Economic Impact of the Port of Geelong

A report prepared for

Victorian Regional Channels Authority
GeelongPort
GrainCorp
Shell Geelong Refinery
Department of Transport

Prepared by

EconSearch Pty Ltd

28 April 2010

EconSearch Pty Ltd
214 Kensington Road
Marryatville SA 5068
Tel: (08) 8431 5533
Fax: (08) 8431 7710
www.econsearch.com.au

Contents

Tables

Figures

Acknowledgments

EconSearch relied heavily on the voluntary cooperation of port-related businesses and organisations in providing data for the port impact survey. Without this assistance the compilation and estimation of the port economic impacts would not have been possible.

The input, assistance and guidance of the project Steering Committee members is also gratefully acknowledged. The Steering Committee members were Kas Szakiel (Victorian Regional Channels Authority - VRCA), Dilip Abraham (VRCA), Shane Collins (GeelongPort), Craig Cochrane (GrainCorp Ltd), Peter Dorling (Committee for Geelong), Paul Hamer (Department of Transport), Simon Jackson (City of Greater Geelong), David Kenwood (Patrick Ports), Peter McGovern (VRCA), Lawrie Miller (Geelong Chamber of Commerce), David Peart (Geelong Manufacturing Council), Vek Rancic (Incitec Pivot Limited), Andrew Scott (G21 – Geelong Region Alliance), Lindsay Ward (GeelongPort), Bruce Victor (Svitzer).

Document History and Status

Doc Ver	Doc Status	Issued To	Qty elec	Qty hard	Date	Reviewed	Approved
1	Draft	Kas Szakiel	1		28/01/10	-	JBM
2	Draft	Kas Szakiel	1		11/02/10	ESC	JBM
3	Draft	Kas Szakiel	1		25/03/10	-	JBM
4	Final	Kas Szakiel	1 Word 1 PDF		28/04/10	-	JBM

Printed:	21/06/2010 5:05:00 PM
Last Saved:	28/04/2010 6:28:00 PM
File Name:	S:\1_Projects\Current\0927_Geelong Port\Reports\Geelong Port_Final_100428.docx
Project Manager:	Julian Morison
Principal Author/s:	Julian Morison and Lisa Rippin
Name of Client:	Victorian Regional Channels Authority, GeelongPort, GrainCorp, Shell Geelong Refinery, Department of Transport
Name of Project:	The Economic Impact of the Port of Geelong
Document Version:	4
Job Number:	0927

Executive Summary

Role and Impact of Ports

The operation of a port generates employment and income for the local community, as well as flow-on effects to other local industries. In addition, all levels of government receive revenue from taxes and other charges on these activities.

In recent years, there has been increased pressure across Australia to restrict the scope of port activities in response to changing perceptions (real or otherwise) about the pollution generated by ports and the contribution to congestion on main roads. Such restrictions can reduce the efficiency of a port and the competitiveness of shippers that use the port. There may also be adverse effects on local income and employment.

Port economic impact studies can contribute to a balanced assessment of the role of ports and to informed consideration of issues such as port planning (Bureau of Transport Economics 2000).

The Port of Geelong

The Port of Geelong is the key feature of Victoria's largest provincial city, Geelong, located approximately 75 km (by road) west of Melbourne. The Port of Geelong is the second largest port in the State of Victoria, with a total throughput of 9.8 million tonnes in 2008/09. The cargo traded during the year had an estimated value of approximately $6.6 billion. Due to both the drought and the effects of the global financial crisis, trade in 2008/09 was well below (13%) the average for the decade of 11.3 million tonnes and significantly down (19%) on the level of trade recorded for 2004/05, the year of the previous economic impact analysis (EconSearch 2005).

Crude oil and petroleum products account for the majority of trade in the port in terms of volume. Grain, woodchips and fertiliser also make a significant contribution to the total volume and value of goods shipped through the port.

The major facilities at the port are located around the shore of Corio Bay, from Point Wilson in the north to Point Henry to the south. There are 15 operational berths available including specialist and general cargo berths. The refinery and tanker berths are located on the northern side of the port and the smelter berth is located near Point Henry in the south. There are numerous general purpose berths and wharves and associated storage and processing facilities located between the refinery and smelter.

Conduct of the Study

The study of the Port of Geelong was undertaken using the general framework for port impact studies developed by the Bureau of Transport Economics (2000). The framework was initially applied in a study of the Port of Fremantle.

The study aimed to measure the economic impact of port-related activity at the regional and state levels. For the purposes of this study, port-related activity was defined as the activity undertaken by firms and organisations in moving cargo through the Port of Geelong and in providing goods and services to directly facilitate the movement of cargo through the port. Port impact was measured in terms of output, value added, household income and employment (refer to the Glossary for definition of these measures).

The estimates of port impact cover the direct effects of the port and the subsequent flow-on effects to other sectors of the regional and state economies. The analysis was based on shipping, cargo and financial data for 2008/09 and updated survey data collected for a similar study conducted four years ago (EconSearch 2005). Input-output models for the Barwon region and Victoria were used to calculate the flow-on effects to other industry sectors.

The economic impacts were estimated under a set of trade assumptions based on a “representative” year. As noted above, there were two aspects of trade in 2008/09 that were not indicative of a representative year and reduced the volume traded by 13% below the average for the decade. First, the global financial crisis dampened trade across almost all commodities, particularly woodchips but also petroleum products and alumina. Second, the drought severely impacted grain trade to the extent that there was less than 270,000 tonnes traded. Over the decade (2000/01 to 2008/09) the average annual quantity of grain traded through the port was almost 950,000 tonnes.

Estimates of Port Impact

Tables 1 and 2 present estimates of the overall impact of the Port of Geelong at the regional and state levels, respectively, incorporating the direct and flow-on effects.

Direct effects

The ***direct impact*** of port-related activity on output, value added, household income and employment is shown in the first column of Table 1 (Table 2 for Victoria). The value of output, estimated to be $186 million, is the sum of gross business revenue of firms defined as port-related (or that proportion of firms' revenues attributable to port-related activity), and gross expenditure by port-related government, semi-government and non-profit organisations. These are revenues generated and expenditure incurred in the Barwon region. The direct impacts are the same for Victoria as a whole.

Table 1 Economic Impact of the Port of Geelong, representative year (Barwon)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Output ($m)	186	124	310
Value added ($m)	94	53	146
Household income ($m)	37	29	66
Employment[a]	612	494	1,106

[a] Number of jobs (full-time equivalent).
Source: EconSearch analysis

Table 2 Economic Impact of the Port of Geelong, representative year (Victoria)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Output ($m)	186	174	360
Value added ($m)	94	87	181
Household income ($m)	37	46	83
Employment[a]	612	689	1,301

[a] Number of jobs (full-time equivalent).

Source: EconSearch analysis

The value added from port-related activity was estimated to be $94 million. Direct employment (full-time equivalents) was estimated to be 612, and corresponding household income was $37 million. This indicates an average gross annual income of around $60,000 for those employed in firms and organisations engaged in port-related activity. Household income includes overtime payments and income tax, although is net of payroll tax and other related charges.

Flow-on effects

The flow-on effects of port-related activity in the Barwon region total $124 million in output ($174 million for Victoria), $53 million in value added ($87 million for Victoria), 494 jobs (689 for Victoria) and $29 million in corresponding household income ($46 million for Victoria) (Tables 1 and 2).

Trade, finance and business services and manufacturing are the three sectors where port-related activity has the largest impact. For all four measures of economic impact (output, value added, employment and income), around 60 per cent of the total flow-on effect occurred in these three sectors. For employment, the combined impact in these sectors was 287 jobs in the Barwon region and 429 jobs state wide, of the total employment flow-on from port-related activity.

Total impact

The operation of the Port of Geelong in a representative year generates, in terms of output, an estimated total impact on the Barwon economy of over $310 million and around $360 million on the Victorian economy as a whole.

Value added attributable to the operation of the port was estimated to be $146 million in the Barwon region ($181 million state wide). This was equivalent to approximately 1.3 per cent of gross regional product, which provides a measure of the overall level of economic activity in the Barwon region. In terms of the State's economy, it represented just over 0.06 per cent of Victoria's gross state product in 2008/09.

Household income generated by the operation of the port totalled $66 million in the Barwon region ($83 million in Victoria). Employment was estimated at over 1,100 jobs (full-time equivalent), which represented 1.7 per cent of total employment in the Barwon region. At the State level, the estimated employment effect of around 1,300 fte jobs was just under 0.06 per cent of Victoria's employment.

On average there were 554 ship visits per year to the Port of Geelong by commercial cargo vessels over the period 2000/01 to 2008/09. The results of the analysis indicated that, in a average year, each ship call at the Port of Geelong involved the following impact on the economies of the Barwon region and Victoria (Table 3).

Table 3 Average impact per ship call for the Port of Geelong, representative year

Indicator	Barwon region	Victoria
Output	$559,000	$650,000
Value added	$264,000	$326,000
Household income	$119,000	$149,000
Jobs (full-time equivalent)	2.0	2.3

Detailed Impact Measures

Estimated port impacts have been disaggregated to identify the relative contribution of the individual port functions and cargo types. These detailed impact measures are provided for the Barwon region in Table 4 and for Victoria in Table 5.

Table 4 Detailed measures of the total economic impact of the Port of Geelong, representative year (Barwon)

Component	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Function				
Port administration	36.2	20.5	6.1	83
Ship operations	58.9	24.8	12.7	198
Ship loading/unloading	64.7	35.6	17.3	258
Land transport & storage	145.6	63.3	28.3	544
Government agencies	4.6	1.9	1.4	23
Total [a]	*309.9*	*146*	*65.8*	*1,106*
Cargo Type				
Woodchips	64.9	30.0	13.5	241
Logs	12.4	6.2	2.9	47
Fertiliser	51.4	23.8	10.4	183
Grain	49.7	22.7	10.0	180
Other Dry Bulk	9.8	4.7	1.9	31
Aluminium Products	10.6	5.0	2.5	40
Steel Products	16.4	8.1	3.7	61
Crude Oil & Petroleum Products	63.6	30.8	14.0	217
Chemicals	8.8	4.3	2.0	32
Other Cargo	22.5	10.8	5.0	79
Total [a]	*309.9*	*146.1*	*65.8*	*1,106*

[a] Components may not sum to totals due to rounding.

Source: EconSearch analysis

Table 5 Detailed measures of the total economic impact of the Port of Geelong, representative year (Victoria)

Component	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Function				
Port administration	38.8	23.2	7.4	100
Ship operations	67.8	31.6	16.1	235
Ship loading/unloading	70.9	40.8	19.3	274
Land transport & storage	177.4	82.6	38.1	668
Government agencies	5.3	2.4	1.6	25
Total [a]	*360.2*	*181*	*82.5*	*1301*
Cargo Type				
Woodchips	76.8	37.6	17.3	285
Logs	14.1	7.4	3.5	53
Fertiliser	60.7	29.9	13.4	219
Grain	59.0	28.7	13.0	216
Other Dry Bulk	11.3	5.8	2.5	38
Aluminium Products	12.1	6.1	3.0	45
Steel Products	18.8	9.8	4.5	70
Crude Oil & Petroleum Products	72.0	37.2	17.0	250
Chemicals	9.9	5.2	2.4	36
Other Cargo	25.6	12.9	6.0	90
Total [a]	*360.2*	*180.7*	*82.5*	*1301*

[a] Components may not sum to totals due to rounding.
Source: EconSearch analysis

The largest impacts occurred in the *land transport and storage* sector (including road and rail transport). The value of services provided by this sector was almost $93 million, with flow-ons to other sectors in the Barwon economy of $53[1] million, which gives a total output impact of $146 million ($177 million in Victoria). The employment impact of land transport and storage was estimated to be 544 fte jobs (668 in Victoria), 323 directly in the sector and flow-on employment in other sectors estimated to be over 220. Associated household income for the 544 Barwon region jobs came to over $28 million.

The *ship loading and unloading* sector, comprised mainly of bulk cargo handling, had a direct and indirect output impact in the Barwon region of over $64 million. Employment generated directly and indirectly by this sector was measured at more than 250, with associated household income of approximately $17 million.

Cargo type

The most significant cargo types in terms of the total volume of trade through the Geelong Port in 2008/09 were:

- crude oil and petroleum products;
- woodchips;

[1] The flow-on impact of $53.0 million is calculated as the difference between the total impact of $145.6 million and the direct effect of $92.6 million (see Table 4.6).

- fertiliser; and
- grain.

Together, these four commodity groups accounted for almost 75 per cent of the total port economic impact (Tables 4 and 5).

Impact of Port Users

In the case of the Port of Geelong, as with most other ports, there is a certain amount of economic activity in the Port's hinterland that would not occur in the local economy if the Port did not have its particular location. Employment data that were collected for ten significant port users for the previous impact study (EconSearch 2005) were updated to 2009. These are not necessarily the ten largest users of the Port of Geelong but are firms that have a high level of dependence on the Port for their local operations and have a prominent presence in the local economy. These ten firms account for direct employment of an estimated 1,808 people (full-time equivalents) in the Barwon economy. Each firm was categorised by industry sector and standard employment to output ratios for each industry sector were applied to the employment data to estimate the value of production by these firms. These data were then used in the Barwon regional economic model to estimate the direct and indirect effects of the operations of these businesses to the local economy.

The results indicate that the ten locally based Port of Geelong users generated direct business turnover of over $2.8 billion in 2008/09 with flow-ons of $915 million giving an estimated total output impact (direct plus flow-ons) on the Barwon economy of around $3.7 billion.

Value added attributable to the operation of the ten firms was estimated to be $418 million in the Barwon region, with flow-ons of $317 million. This provided a total contribution of approximately $735 million or 6.4 per cent of gross regional product in the Barwon region in 2008/09.

Household income generated by the ten locally based Port users totalled $175 million in the Barwon region, with flow-ons of $171 million. Direct employment was estimated at 1,808 jobs (full-time equivalent) and flow-ons of 2,681 fte, giving total employment (direct plus flow-on) generated by the ten Port users as an estimated 4,489 fte. This represented around 5 per cent of total employment in the Barwon region in 2008/09.

Impact of Future Trade Flows

Summary trade forecasts for the principal growth commodities are shown in Table 6. The change in trade volumes will have a significant impact on the economies of the Barwon region and Victoria, particularly the forecast growth in crude oil and petroleum products, motor vehicles and other dry bulk (including coal).

The prospect of expanding trade through the Port of Geelong will generate economic impacts in two broad forms: the impacts arising from the construction and upgrade of port facilities and the impacts associated with the movement of the additional cargo. This second aspect of economic impact has been the focus in this analysis.

Table 6 Forecast trade flows for main commodities (medium scenario) through the Port of Geelong (kt)

	Year				
Commodity	Representative[a]	2014/15	2019/20	2024/25	2029/30
Woodchips & Logs	1,372	1,856	2,151	2,494	2,891
Fertiliser	1,042	917	1,064	1,233	1,429
Grain	948	1,024	1,092	1,163	1,238
Other Dry Bulk (including coal)	104	7,175	7,299	7,501	7,736
Aluminium Products	433	469	498	577	669
Steel Products	145	246	285	331	383
Crude Oil & Petroleum Products	6,717	6,999	7,762	8,629	9,615
Chemicals	319	505	585	678	786
Motor Vehicles	0	404	460	533	618
Other Cargo	179	204	223	255	292
Total	*11,259*	*19,799*	*21,419*	*23,394*	*25,658*

[a] The "representative" year is based on average trade over the period 2000/01 to 2008/09.

Source: Meyrick & Associates and Thompson Clarke (2009), GeelongPort, GrainCorp

The estimated impacts of this set of 'medium scenario' trade flows, measured in terms of employment and contribution to gross regional product, are presented in Table 7. Note that these estimates represent the impacts of *total* forecast trade and include the impacts reported in Tables 1 and 2. Note that if there were no change in trade volumes over time the economic impact of the Port would decline as incremental productivity improvements would reduce the resources (labour and capital) required to move the cargo through the Port.

Table 7 Economic impact of forecast increases in trade (medium scenario) through the Port of Geelong

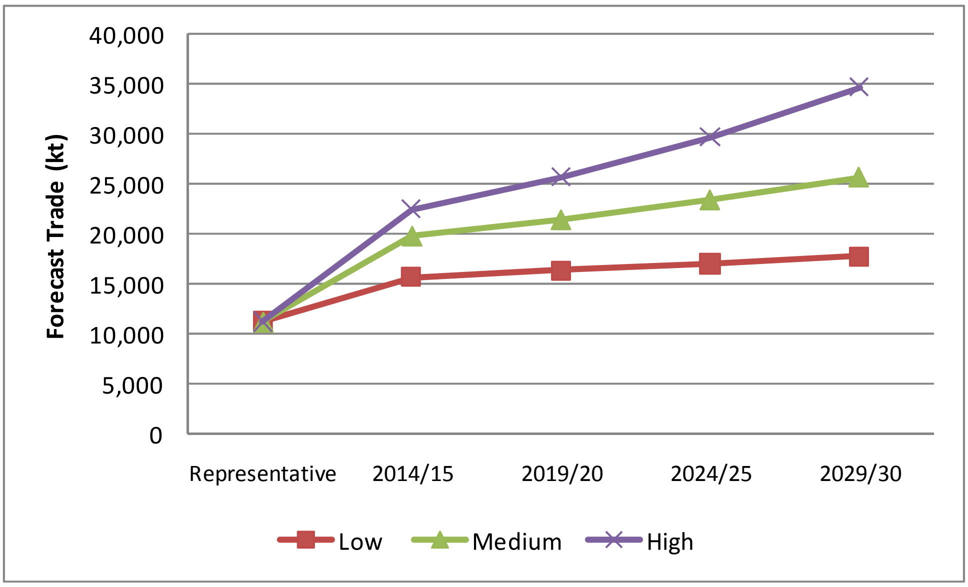
	Year				
	Representative	2014/15	2019/20	2024/25	2029/30
Employment (fte, direct + indirect)					
Barwon Region	1,111	2,342	2,441	2,574	2,725
Total Victoria	1,302	2,705	2,815	2,964	3,134
GRP ($m, direct + indirect)					
Barwon Region	146	310	314	322	331
Total Victoria	181	375	379	389	400

Source: EconSearch analysis

Clearly, the impacts of the increased trade will occur mainly in the Barwon region, with some additional impacts elsewhere in Victoria, mostly Melbourne. In the context of the Barwon regional economy, the impact of the Port on employment by 2014/15 would be equivalent to around 2.5 per cent of total regional employment (at current levels), rising to almost 3.0 per cent by 2029/30. Similarly, gross regional product would be approximately 2.8 per cent in 2014/15, rising to 3.0 per cent by 2029/30.

