WILPINJONG COAL PROJECT

APPENDIX I

Economic Assessment

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ECONOMIC ASSESSMENT

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EXECUTIVE SUMMARY

Wilpinjong Coal Pty Limited (WCPL), a wholly owned subsidiary of Excel Coal Limited, has been selected by the NSW Department of Mineral Resources (now Department of Primary Industries) as the successful tenderer to develop the Wilpinjong Coal Resource in the Western Coalfield of NSW. This coal resource has been identified by the NSW Government as a long term source of coal for NSW electricity generators (DMR 2002).

The proposed Wilpinjong Coal Project (the Project) is located approximately 11 km south-east of the Ulan Coal Mines and comprises the development and operation of an open cut coal mine and related infrastructure, over a 21 year time frame to yield in the order of 147 Mt of product coal for sale to domestic electricity generators and approximately 33 Mt of product coal for export.

The Project is considered in this report within two economic frameworks:

- benefit cost analysis (threshold value analysis) which examines the economic efficiency or net community welfare impacts of the proposal; and
- regional economic impact analysis which examines the impact of the construction and operation phases of the Project on the regional economy (former local government areas of Mudgee, Merriwa and Rylstone) and on the state of NSW.

The benefit cost analysis, identified a range of potential incremental economic costs and benefits of the Project and placed indicative values on the production costs and benefits. External economic costs and benefits of the proposal were identified and discussed. The analysis indicated that the incremental net production benefits of the Project would be in the order of $1,454M. This represents the opportunity cost to society of not proceeding with the Project.

Put another way, any environmental and social costs of the Project, after mitigation by WCPL, would need to be costed at greater than $1,454M to make the Project questionable from an economic efficiency perspective.

The Project will also stimulate economic activity in the regional economy and NSW. Using input-output analysis, it was estimated that the construction year of the Project would contribute the following to the regional economy and NSW economy, respectively:

Regional Economy

- $40M in annual direct and indirect regional output or business turnover;
- $19M in annual direct and indirect regional value added;
- $11M in annual direct and indirect household income; and
- 270 in direct and indirect employment.

NSW Economy

- $83M in annual direct and indirect regional output or business turnover;
- $31M in annual direct and indirect regional value added;
- $17M in annual direct and indirect household income; and
- 391 in direct and indirect employment.

Operation of the Project was estimated to have the following impacts on the regional economy and NSW economy, respectively.

Regional Economy – Operational Phase

- $244M in annual direct and indirect regional output or business turnover;
- $158M in annual direct and indirect regional value added;
- $14M in annual household income; and
- 250 in direct and indirect employment.

NSW Economy – Operational Phase

- $359M in annual direct and indirect regional output or business turnover;
- $186M in annual direct and indirect regional value added;
- $25M in annual household income; and
- 507 in direct and indirect employment.

The main sectors of the regional economy that would be stimulated by the construction phase of the Project are the other construction sector and the cement manufacturing sector, wholesale and retail trade sectors, road transport sector and accommodation, cafes and restaurants sector.

The main sectors of the regional economy impacted by the operation of the Project are likely to be the services to mining sector, agricultural and mining machinery manufacturing sector, electricity supply sector, wholesale and retail trade sectors, rail and road transport sectors, other property services sector and the legal, accounting, marketing and business management services sector.

The Project would directly generate demand for mining employment in the regional economy. Production-induced employment impacts would mainly generate demand for employment in the services sectors (predominantly community services, legal, accounting and business management sector, other businesses services, other services, communications and banking), wholesale and retail trade, manufacturing (predominantly agriculture, mining and construction machinery manufacturing, fabricated metal products manufacturing, other chemicals manufacturing and iron and steel manufacturing) and transport sector (predominantly rail and road transport). Consumption-induced employment flow-ons would mainly generate demand in the wholesale and retail trade sectors and the services sectors (education, health, community services and personal services).

I1 INTRODUCTION

Wilpinjong Coal Pty Limited (WCPL), a wholly owned subsidiary of Excel Coal Limited, has been selected by the NSW Department of Mineral Resources (now Department of Primary Industries) as the successful tenderer to develop the Wilpinjong Coal Resource in the Western Coalfield of NSW. This coal resource has been identified by the NSW Government as a long term source of coal for NSW electricity generators (DMR, 2002).

The proposed Wilpinjong Coal Project (the Project) is located approximately 11 kilometres (km) south-east of the Ulan Coal Mines and comprises the development and operation of an open cut coal mine and ancillary infrastructure over a 21 year time frame, to yield in the order of 147 million tonnes (Mt) of product coal for sale to domestic electricity generators and approximately 33 Mt of product coal for export.

Resource Strategies Pty Ltd has been commissioned by WCPL to prepare an Environmental Impact Statement (EIS) for the Project. An economic impact assessment is required as part of the EIS. The Project description is provided in Section 2 of Volume 1 of the EIS.

Economic analysis is primarily concerned with weighing up the potential economic costs and benefits of the Project to the community (ie. consideration of economic efficiency). The main technique that is used to evaluate proposals with respect to economic efficiency is benefit cost analysis. Information on the regional economic impact or economic activity generated by development proposals is also of interest to decision-makers and has direct links to the analysis of potential impacts on community infrastructure and population.

Both these economic aspects of the Project are considered in this report.

I2 BENEFIT COST ANALYSIS

I2.1 INTRODUCTION

Benefit cost analysis involves examining the costs and benefits of a proposal to both consumers and producers. The net benefit to consumers is referred to as consumers' surplus while the net benefit to producers is referred to as producers' surplus. Consumers' surplus is the difference between what a person would be willing to pay for a good or service (the total benefit to the consumers) and what they have to pay (the cost to the consumer). In a demand and supply framework it is measured as the area between a demand curve and the price line. Producers' surplus is the difference between the costs of the inputs used in the production process (economic cost to producers) and the price received for the finished product (total benefit to producers). In the demand and supply framework, it is measured as the area between a supply curve and a given price for a specified quantity supplied. In practical terms it is the net revenue that is earned by producers (James and Gillespie, 1997).

For commercial activities, the appropriate measure of economic value is the producers' surplus or net revenue earned. For non-market goods, such as environmental impacts, consumers' surplus is the relevant measure of economic impacts.

Where competitive markets exist, prices reflect willingness to pay for goods and the opportunity costs of resources. However, where benefits and costs relate to goods and services that are either not traded in conventional markets (eg. environmental values) or are traded in markets that are subject to distortions (eg. subsidies), economists derive imputed economic values (referred to as shadow prices). Shadow prices are an estimate of what the value would be if a competitive market existed.

To identify and measure the changes in benefits and costs, or consumers' and producers' surplus that may result from a proposal, it is essential to collaborate with other experts contributing information on physical, ecological, cultural and social impacts. This information is then interpreted in terms of economic efficiency.

What follows is a benefit cost analysis of the Project based on technical and environmental advice provided by WCPL and their consultants.

I2.2 IDENTIFICATION OF THE BASE CASE AND THE PROJECT

Identification of the "base case" or "without" Project option is required in order to facilitate the identification and measurement of the incremental economic costs and benefits of the Project. In this study, the "without" Project involves continuation of the agricultural use of the land (ie. use of the land primarily for grazing of sheep and cattle with some limited cropping and areas of remnant and regrowth vegetation).

In contrast to the "base case" the Project comprises the development and operation of an open cut coal mine and related infrastructure, including:

- development and operation of an open cut mine within the Mining Lease Application (MLA 1) area to produce coal for domestic electricity generation and export markets;
- selective highwall mining of the Ulan Seam within the MLA 1 area;
- a Coal Handling and Preparation Plant (CHPP) and mine facilities area;
- water management infrastructure including the relocation of Cumbo Creek;
- water supply bores and associated pump and pipeline system;

- placement of mine waste rock (i.e. overburden, interburden/partings and coarse rejects) predominantly within mined-out voids;
- placement of tailings within a combination of out-of-pit and in-pit tailings storages;
- development and rehabilitation of final mine landforms and establishment of woodland vegetation in areas adjacent to the Project;
- a mine access road, temporary construction camp access road, internal access roads and haul roads;
- closure of Wilpinjong Road and Bungulla Road;
- realignment of two sections of Ulan-Wollar Road (including the relocation of two road-rail crossings);
- relocation of the existing 11 kilovolt electricity transmission line;
- an on-site temporary construction camp to accommodate up to 100 people during the construction phase;
- a rail spur and rail loop;
- coal handling and train loading infrastructure;
- transportation of product coal to market via train; and
- Enhancement and Conservation Areas (ECAs).

WCPL's alternatives for the mining of the Wilpinjong coal reserve are essentially limited to different scales, designs, technologies, processes, modes of transport, timing, impact mitigation measures, etc. However, these alternatives could be considered to be variants of the preferred proposal rather than distinct alternatives. Consequently, this benefit cost analysis focuses on WCPL's preferred proposal, compared to the base case identified above.

I2.3 IDENTIFICATION AND VALUATION OF COSTS AND BENEFITS

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

It should be noted that the potential external costs, listed in Table I2.1, 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 I2.1
Potential Economic Costs and Benefits of the Project

Stakeholder	Costs	Benefits
Production (WCPL/ Macquarie Generation/ NSW Govt)	• Opportunity cost of land. • Mining and infrastructure capital costs. • Mine operating costs including: - Rehabilitation costs; - Monitoring costs; and - Transport costs.	• Residual value of land and capital at cessation of the Project. • Value of export and domestic product coal.
External Impacts	• Noise and blast vibration disturbing residents of neighbouring properties. • Air quality affecting the quality of life of the residents of neighbouring properties. • Disturbance of non-Aboriginal heritage sites. • Disturbance of Aboriginal heritage sites. • Disturbance of surface water flows. • Disturbance of groundwater flows. • Disturbance of flora and fauna. • Increased traffic on local roads. • Generation of greenhouse gas. • Modification of the visual landscape.	

I2.3.1 Production Costs and Benefits

The following cost and revenue estimates are based on the financial information provided by WCPL with adjustments made where necessary to reflect economic values.

Opportunity Cost of Land

It is relevant to include in a benefit cost analysis the opportunity cost of land, regardless of whether or not the land has already been purchased by the proponent. This is because there is generally an opportunity cost of using the subject land for mining or other purposes rather than its next best use permissible under the existing land use regulations. An indication of the opportunity cost of the land can be gained from its market value, which in turn reflects it structural, access and environmental attributes as well as its income producing potential.

Land the subject of the mining Project, including land identified as potentially required for air and noise buffer areas, was identified and valued based on actual acquisition costs and extrapolation of average acquisition costs to land not yet acquired. For the purpose of this analysis the opportunity cost of this land was estimated at $8.8M[1].

Part of this opportunity cost relates to foregone agricultural activity as a result of the area impacted by the open cut mine and contained infrastructure. The value of this foregone agricultural activity can be estimated from examination of the agricultural suitability of the subject land, identification of typical enterprise budgets and carrying capacities for the area.

[1] It should be noted that this is an overestimate of the opportunity cost of affected land, as some land will only be marginally impacted eg. by noise or air impacts, and hence the whole value of the property will not be lost.

The Project impacts three agricultural suitability classes defined as:

- Class 3 – Grazing land or land well suited to pasture improvement. It may be cultivated or cropped in rotation with pasture. The overall production level is moderate because of edaphic or environmental constraints. Erosion hazard, soil structural breakdown and other factors including climate may limit the capacity for cultivation, and soil conservation or drainage works may be required (Riddler, 1996).
- Class 4 – land suitable for grazing but not for cultivation. Agriculture is based on native pastures or improved pastures established using minimum tillage techniques. Production may be seasonally high but the overall production level is low as a result of major environmental constraints (*ibid*.).
- Class 5 – Land unsuitable for agriculture or at best suited to only to light grazing. Agricultural production is very low to zero as a result of severe constraints, including economic factors, which preclude land improvement (*ibid*.).

There is no Class 1 or 2 land affected by the Project.

Table I2.2 summarises the area of land within the proposed open cut mine and contained infrastructure area in terms of agricultural suitability and vegetation status.

Table I2.2
Impact of the Project on Agricultural Land

Agricultural Class	Vegetated (ha)	Cleared (ha)
3	130	1,494
4	20	1
5	140	135
Total	**290**	**1,630**

Source: After JAMMEL, 2005; FloraSearch, 2005

Table 12.2 indicates that 1,920 ha of agricultural land would be impacted by the Project[2] with 290 ha of this vegetated and 1,630 cleared.

Agricultural production in the area is predominantly grazing of sheep and cattle with some limited cropping.

NSW Department of Primary Industries (DPI, formerly NSW Agriculture) produces a number of indicative farm budgets that can be used to estimate the gross margin that can be obtained from different agricultural production systems.

Advice from NSW DPI suggests sheep gross margins of $26 to $30 per dry sheep equivalent (DSE) and beef gross margins of between $27 and $39 per DSE. The average DSE for the district is in the order of 7 per ha, although the subject land's agricultural suitability classification is likely to mean a lower DSE, say in the order of 5 per ha. Based on this assumption, gross margins per ha would range from $130 to $195 per ha. The opportunity cost of agricultural production, discounting at 7% in perpetuity would be in the order of $1,850 to $2,785 per ha or $3.5M to $5.3M.

[2] This is the land for which agriculture would cease ie. the land impacted by the open cut mine and contained infrastructure.

In addition, proposed ECAs (480 ha) and regeneration areas (350 ha) adjoining the open cut mine and contained infrastructure areas, may impact on agricultural production. Assuming that grazing is totally prohibited from these areas and using the same assumptions as above, the opportunity costs is likely to be in the order of $1.5M and $2.3M.

