



Department of Transport Planning and Local  
Infrastructure  
Murray Basin Region Freight Demand & Infrastructure Study  
Project Report

July 2014

# Executive Summary

The Murray Basin Region Freight Demand and Infrastructure Study has been prepared by GHD on behalf of the Victorian Department of Transport and Local Infrastructure (DTPLI). The study has investigated current and future freight demand in the region in an area covering the north west of Victoria, south west of New South Wales and adjoining areas of South Australia. The study provides a basis for future infrastructure planning in the region.

The project utilised a demand based approach to the development of infrastructure change options, which were refined to key scenarios for comparison of outcomes which benefit industry and communities in the region, enhancing supply chains. Demand data was sourced through extensive consultation with a wide range of government and industry groups. Existing documentation in the form of previous reports and surveys has also been reviewed to assist in identifying strategic options for the region. Infrastructure constraints and issues were identified and data collated as a basis of future needs.

Key outcomes of the demand and infrastructure assessments within the region were confirmation of a high and increasing level of output from freight transport activities relating to grain, mineral sands, food and wine products and general freight (for domestic use and export). Developing transport needs in the mining and interstate sectors were evident with significant growth predicted over the next twenty years and beyond.

Domestic products rely on strong connections to major population centres and capital cities while larger volumes are focused on export customers and rely on efficient links to ports to ensure their competitiveness in international markets. The infrastructure networks provide the life blood for regional industries within this (and other) regions and these industries provide economic and financial benefits as contributors to the State and National economies.

## The Region's Demand Profile

There are five key freight commodity groups identified in the study:

- Grains;
- Mineral sands and other mining;
- General freight (food, wine fruit and vegetables etc);
- Regional containers; and
- Interstate containers.

The first four commodity groups are the key current commodities with mining activity currently concentrated on mineral sands and heavy metal outputs in the north of the region. Grain volumes are forecast to grow by 3% pa and mineral sand sites are increasing in number with additional mines and new entrants under development. General freight and container traffic will continue to grow steadily with population growth and the development of new industries (eg nuts, such as almonds).

The value of the Victoria's exported grain in 2012/13 was over \$2.2 billion with over \$1.5 billion being produced in the Murray Basin region. Mineral sands with a value over \$1 billion and a range of other high value food and wine products (in excess of \$0.5 billion) were also processed and exported from the region.

Significant mining development in the Braemar area, south west of Broken Hill in South Australia and across the border into New South Wales has a high potential for the future output of iron ore (magnetite) and other minerals for export. Interstate traffic is expected to require some relief from

capacity constraints near Adelaide in the future and will add to further demand for the region if an alternative rail link is built to accommodate the Adelaide constraints.

Outputs from industry will continue to grow during the next 20 years and this will impact existing networks and lead to the need for change to meet the increasing demand. The mining development in the north of the region will create a paradigm shift to the scale of freight activity with the volume of product moving to ports for export forecast to reach 50 to 100 million tonnes per annum (mtpa) in future years. It is expected these volumes will be exported through the closest ports in South Australia, provided port throughput capacity can be accommodated. If this is not achieved alternative ports in the region will come into consideration.

## Rail Network Findings

### **Transcontinental Link**

One key aspect of the study was to assess the demand and need for the extension of existing rail networks via a new rail link between the existing Victorian rail network and the transcontinental line from Sydney to Adelaide and Perth. Demand evaluations indicated that while increasing development and mining activity is occurring in the north of the region and existing products could gain benefit from the link, there was not a sufficient demand to justify the connection at the present time.

However, the developments in the region coupled with broader interstate opportunities are likely to change the demand profile significantly over the coming years with additional benefits presenting for the link. Mineral sand and new iron ore mining options in the Murray Basin region are progressing quickly with several miners investigating sites and funding developments. Consequently, there is potential for relatively quick change in the situation where several mines may open in the same timeframe, therefore placing pressure on the export supply chains.

In this regard, demand expectations and opportunities should remain under progressive review with an indicative timeframe of the mid 2020s for demand to reach relevant levels for operation.

Planning for the future Transcontinental Link requires inputs and agreements between the New South Wales and Victorian governments and clarification of management issues for the connection. DTPLI should initiate discussions and progress this level of planning over the next 2 to 3 years to enable further corridor planning and development to occur to meet demand expectations.