Summary low, medium and high trade forecast scenarios for the Port of Geelong are illustrated in Figure 1 with associated employment and gross state product estimates for Victoria in Figures 2 and 3, respectively.

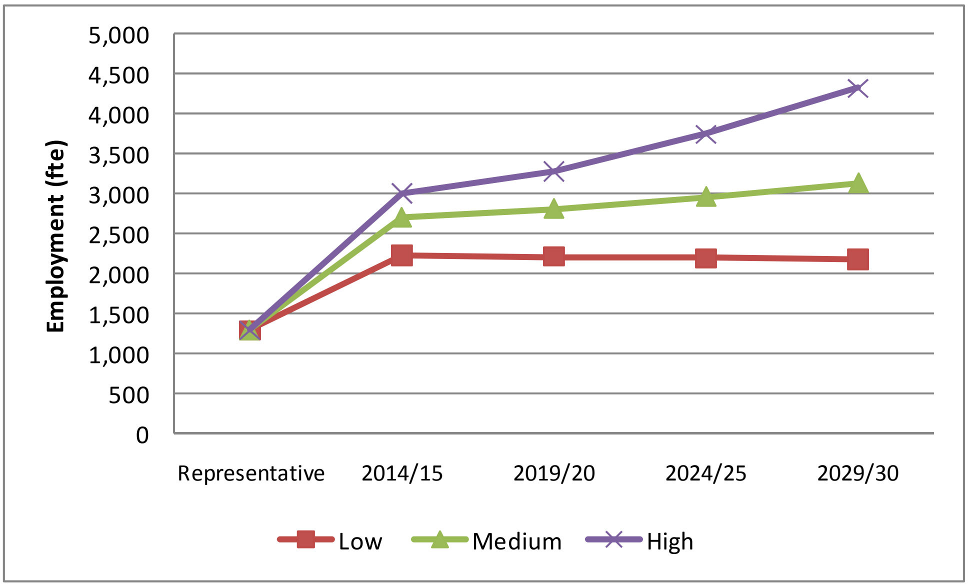
Figure 1 Port of Geelong forecast trade: low, medium and high scenarios (kt)[a]



[a] The "representative" year is based on average trade over the period 2000/01 and 2008/09.

Source: Meyrick & Associates and Thompson Clarke (2009), GeelongPort, GrainCorp

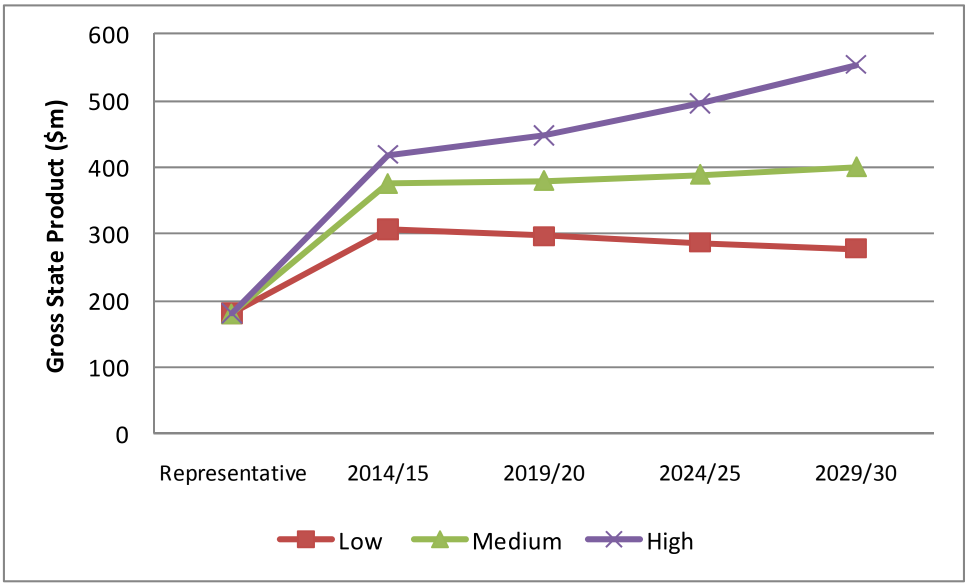
Figure 2 Employment estimates: low, medium and high scenarios (Victoria)[a]



[a] The "representative" year is based on average trade over the period 2000/01 and 2008/09.

Source: EconSearch analysis

Figure 3 Gross state product estimates: low, medium and high scenarios (Victoria)[a]



[a] The "representative" year is based on average trade over the period 2000/01 and 2008/09.

Source: EconSearch analysis

Note that if there were no change in trade volumes over time, or even low level increases as with the low growth scenario, the economic impact of the Port would decline as incremental productivity improvements would reduce the resources (labour and capital) required to move the cargo through the Port.

Interpreting the Results

The estimates of economic impact from this type of analysis indicate the general magnitude of effects associated with the port's activities. They do not provide precise estimates, as only approximate data were available for some parts of the analysis.

The results of the study provide estimates of the impact attributable to activities required for the movement of ships and cargo through the port. They do not indicate net economic benefits, technical efficiency, competitiveness, trade facilitation effects or the contribution of port infrastructure to regional development.

1. Introduction

Background

The role of ports is to provide the point of interface between land and sea transport in the transportation of cargoes in coastal and international trade. Ports facilitate inter-state and international trade by providing important elements of the basic infrastructure and services necessary for cargo shipping and exchange (ORG 1999).

The provision of this infrastructure and the general operation of a port generates employment and income for the local community, as well as flow-on effects to other local industries. In addition, all levels of government receive revenue from taxes and other charges on these activities.

In recent years, there has been increased pressure across Australia to restrict the scope of port activities in response to changing perceptions (real or otherwise) about the pollution generated by ports and the contribution to congestion on main roads. Such restrictions can reduce the efficiency of a port and the competitiveness of shippers that use the port. There may also be adverse effects on local income and employment.

Port economic impact studies can contribute to a balanced assessment of the role of ports and to informed consideration of issues such as port planning (Bureau of Transport Economics 2000).

Study brief

The objectives of the Economic Impact Study are to identify the economic significance of the Port of Geelong and the contribution that the port makes to employment, Gross Regional Product, Gross State Product, etc. and to reflect the data in the following manner with direct and indirect benefits identified separately.

1. Economic impact per vessel visiting the port.
2. Multiplier effect per dollar of port activity.
3. Economic impact of existing and forecast trade separately.
4. The market value of existing and forecast trade.

In general terms, the requirement of the Economic Impact Study is to obtain data to support a Business Case for the development of port-related infrastructure on the basis of expected trade levels and the economic benefit to the state, particularly the Barwon region.

More specifically, the study is to provide:

- the economic contribution of the Port itself to the Barwon and Victorian economies in a “representative” year; and
- the economic value to the region of increased trade resulting from the ability to export/import through the Port of Geelong.

In measuring the economic impact of the Port, the following aspects to the study were required:

1. The study must utilise the general framework and methodology set out in Bureau of Transport Economics (2000) *Regional Impacts of Ports*, Report No. 101, BTE, Canberra.
2. The impact measures should be calculated in terms of:
   - output;
   - value-added;
   - household income; and
   - employment.
3. The impact measures should be able to be disaggregated in terms of:
   - port function (i.e. the major activities undertaken within the port – Port administration, towage, pilotage, stevedoring, etc); and
   - cargo type (e.g. general cargo, break-bulk, dry bulk, bulk liquid as appropriate for the port).

Study aims

The objective of the project was to assess the direct and indirect economic impact of the movement of cargo through the Port of Geelong. The income and expenditures of the firms engaged in port-related activity and of firms transporting freight to and from the port comprise the direct economic impact.

These direct impacts were used as a basis for assessing the indirect economic impacts of port-related activity. All impacts were measured in terms of household income, output, value added and employment. These measures are defined in more detail in the Glossary at the end of this report.

The impacts were disaggregated by major port functions, which are listed below.

- Administration
- Ship operations and ship movement
- Ship loading and unloading/cargo services
- Land transport and storage (including road and rail transport)
- Government agencies

The impacts were also disaggregated by cargo type, as detailed in the terms of reference and as listed below.

- Woodchips
- Logs
- Fertiliser
- Grain
- Other dry bulk
- Aluminium products
- Steel products
- Crude oil & petroleum products
- Chemicals
- Other cargo

Port-related activity

For the purpose of measuring the impact of *port-related activity* on the economy, it is necessary to have a clear definition of what comprises such activity.

Port-related activity is the activity undertaken by firms and organisations in moving cargo through the Port of Geelong and in providing goods and services to directly facilitate the movement of cargo through the port.

Included under this definition are firms that provide various maritime services such as transport firms, stevedoring companies and shipping agents. However, users of the port are not included. For example, manufacturing firms, distributors and retailers that import and export goods through the port in the course of their business, although dependent on the port to move their cargo, are not considered to be firms directly involved in *port-related activity*[2]. Also, activities related to commercial fishing and recreational boating are excluded from the definition.

[2] Some port users are involved in cargo loading and unloading, for example, and the expenditures associated with this part of their operations are included in the analysis.

2. The Port of Geelong

2.1 Introduction

The Port of Geelong is the second largest port in the State of Victoria and is the key feature of Victoria's largest provincial city. The port is located on Corio Bay, approximately 75 km (by road) west of Melbourne. The Port of Geelong handled approximately 10 million tonnes of cargo in 2008/09 with a total of 611 ship calls.

The governance arrangements for the Port of Geelong are more complex than other commercial trading ports in Victoria with two land managers, a separate channel management authority and a number of large port reliant industries. Geelong Port's major facilities are owned by Ports Proprietary Ltd and managed by GeelongPort. In addition, GrainCorp own and operate a specialist grain pier.

Imports include crude oil, petroleum products, fertilisers, aluminium smelting raw materials, bulk liquids, steel and pig iron. Major exports include petroleum products, fertilisers, grain, woodchips and logs.

Victoria has four major commercial trading ports: Melbourne, Geelong, Hastings and Portland. Geelong is the second largest of these ports behind the Port of Melbourne. In terms of total volume of trade the Port of Geelong contributed 22 per cent of the total trade of the four major Victorian Ports in 2008/09 (Table 2.1).

Table 2.1 Trade activity of Victorian major ports, 2008/09

	Ship Visits		Total Trade	
Port	Number	Share (%)	Million tonnes	Share (%)
Melbourne	3,423	75%	29.1	65%
Geelong	611	13%	9.8	22%
Portland	279	6%	2.9	7%
Hastings	235	5%	2.7	6%
Total	**4,548**	**100%**	**44.5**	**100%**

Source: GeelongPort, Port of Hastings Corporation, Melbourne Port Corporation and Portland Port Corporation.

It is worth noting that because of the combined effects of drought, which impacted directly on fertiliser imports and grain exports, and the global financial crisis, which affected most other commodities, the volume of trade through the Port of Geelong in 2008/09 was over 13 per cent below the annual average since 2000/01.

2.2 Infrastructure, Facilities and Port-related Activity

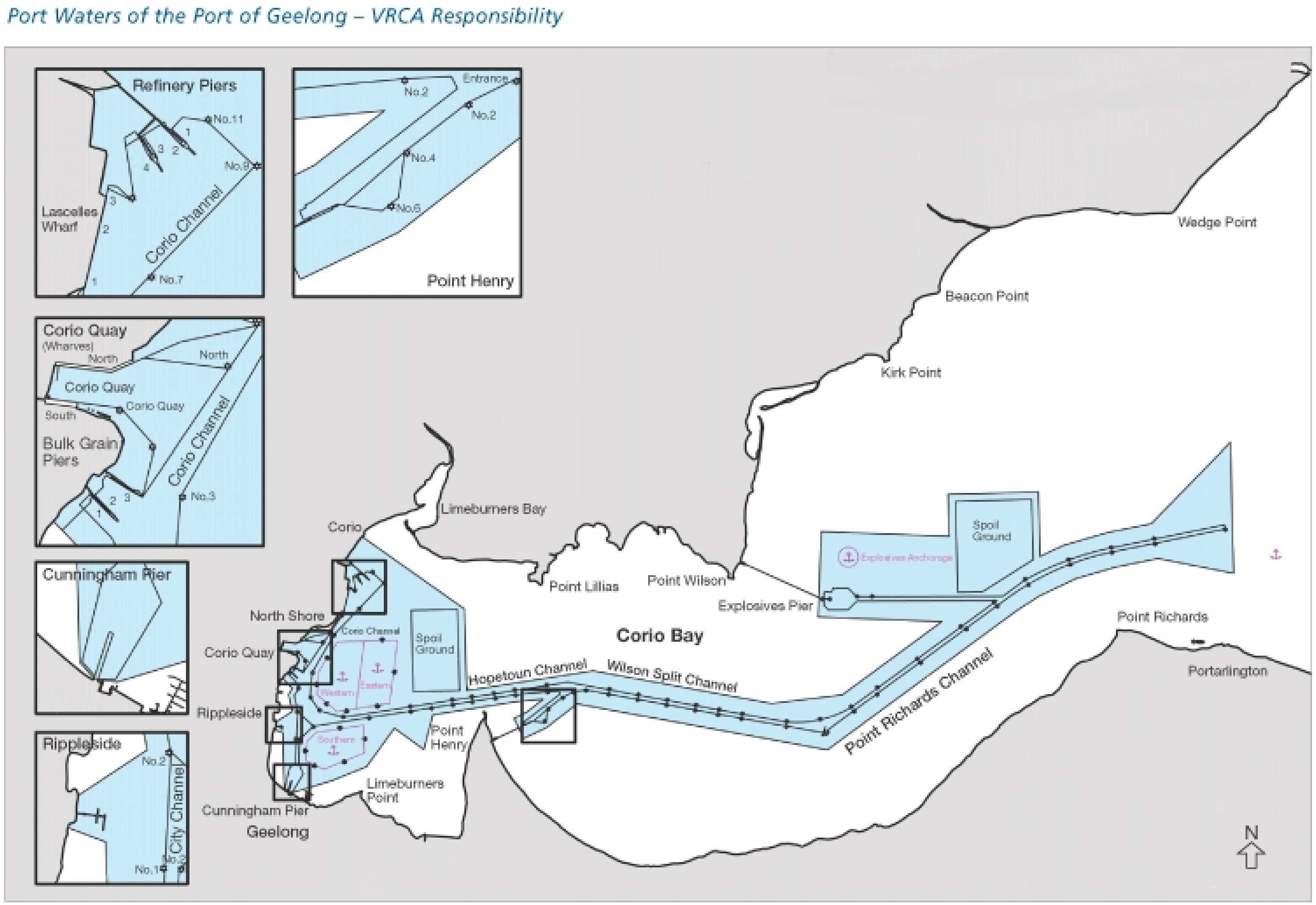
The port's major facilities are located around Corio Bay, extending from Point Wilson in the north to Point Henry in the south (Figures 2.1 and 2.2). Towards the northern end of the port is the Shell refinery and associated tanker berths. In the south is the Alcoa aluminium smelter berth. Between these are general-purpose facilities, berths and wharfs and the associated storage and processing facilities. There are 14 berths in total including specialist berths for:

- oil and petroleum products;
- bulk handling of grain;
- general cargo;
- alumina;
- fertilisers;
- chemicals;
- LPG; and
- woodchips.

Transport of commodities to or from the port is generally by road or rail depending on the type of goods being transport. Products such as oil are processed at the refinery located at the port. Similarly, raw products for aluminium production are imported and used at the aluminium smelter located at the port. Only minimal quantities of these commodities are transported in their raw form from the port.

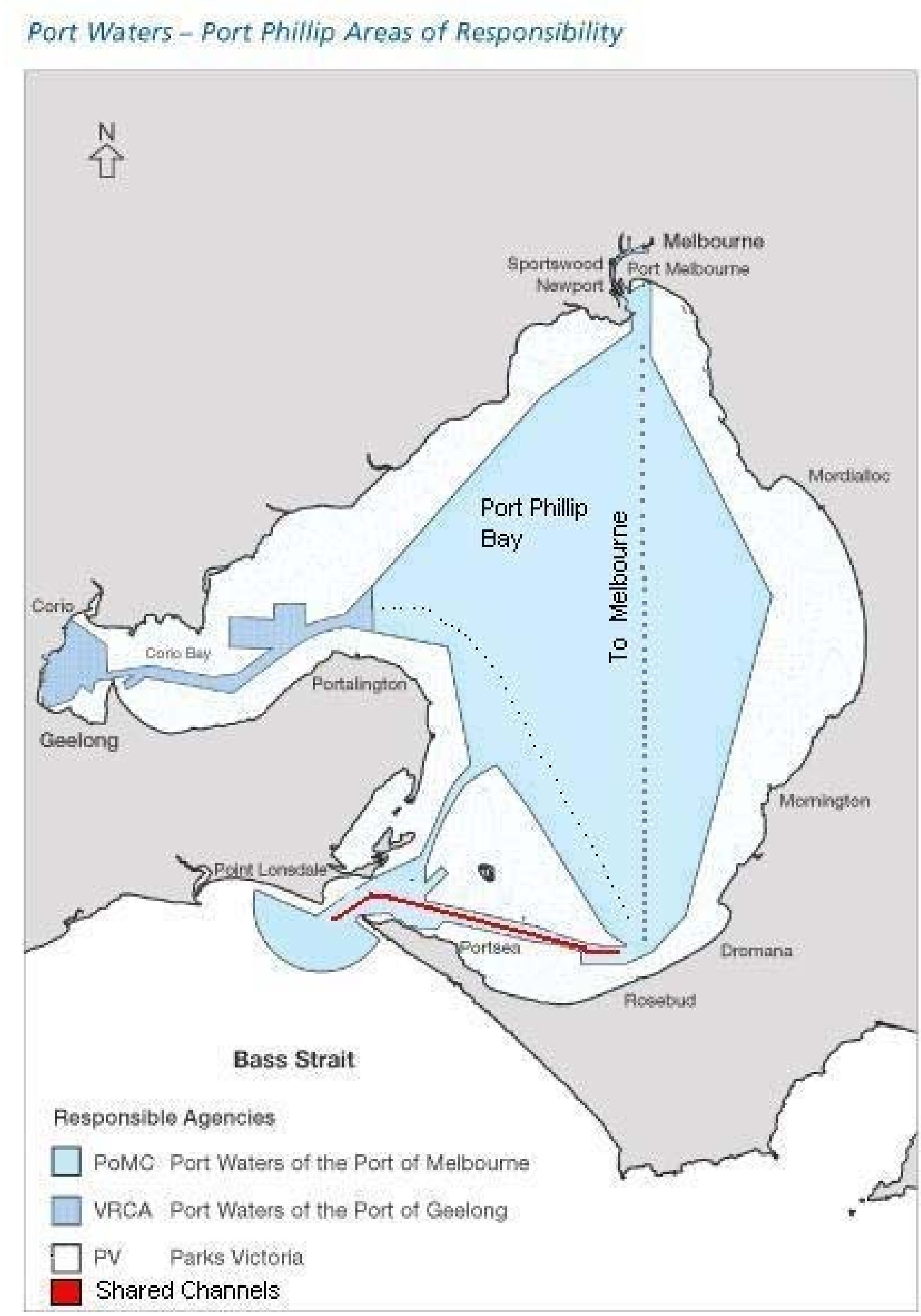
As noted earlier, the firms and organisations involved in *port-related activity* can be grouped according to their function. A brief explanation of each group is provided in Appendix I.