Mining and Infrastructure Capital Costs

The capital costs associated with the Project include:

- construction of the CHPP;
- civil works (eg. earthworks, services, buildings etc);
- pre-mining costs (eg. mine planning, modelling, project management); and
- other construction works.

These capital costs are estimated at in the order of $86M and will occur primarily in Year 1. Ongoing capital expenditure of $109,000 pa is also assumed to occur over the life of the Project. For the purpose of the analysis GST has been added to these costs.

Mine and Processing Operating Costs

The annual operating costs of the Project comprise:

- management costs;
- mining costs;
- haulage costs;
- pit services;
- rehabilitation costs;
- CHPP costs;
- contractor overheads and margins; and
- delivery costs (free on board for exports) and to Macquarie Generation.

In total these resource costs are estimated to be in the order of $131M per annum. It should be noted that while royalties are a cost of the Project, they are part of the overall producer surplus benefit of the mining activity that is redistributed by government. Royalties have therefore not been included in the calculation of the resource costs of operating the Project. GST on inputs to production (excluding land acquisition for which no GST is payable) has also been added to the above resource costs, since net GST is part of the surplus generated by the Project but redistributed to Government.

Sale Value of Coal

The provisional mining schedule for the Project is provided in Table I2.3.

Table I2.3
Provisional Mining Schedule

Year	Open Cut Waste Rock (Mbcm)	Open Cut ROM Coal (Mtpa)	CHPP Rejects (Mtpa)	Product Coal (Mtpa)	
				Domestic	Export
1	1.0	1.5	0.4	0.9	0.2
2	5.5	9.5	2.7	5.6	1.2
3	7.7	13	3.4	7.6	2.0
4	11.0	13	3.4	7.8	1.8
5	11.2	13	3.4	8.3	1.3
6	9.3	13	3.5	8.1	1.4
7	13.8	13	3.3	7.9	1.8
8	12.9	13	3.3	7.5	2.2
9	19.5	13	3.6	7.4	2.0
10	14.3	13	3.6	7.6	1.8
11	19.1	13	3.5	7.3	2.2
12	18.5	13	4.0	7.4	1.6
13	17.1	13	4.0	7.4	1.6
14	15.6	13	4.1	7.5	1.4
15	19.2	13	3.7	8.2	1.1
16	22.7	13	3.6	7.3	2.1
17	26.5	13	3.7	7.2	2.1
18	23.8	13	4.0	7.6	1.4
19	25.0	13	4.2	7.4	1.4
20	26.4	13	4.0	7.4	1.6
21	9.8	5.6	1.8	3.2	0.6
Total	**329.9**	**250.6**	**71.2**	**146.6**	**32.8**

Source: WCPL (2004)

Average annual production is approximately 7.0 Mtpa domestic product coal and 1.6 Mtpa of export coal.

While in the short run export thermal coal is obtaining prices up to $65 per tonne, a reasonable medium term average real price for export thermal coal is $50 FOB (Austock Coal Research Report, 2004).

Based on consideration of the coal grade (average of 22.8 Gigajoules [Gj] per tonne), the medium term real value of the domestic coal is considered to be $27.36 per tonne, exclusive of GST. In accordance with Sinden and Thampapillai (1995), if the output is a net increase in total output, it should be valued at what consumers are willing to pay for it – which is the price inclusive of GST. Hence for the purpose of the analysis a domestic price of $30.10 (inclusive of GST) has been used.

Hence, the average annual value of the coal is estimated to be $288M.

Residual Value at End of the Evaluation Period

At the end of the Project, capital equipment and land may have some residual value that is a benefit to WCPL. However, for the purpose of this analysis, capital equipment and land the subject of the mine are assumed to have no residual value.

I2.3.2 External Costs and Benefits

The EIS main text and specialist appendices provide a detailed consideration of the potential environmental impacts of the Project and the proposed means of mitigation. These main potential environmental impacts are briefly considered below from an economic perspective.

Groundwater – Potential impacts on groundwater resources due to open cut mining and the use of bores to supply make-up water to the Project include impacts on the depth of the water table, impacts on other groundwater users and the possible transference of pollutants to groundwater.

The groundwater assessment identified the potential for the drawdown of the local water table due to the dewatering of the open cut workings and pumping from water supply bores, and the potential reduction of expression of groundwater into Wilpinjong Creek. The groundwater table would be expected to recover gradually following the completion of mining. WCPL would monitor the effect of the Project on the groundwater system. Mitigation measures would include deepening of water supply bores or lowering of pump-set positions if monitoring indicates an adverse impact on existing groundwater users.

Where the groundwater impacts of the Project reduce artesian expression of groundwater to the streams in the Project area, it may impact on any production reliant on stream flows as well as consumer surpluses associated with use or non-use of streams which could potentially be measured by the productivity method, travel cost method, contingent valuation or choice modelling. Modelling indicates a maximum potential reduction in annual average flow in Wilpinjong Creek of 11%. The reduction in baseflow contribution would have lesser impact on the average flows of Wollar Creek (below the Wilpinjong Creek confluence).

Any impacts on registered private and domestic bores could potentially be valued at the cost of any required treatment or provision of an alternative water resource.

Providing the tailings management recommendations of the geochemical assessment (Appendix C of the EIS) are implemented, the long term groundwater quality of the Project area is expected to be similar to the current groundwater quality in the Ulan Seam.

Surface Water – the Project is located within the catchment of the Goulburn River, which is a major tributary of the Hunter River. Within the MLA 1 area, Cumbo, Bens, Narrow, Spring and Planters Creeks drain into Wilpinjong Creek which in turn joins Wollar Creek approximately 4 km downstream of the confluence of Cumbo and Wilpinjong Creeks. Wollar Creek flows into the Goulburn River approximately 12 km north of the village of Wollar.

The Project would include the relocation of the lower section of Cumbo Creek. Temporary relocation of this section of the Creek could potentially impact use and non-use values of consumers and be valued using the contingent valuation method or choice modelling.

Water supply for the Project would be in the form of recycled water from tailings emplacements, capture of runoff from active mining and operational areas and groundwater extraction predominantly from the Ulan Seam and Marrangaroo Sandstone via collection of pit inflow and a water supply borefield.

Water management and mitigation measures include:

- the effective diversion of runoff from undisturbed areas around areas of disturbance;
- the containment, and treatment where necessary, of runoff from areas of disturbance; and
- water conservation via maximising reuse.

A site water management plan would be developed to minimise the potential for contamination of surface water resources and to detail on-site water management. The Project includes the regeneration of areas of riparian vegetation along Wilpinjong and Cumbo Creeks.

Noise and Blast Vibration – noise and blasting on-site has the potential to impact on sensitive receptors such as nearby residences and buildings. Analysis indicates that Project vibration effects would exceed relevant criteria at one residence to the immediate north of the Project open pits. An increase in noise levels associated with the open cut workings and product coal rail movements would be experienced at sensitive receptors in close proximity to the development. Noise mitigation measures have been included in the development where practicable to minimise these impacts (eg. the use of noise reduction measures on mobile and fixed equipment) and an ongoing noise and blast vibration monitoring program would be implemented over the life of the Project.

Any impact on adjoining landholders could potentially be valued using the property valuation method ie. how property prices are affected by the noise and blast vibration. However, the land included in the estimation of the opportunity cost of land in Section I2.3.1 is considered to already include all land that would be adversely impacted by the mine via noise and blast vibration. This impact has therefore already been incorporated into the analysis.

Air Quality - potential air quality impacts include dust generation and minor gaseous emissions from the CHPP and open cut mining operations to the surrounding environment. However, any potential externality costs would be largely internalised. Dust suppression methods such as hoods, shrouds, dust suppressants and road watering would be used where appropriate. Also, the land included in the estimation of the opportunity cost of land in Section I2.3.1 is considered to already include all land that would be adversely impacted by the mine via dust emissions. This impact has therefore already been incorporated into the analysis.

***Transport* –** potential impacts on road transport associated with the Project include increased traffic flows on local roads associated with workforce movements and deliveries to the mine. Some alteration of the local road network would also be required including the closure of local access roads in the MLA 1 area and provision of a new intersection on Wollar Road for the Project access road. This latter cost is included in the estimate of capital costs in Section I2.3.1.

The costs of construction and operation of the rail spur and loop are also included in the above capital and operating cost estimates. Rail movements on the Gulgong-Sandy Hollow railway would increase as a result of the Project transport of product coal to the electricity generation facilities in the Hunter Valley and for export via the Port of Newcastle.

Non-Aboriginal Heritage – a non-Aboriginal heritage assessment indicates that the Project would impact on a number of items of local heritage significance, including houses, cottages, sheds and other rural items such as fences and embankments. No sites of regional, state or national significance were identified. Archival recordings of nine sites were completed as a mitigation measure. Any impacts on non-Aboriginal heritage may impact the consumer surplus of visitors to these items as well as people's non use values. These could potentially be measured through the contingent valuation method.

Aboriginal Heritage - archaeological surveys have been conducted within the Project disturbance area and selected adjoining areas. A number of Aboriginal sites have been recorded including a number of individual finds and artefact scatters in the Project disturbance areas and the ECAs. Outside of the Project disturbance area a large number of rock shelters were recorded, including three rock shelters with rock art. Scarred trees were identified both inside and outside of the Project disturbance area.

Mitigation measures proposed by WCPL include avoidance where feasible, salvage and collection of artefacts from open cut disturbance areas prior to mining and relocation of artefacts back onto post mining landforms. Sites located outside of the Project disturbance area including shelters with rock art, scar trees and large artefact scatters and rock shelters would also be managed to minimise indirect impacts.

Any impacts on heritage may impact the consumer surplus of individuals within the indigenous and broader community. These could potentially be measured through the contingent valuation method although such techniques have limited application to indigenous communities.

To some extent these have been included in the analysis via the incorporation of the costs of the three ECAs adjoining the Project disturbance area for the conservation of Aboriginal heritage and flora/fauna.

Flora and Fauna – the majority of the Project disturbance is located in areas of existing clearing associated with grazing and limited cropping. However, there are some areas of remnant or regrowth vegetation that would be removed by the open cut developments. A number of threatened flora and fauna species were identified in the Project area and surrounds.

Any impacts on flora and fauna species would likely affect the non use economic values (consumers' surplus) of individuals and could potentially be interpreted in an economic context via surveys to elicit the community's willingness to pay to avoid any potential impacts ie. the contingent valuation method or choice modelling.

To some extent any impacts on flora and fauna species have been internalised by WCPL's proposed mitigation measures which include the progressive rehabilitation of the open cut area to a combination of native woodland and grazing areas and commitment to three large ECAs adjoining the Project disturbance area for conservation of flora/fauna and Aboriginal heritage.

Greenhouse Gas Generation – the Project would generate carbon dioxide (CO_2) predominantly from the use of electricity and diesel in fixed and mobile equipment. Some CO_2 and methane (CH_4) would also be released in the form of fugitive emissions, as the coal is mined. Gas testing on-site indicates approximately 1.2t of CO_2-e would be released as fugitive emissions per tonne of ROM coal mined. This emission rate per tonne of ROM coal is low in comparison to most underground and open cut mines in NSW, because the coal seams at the Project are very shallow and the majority of coal seam gases have already been naturally liberated.

The amount of carbon dioxide equivalent (CO_2-e) generated by the Project is estimated to vary over time as production varies, on average the annual CO_2-e per annum is estimated at 92,784 tonnes.

There is no single agreed and robust price or cost per unit of CO_2-e emissions, rather there are a variety of approaches that can be taken to deriving a price or cost. These different approaches do not yield a single price/cost, but a range from near zero to $15 per tonne CO_2-e. This range was obtained by accounting for a number of sources of information including:

- the observation that, on a global basis, the vast majority of emissions are not regulated, taxed or included in emissions trading schemes;
- the observed value of early trades in carbon, facilitated by independent brokers or as part of early regulatory schemes;
- the observed value of carbon trades in the NSW Electricity Benchmarks Scheme;
- the implied value of carbon emissions from economic modelling studies of the impact of Australia seeking to achieve particular emissions targets;

- the implied value of optimal carbon changes derived from economic studies that seek to determine the best balance between avoiding the costs of climate change and avoiding the economic slowdown from abatement; and
- the subsidies per tonne of emissions avoided (implicit or explicit) that the Australian Government as been prepared to pay through a number of its schemes including the Mandatory Renewable Energy Target scheme and the Greenhouse Gas Abatement Program.

Using this range, total costs of CO_2-e emissions from the Project would be in the order of between $0M to $1.4M per annum. For the core analysis a figure of $10 per tonne CO_2-e has been used ie. an average of annual cost of $927,840.

Visual Impacts – the Project would be visible from the Ulan-Wollar Road (local unsealed road) and other elevated locations within the local area, however the progressive backfilling of the mined out areas and the screening effects of surrounding ridges and topography indicate only a very limited number of private residences would have views of the proposed development. To minimise visual impacts, rapid rehabilitation of the backfilled mine area would be undertaken wherever practicable and in one case some visual screening at the receiver location may be employed to reduce impacts in the short term. Visual intrusion can potentially impact the consumer surplus of affected households (reflected in changes in property values of affected lands) and visitors to surrounding areas (which can be measured via the contingent valuation method).

I2.4 CONSOLIDATION OF VALUE ESTIMATES

To determine the threshold value, a 7% discount rate was used to consolidate the streams of quantified production costs and benefits over time into a present value. It was found that at a 7% discount rate, the net incremental production benefits of the Project would be in the order of $1,454M net present value (NPV) essentially distributed between Macquarie Generation and WCPL.