#### ***Recommendation 1 Progress Planning for the Transcontinental Link with an indicative timeframe of the mid 2020s for demand to reach relevant levels for operation.***

DTPLI should engage in discussions with the other relevant jurisdictions. Options in the planning process may include bringing the corridor into operation at an earlier date if demand increases and allows a business case to be proven. Regular monitoring of developments in the Mildura to Broken Hill corridor and, in particular, the Braemar area, should be carried out by DTPLI in conjunction with the South Australian and New South Wales authorities.

#### ***Recommendation 2 Undertake further detailed corridor alignment planning and develop a concept design for the Transcontinental Link***

DTPLI should assess the proposed alignments of the Transcontinental Link corridor in coordination with other jurisdictions including the New South Wales authorities, Australian Rail Track Corporation and the relevant Commonwealth Government Departments. The concept design would include environmental and physical aspects of the link, inclusive of river crossings, flood histories and flood mitigation. The concept design would permit a clear definition of issues and costs associated with the link.

## Victorian Network

The efficiency of the supply chain to ports is a key issue in international competitiveness and the balance of road and rail mode share is a key issue in cost and impacts on regional infrastructure.

Products from within the Murray Basin and the north west of Victoria for the domestic and export markets utilise rail transport with much of the task reliant on the Mildura and Hopetoun corridors. Rail provides approximately 45-50% of grain movements (2.1 million tonnes in an average year) and increases with larger harvests. Grain handlers and port managers are seeking additional rail mode share to increase productivity and to reduce load transfer costs. Mineral sand miners currently move approximately 550,000 tonnes pa to be processed and exported by rail with an additional 240,000 tpa likely to be moved direct to port in the near future.

The rail network provides considerable potential to alleviate the strained road network thereby balancing the mode use to provide maximum benefits and to increase the competitiveness of logistics for the region.

Rail trunk spines, some in broad gauge and some in standard gauge, already exist in the region but have linkage/connectivity gaps. Their effectiveness and efficiency are limited by the mix of gauge and the low axle load of 19 tonnes on the broad gauge network. The interstate rail corridor (standard gauge) and the Mildura line (broad gauge) are major rail spines but only the standard gauge western main line has a higher axle load of 23 tonnes.

Over recent years rail productivity has remained almost static and has not kept in line with road transport improvements. The rail network has been maintained with little focus on the industries it serves or the benefits it can convey. Road mode share has increased with the resulting negative impacts on the road network, port interfaces and the community. Considerable opportunity exists to bring about a significant mode shift from road to rail.

In this study four intrastate rail network change options were considered in order to:

- Enable further logistics flexibility, efficiency and ease of use of the rail network by providing additional standard gauge rail access and higher axle loads, initially to 21 tonnes;
- Promote mode shift to rail to gain further logistics efficiencies in the port supply chain therefore improving road safety and reducing road congestion and lowering maintenance costs on roads.

The grain and mineral sands industries have both signalled a move to a greater share on rail if gauge standardisation is implemented and if axle loads can be improved.

The four intrastate rail network change options considered were:

- Option 1 - A new rail link Lascelles to Hopetoun (approx. 27 km) plus gauge standardization, Lascelles to Yelta (approx. 187 km);
- Option 2 - A new rail link Litchfield to Minyip (approx. 35 km) plus gauge standardization, Donald to Yelta (approx. 294 km);
- Option 3 - Gauge standardization, Gheringhap to Yelta plus the Sea Lake and Manangatang Branch Lines (approx. 936 km); and
- Option 4 - Gauge standardization, Maryborough to Yelta plus the Sea Lake and Manangatang Branch Lines (approx. 859 km) and the refurbishment of the Maryborough to Ararat line.

The four options considered, can be divided into two basic classifications. Options 1 and 2 are based on a trunk line model, while Options 3 and 4 provide a network model. The trunk line model creates an efficient rail highway providing the opportunity for as much freight as possible in the region to funnel onto this line. The network model upgrades all lines thereby ensuring all areas of the region are equally serviced.