Figure 2.1 Facilities at the Port of Geelong



Source: VRCA

Figure 2.2 Port of Geelong and Port Phillip Bay



Source: VRCA

2.3 Cargo and Trade Patterns

2.3.1 Volume of trade

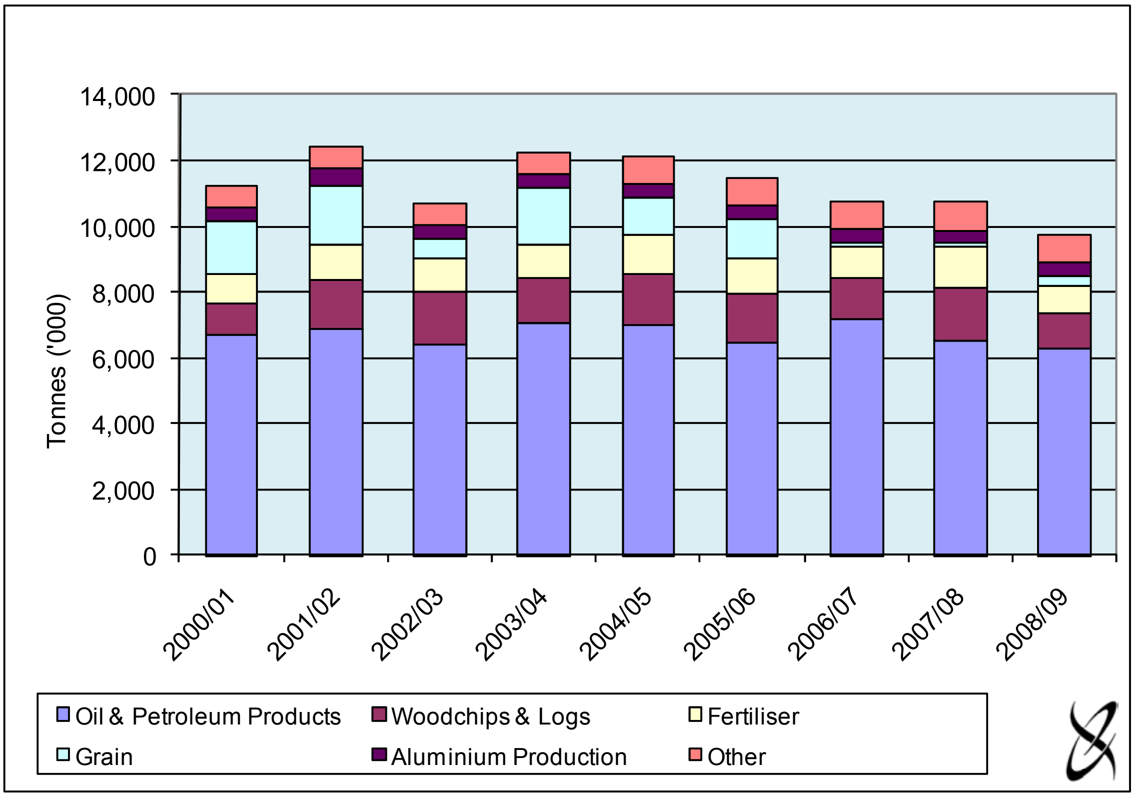
Total cargo moved through the Port of Geelong, on a tonnage basis, has been relatively steady over the nine years to 2008/09 (Figure 2.3 and Table 2.3), with the greatest year-to-year variations due to fluctuations in grain production, which has been severely impacted by drought over the past 3 years, and to a lesser extent woodchips. The share of the major commodities is shown in Table 2.2 and compared with the average for the years 2000/01 to 2008/09.

Table 2.2 Major commodities traded through the Port of Geelong, 2008/09

Commodity	2008/09	Average 2000/01 - 2008/09
Crude oil and petroleum products	65%	60%
Woodchips and logs	11%	12%
Fertiliser	9%	9%
Grain	3%	8%
Aluminium products	5%	4%
Other	9%	7%
Total	**100%**	**100%**

Source: GrainCorp and GeelongPort

Figure 2.3 Total trade volume through the Port of Geelong, 2000/01 to 2008/09



Source: Table 2.3

Table 2.3 Cargo traded through the Port of Geelong, 2000/01 to 2008/09 (tonnes)

Cargo Type	Tonnes									**Average**
	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	**00/01-08/09**
Woodchips & logs	909,105	1,499,665	1,611,825	1,348,846	1,561,778	1,483,006	1,252,865	1,631,247	1,048,642	**1,371,887**
Fertiliser	911,497	1,036,445	1,030,207	1,028,112	1,219,073	1,121,078	948,797	1,241,689	841,723	**1,042,069**
Grain	1,605,055	1,827,848	558,674	1,715,265	1,114,922	1,171,168	116,680	152,263	268,552	**947,825**
Other dry bulk	18,391	5,052	33,886	28,284	164,107	158,250	198,923	190,090	143,133	**104,457**
Aluminium products	443,070	497,297	423,144	430,074	432,768	442,189	427,883	359,702	444,271	**433,378**
Steel products	98,494	94,079	104,114	162,871	161,608	145,313	159,898	181,443	194,079	**144,655**
Crude oil & petroleum products	6,719,715	6,885,540	6,390,613	7,074,707	6,978,559	6,438,247	7,178,748	6,486,061	6,297,882	**6,716,675**
Chemicals	170,874	205,956	168,754	178,989	184,859	179,619	184,269	180,236	185,633	**182,132**
Other	343,383	343,910	340,263	245,855	288,322	301,480	293,701	347,360	336,895	**315,685**
Calcite	97,644	90,815	118,716	86,215	111,444	113,328	102,664	104,595	97,264	**102,521**
Other Break Bulk	22,700	64,166	65,518	42,428	47,730	0	0	0	0	**26,949**
Sulphuric Acid	159,073	139,240	138,773	115,652	122,382	130,765	125,295	148,782	152,966	**136,992**
Containers	0	0	0	0	0	0	0	0	0	**0**
General Cargoes	63,966	49,689	17,256	1,560	6,766	57,387	65,742	93,983	86,665	**49,224**
Total	**11,219,584**	**12,395,792**	**10,661,480**	**12,213,003**	**12,105,996**	**11,440,350**	**10,761,764**	**10,770,091**	**9,760,810**	**11,258,763**

Source: GrainCorp and GeelongPort

It should be noted that there were two aspects of trade in 2008/09 that were not indicative of a representative year and reduced the volume traded by 13% below the average for the decade. First, the global financial crisis dampened trade across almost all commodities, particularly woodchips but also petroleum products and alumina. Second, the drought severely impacted grain trade to the extent that there was less than 270,000 tonnes traded.

Crude oil and petroleum products

Oil and petroleum product imports generally consist of crude oil for refinery processing and of refined petroleum based products. Exports are mostly of petroleum based refined products. There is a dedicated refinery pier to the north of the port where ships are berthed.

Grain

Grain includes bagged and bulk grain, the major varieties include wheat, barley, oilseeds, pulses and rice. Grain that is handled by GrainCorp is through a specialised facility towards the northern end of the port. Grain that is exported by companies other than GrainCorp is through the GeelongPort berth at Lascelles Wharf.

Forestry products

Woodchip exports are from either plantation pine, hardwood or plantation blue gum. They are shipped by two major exporters (Midway and SPE) from either the Corio Quay or the GrainCorp terminal. Traditionally the majority of exports comprised of softwood chips, sourced from plantation timber. There has been an increasing amount of hardwood chips exported as plantation blue gums are reaching maturity. Hardwood chips are also sourced from old growth forests in the Gippsland region. Softwood chips are transported either via road or rail to the port where they are chipped and stored adjacent to the wharves.

Bulk logs are generally stored at Corio Quay South in leased storage facilities and then transported by truck to the wharves. Logs exported in bulk are mostly softwood for overseas pulp production and some for sawn timber production.

Fertiliser

Fertiliser trade comprises of imports of both raw materials and manufactured products and the export of manufactured products. Sulphuric acid is imported and used in fertiliser production.

Aluminium

There is a dedicated smelter berth at the southern end of the Port of Geelong where the majority of smelter related raw material imports are unloaded. A small amount of the smelter's output (aluminium in ingot form) is transported to either Corio Quay or Lascelles Wharf for export. The majority of ingots are transported via road to domestic destinations.

2.3.2 Value of trade

In line with the steady volume of products traded through the Port, the total value of the cargo has been relatively stable in recent years. Table 2.4 shows that in the nine years to 2008/09 the value of trade through the Port fluctuated between $4.5 billion and $7.7 billion, averaging just over $6.0 billion for the nine year period.

Table 2.4 Estimated value of cargo shipped through the Port of Geelong, 2000/01 to 2008/09 ($m) [a]

Cargo Type	**Value ($m)**								
	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Imports									
Dry Bulk	900	1,055	818	591	727	755	716	930	951
Liquid Bulk	2,156	1,907	1,939	1,991	2,722	3,344	3,748	4,235	3,770
Other	498	492	152	161	269	259	309	341	477
Total Imports	*3,555*	*3,454*	*2,909*	*2,743*	*3,718*	*4,358*	*4,773*	*5,505*	*5,198*
Exports									
Dry Bulk	573	767	422	611	552	533	272	411	404
Liquid Bulk	929	865	838	902	1,088	1,256	1,525	1,611	1,461
Other	342	555	383	306	266	296	250	188	179
Total Exports	*1,844*	*2,187*	*1,643*	*1,819*	*1,906*	*2,085*	*2,047*	*2,209*	*2,044*
Total Trade	***5,399***	***5,641***	***4,552***	***4,562***	***5,624***	***6,442***	***6,819***	***7,715***	***7,242***

[a] Average annual prices were estimated for each commodity and applied to the trade volumes specified in Table 2.3.

Source: ABS (2009), ABARE (2009), EconSearch analysis.

3. Input-output Method and Port-related Multipliers

3.1 Method of Analysis

As required in the project brief, the approach adopted for this analysis follows that described in Bureau of Transport Economics (2000). The method was detailed in the previous economic impact analysis report (EconSearch 2005) and is summarised here. The concept, nature and methodology of impact measurement at the regional level are described in general terms in Appendix III.

The main steps in undertaking the analysis are summarised below.

Step 1 Preparation of input-output tables – tables were required for the Barwon region (Figure 3.1) and Victoria. A Barwon region table was provided courtesy of the City of Geelong. An input-output table for Victoria was prepared in-house by EconSearch. This is an update of the model used in the previous study.

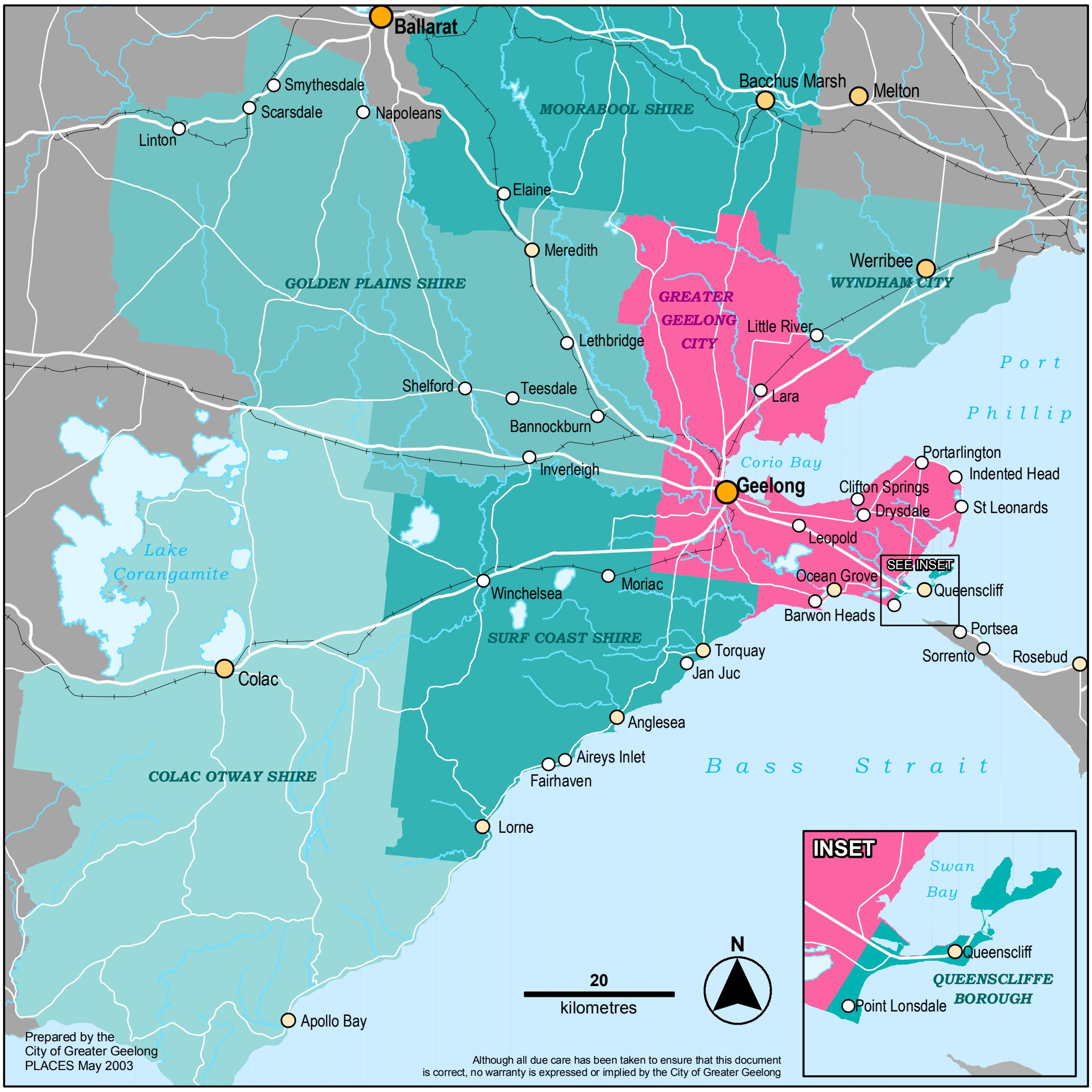
Step 2 Definition and estimation of the economic structure of each port-related sub-sector - total port-related activity was disaggregated into five categories of port-related activity (sub-sectors), detailed in Section 2.2. As well, ten cargo sectors, also detailed in Section 2.2, were identified for separate representation in the impact estimation procedure. These cargo types were distinguished largely by method of handling; for example, the different handling requirements of dry bulk cargoes and general cargoes impose different mixes of support service requirements in the port.

Step 3a Data collection – survey: A series of succinct questionnaires were prepared for completion by firms and government agencies that undertake economic activity in, or related to, the Port of Geelong. The questions were designed to elicit the scale of the respondent's port-related activity, the amounts paid by the respondent to other parties for the labour and other inputs used in such port-related work, and the amounts of revenue received from customers in payment for such work. For both payments and receipts, information was sought on how the amounts were divided between parties located within, and parties located outside, the Barwon region. The full questionnaires are reproduced in Appendix II.

Step 3b Data collection – aggregate port data: the survey data were complemented with information provided by GrainCorp, GeelongPort and VRCA. These statistics provided information on cargo tonnages and estimates of various ship and cargo costs broken down by commodity type. These costs included wharfage, pilotage, navigation services, ships utilities and site occupation. Data were also provided on ship numbers, on a cargo type basis.

Step 4 Estimation of total port-related activity - total port-related activity was calculated by aggregating the estimates derived for the five sub-sectors defined in Step 2. This provided an indication of the total direct contribution of port activity to the economies of the Barwon region and Victoria.

Figure 3.1 Map of the Barwon region



Source: G21 Geelong Regional Alliance Ltd.

Step 5 Final model adjustment - the preceding steps provided the necessary basic data for the impact estimation process. Step 5 involved the insertion into the input-output table of the rows and columns developed for representation of the five port-related sectors and the three cargo groups. Adjustments were carried out to comply with certain technical requirements of the input-output technique, including the avoidance of double counting and the subtraction of these 'new' sectors from the existing sectors of the table.

Step 6 Estimation of the economic impact of the port - the completion of Step 5 provided an input-output table with rows and columns showing the five port-related sectors and another table showing the ten cargo sectors. These rows and columns represented the direct impact of the port sectors on the economy of the Barwon region. The final stage of the study involved the manipulation of the input-output table (calculation of multipliers) to produce estimates of the direct and indirect impacts of these sectors on the Barwon regional and Victorian state economies.

3.2 Estimation of the Flow-on Effects

The input-output tables, modified so as to include Geelong port-related activities[3], were used to prepare the port-specific multipliers. The essence of impact measurement is the empirical measurement of the relationship between cause and effect, or between the impacting agent and the expected impact. This relationship can be expressed in terms of a multiplier.

In this study, output, income, employment and value added multipliers were used to express impacts in terms of a 'per unit of output of port-related activity'.