I2.5 APPLICATION OF DECISION CRITERIA

The main decision criterion for assessing the economic desirability of a proposal is usually the net present value (NPV). The NPV is the sum of the discounted benefits less the sum of the discounted costs. A positive NPV indicates that it would be desirable from an economic perspective for society to allocate resources to the Project, because the community would obtain net benefits from the Project. In this instance, because the potential environmental impacts of the proposal have not been valued, the NPV represents a threshold value.

What this indicates is that, on the basis of the assumptions made, there are likely to be net incremental production benefits (after internalisation of agricultural impacts, noise and blast vibration impacts, air quality impacts, flora and fauna impacts and Aboriginal heritage impacts) of $1,454M from the Project. If the potential residual environmental and social impacts of the Project, after mitigation, were likely to be valued at greater than $1,454M then from an economic efficiency perspective the proposal would not be desirable. However, to the extent that the potential external economic costs of the proposal may be able to be substantially ameliorated or are considered to be valued at less than $1,454M, the Project would be desirable from an economic efficiency perspective.

I2.6 SENSITIVITY ANALYSIS

The above result 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 1997) to determine the effect on the NPV. In this analysis, the net production benefit (threshold value) was tested for changes to the following variables:

- capital costs;
- operating costs; and
- coal values.

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 coal values, operating costs would need to double to result in a negative NPV. Similarly, domestic value of coal would need to reduce to less than 35% of the assumed value for the NPV to be negative.

I2.7 BENEFIT COST ANALYSIS CONCLUSION

The Project is estimated to result in incremental net production benefits of in the order of $1,454M. This figure represents the opportunity cost to society of not proceeding with the proposal. Interpreted another way, any environmental impacts from the proposal, after mitigation by WCPL, would need to be valued at greater than $1,454M to make the Project questionable from an economic efficiency perspective.

This is equivalent to each household in the Mudgee, Merriwa and Rylstone region having a willingness to pay of $154,000 to avoid any of the residual environmental and social impacts of the Project, after mitigation by WCPL. The equivalent figure for the NSW households is $575.

I3 REGIONAL ECONOMIC IMPACTS

I3.1 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 employment, income, gross regional product and gross regional output.

These indicators can be defined as follows:

- ***Gross regional output*** - is the gross value of business turnover;
- ***Value-added*** – is 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*** – is the wages paid to employees including imputed wages for self employed and business owners; and
- ***Employment*** – is 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 Project; and
- the impact of the operation of the Project.

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 associated with the Project 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 Project have been estimated for two regions:

- NSW; and
- the region comprising the former LGAs of Mudgee, Merriwa and Rylstone.

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 regional 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 Project (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, p 2-1).

I3.2 INPUT OUTPUT TABLE AND ECONOMIC STRUCTURE OF THE REGION

For this study, two input output tables were used:

- a 2000-01 input-output table of the NSW economy developed by the Centre for Agricultural and Regional Economics (CARE) using the Generation of Regional Input-output Tables (GRIT) procedure; and
- a 2000-01 input-output table of the regional economy, developed by Gillespie Economics using the GRIT procedure.

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

Highly aggregated 2001 input-output tables for NSW economy and the regional economy are provided in Table I3.1 and Table I3.2. 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 (from the region) employed in each industry is also indicated in the final row.

Table I3.1
Aggregated Transactions Table: NSW Economy 2000-01 $'000

	Ag/Forest/ Fish	Mining	Manufact-uring	Utilities	Building	Services	TOTAL	H-hold Exp	O.F.D	Exports	Total
Ag/Forest/Fish	837,023	2,439	3,121,709	463	10,066	306,839	**4,278,539**	822,126	636,626	4,125,589	**9,862,880**
Mining	5,652	212,186	2,432,110	271,315	90,610	127,306	**3,139,179**	26,585	-50,440	4,328,971	**7,444,294**
Manufacturing	1,270,348	738,871	25,149,154	609,260	5,078,821	17,615,714	**50,462,167**	21,910,219	10,266,636	42,420,940	**125,059,963**
Utilities	69,799	100,205	1,466,256	792,155	34,026	2,334,402	**4,796,843**	4,767,459	204,846	17,348	**9,786,495**
Building	28,667	22,626	11,186	6,429	12,744	909,975	**991,627**	0	17,134,126	24,527	**18,150,280**
Services	1,626,674	1,005,985	17,524,606	1,417,175	3,429,349	74,234,660	**99,238,449**	89,172,065	43,542,228	30,352,294	**262,305,037**
TOTAL	**3,838,163**	**2,082,311**	**49,705,021**	**3,096,798**	**8,655,616**	**95,528,896**	**162,906,804**	**116,698,453**	**71,734,023**	**81,269,669**	**432,608,949**
H-hold Income	2,991,412	1,105,865	11,831,244	1,122,199	6,329,488	70,585,278	**93,965,486**	0	0		**93,965,486**
O.V.A.	2,093,100	2,641,217	16,720,602	4,357,212	2,112,604	79,161,739	**107,086,475**	20,925,131	3,174,230		**131,185,836**
Imports	940,204	1,614,901	46,803,096	1,210,287	1,052,571	17,029,123	**68,650,183**	19,657,219	13,591,792		**101,899,195**
TOTAL	**9,862,880**	**7,444,294**	**125,059,963**	**9,786,495**	**18,150,280**	**262,305,037**	**432,608,949**	**157,280,803**	**88,500,045**	**81,269,669**	**759,659,466**
Employment	96,130	15,095	322,393	20,835	194,118	2,092,051	**2,740,622**				

Table I3.2
Aggregated Transactions Table: Regional Economy 2000-01 $'000

	Ag/Forest/ Fish	Mining	Manufact-uring	Utilities	Building	Services	TOTAL	H-hold Exp	O.F.D	Exports	Total
Ag/Forest/Fish	14,627	52	42,787	2	28	665	**58,161**	1,738	14,180	75,185	**149,264**
Mining	58	2,677	6,454	1,272	254	300	**11,015**	67	553	185,536	**197,172**
Manufacturing	5,816	8,108	36,028	936	6,068	14,931	**71,887**	22,923	33,065	314,881	**442,755**
Utilities	908	2,187	5,567	3,341	85	4,798	**16,885**	11,405	12,014	1,519	**41,823**
Building	470	213	38	25	27	1,038	**1,812**	0	41,240	67	**43,119**
Services	16,734	14,017	58,329	3,045	4,849	77,587	**174,561**	119,721	157,837	78,820	**530,938**
TOTAL	**38,614**	**27,253**	**149,203**	**8,621**	**11,311**	**99,319**	**334,321**	**155,854**	**258,889**	**656,006**	**1,405,070**
H-hold Income	51,168	32,005	35,915	4,719	14,717	155,463	**293,988**	0	0		**293,988**
O.V.A.	28,434	72,626	71,646	18,601	5,836	141,278	**338,421**	52,897	11,456		**402,774**
Imports	31,047	65,287	185,992	9,883	11,254	134,878	**438,340**	188,844	49,053		**676,237**
TOTAL	**149,264**	**197,172**	**442,755**	**41,823**	**43,119**	**530,938**	**1,405,070**	**397,595**	**319,398**	**656,006**	**2,778,069**
Employment	1,691	397	1,003	88	428	5,085	**8,692**				

From the above tables, it can be seen that the value of the gross regional output for the NSW economy and the regional economy in 2001 is estimated by the model at $759,659M and $2,778M, respectively. However, it is generally considered that gross regional product (value-added) is a better measure of economic activity, as it avoids double counting associated with purchases of intermediate products.

Gross regional product for the NSW economy is estimated at $225,151M comprising $93,965M to households as wages and salaries (including payments to self employed persons and employers) and $131,185M in Other Value Added. Gross regional product for the regional economy is estimated at $696M, comprising $293M to households as wages and salaries (including payments to self employed persons and employers) and $676M in Other Value Added.

The employment totals were 2,740,622 and 8,692 for the NSW and regional economy, respectively.

The economic structure of the regional economy may be compared with that for NSW through a comparison of Figure I3.1 and Figure I3.2. This reveals that the agriculture, forestry and fishing sector, mining sector and manufacturing sector in the regional economy are of greater relative importance than they are to the NSW economy. While the building sector and, in particular, the services sectors are of less relative importance than they are to the NSW economy.

The destination of imports into the respective regions from all sources (overseas, inter regional and interstate) are shown in aggregate in Figures I3.3 and I3.4.

For NSW, the intermediate sector of manufacturing has the greatest reliance on imports while for the regional economy most intermediate sectors, apart from building and utilities, rely on imports. This reflects the small size of the economy and hence its inability to supply all the inputs demanded by industries.

Figure I3.1
Summary of Aggregated Sectors: Regional Economy (2000-01)

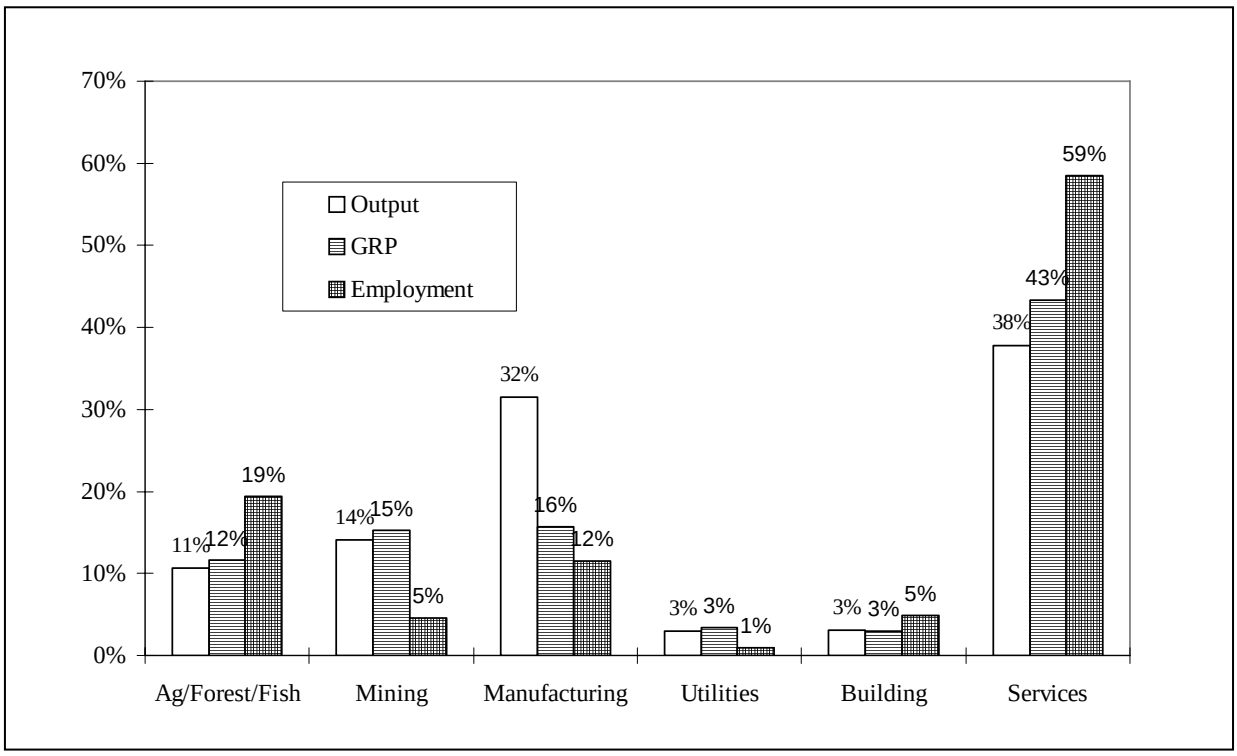


Figure I3.2
Summary of Aggregated Sectors: NSW Economy (2000-01)