Options 1 and 2 propose the development of new standard gauge links from the existing western Victoria standard gauge network via the Hopetoun line to the Mildura line. These options therefore utilise the existing standard gauge infrastructure and provide links to the interstate standard gauge network. These two options represent a minimalist approach to changing access to the network and therefore are the cheapest. If either of these two options were adopted, the remaining lines in the Murray Basin region would remain on broad gauge for the time being and should be assessed for gauge standardisation after two years of the Mildura trunk line operations.

Options 3 and 4 propose to gauge standardise the entire existing network within the Murray Basin region. They are therefore the most expensive solutions but they provide the greatest scope of standardisation and provide the biggest opportunity for industry to invest in the network and maximise the use of the rail network. As Option 3 maintains the existing network in standard gauge form, the continuing passenger priority over freight continues. Option 4 is similar to Option 3 but proposes to reopen the closed Maryborough - Ararat line in order to avoid the freight/passenger service conflict but at the cost of a detour to travel to Geelong.

The network options, Options 3 and 4, without the links to the Hopetoun line which are provided in Options 1 and 2, are not necessarily the most efficient for the mineral sands and grain supply chains. This is because they do not provide the most direct access to both of the bulk export ports of Geelong and Portland. They do not provide the most effective connection into the western interstate mainline and limit access to final destinations of interstate and many intrastate freight movements.

All options have been assessed on the basis of increasing the current axle loading from 19 Tonne Axle Load (TAL) to 21 TAL and 23 TAL. The increase in axle loading is more expensive not only in the initial capital cost but also in maintaining the standard. The benefit of an axle load increase means that a 15%-30% immediate efficiency gain is achievable. The long term benefit of the uplift in train carrying capacity is a mode shift from road to rail resulting in cheaper transport costs to producers. An average grain train load will be able to increase by approximately 300 to 400 tonnes (at 21 TAL) at virtually no extra operating cost. The resulting mode shift to rail will result in safer transport, lower fuel consumption, lower carbon emissions and reduced terminal costs. The axle loading increase provides the best opportunity for industry to focus and invest in its supply chain on its rail service and thus provide a greater mode shift.

The competition benefits include national rail operators being able to utilise their rolling stock more efficiently by redeploying them across Australia according to demand and therefore provide confidence to invest in modern rail equipment.

The investment estimates range from \$156 m to \$220 m, inclusive of \$40 m of periodic maintenance to bring the Hopetoun and Mildura lines up to a fit for purpose condition. Based on Government providing an investment in infrastructure change, a co-investment contribution by industry would be required to maximise the benefits from this large project. This co-investment may take various forms including options for aligned infrastructure and terminal sites, rail rolling stock improvements or industry investment in lower volume rail lines.

The Ouyen to Murrayville (Pinnaroo) line carries very low tonnages at the present time. The five year rail average on this line is approximately 30,000 tonnes per annum and the road mode share is 66% of the freight task. A business case to justify gauge standardisation would need to be developed by the Grain Industry since it is considered that the capital expenditure and ongoing maintenance costs cannot be justified at this time. A similar situation exists in South Australia with uncertainty over the future of the Pinnaroo to Murray Bridge line without an increase in freight being transported. The section of line between Pinnaroo in South Australia and Panitya in Victoria would need to be gauge standardised by the South Australian government to link Ouyen to Murray Bridge. Industry support and investment would be required in a similar way that industry invested in the Yaapeet Line and other Victorian lines.



All four options are shown on the map below.



The benefits from a proposed investment in standardisation have been assessed at a high level with all options indicating positive outcomes for the state and for industry.

The high level benefit cost ratios will require further detailed assessment to thoroughly investigate and develop a rigorous business case to confirm detailed capital and operational costs and benefits. The sensitivity of industry capital investments, timing and its intentions for major freight movements need to be analysed as part of this business case. This further work will also include consultation with major companies to provide input to their supply chain options and potential aligned investment in the network.

The development of a standard gauge trunk line to Mildura providing for axle load improvement will also facilitate the future interstate rail link - the Transcontinental Link - from Mildura (Yelta) to Broken Hill which will provide improved access for interstate movements. A future rail bypass of Mildura would further enhance safety and efficiency with the elimination of approximately 22 level crossings in and around Mildura.