Each multiplier can be disaggregated into a number of components, differentiating the direct and flow-on effects of port-related activity. *Direct effects*, sometimes referred to as *initial effects*, are the stimulus for the impact analysis and correspond, in this analysis, to port-related activity. *Flow-on effects* measure the economic activity in other sectors of the economy in response to the initial stimulus. The various multiplier components are shown in Table 3.1.

Flow-on effects are divided into two components, *production-induced effects,* which are a measure of business-to-business transactions, and *consumption-induced effects*, which represent the expenditure of household income received as payments for labour used in producing the additional output. Production-induced effects can be further divided into *first-round effects* and *industrial-support effects*.

Table 3.1 Input-output multiplier components

Multiplier component	**Description**
Direct (initial) effect	The stimulus for the impact analysis – normally assumed to be a dollar change in sales to final demand
Flow-on effects:	
-Production-induced effects:	
First-round effects	Refers to the purchases of inputs required from other sectors in the economy in order to produce the additional output
Industrial-support effects	Refers to second, third and subsequent-round industrial flow-on effects triggered by the purchases in the first round
-Consumption-induced effects	Stem from the spending of household income received as payments for labour used in producing the additional output
Total effect	Direct effect+ flow-on effects
Type I multiplier	(Direct + production induced)/direct
Type II multiplier	(Direct + production induced + consumption induced)/direct

[3] Section 3.1 of this report and BTE (2000, pp. 96-97) describe the process of modifying input-output tables and preparing port-specific multipliers.

Utilising the Barwon and Victorian input-output tables, which incorporated the Port of Geelong sector, a range of multipliers were calculated for the various dimensions of impact analysis required in the study brief. Aggregate multipliers are shown in Tables 3.2 to 3.5. Disaggregated multipliers are provided in Appendix V for the Barwon region and Appendix VI for Victoria.

Multipliers are usually presented in 'per unit of output terms', as they are here. The port sector output multiplier in the Barwon region (Table 3.2) can be interpreted as follows: an initial $1 of output in the port sector leads to a flow-on effect in other sectors of the Barwon regional economy of 68 cents, giving a total effect of $1.68. Each dollar of output also generates 20 cents in direct household income (i.e., wages and salaries paid to employees of port-related firms and organisations) and a further 17 cents to workers in associated industries. Similarly, each dollar of output results in 50 cents in value added in the port sector and a further 30 cents in value added in other sectors of the economy.

Employment multipliers are expressed in terms of jobs per *million* dollars of output and relate to full-time equivalent jobs. In Table 3.2, the direct effect of 3.3 jobs per million dollars of output in the port sector results in 2.7 jobs in other sectors of the economy, realising a total effect of 6.0 jobs per million dollars of port sector output.

Table 3.2 Multipliers for Geelong port industry, representative year (Barwon)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Output[a]	1.00	0.68	1.68
Value added[a]	0.50	0.30	0.80
Household income[a]	0.20	0.17	0.37
Employment[b]	3.3	2.7	6.0

[a] Dollar impact of $1.00 of output in port industry.

[b] Number of jobs (full-time equivalent) per $million of output in port industry.

Source: EconSearch analysis

Utilising the Victorian input-output table, multipliers for the Geelong port industry were calculated for Victoria as a whole and are presented in Table 3.3. The direct effects are identical to those for the Barwon region; however the flow-on effects are greater, reflecting the additional linkages the Port of Geelong has with the broader Victorian economy. The interpretation of the multipliers is the same as for the Barwon region.

Table 3.3 Multipliers for Geelong port industry, representative year (Victoria)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*[c]
Output[a]	1.00	0.94	1.94
Value added[a]	0.50	0.47	0.97
Household income[a]	0.20	0.25	0.44
Employment[b]	3.3	3.7	7.0

[a] Dollar impact of $1.00 of output in port industry.

[b] Number of jobs (full-time equivalent) per $million of output in port industry.

[c] Rounding errors occur.

Source: EconSearch analysis

As noted earlier, multipliers were estimated not only for the port as a whole but also for the port activity disaggregated on the basis of port function (port company operations, ship operations, etc.) and cargo type (woodchips, grain, etc.). These multipliers are presented in Table 3.4 for the Barwon region and Table 3.5 for Victoria. Note that in both tables they are *total* multipliers, as defined in Table 3.1, and correspond to the "Total Impact" multipliers presented in Tables 3.2 and 3.3.

Table 3.4 Multipliers for components of Geelong port industry, representative year (Barwon)

Port component	*Output* [a]	*Value added* [a]	*Household income* [a]	*Employment* [b]
Function				
Port administration	1.74	0.99	0.29	4.0
Ship operations	1.91	0.80	0.41	6.4
Ship loading/unloading	1.64	0.90	0.44	6.5
Land transport & storage	1.57	0.68	0.31	5.9
Government agencies	2.18	0.90	0.65	10.9
Total	*1.68*	*0.80*	*0.37*	*6.0*
Cargo Type				
Woodchips	1.61	0.75	0.34	6.0
Logs	1.65	0.82	0.39	6.2
Fertiliser	1.64	0.76	0.33	5.8
Grain	1.62	0.74	0.33	5.9
Other Dry Bulk	1.70	0.81	0.33	5.4
Aluminium Products	1.74	0.83	0.41	6.5
Steel Products	1.64	0.81	0.37	6.2
Crude Oil & Petroleum Products	1.76	0.85	0.39	6.0
Chemicals	1.75	0.87	0.41	6.3
Other Cargo	1.74	0.84	0.39	6.1
Total	*1.68*	*0.80*	*0.37*	*6.0*

[a] Dollar impact of $1.00 of output in port industry.

[b] Number of jobs (full-time equivalent) per $million of output in port industry.

Source: EconSearch analysis

Table 3.5 Multipliers for components of Geelong port industry, representative year (Victoria)

Port component	*Output* [a]	*Value added* [a]	*Household income* [a]	*Employment* [b]
Function				
Port administration	1.87	1.12	0.36	4.8
Ship operations	2.20	1.03	0.52	7.6
Ship loading/unloading	1.80	1.04	0.49	6.9
Land transport & storage	1.92	0.89	0.41	7.2
Government agencies	2.52	1.15	0.76	12.0
Total	*1.94*	*0.97*	*0.44*	*7.0*
Cargo Type				
Woodchips	1.91	0.94	0.43	7.1
Logs	1.87	0.98	0.46	7.0
Fertiliser	1.93	0.95	0.43	7.0
Grain	1.93	0.94	0.42	7.0
Other Dry Bulk	1.96	1.00	0.42	6.5
Aluminium Products	1.98	1.01	0.49	7.4
Steel Products	1.88	0.98	0.45	7.0
Crude Oil & Petroleum Products	1.99	1.03	0.47	6.9
Chemicals	1.96	1.04	0.48	7.1
Other Cargo	1.99	1.01	0.46	7.0
Total	*1.94*	*0.97*	*0.44*	*7.0*

[a] Dollar impact of $1.00 of output in port industry.

[b] Number of jobs (full-time equivalent) per $million of output in port industry.

Source: EconSearch analysis

4. Economic Impact of the Port of Geelong

This section presents estimates of the regional and state impact of the Port of Geelong in terms of output (gross revenue/expenditure), value added (payments to primary inputs of production), household income and employment. Detailed impact measures cover the impact attributable to individual port functions, commodities, and cargo types.

The economic impacts were estimated under a set of trade assumptions based on a "representative" year. There were two aspects of trade in 2008/09 that were not indicative of a representative year. First, the global financial crisis dampened trade across almost all commodities, particularly woodchips but also petroleum products and alumina. Second, the drought severely impacted grain trade to the extent that there was less than 270,000 tonnes traded. Over the past decade (2000/01 to 2008/09) the average annual quantity of grain traded through the port was almost 950,000 tonnes.

Although output provides a readily understandable indicator of economic activity, problems of double counting can arise when the output of a number of firms are aggregated to give an industry view. For example, if the output of the Port Administration is added to the output of the firms that provide services to the administrative firms (e.g. dredging services, pest control, etc), then the value of those services will be counted twice in the aggregate figure. A more appropriate indicator of the port's relative contribution to the State's economy is value added (payments to primary inputs of production, i.e. gross operating surplus plus wages and salaries). Value added can be directly compared to gross state product and it avoids the problem of double counting.

4.1 Overall Impact

Tables 4.1 and 4.2 present estimates of the overall impact of the Port of Geelong at the regional and state levels, incorporating the direct effects and the flow-on effects.

Direct effects

The ***direct impact*** of port-related activity on output, value added, household income and employment in the Barwon region is shown in the first column of Table 4.1 (Table 4.2 for Victoria). The value of output, estimated to be $186 million, is the sum of gross business revenue of firms defined as port-related (or that proportion of firms' revenues attributable to port-related activity), and gross expenditure by port-related government, semi-government and non-profit organisations. These are revenues generated and expenditure incurred in the Barwon region. The direct impacts are the same for Victoria as a whole.

The value added from port-related activity was estimated to be $94 million. Value added refers to the difference between the total revenue of a firm and the cost of bought-in materials, services and components. It represents payments to the primary inputs of production (labour, capital and land), and can be used to describe the contribution of an industry to gross regional (or state) product.

Table 4.1 Economic impact of the Port of Geelong, representative year (Barwon)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact* [b]
Output ($m)	186	124	310
Value added ($m)	94	53	146
Household income ($m)	37	29	66
Employment[a]	612	494	1,106

[a] Number of jobs (full-time equivalent).

[b] Rounding errors occur.

Source: EconSearch analysis

Table 4.2 Economic impact of the Port of Geelong, representative year (Victoria)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Output ($m)	186	174	360
Value added ($m)	94	87	181
Household income ($m)	37	46	83
Employment[a]	612	689	1,301

[a] Number of jobs (full-time equivalent).

Source: EconSearch analysis

Direct employment (full-time equivalents) was estimated to be 612, and corresponding household income was $37 million. This indicates an average gross annual income of around $60,000 for those employed in firms and organisations engaged in port-related activity. Household income includes overtime payments and income tax, although is net of payroll tax and other related charges.

Flow-on effects

As described earlier, input-output multipliers can be used to estimate the ***indirect (flow-on) impact*** of Geelong port-related activity on the economy of the Barwon region and Victoria. Multipliers were used to calculate flow-on effects for each of the four economic indicators: output, value added, employment and household income, and are shown in Tables 3.2 and 3.3.

The flow-on effects of port-related activity in the Barwon region total $124 million in output ($174 million for Victoria), $53 million in value added ($87 million for Victoria), 494 fte jobs (689 for Victoria) and $29 million in corresponding household income ($46 million for Victoria) (Tables 4.1 and 4.2).

Flow-on impacts from port-related activity occur in many sectors of the Barwon and Victorian economies. A unique characteristic of the input-output model is the facility to calculate the size of the flow-on multiplier and the extent of the impact in each of the other sectors in the local economy. The sectoral distribution and ranking of the indirect (flow-on) impacts, in terms of output, value added, employment and household income, are shown in Table 4.3 for the Barwon region and Table 4.4 for Victoria.

Table 4.3 Flow-on effects for the Port of Geelong by industry sector, representative year (Barwon)

Sector[a,b]	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Primary	2.0	1.1	0.2	10
Mining	0.2	0.1	0.0	0
Manufacturing	25.1	4.9	2.7	37
Utilities	5.3	2.8	0.8	7
Construction	6.7	2.0	0.9	17
Wholesale and retail trade, etc.	24.5	11.6	7.1	172
Accomm, restaurants, etc.	5.7	2.2	1.3	35
Transport, storage (excl port)	9.1	3.6	1.8	28
Communication	4.8	2.4	0.7	11
Finance, business services	28.2	14.2	7.6	78
Public administration	1.2	0.6	0.5	6
Community services	6.7	4.9	4.1	60
Recreation, personal services	4.8	2.2	1.6	33
Total flow-on[c]	*124.1*	*52.5*	*29.3*	*494*

[a] Individual sectors are ranked by value added.

[b] Refer to Appendix IV for detailed sector definitions.

[c] Components may not sum to totals due to rounding.

Source: EconSearch analysis

Table 4.4 Flow-on effects for the Port of Geelong by industry sector, representative year (Victoria)

Sector[a,b]	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Primary	2.0	1.0	0.6	12
Mining	0.9	0.5	0.1	1
Manufacturing	33.3	9.2	4.1	67
Utilities	7.3	3.9	0.8	11
Construction	5.5	2.8	1.7	30
Wholesale and retail trade, etc.	29.2	13.6	10.6	216
Accomm, restaurants, etc.	6.4	2.5	1.6	37
Transport, storage (excl port)	11.6	6.3	3.9	44
Communication	8.1	4.9	2.2	24
Finance, business services	43.0	22.1	13.9	146
Ownership of dwellings	13.6	12.0	0.0	0
Public administration	1.8	0.7	0.5	6
Community services	4.9	3.9	3.4	49
Recreation, personal services	6.8	3.7	2.6	48
Total flow-on[c]	*174.5*	*87.1*	*46.0*	*689*

[a] Individual sectors are ranked by value added.

[b] Refer to Appendix IV for detailed sector definitions.

[c] Components may not sum to totals due to rounding.

Source: EconSearch analysis

The ranking of sectors is determined, to a certain extent, by the labour intensity of the impacting industry (in this study, the Geelong Port sector). Generally, if the industry is labour intensive and direct purchases of goods and services by firms in the industry are relatively small, then the flow-on effects will occur predominantly in those sectors providing goods and services to households, i.e. those sectors where households spend the wages and salaries earned working in the impacting sector. It will be these sectors which are ranked highly in terms of economic impact.

To identify the nature of the linkage between the impacting sector and other sectors in the economy, a distinction is made between *consumption-induced* and *production-induced* flow-on effects in calculating sector multipliers. Consumption-induced effects are those brought about by household expenditures, while production-induced effects are generated by the direct purchases of local goods and services by firms in the impacting sector. Generally, in a relatively labour intensive sector the consumption induced effects will be large and the production-induced effects relatively small. The port sector has traditionally been labour intensive, but with the productivity improvements of recent years and where the majority of cargo is handled in bulk, such as at the Port of Geelong, the labour intensity is much less than was previously the case. For the Geelong Port sector, about 55 per cent of the output flow-ons were estimated to be consumption-induced and about 45 per cent production-induced. These proportions were similar for the value added, employment and household income flow-on effects (see Appendices V and VI for details).

As revealed in Tables 4.3 and 4.4, trade, finance and business services, and manufacturing are the three sectors where port-related activity has the largest flow-on impact. For all four measures of economic impact (output, value added, employment and income), over 60 per cent of the total flow-on effect occurred in these three sectors. For employment, the combined impact in these sectors was 287 jobs in the Barwon region and 429 jobs state wide, of the total employment flow-on from port-related activity.

Total impact

The operation of the Port of Geelong in 2008/09 generated, in terms of output, an estimated total impact on the Barwon economy of over $310 million and around $360 million on the Victorian economy as a whole (Tables 4.1 and 4.2).

Value added attributable to the operation of the port was estimated to be $146 million in the Barwon region ($181 million state wide). This was equivalent to approximately 1.3 per cent of gross regional product, which provides a measure of the overall level of economic activity in the Barwon region. In terms of the State's economy, it represented just over 0.06 per cent of Victoria's gross state product in 2008/09.

Household income generated by the operation of the port totalled $66 million in the Barwon region ($83 million in Victoria). Employment was estimated at over 1,100 jobs (full-time equivalent), which represented 1.7 per cent of total employment in the Barwon region. At the State level, the estimated employment effect of around 1,300 fte jobs was just under 0.06 per cent of Victoria's employment.

On average there were 554 ship visits per year to the Port of Geelong by commercial cargo vessels over the period 2000/01 to 2008/09. The results of the analysis indicated that, in an average year, each ship call at the Port of Geelong involved the following impact on the economies of the Barwon region and Victoria (Table 4.5).

Table 4.5 Average impact per ship call for the Port of Geelong, representative year

Indicator	Barwon region	Victoria
Output	$559,000	$650,000
Value added	$264,000	$326,000
Household income	$119,000	$149,000
Jobs (full-time equivalent)	2.0	2.3

Source: EconSearch analysis

4.2 Components of Port Impact

Estimated port impacts have been disaggregated to identify the relative contribution of the individual port functions and cargo types. The proportion for a particular component often varies according to the impact measure being used. This variation reflects differences in factors such as profitability, capital intensity, average income and labour intensity.

Port functions

As described in Section 2, total port-related activity was partitioned into five specific functions: port management; ship movement; ship loading and unloading; land transport and storage; and government services. The dimensions of these sectors, in terms of output, value added, employment and household income, are detailed in Tables 4.6 and 4.7 for the Barwon region and Victoria, respectively.

Total multipliers were calculated for each of these port-related sectors and are shown in Tables 3.4 and 3.5. Tables 4.6 (Barwon) and 4.7 (Victoria) provide estimates of the total impacts calculated using these multipliers.

Table 4.6 Economic impact of the Port of Geelong by port function, representative year (Barwon)

Function	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Direct Effects				
Port administration	20.8	14.2	2.8	30
Ship operations	30.8	13.3	6.4	95
Ship loading/unloading	39.4	24.5	11.0	151
Land transport & storage	92.6	40.8	15.5	323
Government agencies	2.1	0.8	0.8	13
Total [a]	*185.7*	*93.6*	*36.5*	*612*
Total Impact				
Port administration	36.2	20.5	6.1	83
Ship operations	58.9	24.8	12.7	198
Ship loading/unloading	64.7	35.6	17.3	258
Land transport & storage	145.6	63.3	28.3	544
Government agencies	4.6	1.9	1.4	23
Total [a]	*309.9*	*146.1*	*65.8*	*1,106*

[a] Components may not sum to totals due to rounding.

Source: EconSearch analysis

Table 4.7 Economic impact of the Port of Geelong by port function, representative year (Victoria)

Function	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Direct Effects				
Port administration	20.8	14.2	2.8	30
Ship operations	30.8	13.3	6.4	95
Ship loading/unloading	39.4	24.5	11.0	151
Land transport & storage	92.6	40.8	15.5	323
Government agencies	2.1	0.8	0.8	13
Total [a]	*185.7*	*93.6*	*36.5*	*612*
Total Impact				
Port administration	38.8	23.2	7.4	100
Ship operations	67.8	31.6	16.1	235
Ship loading/unloading	70.9	40.8	19.3	274
Land transport & storage	177.4	82.6	38.1	668
Government agencies	5.3	2.4	1.6	25
Total [a]	*360.2*	*180.7*	*82.5*	*1,301*

[a] Components may not sum to totals due to rounding.