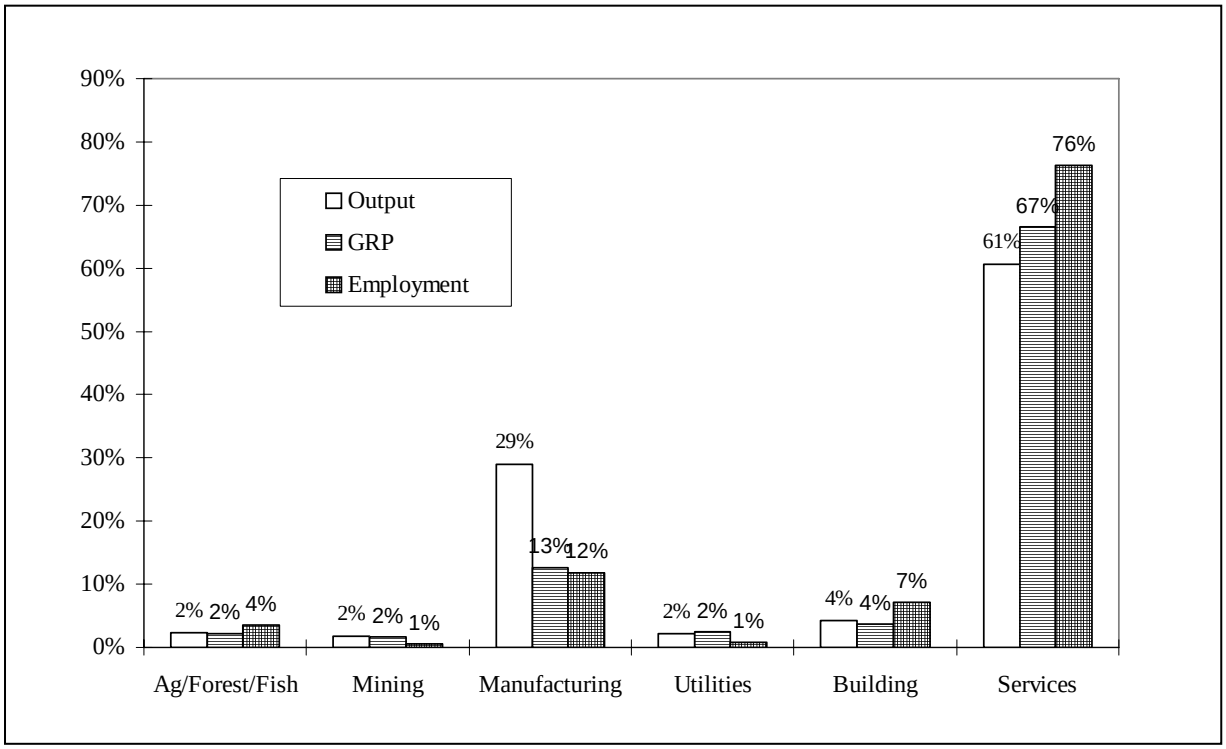
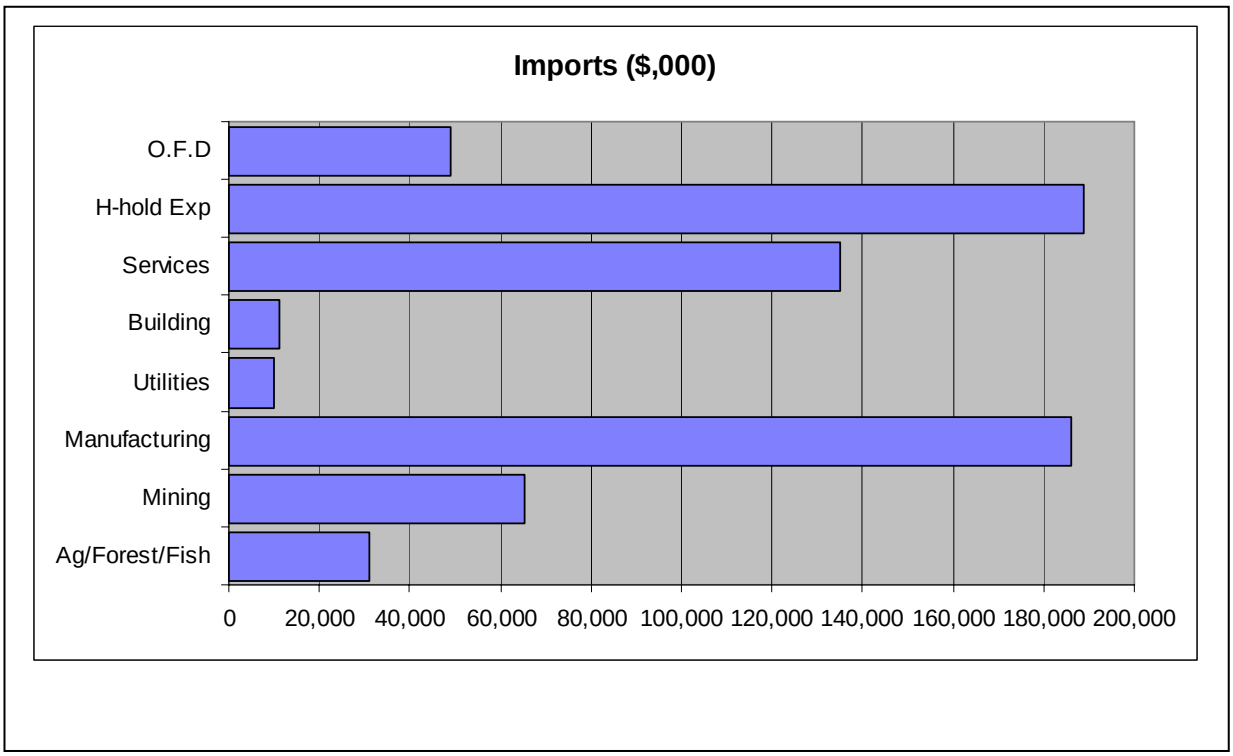
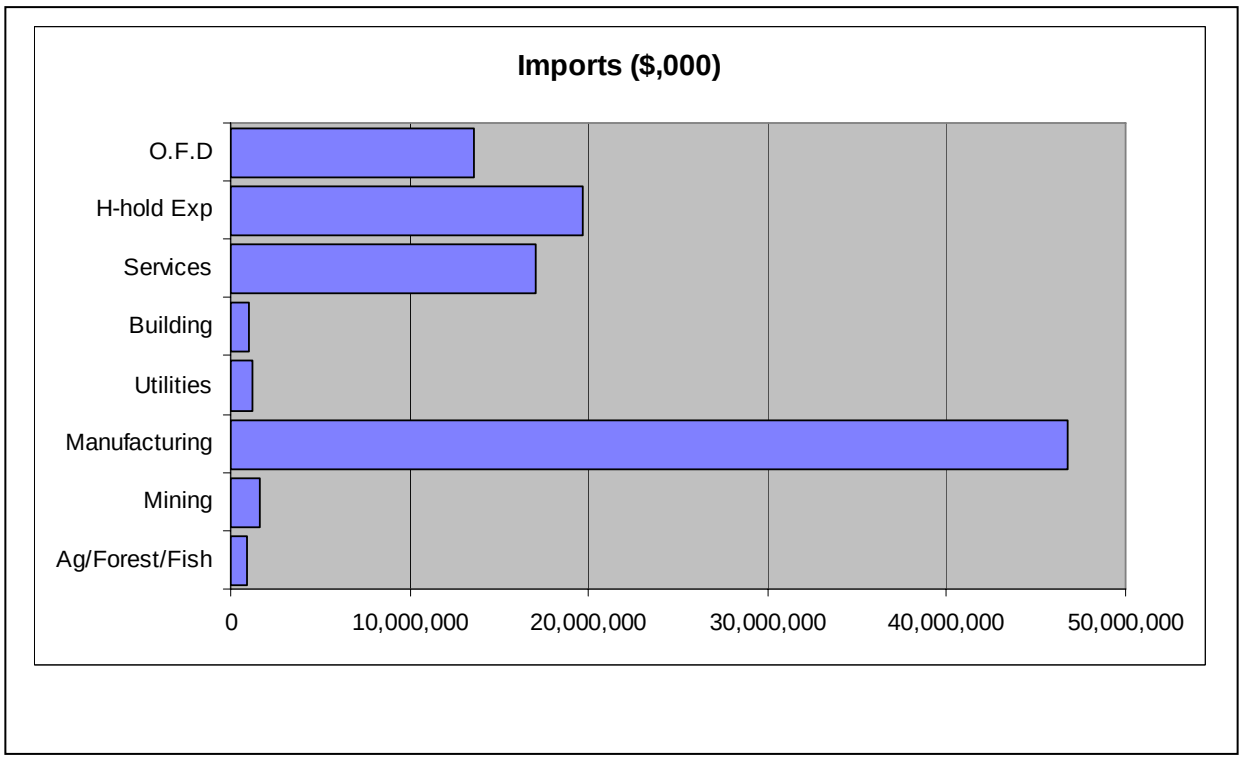


Figure I3.3
Regional Economy - Distribution of Imports by Destination Sector



Note: OFD is other final demand and includes Government final consumption expenditure, private gross fixed capital expenditure, public enterprise and general government gross fixed capital expenditure and increases in stocks.

Figure I3.4
NSW Economy - Distribution of Imports by Destination Sector



Figures I3.5 to I3.10 provide a more expansive sectoral distribution of gross regional output, employment, household income, gross regional product, 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 coal mining sector is by far the most significant sector of the regional economy followed by food manufacturing which is predominantly wine and spirits manufacturing and meat and meat products manufacturing. However, reflecting the capital intensive nature of mining, coal mining is 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 education and health services sectors), sheep and beef sectors and accommodation, cafes and restaurants. This reflects the labour intensive nature of these sectors. In terms of total wages paid to employers the coal sector, retail sectors, education, sheep, wholesale trade, health and beef sectors are significant. While not being the most significant contributor to regional employment, the coal mining sector is the most significant contributor to total regional incomes, reflecting the high average wage levels in this sector. The coal mining sector is also the major sector responsible for exports from the region, followed by the manufacturing sectors of wine and spirits, meat and meat products and concrete. Imports are more evenly spread across sectors with the major importing sectors being the coal mining sector, wine and spirits, wholesale and retail trade and concrete.

The coal mining sector is the most productive sector of the economy (as measured through Gross Regional Product per employee) and has the highest average wage of all the economy sectors.

I3.3 MULTIPLIERS

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

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

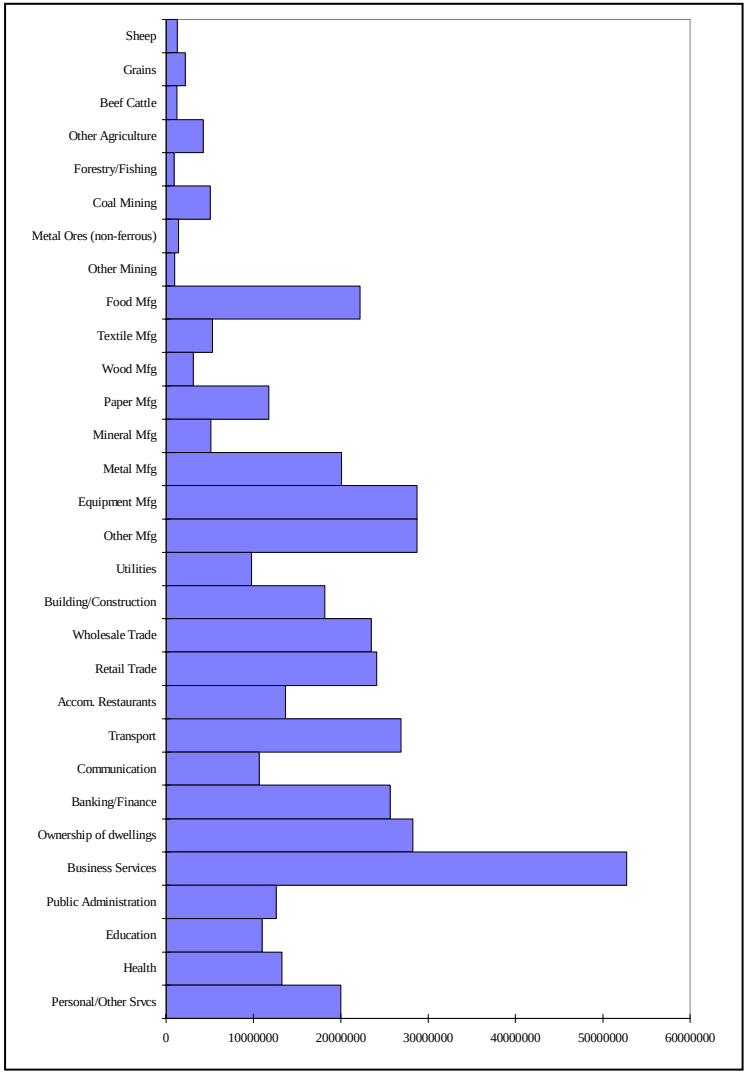
- “there is a fixed input structure in each industry, described by fixed technological coefficients;
- all products of an industry are identical or are made in fixed proportions to each other;
- each industry exhibits constant returns to scale in production;
- unlimited labour and capital are available 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.” (ABS 1995, p 24).

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, gross regional product and income multipliers show the gross regional output, employment, gross regional product and income responses to an initial gross regional output stimulus (Jensen and West, 1986).

