is likely to be undertaken in-house and on the job. The construction phase of the Snapper Mine is likely to place minimal demands on schools since the majority of incoming workers are expected to be single and unaccompanied. During operation of the mine there would be some additional demand placed on schools, but this demand is predicted to be insignificant in comparison to current enrolments and the DoET has confirmed that there is considerable excess capacity in School infrastructure in both Broken Hill and Wentworth SLA and hence the Snapper Mine would have minimal impact.

The anticipated population increase during construction and operation of the Snapper Mine is very small compared to the total populations of each of the affected regions and population centres and hence no significant impact on health service delivery or infrastructure is predicted.

The proposal also has the potential to indirectly positively impact on public health through the provision of employment opportunities and the reduction in unemployment.

Cessation of the Snapper Mine after 16 years of operation may lead to a reduction in economic activity. The significance of these cessation impacts would depend on:

- The degree to which any displaced workers and their families remain within the region, even if they remain unemployed. This is because continued expenditure by these people in the regional economy (even at reduced levels) contributes to final demand.
- The economic structure and trends in the regional economy at the time. For example, if cessation of the Snapper Mine takes place in a declining economy the impacts might be felt more greatly than if it takes place in a growing, diversified economy.
- Whether other mineral sand developments or other opportunities in the region arise that allow employment of displaced workers.

Given these uncertainties it is not possible to foresee the likely circumstances within which cessation of the Snapper Mine would occur. It is therefore important for regional authorities and leaders to take every advantage from the stimulation to regional economic activity and skills and expertise that the Snapper Mine would bring to the region, to strengthen and broaden the region's economic base.

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**Attachment JA**

**The GRIT System for Generating Input-Output Tables**

“The Generation of Regional Input-Output Tables (GRIT) system was designed to:

- combine the benefits of survey based tables (accuracy and understanding of the economic structure) with those of non-survey tables (speed and low cost);
- enable the tables to be compiled from other recently compiled tables;
- allow tables to be constructed for any region for which certain minimum amounts of data were available;
- develop regional tables from national tables using available region-specific data;
- produce tables consistent with the national tables in terms of sector classification and accounting conventions;
- proceed in a number of clearly defined stages; and
- provide for the possibility of ready updates of the tables.

The resultant GRIT procedure has a number of well-defined steps. Of particular significance are those that involve the analyst incorporating region-specific data and information specific to the objectives of the study. The analyst has to be satisfied about the accuracy of the information used for the important sectors; in this case the non-ferrous metals and building and construction sectors. The method allows the analyst to allocate available research resources to improving the data for those sectors of the economy that are most important for the study. It also means that the method should be used by an analyst who is familiar with the economy being modelled, or at least someone with that familiarity should be consulted.

An important characteristic of GRIT-produced tables relates to their accuracy. In the past, survey-based tables involved gathering data for every cell in the table, thereby building up a table with considerable accuracy. A fundamental principle of the GRIT method is that not all cells in the table are equally important. Some are not important because they are of very small value and, therefore, have no possibility of having a significant effect on the estimates of multipliers and economic impacts. Others are not important because of the lack of linkages that relate to the particular sectors that are being studied. Therefore, the GRIT procedure involves determining those sectors and, in some cases, cells that are of particular significance for the analysis. These represent the main targets for the allocation of research resources in data gathering. For the remainder of the table, the aim is for it to be 'holistically' accurate (Jensen, 1980). That means a generally accurate representation of the economy is provided by the table, but does not guarantee the accuracy of any particular cell. A summary of the steps involved in the GRIT process is shown in Table JA-1” (Powell and Chalmers, 1995).

**Table JA-1  
The GRIT Method**

Phase	Step	Action
PHASE I		ADJUSTMENTS TO NATIONAL TABLE
	1	Selection of national input-output table (106-sector table with direct allocation of all imports, in basic values).
	2	Adjustment of national table for updating.
	3	Adjustment for international trade.
PHASE II		ADJUSTMENTS FOR REGIONAL IMPORTS (Steps 4-14 apply to each region for which input-output tables are required)
	4	Calculation of 'non-existent' sectors.
	5	Calculation of remaining imports.
PHASE III		DEFINITION OF REGIONAL SECTORS
	6	Insertion of disaggregated superior data.
	7	Aggregation of sectors.
	8	Insertion of aggregated superior data.
PHASE IV		DERIVATION OF PROTOTYPE TRANSACTIONS TABLES
	9	Derivation of transactions values.
	10	Adjustments to complete the prototype tables.
	11	Derivation of inverses and multipliers for prototype tables.
PHASE V		DERIVATION OF FINAL TRANSACTIONS TABLES
	12	Final superior data insertions and other adjustments.
	13	Derivation of final transactions tables.
	14	Derivation of inverses and multipliers for final tables.

Source: Bayne and West (1988)

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