Source: EconSearch analysis

The largest impacts occurred in the *land transport and storage* sector (including road and rail transport). The value of services provided by this sector was almost $93 million, with flow-ons to other sectors in the Barwon economy of $53[4] million, which gives a total output impact of $146 million ($177 million in Victoria). The employment impact of land transport and storage was estimated to be 544 fte jobs (668 in Victoria), 323 directly in the sector and flow-on employment in other sectors estimated to be over 220. Associated household income for the 544 Barwon region jobs came to over $28 million ($38 million in the whole of Victoria).

The *ship loading and unloading* sector, comprised mainly of bulk cargo handling, provided services valued at over $39 million, with flow-ons to other sectors in the Barwon regional economy of around $24 million ($31 million state wide). Employment in the sector was measured at around 150 with associated household income of approximately $11 million. Flow-on employment in other sectors was estimated to be over 100 (120 in Victoria), earning over $6 million in household income during 2008/09 ($8 million in the whole of Victoria).

The *ship operations* sector had impacts similar to the ship loading and unloading sector. Direct and flow-on employment in the ship operations sector accounted for almost 200 full-time equivalent jobs (230 state wide), generating household income of almost $13 million in the Barwon region (approximately $16 million in Victoria in total).

The *port administration* sector is an important component of total port-related activity, particularly in terms of direct and flow-on employment of over 80 jobs in the Barwon region (100 jobs in Victoria) and corresponding household income of $6 million ($7 million state wide). The port-related activity of *government agencies* comprises a minor component of the total port impact.

4 The flow-on impact of $53.0 million is calculated as the difference between the total impact of $145.6 million and the direct effect of $92.6 million (see Table 4.6).

Cargo type

Tables 4.8 and 4.9 show the breakdown of direct and total impacts by the major cargo types traded in the representative year for the Barwon region and Victoria, respectively. Details on tonnages for that year are provided in Table 2.3. The interpretation of the results is the same as that described above for the various port functions.

Of the ten commodity groups, the four largest, woodchips, fertiliser, grain and crude oil and petroleum, account for around 75 per cent of the total port impact.

Table 4.8 Economic impact of the Port of Geelong by cargo type, representative year (Barwon)

Cargo type	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Direct Effects				
Woodchips	40.3	19.5	7.6	139
Logs	7.5	4.1	1.7	27
Fertiliser	31.4	15.3	5.7	102
Grain	30.7	14.6	5.5	102
Other Dry Bulk	5.8	3.0	1.0	16
Aluminium Products	6.1	3.1	1.4	22
Steel Products	10.0	5.3	2.2	35
Crude Oil & Petroleum Products	36.1	19.2	7.6	112
Chemicals	5.0	2.8	1.2	17
Other Cargo	12.9	6.6	2.6	41
Total [a]	*185.7*	*93.6*	*36.5*	*612*
Total Impact				
Woodchips	64.9	30.0	13.5	241
Logs	12.4	6.2	2.9	47
Fertiliser	51.4	23.8	10.4	183
Grain	49.7	22.7	10.0	180
Other Dry Bulk	9.8	4.7	1.9	31
Aluminium Products	10.6	5.0	2.5	40
Steel Products	16.4	8.1	3.7	61
Crude Oil & Petroleum Products	63.6	30.8	14.0	217
Chemicals	8.8	4.3	2.0	32
Other Cargo	22.5	10.8	5.0	79
Total [a]	*309.9*	*146.1*	*65.8*	*1,106*

[a] Components may not sum to totals due to rounding.

Source: EconSearch analysis

Table 4.9 Economic impact of the Port of Geelong by cargo type, representative year (Victoria)

Cargo type	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Direct Effects				
Woodchips	40.3	19.5	7.6	139
Logs	7.5	4.1	1.7	27
Fertiliser	31.4	15.3	5.7	102
Grain	30.7	14.6	5.5	102
Other Dry Bulk	5.8	3.0	1.0	16
Aluminium Products	6.1	3.1	1.4	22
Steel Products	10.0	5.3	2.2	35
Crude Oil & Petroleum Products	36.1	19.2	7.6	112
Chemicals	5.0	2.8	1.2	17
Other Cargo	12.9	6.6	2.6	41
Total [a]	*185.7*	*93.6*	*36.5*	*612*
Total Impact				
Woodchips	76.8	37.6	17.3	285
Logs	14.1	7.4	3.5	53
Fertiliser	60.7	29.9	13.4	219
Grain	59.0	28.7	13.0	216
Other Dry Bulk	11.3	5.8	2.5	38
Aluminium Products	12.1	6.1	3.0	45
Steel Products	18.8	9.8	4.5	70
Crude Oil & Petroleum Products	72.0	37.2	17.0	250
Chemicals	9.9	5.2	2.4	36
Other Cargo	25.6	12.9	6.0	90
Total [a]	*360.2*	*180.7*	*82.5*	*1,301*

[a] Components may not sum to totals due to rounding.

Source: EconSearch analysis

4.3 Interpreting the Results

As noted in BTE (2000, pp107-108), the estimates of economic impact from this type of analysis indicate the general magnitude of effects associated with the port's activities. They do not provide precise estimates, as only approximate data were available for some parts of the analysis.

The results of the study provide estimates of the impact attributable to activities required for the movement of ships and cargo through the port. They do not indicate net economic benefits, technical efficiency, competitiveness, trade facilitation effects or the contribution of port infrastructure to regional development.

Data from the study may potentially be used to forecast the likely impact of increased trade through the port. However, such an assessment should not be based on a mechanistic application of multipliers estimated as part of this study. Such estimates should take account of factors such as the cargo types involved, economies or diseconomies of scale and existing capacity utilisation.

5. The Economic Impact of Future Trade Flows

In 2009, transport economists Meyrick and Associates together with Thompson Clarke prepared forecasts of trade growth to the year 2030 for the Port of Geelong. In this section of the report the 'medium case' forecast is reported (Table 5.1). The medium case forecast anticipated that by 2020 overall trade through the port would grow by 90 per cent above the representative year baseline and by 2030 it would be almost 130 per cent above the baseline. Forecasts for the low case and high case are provided in Appendices VII and VIII, respectively.

Table 5.1 Forecast trade flows for main commodities, Port of Geelong: medium case (kt)

	Year				
Commodity	Representative[a]	2014/15	2019/20	2024/25	2029/30
Woodchips & Logs	1,372	1,856	2,151	2,494	2,891
Fertiliser	1,042	917	1,064	1,233	1,429
Grain	948	1,024	1,092	1,163	1,238
Other Dry Bulk (including coal)	104	7,175	7,299	7,501	7,736
Aluminium Products	433	469	498	577	669
Steel Products	145	246	285	331	383
Crude Oil & Petroleum Products	6,717	6,999	7,762	8,629	9,615
Chemicals	319	505	585	678	786
Motor Vehicles	0	404	460	533	618
Other Cargo	179	204	223	255	292
Total	*11,259*	*19,799*	*21,419*	*23,394*	*25,658*

[a] The "representative" year is based on average trade over the period 2000/01 and 2008/09.

Source: Meyrick & Associates and Thompson Clarke (2009), GeelongPort, GrainCorp

As noted in the 2009 Port Land Use Strategy (GeelongPort and Department of Transport 2009), the trade growth predicted for the Port of Geelong has implications for the provision of wharves and backup land, road and rail access. The strategy indicated that berthing requirements for 2020 and beyond are:

- extension of Corio Quay North (increased demand for export of woodchips);
- extension of Corio Quay South (increased demand for steel products imports, including coil, plate, bulk minerals, mineral sands, and roll on-roll off vessels (cars). The key issue is the shortage of available backup land);
- extension of Lascelles Wharf (growth in fertiliser trade and forestry industries); and
- grain berth current capacity is adequate for future demand.

The capacity of the port to realise the forecasts detailed in Table 5.1 will also be dependent on the deepening of the Geelong Shipping Channel. According to Thompson Clarke Shipping (2009), three cargoes, crude oil, grain and fertiliser, could directly benefit through economies of scale were channel deepening to occur. Woodchips, as well, has the potential to benefit from channel deepening.

In addition there are land availability and land transport access issues in relation to the potential for port facilities to meet trade growth. For example, the Port Land Use Strategy indicates:

- there are no rail connections to the Lascelles Wharf precinct;
- there are limitations of existing on-road freight links to the Geelong Ring Road from the operational port in the liquid bulk precinct; and
- there is a lack of available back up land and developable industrial land in the Lascelles Wharf, Corio Quay and Point Henry precincts (GeelongPort and Department of Transport 2009).

The anticipated expansion of trade through the Port of Geelong will generate economic impacts in two broad forms: the impacts arising from the construction and upgrade of port facilities and the impacts associated with the movement of the additional cargo. This section provides estimates of the second of these two categories of impact, namely the economic impacts of increased trade.

The economic value to the region of increased trade resulting from the ability to export/import through Port of Geelong was estimated based on the trade forecasts detailed in Table 5.1 and the Barwon regional economic model, developed for the impact analysis presented in Section 4.

The estimated impacts of forecast trade (medium case), measured in terms of employment and contribution to gross regional product, are presented in Table 5.2 for the Barwon region and Table 5.3 for Victoria.

The impacts on the State and regional economies have been estimated on the basis of:

- current employment to output ratios in each of the industries;
- labour productivity improvements of 1% per annum over the forecast period;
- total factor productivity of 2.5% per annum over the forecast period; and
- current economic linkages expressed in the Barwon region and Victorian economic models.

Note that the estimated impacts presented in Tables 5.2 and 5.3 represent the impacts of port related activity associated with the forecast trade. The estimates do not include the impacts of the construction activity that will be necessary to enable the forecast growth to occur.

Clearly, the impacts of the increased trade will occur mainly in the Barwon region, with some additional impacts elsewhere in Victoria, mostly Melbourne. In the context of the Barwon regional economy, the impact of the Port on employment by 2014/15 would be equivalent to around 2.5 per cent of total regional employment (at current levels), rising to almost 3.0 per cent by 2029/30. Similarly, gross regional product would be approximately 2.8 per cent in 2014/15, rising to 3.0 per cent by 2029/30.

Table 5.2 Economic impact on the Barwon region of forecast increases in trade through Port of Geelong: medium case

	Year				
	Representative	2014/15	2019/20	2024/25	2029/30
Employment Impact (direct + indirect)					
Woodchips & Logs	288	367	404	446	492
Fertiliser	183	152	167	184	203
Grain	180	183	185	188	190
Other Dry Bulk (including coal)	31	698	675	659	646
Aluminium Products	40	41	41	45	50
Steel Products	61	98	108	119	132
Crude Oil & Petroleum Products	217	213	225	238	252
Chemicals	32	47	52	57	63
Motor Vehicles	0	461	497	546	600
Other Cargo	79	83	85	91	98
Total Employment Impact (fte)	**1,111**	**2,342**	**2,441**	**2,574**	**2,725**
Total GRP Impact ($m)	**146**	**310**	**314**	**322**	**331**

Source: EconSearch analysis

Table 5.3 Economic impact on Victoria of forecast increases in trade through Port of Geelong: medium case

	Year				
	Representative	2014/15	2019/20	2024/25	2029/30
Employment Impact (direct + indirect)					
Woodchips & Logs	339	431	475	524	578
Fertiliser	219	181	200	220	243
Grain	216	219	222	225	228
Other Dry Bulk (including coal)	38	838	810	791	775
Aluminium Products	45	46	46	51	56
Steel Products	70	112	123	136	150
Crude Oil & Petroleum Products	250	246	259	274	290
Chemicals	36	53	59	65	71
Motor Vehicles	0	483	521	573	630
Other Cargo	90	95	98	105	113
Total Employment Impact (fte)	**1,302**	**2,705**	**2,815**	**2,964**	**3,134**
Total GRP Impact ($m)	**181**	**375**	**379**	**389**	**400**

Source: EconSearch analysis

Estimated impacts for the low case and high case are provided in detail in Appendices VII and VIII, respectively, and are summarised in Table 5.4.

Table 5.4 Summary economic impact of forecast increases in trade through Port of Geelong: low, medium and high cases

	Year				
	Representative	2014/15	2019/20	2024/25	2029/30
Forecast Trade Flows (kt)					
Low	11,259	15,739	16,377	17,074	17,806
Medium	11,259	19,799	21,419	23,394	25,658
High	11,259	22,527	25,702	29,741	34,725
Employment (fte, direct + indirect)					
Barwon Region					
Low	1,111	1,944	1,935	1,920	1,906
Medium	1,111	2,342	2,441	2,574	2,725
High	1,111	2,601	2,839	3,249	3,752
Total Victoria					
Low	1,302	2,231	2,219	2,201	2,184
Medium	1,302	2,705	2,815	2,964	3,134
High	1,302	3,010	3,280	3,747	4,320
GRP ($m, direct + indirect)					
Barwon Region					
Low	146	254	246	238	230
Medium	146	310	314	322	331
High	146	220	271	316	369
Total Victoria					
Low	181	307	297	287	278
Medium	181	375	379	389	400
High	181	419	448	496	553

Source: Tables 5.2 and 5.3, Appendices VII and VIII.

6. The Economic Impact of Port Users

Users of the Port of Geelong include a variety of companies which trade in liquid and dry bulk and break-bulk products. Some of these are large firms with large volumes of trade while others are smaller operations moving modest levels of cargo through the port each year. The activities of these firms, large and small, are, for the most part, not included in the impacts reported in Section 4 of this report. The following sections provide an overview of the significance of the Port to four Geelong based firms (Section 6.1) and an estimate of the impact that ten of the top port users have on the local economy (Section 6.2).

6.1 Examples of Local Port Users

For a range of companies the Port of Geelong is integral to the location of their operations, either as a source of inputs, as a facility for efficient export of end products or, in some cases, the infrastructure to facilitate both imports and exports. This section provides a brief description of the nature of the dependence on the Port of five locally operating firms, namely Alcoa Australia, Terminals Pty Ltd, Incitec Pivot Limited (IPL), Midway Pty Ltd and Shell Co of Australia.

Alcoa

View of the Point Henry site from Geelong's Eastern Beach
Source: http://www.alcoa.com/australia/en/home.asp

Alcoa Australia has two operations situated at Point Henry, consisting of the Point Henry smelter and the Alcoa Australia Rolled Products plant. The smelter, established in 1963, was one of the first plants in Australia to produce primary aluminium for domestic and international use. It is one of the world's most efficient smelters producing 190,000 tonnes of aluminium per year.

Approximately half of the aluminium produced at the Point Henry smelter is sold to the adjacent Alcoa Australia Rolled Products plant where it is rolled into aluminium sheets.

The plant produces around 90,000 tonnes of rolled aluminium per year for use in beverage cans and wine screw cap closures. Over 50 per cent of the rolled aluminium is exported.

To produce aluminium the smelter requires alumina, alumina fluoride, petroleum coke and liquid pitch to be shipped through the Port of Geelong. Point Henry receives around 380,000 tonnes of alumina each year from Western Australia. Aluminium fluoride arrives by ship from the USA. Petroleum coke is imported from both the USA and China. Pitch arrives at Point Henry in liquid form from Portland, and as this material needs to remain in liquid form, it is stored in a purpose-built, heated tank. The other raw materials are unloaded from the ships and transported along a conveyor belt to four large tanks where they are stored until needed.

The Alcoa Point Henry operations employ approximately 1,000 people in the Geelong area. Alcoa's operations at Point Henry have contributed to many community projects in Geelong and the surrounding area for over 40 years.

One way Alcoa Point Henry supports the local community is through its Partnering Stronger Communities program. The program incorporates financial and focuses on a shared commitment to making local communities stronger and a better place to live and work. Some major partners include the Geelong Performing Arts Centre, Geelong Regional Vocational Education Council, Greening Australia, United Way, BacLinks, Geelong Cats, Barwon Water and the Whittington Community Renewal Project.

In 2009, together with community partner Greening Australia, Alcoa employees, local primary school students and aged care clients celebrated World Environment Day. Activities involved planting approximately 500 trees and grasses to rehabilitate a degraded area of the Surry River at Narrawong. Through this partnership Point Henry Alcoa and Greening Australia were awarded the United Nations World Environment Day Best Environmental Initiative Award in 2008 (Alcoa of Australia Limited 2009).

On 1 March 2010 Alcoa and Loy Yang Power announced a new base-load electricity contract to power Alcoa's smelter at Point Henry to 2036. This will underpin the future viability and economic impacts of the company in the region.

Terminals Pty Ltd

Terminals Corio facility; Source: Graham Tumblety, Terminals

Terminals Pty Ltd is Australia's largest independent operator of bulk liquid and gas storage facilities with plants located at major ports throughout Australia. Their Geelong operation at Corio has facilities capable of handling flammable liquids, combustible liquids, corrosive liquids, fats and oils and hazardous and non-hazardous liquids. Site facilities include ship loading and unloading, five dock lines, road tanker loading and unloading, nitrogen blanketing and product heating.

The site at Corio was initially established to support PVC manufacturing but now handles inputs for plastic bottle manufacturing, the paint, printing, dairy and pharmaceutical industries and a wide range of other manufacturers.

Storage capacity on site is 42,000 cubic metres in 20 tanks with an annual throughput of around 200,000 tonnes from around 35 ship visits per year. Services provided by Terminals include the transfer of liquid products to and from bulk ships by pipeline, storage in bulk quantities, loading and discharge of road tanker trucks.

Currently 16 people are employed at the Geelong site, 14 on a full-time basis and 2 part-time.

Terminals is actively involved in community consultation groups in the Geelong area where their facilities are operated. The Terminals Geelong Community Consultation Committee was created to monitor the facility from a community view point and raise and address health, safety and environmental issues relating to it with Terminals Pty Ltd and the relevant regulators, and to facilitate a process to achieve the progressive environmental improvement of the facility at Geelong.

Incitec Pivot Limited (IPL)

Incitec Pivot Limited is a leading global chemicals company with nitrogen-based manufacturing at its core. The company's four main business areas are manufacturing, fertilisers, explosives and trading. As part of the fertiliser business area Incitec Pivot import significant quantities of the commodity through the Port of Geelong, as well as have a plant on site with the capacity to manufacture 450,000 tonnes of single superphosphate per year. Given the economic conditions surrounding the global financial crisis and the on-going drought in Victoria, the plant has been recently closed.