Figure I3.5 Sectoral Distribution of Gross Regional Output ($,000)

NSW Economy



Regional Economy

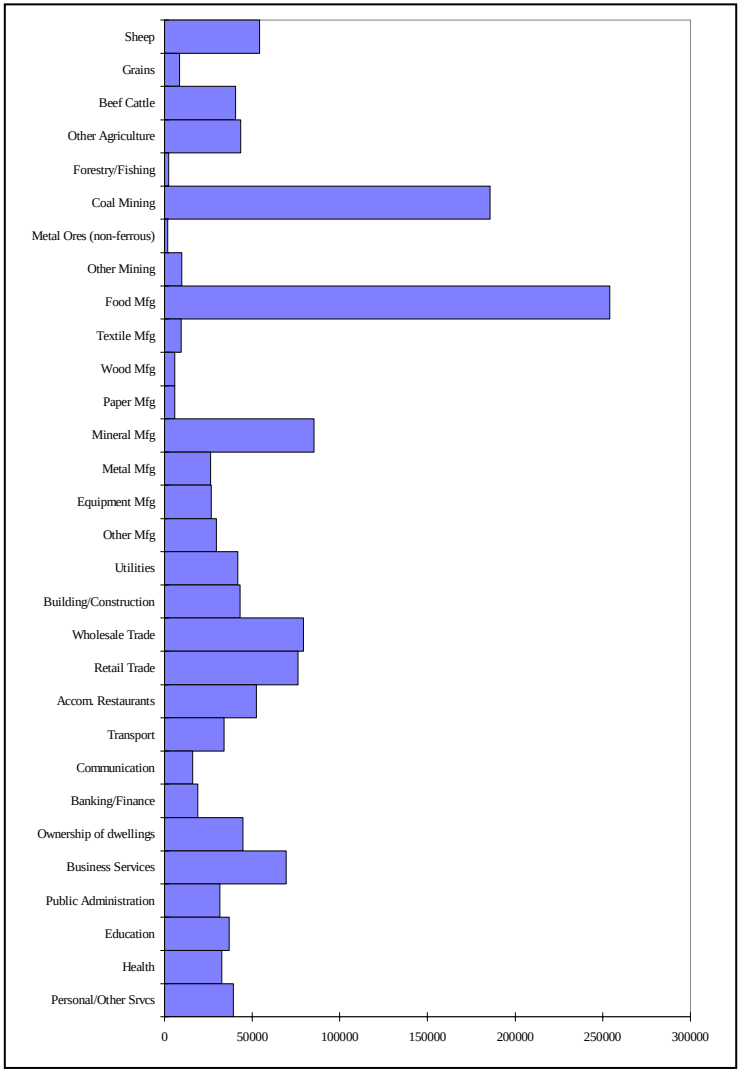
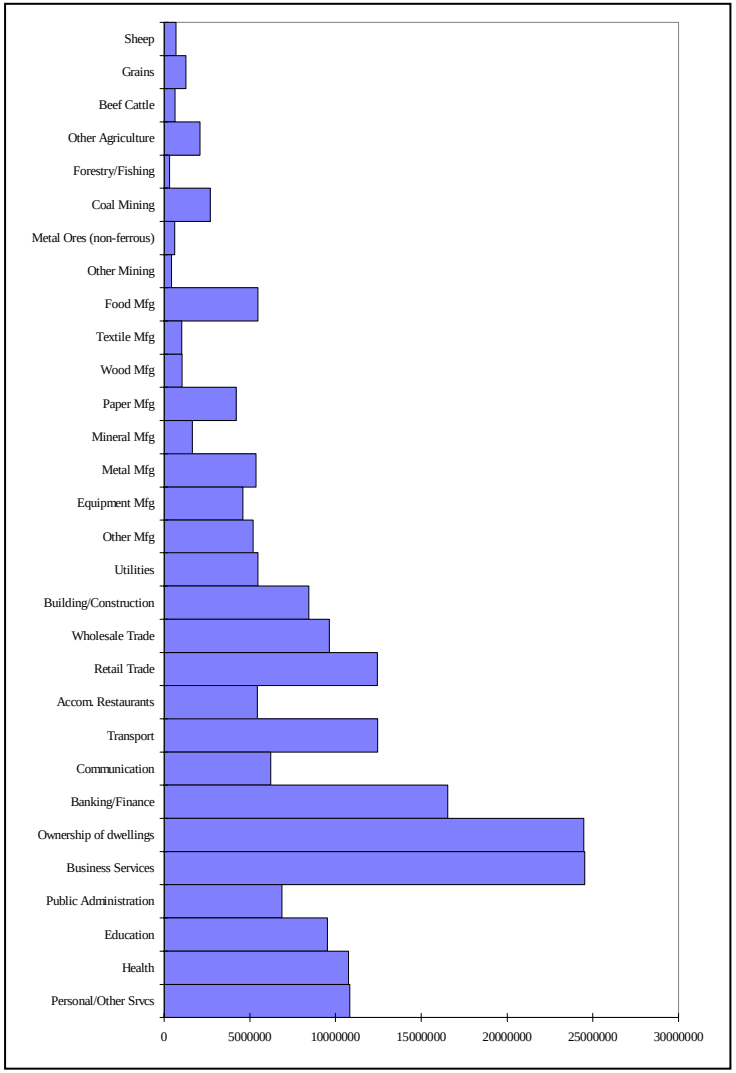


Figure I3.6 Sectoral Distribution of Gross Regional Product ($,000)

NSW Economy



Regional Economy

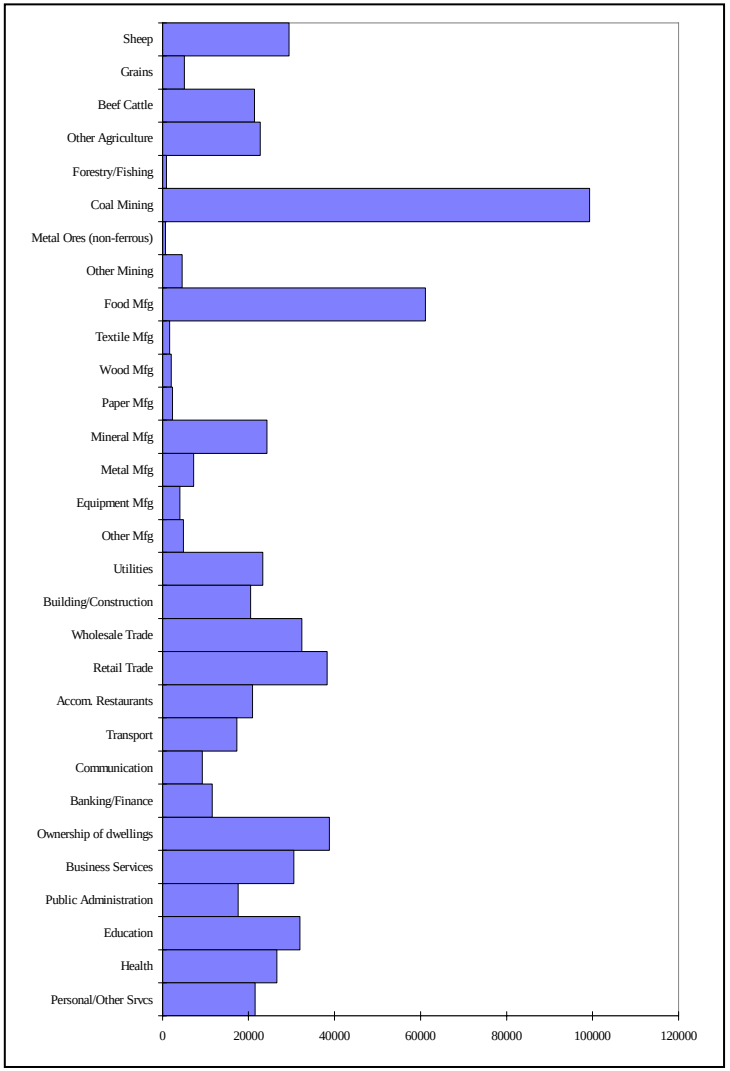
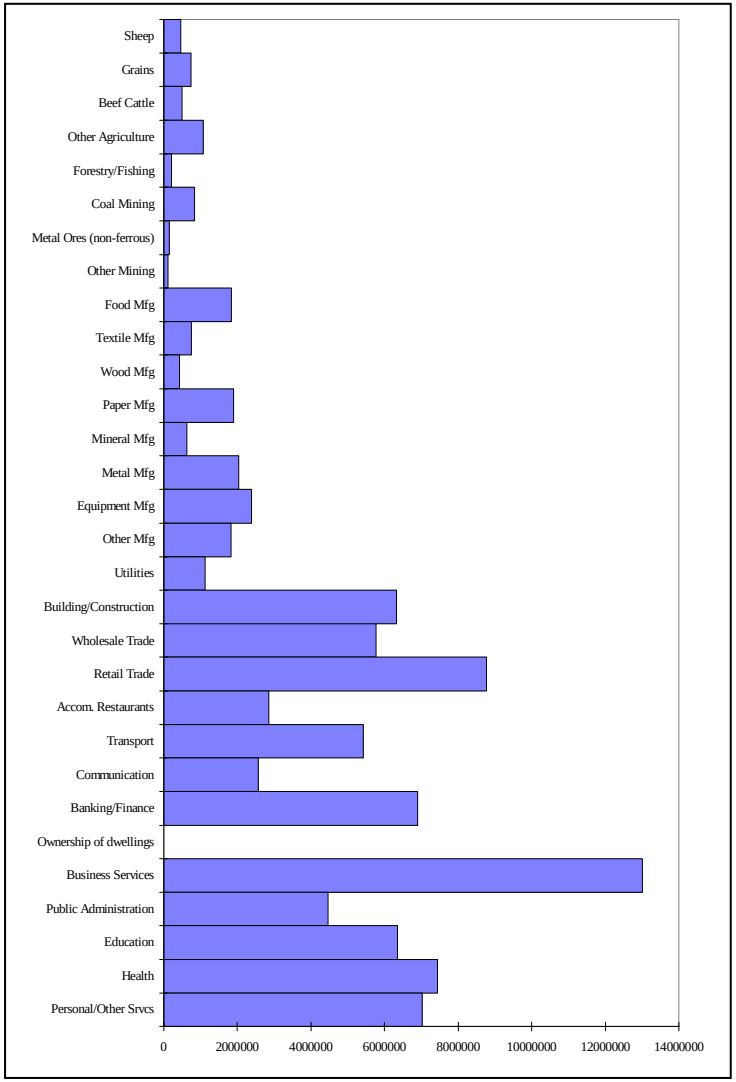


Figure I3.7 Sectoral Distribution of Gross Regional Income ($,000)

NSW Economy



Regional Economy

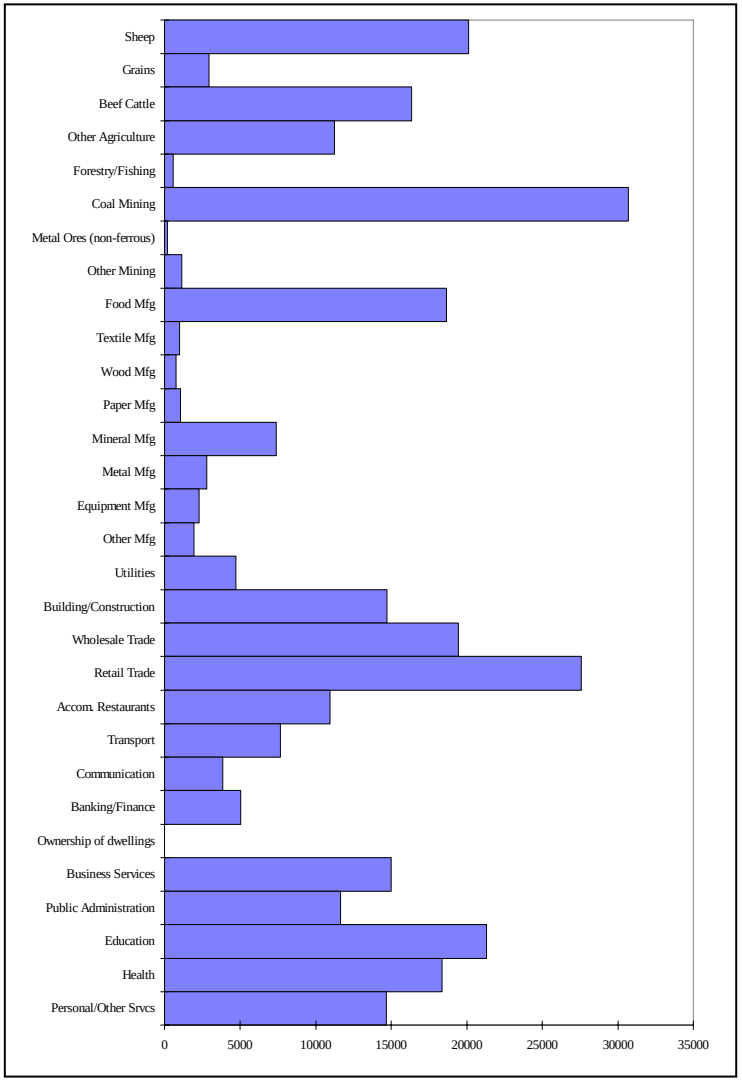
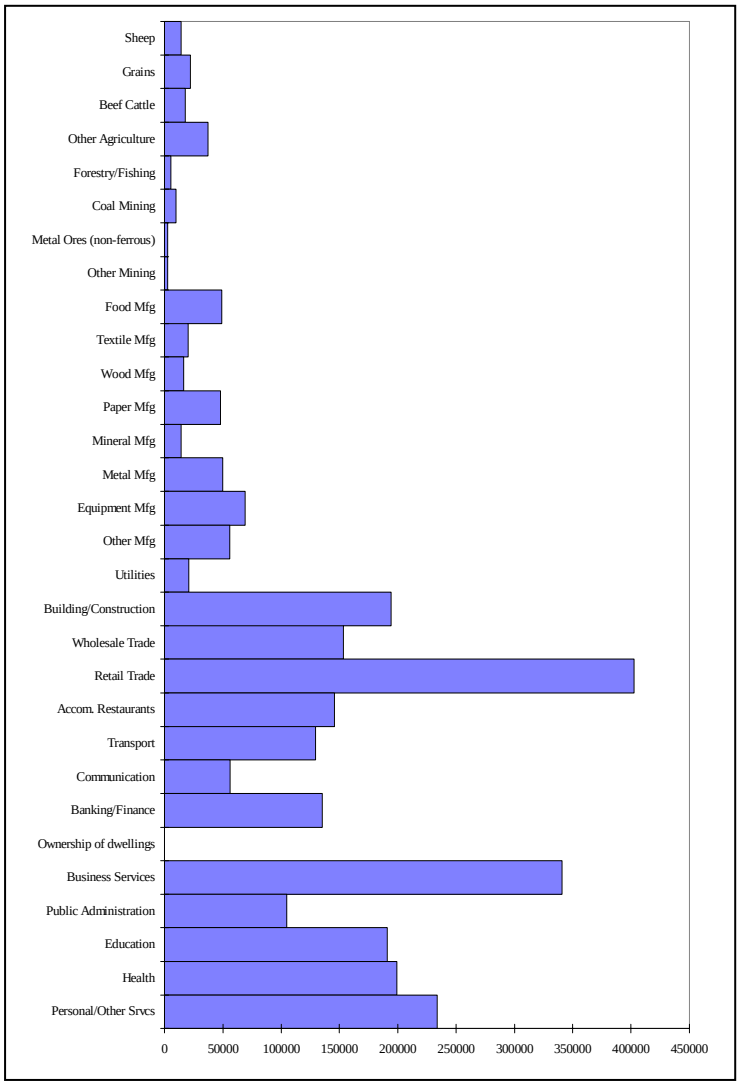


Figure I3.8 Sectoral Distribution of Regional Employment (No.)