***Recommendation 3 Identify a preferred standardisation option and produce a business case for Government consideration and funding allocation.***

Based on all four rail options having an initial positive benefit cost ratio further work is required to finalise a preferred option and develop a detailed business case for Government consideration. The development of a preferred option should include consideration of construction costs, supply chain efficiencies to industry including cycle times; network capacity, timing of construction and asset rolling stock utilisation and integrated transport network outcomes including associated road network impacts. Consideration should also be given to any environmental and social impacts in the development and construction of a modern standardised rail operation. Any assessment should include an increase in the axle load rating to 21 tonnes, as a minimum.

If the preferred option is to standardise the Mildura line only, then gauge standardisation of further rail lines in the Murray Basin region should be considered in stages subject to a positive result from an assessment of two full years of operation of the standardised Mildura line. This will permit DTPLI and industry to assess the actual degree of mode shift to rail and to confirm the effectiveness of the improvements.

#### Road Network Findings

The consultation and demand phase analysis of the study identified a number of issues raised by councils and regional transport groups across the region. Specific constraints occurring on the road networks at river crossings and through major towns were raised as local issues. These issues require broader inputs on total traffic and passenger flows by VicRoads to assess their viability. In the case of the Murray River crossings, New South Wales Roads and Maritime Services input is also required.

Mineral sands exports in Victoria are currently transported by road to the nearest standard gauge rail connection which provides access to the processing plant at Hamilton and to the export port of Portland. Proposed location changes for the mineral sands mines in coming years will result in a longer distance to the rail heads with further impact on roads within the region.

Bulk grain is moved by road and rail to ports and domestic markets. As productivity improvements have become available in the road transport fleet there has been a shift towards additional road mode share. This has provided increased flexibility for smaller load parcels but has also created issues for road maintenance, particularly on lower standard roads. Loading and unloading for trucks is also more expensive than rail.

Consistent messages were received from across councils and industry on the significant mismatch between the larger trucks now used for freight and the capability of parts of the road network, particularly for Class 'C' roads and local roads. Improvements to productivity of trucks with larger mass limits have helped reduce supply chain costs, however the lower class roads (in particular) have not been constructed to cater for the magnitude and frequency of these loads. This is resulting in maintenance issues and increasing costs to road managers as the size of the freight task increases.

Over 360,000 road trips are required to transfer grain to terminals and a further 160,000 to 180,000 road trips to move the product to ports and to domestic users. The regional road maintenance task and the increased road congestion in the port precincts is placing a large financial burden on many stakeholders, increasing the costs to growers/producers and to both local and state government.

Road upgrade strategies will depend on usage profiles and coordination with industry groups and councils in order to confirm optimal heavy vehicle routes and parameters for use.

One proposed change to road management in the region is to manage the load on the road network through an ongoing audit of network use and the development of comparative condition criteria which can be used to help prioritise heavy vehicle routes and to address major points of impact across the road network.

Recommendations are made for a review of the conditions of roads and current road management practices in order to clarify the present status of the road network with a view to optimising maintenance, defining appropriate routes and achieving a more sustainable and safe operation of road infrastructure.

***Recommendation 4 Conduct a detailed audit and assessment of road usage and road conditions to help assess important links in the road network***

DTPLI should coordinate with VicRoads, industry groups and local government to establish working parties based on the locality of freight usage. A detailed audit and assessment of road use in the regions is required with data collected inside a strategic framework which provides balanced criteria on use and condition of roads. This will give a clear understanding of priority issues which can then be addressed through funding programs.

This can also build on earlier work undertaken in most municipalities in conjunction with the Municipal Association of Victoria.

***Recommendation 5 VicRoads, local government and industry groups should work together to plan feeder routes to rail terminals***

Outputs of the audit in ***Recommendation 5*** above should be used to bring together VicRoads, industry groups, local government and DTPLI planners to redefine feeder routes to rail terminals and to align road use with appropriate road safety and maintenance standards. The Grain Logistics Task Force and local transport operators could also assist in this process and potentially suggest changes and treatments based on use where appropriate. This recommendation is consistent with utilising road and rail to maximise benefit of both transport networks.