Nevertheless, the importing and distribution business still make IPL a significant operator at the Port with employment of around 30 full-time equivalent jobs. The organisation employs a full array of skills expected in this type of operation, ranging from semi skilled employees through to professionals. With a focus on safety and skill development, the company has an on-going training and competence program.

IPL facility, Port of Geelong; Source: Vek Rancic, IPL

IPL has been involved in a number of water saving projects in recent years, increasing stormwater storage capacity from 5 to 9 megalitres, installing an effluent treatment and process water recycling system, and installing a stormwater collection and treatment system to simultaneously eliminate discharges to Corio Bay and reduce mains water consumption. In total, these initiatives to recycle, reprocess and reuse process water, and capture, treat and use stormwater have resulted in a reduction in mains water by IPL Geelong of up to 50 megalitres per annum.

The site works closely with and supports the North Shore Residents community Group, and is a member of the Geelong Manufacturing Council

The company invested $2.0m, 4 years ago, in a Fluosilicic Acid Manufacturing Plant, and it is actively seeking growth opportunities in fertiliser and industrial chemicals related activities to expand the Geelong operations.

Midway Limited

The Midway Group is an integrated forestry company based in Geelong with majority shareholdings in South West Fibre based in the Green Triangle region, and Queensland Commodity Exports based in Brisbane. The company was established in 1980 by 16 Victorian hardwood saw millers to develop a viable export market for hardwood sawmill residues.

Midway exports up to 1.0 million tonnes of hardwood and softwood chips each year through the Geelong Port and produces softwood plantation sawlogs for local and export markets.

Midway's integrated forestry operation manages 26,000 ha of plantations in Victoria and processes wood at the 19 ha freehold site adjacent to Corio Quay. Over 50 people are directly employed by Midway and the company provides indirect employment for up to 1,000 people in the region.

With a focus on safety and skill development, the company has an on-going training and competence programmes. These include both internal programs for in-house training and the engagement of external registered training organisations for an array of licensed activities (e.g. plant, fork lift, vehicle operation).

Midway facility, Port of Geelong
Source: Les Branch, Midway Ltd

During the construction of its new office in 2008, Midway contributed to the revegetation of the waterfront from the office to the GeelongPort site. The Midway Group provide ongoing sponsorship to community football and netball teams, are an active member of the Old Beechy Rail Committee. Midway also supports and provides annual donations to over 50 CFA groups in country Victoria.

In 2006 the company invested $17 million in a site upgrade with the construction of a second processing line and stockpile facility including an additional 3 chip reclaims so that the site can hold and ship load multi products. More recently a ring debarker has been added to the site equipment at a cost of $300K for debarking softwood logs.

An investment of approximately $25 million on a new woodchip ship loader at the port. Commissioning of the new ship loader is expected to occur in April 2010.

Shell

The Geelong Shell Refinery is one of the largest of seven refineries in Australia. It supplies approximately half of Victoria's and the majority of Tasmania's fuel needs. Depending on the costs and supply conditions, product is also shipped into Brisbane, Townsville, Sydney, Adelaide, Esperance and New Zealand.

The major products produced at the Shell refinery include petrol (25 per cent being high octane grades), diesel fuel, jet fuel, bitumen, LPG, specialty solvents and avgas. At full capacity the refinery can process up to 120,000 barrels of oil per day.

Geelong refinery view from Corio Bay
Source: http://www.shell.com.au

Approximately 90 per cent of crude and other feedstock arrives at the refinery via ship. Crude oil is sourced from the Far East (e.g. Vietnam, Malaysia, Brunei and Indonesia), West Africa (e.g. Algeria and Gabon), United Arab Emirates, New Zealand, and Australia's own oilfields via the Western Port-Altona-Geelong (WAG) pipeline, truck and by ship. The refinery is heavily reliant on the Port of Geelong because the use of ships for transport is the only economically feasible way of running the refinery.

Approximately 470 people are employed on site at the Geelong refinery, as well as up to 150 contractors. The refinery employs the full range of skills expected in a complex manufacturing organisation, ranging from process operators and 80 maintenance tradespeople through to business functions (human resources, procurement, communications, finance, health, safety, security and environment, organisational development/business improvement) and technical and engineering professionals. Geelong has an on-going training and competence programme with an emphasis on safety and technical skill development. For decades the refinery has conducted an apprenticeship programme. The intake can vary from two to four apprentices a year.

The Shell Geelong Refinery has spent $210 million in the past five years on equipment that allows the production of low benzene gasoline and low sulphur diesel products as part of the Federal Government's Clean Fuels Legislation. Another $130 million has been spent on environmental improvement projects to reduce the emissions of the refinery.

Additionally, Shell will be contributing approximately half of the $90 million cost of the Northern Water Plant (NWP) currently being designed by Barwon Water. The Barwon Water owned and operated NWP will recycle sewage from homes and trade waste from Shell Geelong Refinery. The 'Class A' water will be used by the refinery, saving 5 per cent (2,000 megalitres per year) of Geelong's total water consumption.

The refinery undertakes a range of Community Capacity Building programmes. Shell works actively with the community to help equip students and young adults with the necessary information and skills to obtain future employment with Shell and other employers.

Each year the refinery contributes hundreds of thousands of dollars towards the Geelong community through its social investment programme as well as sponsorships and donations. Shell's social investment programmes are targeted investments that assist community organisations to achieve their goals and help build community capacity.

6.2 Economic Impact on the Barwon Economy of Ten Port Users

The main purpose of this study has been to provide an analysis of port-related activity at the Port of Geelong; the economic activity involved in the movement of ships in and out of the Port, the movement of cargo to and from the Port and on and off ships, and the ancillary services that supports this movement of ships and cargo. These various activities define the operation of the Port and, collectively, they generate, directly and indirectly, an impact on the Barwon and Victorian economies that was reported in detail in Section 4.

The results presented in Section 4 provide a contained and well-defined economic impact that is consistent with the Bureau of Transport and Regional Economics (BTRE) definition of regional port impact. The method has been applied in numerous studies of ports across Australia (e.g. BTE (2000, 2001); EconSearch (2001, 2003); EconSearch and NIEIR (2002)). The BTRE framework, quite intentionally, excludes from the calculated regional impact the economic contribution that port users have on the local economy. For example, the activities of a manufacturing firm that imports raw materials and then exports processed products through the port is not included in the BTRE definition of port-related activity. The economic activity associated with the movement of the raw material and processed product back and forth across the wharf is included, however the processing activity itself is not. In striving to develop a method that gives a consistent and comparable measure of regional economic impact, this is a reasonable approach because it would be otherwise very difficult to define in a consistent manner those manufacturing activities that are attributable to the port and those that are not.

Nevertheless, in the case of the Port of Geelong, as with most other ports, there is a certain amount of economic activity in the Port’s hinterland that would not occur in the local economy if the Port did not have its particular location. With the assistance of G21 – Geelong Regional Alliance Ltd, employment data were collected for ten significant port users. These are not necessarily the ten largest users of the Port of Geelong but are firms that have a high level of dependence on the Port for their local operations and have a prominent presence in the local economy. These ten firms account for direct employment of an estimated 1,800 people (full-time equivalents) in the Barwon economy. Each firm was categorised by industry sector and standard employment to output ratios for each industry sector were applied to the employment data to estimate the value of production by these firms. These data were then used in the Barwon regional economic model to estimate the direct and indirect effects of the operations of these businesses to the local economy. The results of the analysis are provided in Table 6.1.

The operation of the ten locally based Port of Geelong users generated direct business turnover of over $2.8 billion in 2008/09 with flow-ons of $915 million giving an estimated total output impact (direct plus flow-ons) on the Barwon economy of around $3.7 billion.

Value added attributable to the operation of the ten firms was estimated to be $418 million in the Barwon region, with flow-ons of $317 million. This provided a total contribution of approximately $735 million or 6.4 per cent of gross regional product in the Barwon region in 2008/09.

Table 6.1 Direct and flow-on effects of ten Port of Geelong users, Barwon region, 2008/09

Sector[a]	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment fte no.*
Direct Effect				
Port Users	*2,807.8*	*417.7*	*175.0*	*1,808*
Flow-on Effect				
Primary	11.3	6.1	1.3	52
Mining	23.4	12.2	2.8	32
Manufacturing	411.8	76.1	37.3	441
Utilities	28.6	15.1	4.4	37
Construction	11.3	3.4	1.5	29
Wholesale and retail trade, etc.	130.9	60.8	36.7	797
Accomm., restaurants, etc.	32.0	12.5	7.2	197
Transport, storage (excl port)	58.6	22.9	11.4	178
Communication	15.5	7.6	2.4	37
Finance, business services	124.9	60.4	32.9	358
Public administration	5.7	3.0	2.5	30
Community services	36.9	26.9	22.9	330
Recreation, personal services	24.1	10.9	7.8	163
Total Flow-on Effect	*915.1*	*317.9*	*171.1*	*2,681*
Total[b]	***3,722.9***	***735.6***	***346.0***	***4,489***

[a] Refer to Appendix IV for detailed sector definitions.

[b] Components may not sum to totals due to rounding.

Source: EconSearch analysis

Household income generated by the ten locally based Port users totalled $175 million in the Barwon region, with flow-ons of $171 million. Direct employment was estimated at 1,808 fte jobs and flow-ons of 2,681 fte, giving total employment (direct plus flow-on) generated by the ten Port users as an estimated 4,489 fte. This represented around 5 per cent of total employment in the Barwon region in 2008/09.

Appendix I Port Related Activity

The firms and organisations involved in *port-related activity* can be grouped according to their function as described below.

(1) Administration

This function is comprised of general port management and operations.

(2) Ship operations

Three sub-groups make up the shipping group. The first of these relates to the activities of shipping lines and agents. The local expenditures incurred by these companies in the operation of their business comprise part of the shipping component of port-related activity.

The second sub-group relates to moving the ships into and out of the port. This includes towage, linesmen services and mooring and unmooring.

The third sub-group includes services provided to ships while they are in the port. Firms providing these services include ship chandlers and provedores, ship repairers and oil bunkering companies.

(3) Ship loading and unloading and cargo services

This group relates to the movement of cargo on and off the ship. For containers and other general cargo, this generally involves moving the cargo across the wharf and onto (or off) some form of land-based transport (road or rail). This type of cargo movement is undertaken by stevedoring companies. Bulk cargoes (oil, chemicals, gas, etc) are generally moved through specialised facilities, sometimes owned and operated by the importing/exporting firm.

This group also includes all those firms associated with the documentation for importing and exporting cargo (shipping and customs agents and freight forwarders), container services (container repair and storage) and fumigation.

(4) Land transport and storage

This group comprises the activities of the railways and road transport firms in moving cargo to and from the port. Only expenditures directly related to cargo moving through the port are included in this component of port-related activity. Port-related storage is also included in this category.

The Geelong Port is serviced by a system of road and rail transportation systems. There are some limitations on the Ports ability to compete for some bulk product trade due to the lack of rail access to Lascelles Wharf and Corio Quay.

(5) Government agencies

This group includes cargo inspection and regulation (customs, quarantine, and environmental inspections) as well as ship safety.

Table I.1 Definition of port functions

Port industry group	*Components*
Port company operations	Planning, co-ordination & promotion Land and property management Safety and emergency response Port maintenance Dredging
Ship operation & ship movement	Shipping lines Ship managers Ship repairs and maintenance [a] Bunkering Ship chandlers/provedores [b] Marine and cargo surveyors Waste disposal
	Shipping channels Navigation aids Ship agents Towage operators Pilots Mooring/unmooring services [c]
Ship loading/unloading	Wharves, berths, jetties, etc. [d] Stevedoring (non-bulk) Bulk cargo loading/unloading Passenger terminals
Cargo services	Customs agents Freight forwarders Container packing/unpacking Container parks Fumigation
Land transport and storage [e]	Road transport Rail transport Storage facilities
Government agencies	Customs Quarantine Ship safety [f]

a. Only for vessels in the port for the purpose of bringing in or taking out cargo.
b. Supply of stores and provisions to ships. Excludes supplies to commercial fishing or recreational boating sectors.
c. Includes linesmen and launch service.
d. Construction and maintenance.
e. Port-related activities only. Involves movement of cargo within the port and between the port and closest inland points (e.g. warehouses, bonded storage).
f. Australian Maritime Safety Authority.

Several Commonwealth agencies oversee port related activities at the Port of Geelong. The Australian Quarantine and Inspection Service (AQIS) undertakes import and export inspection and certification. The Australian Maritime Safety Authority (AMSA) undertakes inspections to ensure that ships meet specified safety standards. The Australian Customs Service examines cargoes to ensure that import and export requirements and restrictions are not breached.

Appendix II Survey Questionnaires

This appendix contains the version of the questionnaire that was sent to firms whose activities were primarily Geelong port-related.

EconSearch Pty Ltd
214 Kensington Road
Marryatville SA 5068
Tel: 08 8431 5533
Fax: 08 8431 7710
Email: jbmorison@econsearch.com.au
Contact: Julian Morison

**PORT OF GEELONG ECONOMIC IMPACT STUDY 2008/09 –
PORT SERVICE – PROVIDERS QUESTIONNAIRE**

Please read this first:

- If exact figures are not available, please provide careful estimates.
- Please report all monetary values in ***thousands of dollars*** ($'000).
- An electronic version of this questionnaire can be sent to you by email, if requested.

1. Company Information

Company Name: ______________________________

Contact Name: ______________________________

Contact Phone Number: ______________________________

Port – Related Activities (see attached list): ______________________________

____

2. Staff numbers and associated costs incurred in Victoria related to activities through the Port of Geelong (average for financial year 2008/09, including working proprietors, managers, directors):

Full Time ____________

Part Time ____________ (total)

____________ (full – time equivalents)

Contractors ____________ (full – time equivalents)

Gross wages & salaries in 2008/09 ($'000) __________
(including associated costs, e.g. superannuation, but excluding payroll tax)

3. What other major costs, in addition to gross wages and salaries, were incurred in 2008/09 related to activities through the Port of Geelong: (e.g. fuel, repairs and maintenance, contractors, power)

Expenditure item	($'000)	% in Barwon Region	% in rest of Victoria

4. Please break down your Port of Geelong related revenue by cargo type and estimate market share for each cargo type (i.e. your firm's share of the Geelong market for that cargo type).

Cargo Type	Revenue in 2008/09 ($'000)	Estimated market share for each cargo type (%)
Woodchips		
Logs		
Fertiliser		
Grain		
Other dry bulk		
Aluminium products		
Steel products		
Crude oil & petroleum products		
Chemicals		
Other (please specify)		
TOTAL		

5. If your activity in the Port of Geelong in 2008/09 was not a typical year, please explain in what way(s) it differed from the norm.

6. How has your activity in the Port of Geelong changed over the past 5 years?

7. In what ways do you expect your activity to change over the next 5 years?

8. What infrastructure investments or other changes are required to enable the Port of Geelong to increase the volume of trade through the Port?

9. How would you describe your firm's dependence on the Port (e.g. if the Port wasn't there how would it affect your business operations)?

10. Any other comments about the Port of Geelong?

Thank you for your time and cooperation.

Please return the questionnaire by email to jbmorison@econsearch.com.au or by fax to (08) 8431 7710.

If you have any queries don't hesitate to contact Julian Morison on 08 8431-5533 or 0419 869-633

Appendix III Economic Impact Analysis

This study provides estimates of the economic impact of *port-related activity* on the economy of the Barwon region and the state of Victoria. The methodological basis for the study is input-output analysis. In this appendix the concept of economic impact, the process of impact measurement and the use of input-output models in impact measurement are briefly reviewed. The research methodology applied in this study is outlined in more specific terms in Section 3.

The input-output model is suitable for the detailed description of regional economies and for measuring the impacts of existing industries, new industries or changes in the size of industries on the regional economy. It is therefore appropriate to apply the model in estimating the impact of port-related activity on the economy of the Barwon region.

In the following sections the method of economic impact analysis is outlined and the structure of the input-output model and multipliers, the tools used in the estimation of economic impacts, are detailed.

Economic impact analysis

The term *impact* has no unambiguous meaning; it is used in a wide variety of contexts, and synonymously with several terms such as *results*, *incidence*, *effect*, *significance*, *contribution*, *consequence* and *importance*. It is therefore important to define clearly the concept of economic impact, and the particular use of the term applied in this study.

One of the main ends of economic research is the study of impacts, where the term refers generally to the consequences of some expected or hypothetical phenomenon, either physical or social. For example, the recent emergence of environmental impact statements reflects a desire on the part of authorities to be informed on the likely consequences of a new development, both in terms of effects on the physical environment and the socio-economic environment. An impact study is intended to isolate and identify the more significant consequences of an event or phenomenon for planning purposes.

It is necessary to distinguish between the *impacting agent*, which is the phenomenon or event under study, and the *impacts*, which are the results of the existence of, or change in, the impacting agent. Socio-economic impact studies tend to be restricted to the consequences of significant existing or new phenomena. These phenomena cause a wide variety of impacts to occur in economic, sociological, political, physical and welfare terms. For example, the activity associated with the port in Geelong has resulted in a wide variety of impacts on the regional, social and economic structure of Geelong and the Barwon region as a whole. Apart from the economic consequences of the port, some of which are the subject of this study, virtually every facet of the regional social structure will be affected by the existence of the port.

Since this study is concerned solely with economic impact, it omits the wide variety of non-economic impacts of the industry on the region, many of which are clearly significant. The *economic* consequence of the presence of the port will be felt in many aspects of activity in the Geelong region, ranging from levels of regional output, income and employment, to land prices (including residential, commercial and industrial land), house and building prices, local government rates, supply and demand of labour, demand and supply of urban infrastructure and so on. Unfortunately, fully comprehensive models, including all aspects of regional economic activity, are not available and more complex econometric models with an ability to include a wide variety of economic phenomena have not been satisfactorily developed for impact analysis at a regional level in Australia.

Consistent with the BTE (2000) approach, the input-output model was considered the most appropriate for this economic impact assessment. This model is, however, limited to those aspects of impact which can be represented in the input-output model, ie output, income, employment and value added. The procedures used in input-output analysis are detailed in the following section.

While it is quite clear that significant economic and social impacts are associated with port-related activity, measurement of these impacts does not, *per se*, constitute an economic evaluation of the industry. Such an evaluation is possible only through a comprehensive cost-benefit analysis of the industry, which would take into account both the direct and indirect impacts of the industry as recorded in this study.