NSW Economy



Regional Economy

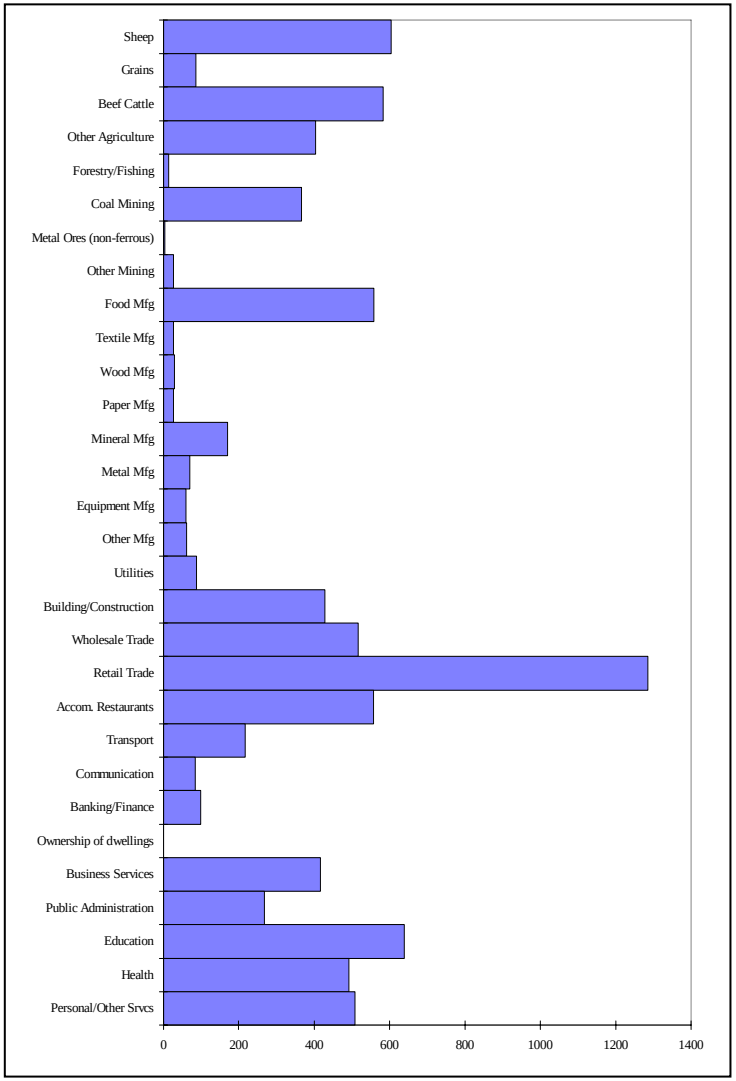
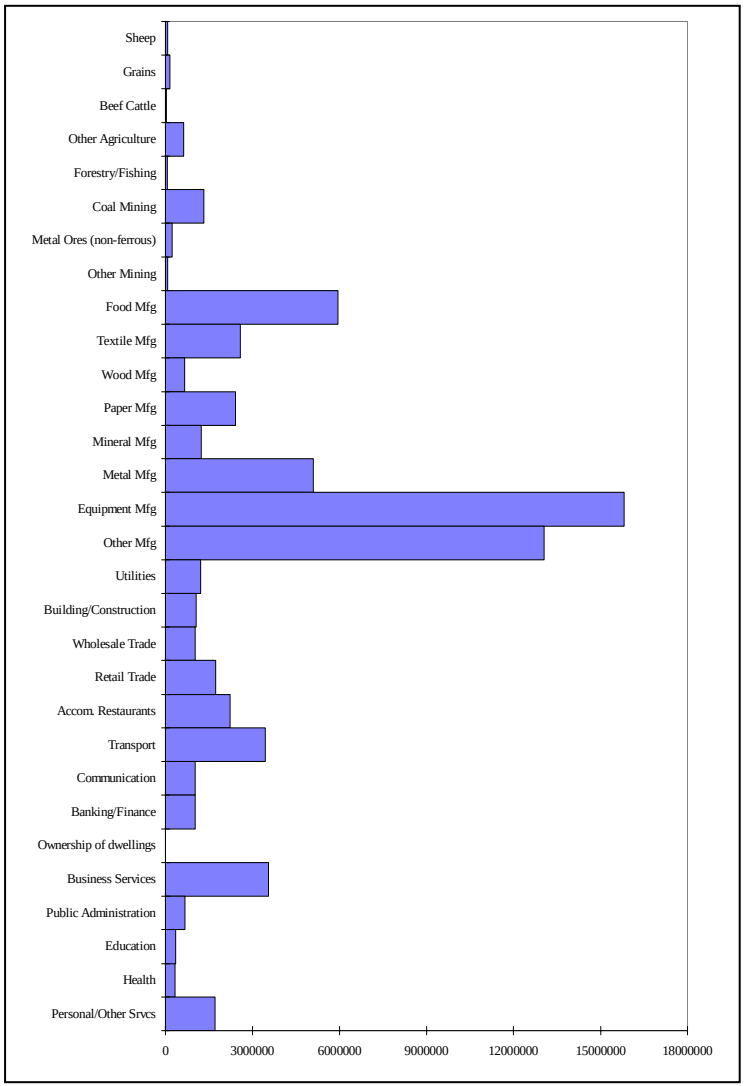


Figure I3.9 Sectoral Distribution of Imports ($,000)

NSW Economy



Regional Economy

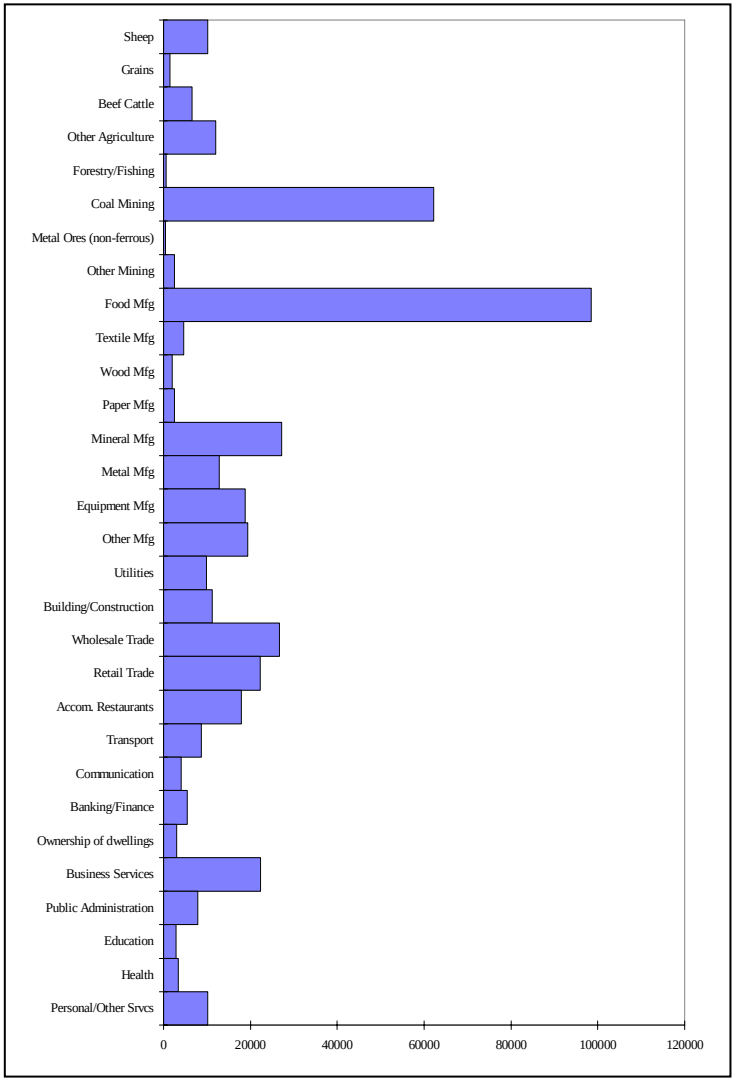
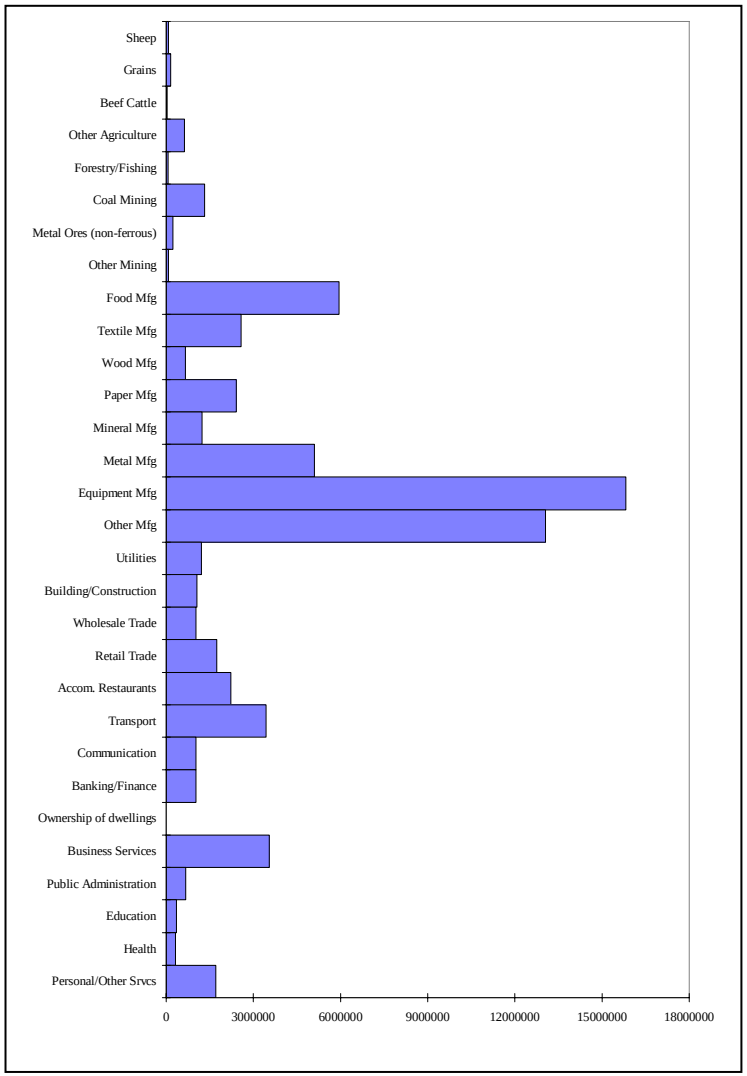
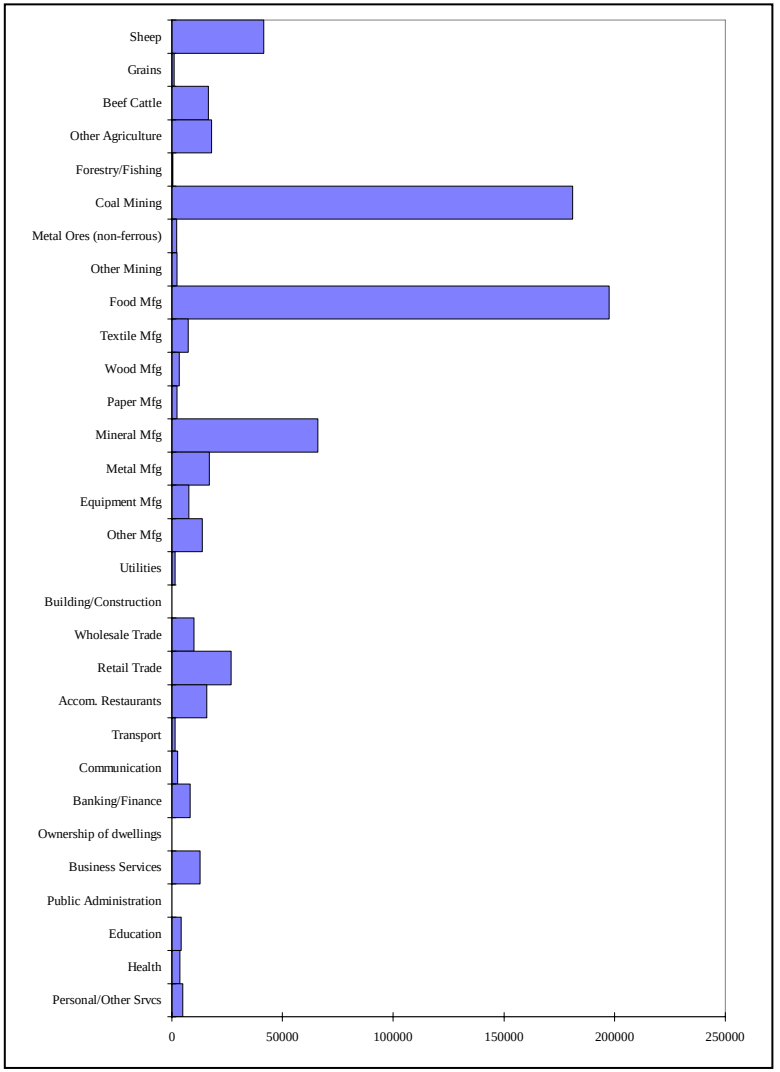


Figure I3.10 Sectoral Distribution of Gross Regional Exports ($,000)

NSW Economy



Regional Economy



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 (Powell and Chalmers, 1995; ABS, 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 (Powell and Chalmers, 1995; ABS, 1995).