In summary, an economic impact may be defined in general terms as the measured economic effect of, or change which is attributable to, the impacting agent[5] on the economy in question.

Multipliers and impact measurement

The essence of impact measurement is the empirical measurement of the relationship between cause and effect, or between the impacting agent and the expected impact. This relationship can be expressed in two ways:

(i) on a 'per unit of impact' basis. This is normally expressed in terms of a multiplier which expresses the cause-effect relationship in empirical terms. In this study, output, income, employment and value added multipliers are used to express impacts in terms of a 'per unit of output of port-related activity'.

(ii) on an aggregate value basis. This expresses the total absolute effect, measured in terms of output, income, employment, and value added of the existence of port-related activity.

The selection of methodology for impact measurement is therefore selection of the most appropriate method of estimation of multipliers. Four general methods are available for this purpose, namely economic base multipliers, regional Keynesian multipliers, econometric models and input-output models. The consultants had access to an established methodological and research structure for the calculation of an input-output table for the Barwon region, and to methods of calculating multipliers from these tables. There was, therefore, a distinct advantage in the use of the input-output technique, apart from the fact that it is generally considered to be methodologically superior to the simpler techniques such as the economic base approach or the use of regional Keynesian employment multipliers. This superiority is generally considered to be attributable to the following factors (Jensen and West 1986):

(i) In terms of the incidence of impact, the economic base and the Keynesian approaches normally provide impact measurement only in

[5] The impacting agent may be an actual or potential source of economic change, or an industry which is established and operating in the economy.

aggregate terms, i.e. the total impact felt by all sectors collectively. Input-output multipliers allow the analyst to examine the manner in which the total impact is distributed among the sectors of the economy. This is a reflection of the internal linkages and interdependencies in the economy which are specified in the input-output table.

(ii) Input-output multipliers also allow the identification of the components of the multiplier; the economic base and Keynesian models do not, in their standard form, provide all of these details. The components are as follows:

(a) the **initial** effect, which is the stimulus for the impact analysis – normally assumed to be a dollar change in sales to final demand;

(b) the **first-round** effect, which refers to the purchases of inputs required from other sectors in the economy in order to produce the additional output;

(c) the **industrial-support** effect, which refers to second, third and subsequent-round industrial flow-on effects triggered by the purchases in the first round; and

(d) the **consumption-induced** effects, which stem from the spending of household income received as payments for labour used in producing the additional output.

Regional econometric models, including models of the general equilibrium family, were not available for the region or project in question, and were not considered necessary for the view of impact taken in this study.

Input-output analysis

An outline of the input-output technique can be found in any one of a number of standard texts dealing with the subject (see, for example, Hewings (1985), Midmore and Harrison-Mayfield (1996), Miller and Blair (1985), Jensen and West (1986) and West (1993, 1995, 1999). An input-output table is a simple mathematical representation of the production aspects of an economy viewed at a particular point in time. In the purely hypothetical case of no significant change in the economy from one time period to another, the table would remain relatively unchanged over that period. In reality, any economy continually experiences many types of shocks or stimuli (positive and negative) and these may be ephemeral in nature or lead to long-term structural changes in the nature of the economy. Many of these stimuli can be represented in the input-output model by appropriate adjustments to the input-output table. Some of these methods are outlined in the following section.

Methods of impact measurement using input-output analysis

The task of measuring economic impacts through the input-output model is largely one of representing the impact in the most appropriate manner in the transactions table. Once this has been completed, the analytical derivation of the impact is possible through multiplier calculation in the conventional manner.

The responsibility of the input-output analyst is to determine the nature of the impact under study, the relationship of the impacting agent with the economy in question, and to simulate this relationship as closely as possible in the transactions table of the regional economy. Some common types of impact, requiring different treatment of the input-output table, are listed below.

(a) A change in the level of output of a sector or sectors, due to changes in the level of final demand, may be traced by use of multipliers or by matrix multiplication using the table in its original form.

(b) A change in the technology or trading patterns of an existing industry would be reflected in changed column or row entries in the existing transactions table. The effects of this type of change would be measured by comparing multipliers, output levels and employment levels before and after the impact occurred.

(c) A new or existing firm or industry can be incorporated into the study in either of two ways. If the impact is regarded as of little significance, or if the firm is thought to show a cost structure (ie a column in the A matrix) similar to the average existing firm in the table, the new firm can be adequately represented by the existing sector of the table without any significant strain on the assumptions of the model. If, however, the firm or industry to be examined is considered to be of some significance, or if the requirements of the study called for a detailed study of the firm or industry *per se*, a new row and column representing that firm or industry should be prepared and incorporated into the input-output table and normal multiplier calculation carried out. Only in this manner is a detailed study of the impact of the firm or industry possible. The latter procedure was used in this study and new rows and columns were prepared for each aspect of port-related activity, as described in Chapter 3.

Limitations of input-output analysis

The input-output model, like all economic models, is not capable of a perfect or near-perfect simulation of economic reality. It is therefore important to clarify the limitations of the model. Two points are made in the context of the present study.

The first point refers to the accuracy of multiplier estimates. The results of any social or economic analysis must, by the nature of the data and the techniques of analysis used, be interpreted in a broad accuracy framework. While the mathematical operations of the technique produce results which appear to be precise, a professional assessment of accuracy in general terms is necessary. The accuracy of the estimates in this study as in other studies of this nature, should be interpreted in an 'order of magnitude' holistic framework (Jensen 1980).

The second point refers to the question of the linearity assumption of the input-output model. The notion of linearity is common to most methods of impact analysis, including most of the alternative methods discussed above. This or some other equally convenient assumption is usually necessary to achieve workable economic models. The main question is not the existence of the assumption but the extent to which it results in unacceptable inaccuracies in empirical work. In this study it was felt that since port-related activity is long-established, and clearly a 'permanent' and integrated part of the regional economy, the linearity assumption posed no problem in the estimation and interpretation of the significance of the industry in the economy of the Barwon region.

Appendix IV Input-Output Sector Definitions

Aggregated Barwon & Victorian input-output table sectors	Corresponding national input-output table sectors [6]
1. Primary	0101 Sheep 0102 Grains 0103 Beef cattle 0104 Dairy cattle 0105 Pigs 0106 Poultry 0107 Other agriculture 0200 Services to agric., hunting & trapping 0300 Forestry and logging 0400 Commercial fishing
2. Mining	1100 Coal; oil and gas 1301 Iron ores 1302 Non-ferrous metal ores 1400 Other mining 1500 Services to mining
3. Manufacturing	2101 Meat & meat products 2102 Dairy products 2103 Fruit and vegetable products 2104 Oils and fats 2105 Flour & cereal foods 2106 Bakery products 2107 Confectionery 2108 Other food products 2109 Soft drinks, cordials and syrups 2110 Beer and malt 2111 Wine & spirits 2112 Tobacco products 2201 Textile fibres, yarns etc. 2202 Textile products 2203 Knitting mill products 2204 Clothing 2205 Footwear 2206 Leather & leather products 2301 Sawmill products 2302 Other wood products 2303 Pulp, paper & paperboard 2305 Paper bags and products 2401 Printing & services to printing 2402 Publishing; recorded media etc.

6 Concordance between the national input-output sectors and ANZSIC sectors can be found in Australian Bureau of Statistics (2001).

Aggregated Barwon & Victorian input-output table sectors	Corresponding national input-output table sectors
3. Manufacturing (cont.)	2501 Petroleum & coal products 2502 Basic chemicals 2503 Paints 2504 Pharmaceuticals etc. 2505 Soap & other detergents 2506 Cosmetic & toiletry preparations 2507 Other chemical products 2508 Rubber products 2509 Plastic products 2601 Glass & glass products 2602 Ceramic products 2603 Cement, lime and concrete slurry 2604 Plaster & other concrete products 2605 Other non-metallic mineral products 2701 Iron & steel 2702 Basic non-ferrous metals etc. 2703 Structural metal products 2704 Sheet metal products 2705 Fabricated metal products 2801 Motor vehicles & parts; other t/port equip 2802 Ships and boats 2803 Railway equipment 2804 Aircraft 2805 Photographic & scientific equipment 2806 Electronic equipment 2807 Household appliances 2808 Other electrical equipment 2809 Agricultural, mining etc. machinery 2810 Other machinery & equipment 2901 Prefabricated buildings 2902 Furniture 2903 Other manufacturing
4. Utilities	3601 Electricity 3602 Gas 3701 Water, sewerage and drainage
5. Building and construction	4101 Residential building 4102 Other construction
6. Wholesale and retail trade, etc., trade	4501 Wholesale trade 5101 Retail trade 5401 Mechanical repairs 5402 Other repairs
7. Accommodation, cafes & restaurants	5701 Accommodation, cafes & restaurants

Aggregated Barwon & Victorian input-output table sectors	Corresponding national input-output table sectors
8. Transport (excl Port)	6101 Road transport 6201 Rail, pipeline & other transport 6301 Water transport 6401 Air & space transport 6601 Services to transport; storage
9. Port	This sector is a composite of parts of a number of other sectors including 6601,6101 and 6201.
10. Communication	7101 Communication services
11. Finance, business services	7301 Banking 7302 Non-bank finance 7303 Financial asset investors 7401 Insurance 7501 Services to finance etc. 7702 Other property services 7801 Scientific research, technical and computer services 7802 Legal, accounting etc. 7803 Other business services
12. Ownership of dwellings	7701 Ownership of dwellings
13. Public administration	8101 Government administration (part) 8201 Defence
14. Community services	8601 Health services 8401 Education 8701 Community services
15. Recreation, personal services	9101 Motion picture, radio etc. 9201 Libraries, museums & the arts 9301 Sport, gambling etc. 9501 Personal Services 9601 Other services

Appendix V Disaggregated Multipliers - Barwon

Table V.1 Disaggregated output multipliers for the Port of Geelong, 2008/09 (Barwon)

Sector [a]	*Initial*	*First* [b]	*Indust.* [b]	*Consumption* [c]	*Total*	%	*Flow-on*	%
Primary	0.00	0.00	0.00	0.01	0.01	0.6	0.01	1.7
Mining	0.00	0.00	0.00	0.00	0.00	0.1	0.00	0.1
Manufacturing	0.00	0.03	0.03	0.08	0.14	8.2	0.14	20.2
Utilities	0.00	0.01	0.00	0.01	0.03	1.7	0.03	4.2
Construction	0.00	0.02	0.01	0.00	0.04	2.1	0.04	5.3
Wholesale and retail trade, etc.	0.00	0.03	0.01	0.09	0.13	8.1	0.13	19.8
Accommodation, restaurants, etc.	0.00	0.00	0.00	0.03	0.03	1.9	0.03	4.6
Transport, storage (excl port)	0.00	0.03	0.01	0.02	0.05	3.0	0.05	7.3
Port	1.00	0.00	0.00	0.00	1.00	59.5	0.00	0.0
Communication	0.00	0.01	0.00	0.01	0.03	1.6	0.03	3.8
Finance, business services	0.00	0.06	0.04	0.05	0.15	9.2	0.15	22.6
Ownership of dwellings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Public administration	0.00	0.00	0.00	0.00	0.01	0.4	0.01	0.9
Community services	0.00	0.00	0.00	0.04	0.04	2.2	0.04	5.5
Recreation, personal services	0.00	0.00	0.00	0.02	0.03	1.6	0.03	3.9
Total	1.00	0.21	0.11	0.36	1.68	100.0	0.68	100.0

a. Sector definitions are given in Appendix IV.

b. First-round + industrial-support effects = production-induced effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.32

Type II Multiplier 1.68

Source EconSearch analysis.

Table V.2 Disaggregated value added multipliers for the Port of Geelong, 2008/09 (Barwon)

Sector [a]	*Initial*	*First* [b]	*Indust.* [b]	*Consumption* [c]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mining	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.20
Manufacturing	0.00	0.01	0.01	0.02	0.03	3.40	0.03	9.40
Utilities	0.00	0.01	0.00	0.01	0.02	1.90	0.02	5.20
Construction	0.00	0.01	0.00	0.00	0.01	1.40	0.01	3.70
Wholesale and retail trade, etc.	0.00	0.02	0.00	0.05	0.07	8.20	0.07	22.20
Accommodation, restaurants, etc.	0.00	0.00	0.00	0.01	0.01	1.60	0.01	4.30
Transport, storage (excl port)	0.00	0.01	0.00	0.01	0.02	2.50	0.02	6.70
Port	0.50	0.00	0.00	0.00	0.50	63.00	0.00	0.00
Communication	0.00	0.01	0.00	0.00	0.01	1.60	0.01	4.40
Finance, business services	0.00	0.03	0.02	0.03	0.08	10.00	0.08	26.90
Ownership of dwellings	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
Public administration	0.00	0.00	0.00	0.00	0.00	0.40	0.00	1.10
Community services	0.00	0.00	0.00	0.03	0.03	3.60	0.03	9.60
Recreation, personal services	0.00	0.00	0.00	0.01	0.01	1.60	0.01	4.20
Total	0.50	0.09	0.05	0.16	0.80	100.00	0.30	100.00

a. Sector definitions are given in Appendix IV.

b. First-round + industrial-support effects = production-induced effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.27

Type II Multiplier 1.59

Source EconSearch analysis.

Table V.3 Disaggregated income multipliers for the Port of Geelong, 2008/09 (Barwon)

Sector [a]	*Initial*	*First* [b]	*Indust.* [b]	*Consumption* [c]	*Total*	%	*Flow-on*	%
Primary	0.00	0.00	0.00	0.00	0.00	0.3	0.00	0.8
Mining	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.1
Manufacturing	0.00	0.00	0.00	0.01	0.02	4.2	0.02	9.2
Utilities	0.00	0.00	0.00	0.00	0.00	1.3	0.00	2.7
Construction	0.00	0.00	0.00	0.00	0.01	1.4	0.01	2.9
Wholesale and retail trade, etc.	0.00	0.01	0.00	0.03	0.04	11.2	0.04	24.3
Accommodation, restaurants, etc.	0.00	0.00	0.00	0.01	0.01	2.0	0.01	4.4
Transport, storage (excl port)	0.00	0.01	0.00	0.00	0.01	2.8	0.01	6.0
Port	0.20	0.00	0.00	0.00	0.20	53.7	0.00	0.0
Communication	0.00	0.00	0.00	0.00	0.00	1.2	0.00	2.5
Finance, business services	0.00	0.02	0.01	0.02	0.04	11.9	0.04	25.8
Ownership of dwellings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Public administration	0.00	0.00	0.00	0.00	0.00	0.8	0.00	1.7
Community services	0.00	0.00	0.00	0.02	0.02	6.6	0.02	14.2
Recreation, personal services	0.00	0.00	0.00	0.01	0.01	2.5	0.01	5.4
Total	0.20	0.05	0.02	0.10	0.37	100.0	0.17	100.0

a. Sector definitions are given in Appendix IV.

b. First-round + industrial-support effects = production-induced effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.36

Type II Multiplier 1.86

Source EconSearch analysis.

Table V.4 Disaggregated employment multipliers[a] for the Port of Geelong, 2008/09 (Barwon)

Sector[b]	*Initial*	*First[c]*	*Indust.[c]*	*Consumption[d]*	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.00	0.01	0.04	0.05	0.8	0.05	1.9
Mining	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.1
Manufacturing	0.00	0.04	0.04	0.13	0.20	3.5	0.20	7.7
Utilities	0.00	0.02	0.01	0.01	0.04	0.6	0.04	1.4
Construction	0.00	0.06	0.02	0.01	0.09	1.5	0.09	3.4
Wholesale and retail trade, etc.	0.00	0.23	0.04	0.67	0.95	15.8	0.95	35.0
Accommodation, restaurants, etc.	0.00	0.02	0.01	0.16	0.19	3.2	0.19	7.1
Transport, storage (excl port)	0.00	0.08	0.02	0.05	0.15	2.5	0.15	5.6
Port	3.30	0.00	0.00	0.00	3.30	54.8	0.00	0.0
Communication	0.00	0.03	0.01	0.02	0.06	1.0	0.06	2.3
Finance, business services	0.00	0.16	0.13	0.14	0.42	7.1	0.42	15.6
Ownership of dwellings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Public administration	0.00	0.02	0.01	0.01	0.03	0.5	0.03	1.2
Community services	0.00	0.00	0.01	0.32	0.33	5.6	0.33	12.3
Recreation, personal services	0.00	0.01	0.01	0.16	0.18	3.0	0.18	6.7
Total	3.30	0.68	0.32	1.72	6.01	100.0	2.71	100.0

a. Jobs per million dollars.

b. Sector definitions are given in Appendix IV.

c. First-round + industrial-support effects = production-induced effects.

d. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.30

Type II Multiplier 1.82

Source EconSearch analysis.

Appendix VI Disaggregated Multipliers - Victoria

Table VI.1 Disaggregated output multipliers for the Port of Geelong, 2008/09 (Victoria)

Sector[a]	*Initial*	*First*[b]	*Indust.*[b]	*Consumption*[c]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.00	0.00	0.01	0.01	0.6	0.01	1.1
Mining	0.00	0.00	0.00	0.00	0.01	0.3	0.01	0.5
Manufacturing	0.00	0.04	0.04	0.10	0.18	9.1	0.18	19.0
Utilities	0.00	0.02	0.01	0.02	0.04	2.0	0.04	4.2
Construction	0.00	0.03	0.00	0.00	0.03	1.5	0.03	3.2
Wholesale and retail trade, etc.	0.00	0.05	0.02	0.09	0.16	8.1	0.16	16.8
Accommodation, restaurants, etc.	0.00	0.01	0.01	0.02	0.03	1.8	0.03	3.7
Transport, storage (excl port)	0.00	0.03	0.01	0.02	0.06	3.2	0.06	6.6
Port	1.00	0.00	0.00	0.00	1.00	51.6	0.00	0.0
Communication	0.00	0.02	0.01	0.02	0.04	2.3	0.04	4.7
Finance, business services	0.00	0.08	0.07	0.09	0.23	11.9	0.23	24.7
Ownership of dwellings	0.00	0.00	0.00	0.07	0.07	3.8	0.07	7.8
Public administration	0.00	0.00	0.00	0.00	0.01	0.5	0.01	1.0
Community services	0.00	0.00	0.00	0.02	0.03	1.4	0.03	2.8
Recreation, personal services	0.00	0.00	0.00	0.03	0.04	1.9	0.04	3.9
Total	1.00	0.28	0.18	0.49	1.94	100.0	0.94	100.0

a. Sector definitions are given in Appendix IV.

b. First-round + industrial-support effects = production-induced effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.45

Type II Multiplier 1.94

Source EconSearch analysis.