Industrial support effects - the subsequent or induced extra output from intermediate sectors arising from the first round effects (Powell and Chalmers, 1995; ABS, 1995).

Production induced effects - the sum of the first round effects and industrial support effects ie. the total amount of output from all industries in the economy required to produce the initial $1 change in output (Powell and Chalmers, 1995; ABS, 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 (Powell and Chalmers, 1995; ABS, 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, gross regional product and income multipliers have similar components to the gross regional output multiplier, however, through conversion using the respective coefficients show the employment, gross regional product and income responses to an initial gross regional output stimulus (Jensen and West 1986).

For employment, gross regional product 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.

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

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

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

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

(Centre for Farm Planning and Land Management 1989, p.207)

Type 11A ratio multipliers are used in Section I3.4 to estimate the total regional economic impact of the Project.

I3.4 ECONOMIC IMPACT OF THE PROJECT

The revenue, expenditure and employment associated with the construction and operation of the Project will stimulate economic activity for the regional economy, as well as for the broader NSW economy.

The regional impacts of both these stimuli are estimated for the indicators of output, value-added, income and employment.

I3.4.1 Construction Phase

Economic activity associated with the Wilpinjong construction phase is estimated to mainly occur within three sectors of the economy:

- the other construction sector which includes those involved in the preparation of mine sites as well as the construction of non residential buildings, such as Coal Handling and Preparation Plants;
- other property services sector which is involved in the leasing of industrial machinery, plant or equipment; and
- agriculture, mining and construction machinery manufacturing sector which is involved in manufacturing construction, earthmoving and mining machinery.

I3.4.1.1 Impact on Regional Economy

Given the largely specialist nature of capital equipment and the relatively small size of the economy, for the purpose of this analysis it is assumed that all such purchases and the leasing of machinery are made outside the regional economy. Thus regional economic activity from the mine establishment phase primarily relates to the building and construction sector.

It is estimated that the construction workforce will average approximately 200 people and peak at 250 people.

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

- that the new other construction sector that temporarily establishes in the region will have the same input output coefficients and hence regional linkages as the existing building and construction sector in the region; and
- the 200 average direct workforce will have the same pattern of regional expenditure as a normal workforce within the region.

Under these assumptions in the order of $27.3M of the estimated $86M capital costs would need to be spent on other construction within the region to result in a direct workforce of 200 people. The direct and indirect regional economic impacts of this level of expenditure in the Mudgee, Merriwa and Rylstone region during the construction phase of the Project is provided below.

Impacts

On the basis of the above assumptions, Table I3.3 presents the estimated total and disaggregated regional economic impacts of the construction phase of the Project on the regional economy in terms of output, value added, income and employment.

Table I3.3
Unadjusted Regional Economic Impacts of the Construction Phase of the Project on the Regional Economy

	Direct Effect	Production Induced	Consumpt. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	$27,300	$8,903	$6,035	$14,938	$42,238
Type 11A Ratio	*1.00*	*0.33*	*0.22*	*0.55*	*1.55*
INCOME ($'000)	$8,841	$1,514	$1,585	$3,099	$11,939
Type 11A Ratio	*1.00*	*0.17*	*0.18*	*0.35*	*1.35*
VALUE ADDED ($'000)	$13,757	$3,349	$2,788	$6,136	$19,894
Type 11A Ratio	*1.00*	*0.24*	*0.20*	*0.45*	*1.45*
EMPL. (No.)	200	38	52	90	291
Type 11A Ratio	*1.00*	*0.19*	*0.26*	*0.45*	*1.45*

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 will only occur in a proportional way if workers and their families enter the region. The implicit assumption in the impact summary provided in Table I3.3, is that all employment generated by the construction phase is sourced from workers outside the region who subsequently migrate into the region. Advice from WCPL about the specialist nature of the construction workforce required for the Project suggests that in the order of 60% of the construction workforce will come from outside the region. Adjusted impacts taking this into account are provided in Table I3.4.

Table I3.4
Adjusted Regional Economic Impacts of the Construction Phase of the Project on the Regional Economy

	Direct Effect	Production Induced	Consumpt. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	$27,300	$8,903	$3,621	$12,524	$39,824
Type 11A Ratio	*1.00*	*0.33*	*0.13*	*0.46*	*1.46*
INCOME ($'000)	$8,841	$1,514	$951	$2,465	$11,305
Type 11A Ratio	*1.00*	*0.17*	*0.11*	*0.28*	*1.28*
VALUE ADDED ($'000)	$13,757	$3,349	$1,673	$5,021	$18,779
Type 11A Ratio	*1.00*	*0.24*	*0.01*	*0.25*	*1.25*
EMPL. (No.)	200	38	31	69	270
Type 11A Ratio	*1.00*	*0.19*	*0.16*	*0.35*	*1.35*

Other influences may also impact the estimate of construction impacts on the regional economy. These include:

- that the specialised nature of construction activity, particularly that related to construction of the CHPP may result in purchasing patterns that have a greater reliance on imports rather than local production; and
- that given the manner in which some of the labour will be accommodated ie. in an on-site camp, it is likely that individual expenditure pattern may differ and be less than the remainder of the workforce in the region.

Consequently, the impact estimates in Table I3.4 may tend to overstate likely regional economic impacts of construction. Nevertheless, based on the above approach, construction of the Project may contribute up to:

- $40M in annual direct and indirect regional output or business turnover;
- $19M in annual direct and indirect regional value added;
- $11M in annual direct and indirect household income; and
- 270 in direct and indirect employment.

Multipliers

The adjusted Type 11A ratio multipliers for the construction phase of the mining proposal range from 1.25 for value-added up to 1.46 for output.

Main Sectors Affected

Flow-on impacts from the construction phase of the Project are likely to affect a number of different sectors of the regional economy. The sectors most impacted by output, value-added and income flow-ons are likely to be cement manufacturing, wholesale and retail trade, road transport and accommodation.

Examination of the estimated direct and flow-on employment impacts gives an indication of which sectors employment opportunities would be generated in. This provides important information to the community infrastructure assessment to facilitate consideration of whether this increased demand can be met from the unemployed within the region or from people migrating from outside the region and hence implications for housing demand and demand for community infrastructure, etc.

Table I3.5
Distribution of Average Direct and Flow-on Employment by Industry Sector of the Construction Phase for the Regional Economy

Sector	Average Direct Effects	Production Induced	Adjusted Consumption-induced	Total
Primary	0	0	1	1
Mining	0	1	0	1
Manufacturing	0	10	1	12
Utilities	0	0	0	1
Wholesale/Retail	0	10	14	24
Building/Construction	200	0	0	201
Transport	0	5	1	6
Services	0	11	13	25
Total	**200**	**38**	**31**	**270**

Note: Totals may have minor discrepancies due to rounding.

Direct employment impacts would generate demand for mining employment. Production-induced employment impacts would mainly generate demand for employment in the:

- services sectors (predominantly other property services, legal, accounting and business management sector, scientific research, technical and computer services and other business services);
- wholesale and retail trade;
- manufacturing (predominantly cement lime and concrete slurry manufacturing, structural metal products manufacturing and fabricated metal products manufacturing); and
- transport sector (predominantly road transport).

Consumption-induced employment flow-ons would mainly generate demand in the:

- wholesale and retail trade sectors; and the
- services sectors (education, health, community services and other services).

I3.4.1.2 Impact on the NSW Economy

The NSW economy is likely to be able to also supply some mining machinery manufacturing and machinery leasing that would not be able to be supplied by the smaller Mudgee, Merriwa and Rylstone economy. Based on discussions with the mining contractors it is estimated that in the order of $47M of capital expenditure associated with the Project will be captured by the NSW economy as follows:

- $27.3M in the other construction sector;
- $3.4M in the other property services sector; and
- $16.7M in the agriculture, mining and construction machinery manufacturing sector.

Impacts

On the basis of this assumption, Table I3.6 presents the estimated total and disaggregated regional economic impacts of the construction phase of the Project on the NSW economy in terms of output, value added, income and employment.

Table I3.6
Unadjusted Regional Economic Impacts of the Construction Phase of the Project on the NSW Economy

	Direct Effect	Production Induced	Consumpt. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	$47,400	$35,896	$25,790	$61,685	$109,085
Type 11A Ratio	*1.00*	*0.76*	*0.54*	*1.30*	*2.30*
INCOME ($'000)	$10,875	$6,183	$5,066	$11,249	$22,124
Type 11A Ratio	*1.00*	*0.57*	*0.47*	*1.03*	*2.03*
VALUE ADDED ($'000)	$17,780	$13,560	$13,045	$26,605	$44,385
Type 11A Ratio	*1.00*	*0.76*	*0.73*	*1.50*	*2.50*
EMPL. (No.)	242*	149	147	296	537
Type 11A Ratio	*1.00*	*0.62*	*0.61*	*1.22*	*2.22*

* The additional 42 direct jobs generated by the construction phase in the NSW economy are associated with expenditures in the other property services sector and agriculture, mining and construction machinery manufacturing sector, that are not captured by the regional economy.

Again, the estimated consumption-induced flow-on effects will only occur if workers and their families enter the region. The implicit assumption in the impact summary provided in Table I3.6, is that all employment generated by the expenditure in NSW is sourced from workers outside of NSW who subsequently migrate into the region. A more realistic and conservative assumption is to assume all employment already resides within NSW. Adjusted impacts taking this into account are provided in Table I3.7.

Table I3.7
Adjusted Regional Economic Impacts of the Construction Phase of the Project on the Regional Economy

	Direct Effect	Production Induced	Consumpt. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	$47,400	$35,896	$0	$35,896	$83,296
Type 11A Ratio	*1.00*	*0.76*	*0.00*	*0.76*	*1.76*
INCOME ($'000)	$10,875	$6,183	$0	$6,183	$17,058
Type 11A Ratio	*1.00*	*0.57*	*0.00*	*0.57*	*1.57*
VALUE ADDED ($'000)	$17,780	$13,560	$0	$13,560	$31,340
Type 11A Ratio	*1.00*	*0.76*	*0.00*	*0.76*	*1.76*
EMPL. (No.)	*242*	*149*	*0*	*149*	*391*
Type 11A Ratio	*1.00*	*0.62*	*0.00*	*0.62*	*1.62*

Based on the above approach, construction of the Project would impact the NSW economy as follows:

- $83M in annual direct and indirect regional output or business turnover;
- $31M in annual direct and indirect regional value added;
- $17M in annual direct and indirect household income; and
- 391 in direct and indirect employment.

Multipliers

The adjusted Type 11A ratio multipliers for the construction phase of the mining proposal range from 1.57 for income up to 1.76 for output and value-added in the NSW economy.

Main Sectors Affected

As identified above, the direct affects of the construction phase of the Project on the NSW economy will occur in the other construction sector, other property services sector and the agriculture, mining and construction machinery manufacturing sector.

Flow-on impacts from the construction phase of the Project are likely to affect a number of different sectors of the NSW economy. The sectors most impacted by output, value-added, income and employment flow-ons include wholesale and retail trade, other property services, legal, accounting, marketing and business management services, scientific research, technical and computer services, other business services.

I3.4.2 Operation Phase

For the analysis of the operation phase of the Project, a new Wilpinjong sector was inserted into the regional input-output table and the NSW input-output table, indexed to 2004. To generate this new sector, cost and revenue data generated for the benefit cost analysis was further refined, as follows, to be in the form required for regional economic impact assessment:

- Average annual revenue (based on the market value of the coal) was adjusted to exclude GST and was allocated to the *total output* row of the new sector. For the smaller region of Mudgee, Merriwa and Rylstone revenue and costs were also adjusted to exclude coal transport costs since these would essentially occur outside the region.
- The *income* row was calculated from the estimated average annual level of employment and the average wage of those in the Coal sector.
- The difference between average annual gross revenue and average annual operating costs was allocated to the *other value-added sector.*
- Average annual operating costs (net of *income* paid to employment) was allocated between total *intermediate* sector usage and *imports* in the same ratios as for the Coal sector in Mudgee, Merriwa, Rylstone input-output table and NSW input-output table.
- Estimated total intermediate sector usage was then allocated across 106 sectors in the same ratios as for the Coal sector in Mudgee, Merriwa, Rylstone input-output table and the NSW input-output table.

The major difference between the sectors generated for the regional input-output table and the NSW input-output table was the greater revenue and input costs (intermediate plus imports) for NSW, reflecting the inclusion of transport costs and that NSW is able to provide a greater proportion of the inputs to production whereas the smaller region has greater reliance on imports.

Table I3.8
Project Sector for the Regional Economy and NSW Economy (2004 Dollars)

	Region	NSW
TOTAL INTERMEDIATE	$19,228,503	$53,691,305
Wages and Salaries	$8,367,785	$8,367,785
Other Value Added	$138,455,001	$138,455,001
Imports	$49,629,474	$68,580,005
OUTPUT	**$215,680,762**	**$269,094,095**
Employment	100	100

On this basis the estimated regional economic impacts of the operation phase of the Project were determined for the regional economy and for the NSW economy.

I3.4.2.1 Impacts

The total and disaggregated annual impacts of the operational phase of the Project on the regional economy and the NSW economy in terms of output, value added, income and employment (in 2004 dollars) are shown in Table I3.9 and Table I3.10.

Table I3.9
Unadjusted Annual Regional Economic Impacts of the Operation Phase of the Project on the Regional Economy

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	215,681	24,563	7,611	32,174	247,855
Type 11A Ratio	*1.00*	*0.11*	*0.04*	*0.15*	*1.15*
INCOME ($'000)	8,368	4,690	1,999	6,689	15,057
Type 11A Ratio	*1.00*	*0.56*	*0.24*	*0.80*	*1.80*
VALUE ADDED ($'000)	146,823	9,927	3,516	13,443	160,266
Type 11A Ratio	*1.00*	*0.07*	*0.02*	*0.09*	*1.09*
EMPL. (No.)	100	117.72	65.45	183.16	283.16
Type 11A Ratio	*1.00*	*1.18*	*0.65*	*1.83*	*2.83*

Table I3.10
Unadjusted Annual Regional Economic Impacts of the Operation Phase of the Project on the NSW Economy

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	269,094	90,216	38,394	128,610	397,704
Type 11A Ratio	*1.00*	*0.34*	*0.14*	*0.48*	*1.48*
INCOME ($'000)	8,368	17,027	7,542	24,570	32,938
Type 11A Ratio	*1.00*	*2.04*	*0.90*	*2.94*	*3.94*
VALUE ADDED ($'000)	149,266	36,638	19,421	56,059	202,884
Type 11A Ratio	*1.00*	*0.25*	*0.13*	*0.38*	*1.38*
EMPL. (No.)	100	407	218	625	725
Type 11A Ratio	*1.00*	*4.07*	*2.18*	*6.25*	*7.25*

The implicit assumption in the impact summary provided in Tables I3.9 and I3.10 is that all employment generated by the proposal is sourced from workers outside the regions who subsequently migrate into the regions.

With regard to the regional economy, the specialist nature of many of the skills required for coal mining is estimated to limit the opportunities for the locals to about 50% of the jobs with the remainder coming from workers who migrate into the region. Thus for the regional economy a conservative estimate of the consumption induced flow-on effects is to take 50% of those identified in Table I3.9. This is conservative since it assumes that the 50% of employees who already reside in the region are employed and earn a similar salary to what they will receive working on the Project. To the extent that this overestimates the existing spending power of future employees who already reside in the region the consumption induced effects will be underestimated.

With regard to the NSW Region, it is likely that all the jobs are obtained by people already residing in NSW. Hence conservative estimate of the consumption induced flow-on effects is to take 0% of those identified in Table I3.10. This is conservative since it assumes that the employees who already reside in NSW currently earn the same level of income as they will on the Project, ie. that their disposable income does not increase.

Adjusted estimates of regional economic impacts of the operation phase of the Project, having regard to the estimated sourcing of labour, are provided in Tables I3.11 and I3.12.

Table I3.11
Adjusted Annual Regional Economic Impacts of the Operation Phase of the Project on the Regional Economy

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	215,681	24,563	3,805	28,368	244,049
Type 11A Ratio	*1.00*	*0.11*	*0.02*	*0.13*	*1.13*
INCOME ($'000)	8,368	4,690	999	5,690	14,058
Type 11A Ratio	*1.00*	*0.56*	*0.12*	*0.68*	*1.68*
VALUE ADDED ($'000)	146,823	9,927	1,758	11,685	158,508
Type 11A Ratio	*1.00*	*0.07*	*0.01*	*0.08*	*1.08*
EMPL. (No.)	100	118	33	150	250
Type 11A Ratio	*1.00*	*1.18*	*0.33*	*1.50*	*2.50*

Table I3.12
Adjusted Annual Regional Economic Impacts of the Operation Phase of the Project on the NSW Economy

	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	269,094	90,216	0	90,216	359,310
Type 11A Ratio	*1.00*	*0.34*	*0.00*	*0.34*	*1.34*
INCOME ($'000)	8,368	17,027	0	17,027	25,396
Type 11A Ratio	*1.00*	*2.04*	*0.00*	*2.04*	*3.04*
VALUE ADDED ($'000)	149,266	36,638	0	36,638	185,904
Type 11A Ratio	*1.00*	*0.25*	*0.00*	*0.25*	*1.25*
EMPL. (No.)	100	407	0	407	507
Type 11A Ratio	*1.00*	*4.07*	*0.00*	*4.07*	*5.07*

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

- $244M in annual direct and indirect regional output or business turnover;
- $158M in annual direct and indirect regional value added;
- $14M in annual household income; and
- 250 direct and indirect jobs.

For the NSW economy, the operation of the Project is estimated to contribute:

- $359M in annual direct and indirect regional output or business turnover;
- $186M in annual direct and indirect regional value added;
- $25M in annual household income; and
- 507 direct and indirect jobs.

I3.4.2.2 Multipliers

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

- the magnitude of and relationship between the direct effects eg. 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 unadjusted and adjusted type 11A ratio multipliers for the operational phase of the Project are also provided in Tables I3.9 to I3.12.

For the regional economy, the adjusted Type 11A ratio multipliers for the operational phase of the mining proposal range from 1.08 for value-added up to 2.50 for employment. While for the larger NSW region they range from 1.25 for value added up to 5.07 for employment.

The higher ratio multipliers for employment and income reflect the capital-intensive nature of operation of the Project. 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 high ratio multipliers for employment. The lesser ratio multiplier for income (compared to employment) probably largely reflects comparatively higher wage levels in the mining and ore processing sectors compared to incomes in the sectors that will experience flow-on effects from the Project. The low ratio multipliers for output and value-added largely reflect the high direct output and value-added generated by the Project compared to the sectors that experience flow-on effects from the Project.

I3.4.2.3 Main Sectors Affected

Flow-on impacts from the Project are likely to affect a number of different sectors of the regional economy. The sectors most impacted by output, value-added and income flow-ons are likely to be the:

- *services to mining sector* which consists of businesses engaged in, among other things, exploration or parts of mining operations on a fee or contract basis;
- *agricultural and mining machinery manufacturing sector* which consists of businesses engaged in, among other things, construction, earthmoving and mining machinery;
- *electricity supply sector* which consists of businesses engaged in the generation, transmission or distribution of electricity;
- *wholesale trade sector* which consists of businesses engaged in wholesale trade;
- *retail trade sector* which consists of business engaged in retail trade;
- *rail and road transport sectors* which consists of businesses engaged in operating railways for the transportation of freight or passengers and businesses engaged in, among other things, the transportation of freight by road;
- *other property services sector* which includes business involved in renting and leasing assets including machinery, equipment, motor vehicles, real estate, airplanes, etc; and
- *legal, accounting, marketing and business management services sector* which includes businesses that provide legal services, accounting services or business management services including environmental consultancy services and personnel management services.

For NSW similar sectors are likely to the most impacted, however, other sectors also become more significant such as the *communication sector, banking sector, insurance sector and other business sectors*.

Examination of the estimated direct and flow-on employment impacts gives an indication of in which sectors employment opportunities would be generated. This provides important information to the community infrastructure assessment to facilitate consideration of whether this increased demand can be met from the unemployed within the region or from people migrating from outside the region and hence implications for housing demand and demand for community infrastructure etc.

Table I3.13
Distribution of Average Direct and Flow-on Employment by Industry Sector for the Regional Economy

Sector	Average Direct Effects	Production Induced	Adjusted Consumption-induced	Total
Primary	0	0	1	1
Mining	100	5	0	105
Manufacturing	0	14	2	16
Utilities	0	4	1	4
Wholesale/Retail	0	25	15	40
Building/Construction	0	1	0	1
Transport	0	16	1	17
Services	0	53	14	67
Total	**100**	**118**	**33**	**250**

Note: Totals may have minor discrepancies due to rounding.

Table I3.13 indicates that direct, production-induced and consumption-induced incremental employment impacts of the Project on the regional economy are likely to have different distributions across sectors.

Direct employment impacts would generate demand for mining employment. Production-induced employment impacts would mainly generate demand for employment in the services sectors (predominantly community services, legal, accounting and business management sector, other businesses services, other services, communications and banking), wholesale and retail trade, manufacturing (predominantly agriculture, mining and construction machinery manufacturing, fabricated metal products manufacturing, other chemicals manufacturing and iron and steel manufacturing) and transport sector (predominantly rail and road transport). Consumption-induced employment flow-ons would mainly generate demand in the wholesale and retail trade sectors and the services sectors (education, health, community services and personal services).

I3.5 IMPACT OF CESSATION OF THE PROJECT ON THE REGIONAL ECONOMY

The magnitude of the regional economic impacts of cessation of the Project would largely depend on whether the workers and their families affected by Project cessation would leave the region. Where displaced workers remain in the region 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 on the regional economy of mine closure would approximate the direct effects and production-induced effects identified in Table I3.9. However, if displaced workers and their families leave the region then impacts may begin to approximate the total impacts identified in Table I3.9.

The decision by workers, on cessation of the Project, 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).

There is some evidence to suggest that on closure of major employment activities in regional economies, such as abattoirs etc. that many displaced workers and their families remain in the area. The greater number of families that remain in the region the less would be the economic impact of Project cessation.

The regional economic impetus of the Project may also stimulate a ‘virtuous cycle’ of growth. This theory of regional economic growth suggests that places that are able to attract population immigration (eg. associated with mining 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).

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

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, 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 Mudgee region is highly prospective with coal mining being a major industry in the region. It is therefore possible that over time new mining developments would occur, offering potential to strengthen the economic base and hence buffer against impacts of the cessation of individual coal mining activities.

Nevertheless, given the long term nature of the Project it is not possible to foresee the likely circumstances within which Project cessation would occur. It is therefore important for regional authorities and leaders to take every advantage of the stimulation to regional economic activity and skills and expertise that the Project would bring to the region.

WCPL should consider developing a mine closure plan before mine closure, in consultation with regulatory agencies and the Project Community Consultative Committee. The mine closure plan should include consideration of the amelioration of potential adverse socio-economic effects due to the reduction in employment at Project closure in consultation with the Mid-Western Regional Council.

I4 CONCLUSIONS

A benefit cost analysis, identified a range of incremental economic costs and benefits of the Project and placed indicative values on the production costs and benefits. External economic costs and benefits of the proposal were identified and discussed. The analysis indicated that the incremental net production benefits of the Project would be in the order of $1,454M. This represents the opportunity cost to society of not proceeding with the Project.

Put another way, any environmental costs of the Project, after mitigation by the WCPL, would need to be costed at greater than $1,454M to make the Project questionable from an economic efficiency perspective.

The Project will also stimulate economic activity in the immediate region and NSW.

Using input-output analysis, it was estimated that during the construction phase of the Project it would contribute the following to the regional economy and NSW economy, respectively:

Regional Economy – Construction Phase

- $40M in annual direct and indirect regional output or business turnover;
- $19M in annual direct and indirect regional value added;
- $11M in annual direct and indirect household income; and
- 270 in direct and indirect employment.

NSW Economy – Construction Phase

- $83M in annual direct and indirect regional output or business turnover;
- $31M in annual direct and indirect regional value added;
- $17M in annual direct and indirect household income; and
- 391 in direct and indirect employment.

Operation of the Project was estimated to have the following impacts on the regional economy and NSW economy, respectively:

Regional Economy – Operational Phase

- $244M in annual direct and indirect regional output or business turnover;
- $158M in annual direct and indirect regional value added;
- $14M in annual household income; and
- 250 in direct and indirect employment.

NSW Economy – Operational Phase

- $359M in annual direct and indirect regional output or business turnover;
- $186M in annual direct and indirect regional value added;
- $25M in annual household income; and
- 507 in direct and indirect employment.

The main sectors of the regional economy that would be stimulated by the construction phase of the Project are the other construction sector and the cement manufacturing sector, wholesale and retail trade sectors, road transport sector and accommodation, cafes and restaurants sector.

The main sectors impacted by the operation of the Project are likely to be the services to mining sector, agricultural and mining machinery manufacturing sector, electricity supply sector, wholesale and retail trade sectors, rail and road transport sectors, other property services sector and the legal, accounting, marketing and business management services sector

The Project would directly generate demand for mining employment in the regional economy. Production-induced employment impacts would mainly generate demand for employment in the services sectors (predominantly community services, legal, accounting and business management sector, other businesses services, other services, communications and banking), wholesale and retail trade, manufacturing (predominantly agriculture, mining and construction machinery manufacturing, fabricated metal products manufacturing, other chemicals manufacturing and iron and steel manufacturing) and transport sector (predominantly rail and road transport). Consumption-induced employment flow-ons would mainly generate demand in the wholesale and retail trade sectors and the services sectors (education, health, community services and personal services).

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ATTACHMENT IA

THE GRIT SYSTEM FOR GENERATING INPUT-OUTPUT TABLES

ATTACHMENT IA
THE GRIT SYSTEM FOR GENERATING INPUT-OUTPUT TABLES

"The 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 IA-1" (Powell and Chalmers 1995, p13-14).

Table IA-1
The GRIT Method

Phase	Step	Action
PHASE I		ADJUSTMENTS TO NATIONAL TABLE
	1	Selection of national input-output table. (109-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: Table 2 in Bayne and West (1988)