Table VI.2 Disaggregated value added multipliers for the Port of Geelong, 2008/09 (Victoria)

Sector[a]	*Initial*	*First*[b]	*Indust.*[b]	*Consumption*[c]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.00	0.00	0.00	0.01	0.5	0.01	1.1
Mining	0.00	0.00	0.00	0.00	0.00	0.3	0.00	0.6
Manufacturing	0.00	0.01	0.01	0.03	0.05	5.1	0.05	10.7
Utilities	0.00	0.01	0.00	0.01	0.02	2.1	0.02	4.4
Construction	0.00	0.01	0.00	0.00	0.02	1.6	0.02	3.2
Wholesale and retail trade, etc.	0.00	0.02	0.01	0.04	0.07	7.6	0.07	15.6
Accommodation, restaurants, etc.	0.00	0.00	0.00	0.01	0.01	1.4	0.01	2.9
Transport, storage (excl port)	0.00	0.02	0.01	0.01	0.03	3.5	0.03	7.2
Port	0.50	0.00	0.00	0.00	0.50	51.8	0.00	0.0
Communication	0.00	0.01	0.01	0.01	0.03	2.7	0.03	5.7
Finance, business services	0.00	0.04	0.04	0.05	0.12	12.2	0.12	25.3
Ownership of dwellings	0.00	0.00	0.00	0.07	0.07	6.6	0.07	13.8
Public administration	0.00	0.00	0.00	0.00	0.00	0.4	0.00	0.8
Community services	0.00	0.00	0.00	0.02	0.02	2.1	0.02	4.4
Recreation, personal services	0.00	0.00	0.00	0.02	0.02	2.0	0.02	4.3
Total	0.50	0.13	0.08	0.26	0.97	100.0	0.47	100.0

a. Sector definitions are given in Appendix IV.

b. First-round + industrial-support effects = production-induced effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.42

Type II Multiplier 1.93

Source EconSearch analysis.

Table VI.3 Disaggregated income multipliers for the Port of Geelong, 2008/09 (Victoria)

Sector[a]	*Initial*	*First*[b]	*Indust.*[b]	*Consumption*[c]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.00	0.00	0.00	0.00	0.7	0.00	1.2
Mining	0.00	0.00	0.00	0.00	0.00	0.1	0.00	0.2
Manufacturing	0.00	0.01	0.01	0.01	0.02	5.0	0.02	9.0
Utilities	0.00	0.00	0.00	0.00	0.00	0.9	0.00	1.7
Construction	0.00	0.01	0.00	0.00	0.01	2.1	0.01	3.8
Wholesale and retail trade, etc.	0.00	0.02	0.01	0.03	0.06	12.8	0.06	23.1
Accommodation, restaurants, etc.	0.00	0.00	0.00	0.01	0.01	1.9	0.01	3.4
Transport, storage (excl port)	0.00	0.01	0.01	0.01	0.02	4.7	0.02	8.5
Port	0.20	0.00	0.00	0.00	0.20	44.2	0.00	0.0
Communication	0.00	0.01	0.00	0.01	0.01	2.7	0.01	4.9
Finance, business services	0.00	0.03	0.02	0.03	0.08	16.9	0.08	30.2
Ownership of dwellings	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.0
Public administration	0.00	0.00	0.00	0.00	0.00	0.7	0.00	1.2
Community services	0.00	0.00	0.00	0.02	0.02	4.1	0.02	7.3
Recreation, personal services	0.00	0.00	0.00	0.01	0.01	3.2	0.01	5.7
Total	0.20	0.08	0.05	0.12	0.44	100.0	0.25	100.0

a. Sector definitions are given in Appendix IV.

b. First-round + industrial-support effects = production-induced effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.64

Type II Multiplier 2.25

Source EconSearch analysis.

Table VI.4 Disaggregated employment multipliers[a] for the Port of Geelong, 2008/09 (Victoria)

Sector[b]	*Initial*	*First*[c]	*Indust.*[c]	*Consumption*[d]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.00	0.01	0.05	0.07	1.0	0.07	1.7
Mining	0.00	0.00	0.00	0.00	0.01	0.1	0.01	0.1
Manufacturing	0.00	0.09	0.09	0.19	0.36	5.1	0.36	9.7
Utilities	0.00	0.02	0.01	0.02	0.06	0.8	0.06	1.5
Construction	0.00	0.15	0.00	0.01	0.16	2.3	0.16	4.3
Wholesale and retail trade, etc.	0.00	0.37	0.13	0.66	1.16	16.6	1.16	31.3
Accommodation, restaurants, etc.	0.00	0.03	0.03	0.14	0.20	2.9	0.20	5.4
Transport, storage (excl port)	0.00	0.12	0.05	0.06	0.24	3.4	0.24	6.4
Port	3.30	0.00	0.00	0.00	3.30	47.0	0.00	0.0
Communication	0.00	0.05	0.03	0.05	0.13	1.8	0.13	3.4
Finance, business services	0.00	0.26	0.25	0.28	0.79	11.2	0.79	21.2
Ownership of dwellings	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.0
Public administration	0.00	0.01	0.01	0.01	0.03	0.5	0.03	0.9
Community services	0.00	0.01	0.02	0.24	0.26	3.7	0.26	7.1
Recreation, personal services	0.00	0.02	0.02	0.22	0.26	3.6	0.26	6.9
Total	3.30	1.12	0.64	1.95	7.01	100.0	3.71	100.0

a. Jobs per million dollars.

b. Sector definitions are given in Appendix IV.

c. First-round + industrial-support effects = production-induced effects.

d. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.54

Type II Multiplier 2.13

Source EconSearch analysis.

Appendix VII Forecast Trade and Trade Impacts: Low Case

Appendix Table VII-1 Forecast trade flows for main commodities, Port of Geelong: low case (kt)

	Year				
Commodity	Representative[a]	2014/15	2019/20	2024/25	2029/30
Woodchips & Logs	1,372	1,618	1,700	1,787	1,878
Fertiliser	1,042	800	841	883	929
Grain	948	991	1,042	1,095	1,151
Other Dry Bulk (including coal)	104	4,152	4,190	4,250	4,312
Aluminium Products	433	436	444	467	491
Steel Products	145	214	225	237	249
Crude Oil & Petroleum Products	6,717	6,496	6,827	7,176	7,542
Chemicals	319	431	466	504	546
Motor Vehicles	0	404	434	456	479
Other Cargo	179	197	207	218	229
Total	*11,259*	*15,739*	*16,377*	*17,074*	*17,806*

[a] The "representative" year is based on average trade over the period 2000/01 and 2008/09.

Source: Meyrick & Associates and Thompson Clarke (2009), GeelongPort, GrainCorp

Appendix Table VII-2 Economic impact on the Barwon region of forecast increases in trade through Port of Geelong: low case

	Year				
	Representative	2014/15	2019/20	2024/25	2029/30
Employment Impact (direct + indirect)					
Woodchips & Logs	288	320	320	319	319
Fertiliser	183	132	132	132	132
Grain	180	177	177	177	177
Other Dry Bulk (including coal)	31	412	396	381	368
Aluminium Products	40	38	37	37	37
Steel Products	61	86	86	86	86
Crude Oil & Petroleum Products	217	198	198	198	198
Chemicals	32	40	41	43	44
Motor Vehicles	0	461	470	469	468
Other Cargo	79	80	80	79	79
Total Employment Impact (fte)	**1,111**	**1,944**	**1,935**	**1,920**	**1,906**
Total GRP Impact ($m)	**146**	**254**	**246**	**238**	**230**

Source: EconSearch analysis

Appendix Table VII-3 Economic impact on Victoria of forecast increases in trade through Port of Geelong: low case

	Year				
	Representative	2014/15	2019/20	2024/25	2029/30
Employment Impact (direct + indirect)					
Woodchips & Logs	339	376	376	375	375
Fertiliser	219	158	158	158	158
Grain	216	212	212	212	212
Other Dry Bulk (including coal)	38	495	475	457	441
Aluminium Products	45	43	41	41	41
Steel Products	70	98	98	98	97
Crude Oil & Petroleum Products	250	228	228	228	228
Chemicals	36	45	47	48	49
Motor Vehicles	0	483	492	492	491
Other Cargo	90	93	92	91	91
Total Employment Impact (fte)	**1,302**	**2,231**	**2,219**	**2,201**	**2,184**
Total GRP Impact ($m)	**181**	**307**	**297**	**287**	**278**

Source: EconSearch analysis

Appendix VIII Forecast Trade and Trade Impacts: High Case

Appendix Table VIII-1 Forecast trade flows for main commodities, Port of Geelong: high case (kt)

	Year				
Commodity	Representative[a]	2014/15	2019/20	2024/25	2029/30
Woodchips & Logs	1,372	2,123	2,710	3,459	4,414
Fertiliser	1,042	1,050	1,340	1,710	2,182
Grain	948	1,301	1,660	2,119	2,705
Other Dry Bulk (including coal)	104	8,401	8,621	9,006	9,496
Aluminium Products	433	608	776	990	1,263
Steel Products	145	281	359	458	585
Crude Oil & Petroleum Products	6,717	7,502	8,696	10,082	11,687
Chemicals	319	598	722	874	1,061
Motor Vehicles	0	404	487	622	794
Other Cargo	179	259	330	422	538
Total	*11,259*	*22,527*	*25,702*	*29,741*	*34,725*

[a] The "representative" year is based on average trade over the period 2000/01 and 2008/09.

Source: Meyrick & Associates and Thompson Clarke (2009), GeelongPort, GrainCorp

Appendix Table VIII-2 Economic impact on Barwon of forecast increases in trade through Port of Geelong: high case

	Year				
	Representative	2014/15	2019/20	2024/25	2029/30
Employment Impact (direct + indirect)					
Woodchips & Logs	288	416	498	604	734
Fertiliser	183	173	210	255	310
Grain	180	217	255	309	375
Other Dry Bulk (including coal)	31	784	717	712	713
Aluminium Products	40	53	64	77	94
Steel Products	61	112	137	166	201
Crude Oil & Petroleum Products	217	229	252	278	306
Chemicals	32	54	59	68	79
Motor Vehicles	0	461	526	635	767
Other Cargo	79	102	121	144	172
Total Employment Impact (fte)	**1,111**	**2,601**	**2,839**	**3,249**	**3,752**
Total GRP Impact ($m)	**146**	**346**	**370**	**409**	**457**

Source: EconSearch analysis

Appendix Table VIII-3 Economic impact on Victoria of forecast increases in trade through Port of Geelong: high case

	Year				
	Representative	2014/15	2019/20	2024/25	2029/30
Employment Impact (direct + indirect)					
Woodchips & Logs	339	489	585	710	862
Fertiliser	219	207	252	306	371
Grain	216	260	306	371	451
Other Dry Bulk (including coal)	38	940	861	854	855
Aluminium Products	45	60	72	88	107
Steel Products	70	128	155	189	229
Crude Oil & Petroleum Products	250	263	290	320	353
Chemicals	36	61	67	77	89
Motor Vehicles	0	483	552	666	805
Other Cargo	90	118	140	166	199
Total Employment Impact (fte)	**1,302**	**3,010**	**3,280**	**3,747**	**4,320**
Total GRP Impact ($m)	**181**	**419**	**448**	**496**	**553**

Source: EconSearch analysis

Glossary

Consumption-induced effects are additional output, employment and income resulting from re-spending by households that receive income from employment in direct and indirect activities. Consumption-induced effects are sometimes referred to as "induced effects".

Direct effects are the initial round of output, employment and income generated by an economic activity.

Employment is the number of working proprietors, managers, directors and other employees, in terms of the number of full-time equivalent jobs.

Flow-on effects are the sum of the production-induced effects and the consumption-induced effects.

Gross regional product (at factor cost) is a measure of value added on a regional basis. It can be calculated using two methods. The income method calculates GRP as household income plus other value added. The expenditure method calculates GRP as household expenditure plus other final demand, that is, in total, gross regional expenditure, plus exports less imports.

Household income is wages and salaries and other payments to labour including overtime payments and income tax, but excluding payroll tax.

Input-output analysis is an accounting system of inter-industry transactions based on the notion that no industry exists in isolation.

Input-output table is a transactions table that illustrates and quantifies the purchases and sales of goods and services taking place in an economy at a given point in time. It provides a numerical picture of the size and shape of the economy and its essential features. Each item is shown as a purchase by one sector and a sale by another, thus constructing two sides of a double accounting schedule.

Multiplier is an index (ratio) indicating the overall change in the level of activity that results from an initial change in economic activity. They are an indication of the strength of the linkages between a particular sector and the rest of the regional economy. They can be used to estimate the impact of a change in that particular sector on the rest of the economy. See Table 4.1 for a description of multiplier components.

Output is gross revenue of goods and services produced by commercial organisations plus gross expenditure by government agencies.

Production-induced effects are additional output employment and income resulting from re-spending by firms that receive income from the sale of goods and services to firms undertaking, for example, agricultural activities. Production-induced effects are sometimes referred to as "indirect effects".

Total impact is the sum of the direct effects and the flow-on effects.

Type I multiplier is calculated as (direct effects + production induced effects)/direct effects.

Type II multiplier is calculated as (direct effects + production induced effects + consumption induced effects)/direct effects.

Value added is calculated as the value of output less the cost of goods and services (including imports) used in producing the output. It represents payments to the primary inputs of production (labour, capital and land). Value added is consistent with standard measures of economic activity, such as gross domestic, state or regional product, and it provides an assessment of the net contribution to regional economic growth of a particular enterprise or activity.

References

Alcoa of Australia Limited 2009, *Talking Alcoa*, Victorian Issue 4, August.

Australian Bureau of Agricultural and Resource Economics 2009, Australian *Commodity Statistics 2009,* ABARE, Canberra.

Australian Bureau of Statistics 2009, *Australian National Accounts: Input-Output Tables, 2005-06*, ABS Cat. No. 5209.0, AGPS, Canberra.

Australian Bureau of Statistics 2009, *International Trade*, electronic data service, ABS Cat. No. 5464.0.

Bayne, B. A. and West G.R. 1991, *Generation of Regional Input-Output Tables*, Version 2.0, User's Reference Manual, Department of Economics, University of Queensland.

Bureau of Transport Economics 2000, *Regional Impacts of Ports*, Report No. 101, BTE, Canberra.

Bureau of Transport Economics 2001, *Regional Impact of the Port of Gladstone*, Working Paper No. 47, Department of Transport and Regional Services, Canberra.

Department of Infrastructure 2004, *Victorian Ports Strategic Framework,* Impact Digital Print, DoI, Melbourne.

City of Greater Geelong 2007, *Geelong Port Structure Plan*, City of Greater Geelong, October.

Department of Primary Industries 2005, *Natural Resources – Prospects for Silicon Carbide Production,* New South Wales.

EconSearch 2001, *The Economic Impact of the Port of Bunbury, 1999/00*, a report prepared for the Bunbury Port Authority.

EconSearch 2003, *Economic Impact Study of Sydney's Port, 2001/02*, a report prepared for the Sydney Ports Corporation.

EconSearch 2005, *The Economic Impact of the Port of Geelong, 2004/05*, a report prepared for Victorian Regional Channels Authority, Toll GeelongPort, GrainCorp and Department of Infrastructure, September.

EconSearch and NIEIR 2002, *The Economic Impact of the Port of Melbourne, 2000/01*, a report prepared for the Melbourne Port Corporation.

GeelongPort and Department of Transport 2009, *Port of Geelong: Port Land Use Strategy 2009*, Government of Victoria, August.

Geelong Region Alliance (G21) 2007, *The Geelong Regional Plan: A Sustainable Growth Strategy*, Geelong Region Alliance.

Department of Transport 2008a, *Freight Futures: New Priorities and Directions for Victoria's Ports System*, Government of Victoria.

Department of Transport 2008b, *The Victorian Transport Plan: Overview*, Government of Victoria.

Department of Transport 2009, *Port Futures: Victorian Freight Network Strategy*, Government of Victoria, August.

Forestry SA 2005, *Private Forestry Fact Sheet Number 11 – Woodchip Export Prices Explained,* South Australia.

Hewings, G.J.D. 1985, *Regional Input-Output Analysis*, Sage Publications, Beverly Hills.

Jensen, R.C. 1980, 'The Concept of Accuracy in Input-Output Models', *International Regional Science Review* 5(2), 139-54.

Jensen, R.C. and West, G.R. 1986, *Input-Output for Practitioners: Theory and Applications*, Australian Regional Developments No. 1, AGPS, Canberra.

Meyrick and Associates and Thompson Clarke 2009, *Geelong Port Trade and Shipping Forecasts, 2009 – 2030*, a report prepared for the Victorian Regional Channels Authority, March.

Midmore, P. and Harrison-Mayfield, L. 1996, *Rural Economic Modelling: an Input-Output Approach*, CAB International, Wallington, UK.

Miller, R.E. and Blair, P.D. 1985, *Input-Output Analysis: Foundations and Extensions*, Prentice-Hall, Englewood Cliffs, NJ.

Office of the Regulator-General (ORG) 1999, *Review of Port Services Pricing: Consultative Issues Paper*, Office of the Regulator-General Victoria, Melbourne.

Sinclair Knight Merz 2003, *Geelong Port – Strategic Land Use Plan*, Appendices (Volume B), Armadale, Vic.

Thompson Clarke Shipping 2009, *Geelong Shipping Forecasts, 2009 – 2030*, a report prepared for the Victorian Regional Channels Authority, March.

West, G.R. 1993, *Input-Output Analysis for Practitioners, Version 7.1: User's Guide*, University of Queensland, St Lucia.

___1995, 'Comparison of input-output, input-output + econometric and computable general equilibrium impact models at the regional level', *Economic Systems Research*, 7:2, 209-227.

___1999, 'Notes on some common misconceptions in input-output impact methodology', *Discussion Paper* No. 262, Department of Economics, University of Queensland, St Lucia.

___ 2005, *IOW Users' Guide and Reference, Part B (DRAFT)*, Department of Economics, University of Queensland, St Lucia.

Disclaimer