***Recommendation 6 VicRoads, local government and industry groups should work together on the designation, consolidation and management of heavy vehicle routes***

It is recommended that road movements be consolidated (where possible) to higher class roads where construction, road safety and maintenance standards are more aligned to the current and future road use by heavy vehicles, HPFVs (High Productivity Freight Vehicles) and similar. This work will complement any future rail terminal infrastructure upgrades, and improve the efficiency of the road/rail logistic supply chain.

**Conclusion**

The opportunity to improve the efficiency of the supply chain to ports and international competitiveness for industry is the key to creating sustainable businesses in the Murray Basin region. The balance of road and rail mode share utilising infrastructure networks is central to this proposed project in terms of capital and operational cost to industry and the impacts that transport mode choices have on regional infrastructure. The opportunity exists to reduce the freight based road trips (currently over 500,000 trips for grain alone) and the subsequent impacts on the road network. Increased rail mode share through accelerated gauge standardisation and axle load uplift would alleviate the adverse impacts on the road network and reduce port receival costs. Consequently any reduction in the road network maintenance due to mode shift would also require an increase in the rail network maintenance especially if the rail network axle loading is increased.

The creation of a standard gauge rail freight network with more clearly aligned road connections will boost export opportunities and feed further sustainable regional job growth due to increased land transport efficiency.



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# Appendices

Appendix A – Consultation/Stakeholder List

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*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

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# 1. Introduction

## 1.1 Background to the Murray Basin study

The Murray Basin Freight Infrastructure Study is an examination of the current and future needs for transport infrastructure in the Murray Basin region of north west Victoria, south west New South Wales and east South Australia. The region extends from Horsham in the west of Victoria, to Broken Hill in the north, Balranald to the east and across the Victorian South Australian border to the west.

In recent years the freight task within the region has undergone substantial transformation with new agricultural products, additional mining and changes to the mode of moving goods within the region.

These changes have had an impact on local councils and “changed the face” of the logistics task in the region. Major commodities including grains and mineral resources are being moved increasingly by road in preference to rail throughout the region. This is placing additional loads on local roads.

Future plans for mineral resource mining and related products transiting through the region have the potential to further impact infrastructure needs and outcomes.

This study examines the current and future needs for transport infrastructure so as to clarify infrastructure development requirements in the region.

### 1.1.1 Previous studies and their focus

There have been several studies assessing the needs of the region, looking from different perspectives and with a range of outcomes considered. These studies provide background information for potential development options on both the road and rail networks. The studies include:

- The June 2010 “Adelaide Rail Freight Movements Study” prepared for the Commonwealth Government to examine future rail traffic needs on the main western rail corridor through Adelaide and options for a rail freight bypass of Adelaide;
- A January 2009 study on the Transcontinental rail link (the “Transcon Link”) between Mildura and the Broken Hill area enabling a broader flexibility for rail options across Australia, “Mildura to Menindee - Transcontinental Rail Link”;
- A September 2008 rail freight impact study for the Mildura region, “Mildura Derailed”;
- The December 2007 Victorian Rail Freight Network Review “Switchpoint”;
- The 2007 Melbourne - Mildura Corridor Strategy, “AusLink: Building our National Transport Future” part of AusLink developments and planning which included designating the Mildura rail line as part of the national rail network to highlight opportunities for supply chain improvements in the area and linkages to improve options and flexibility for rail freight movements across the country; and
- Studies assessing interstate double stacking opportunities for container rail freight and the cost of this influencing factor in the future options for interstate freight.

### 1.1.2 Study overview

The Murray Basin Region Freight Study is an examination of the freight and infrastructure demand in the region in order to identify key transport needs. These factors are then linked into infrastructure scenarios to develop recommended options for planning and implementation. The project includes several key stages which will add to the information base on the region and inform future planning. The study comprises:

- An evaluation of freight demand characteristics in the Murray Basin region;
- Information on current and future transport options and potential infrastructure upgrades;
- Development of infrastructure scenarios/options relevant to the future economic sustainability of the region; and
- Assessment of economic outcomes for assessment.

## 1.2 Purpose of this report

The purpose of this report is to advise the Victorian Department of Transport Planning and Local Infrastructure on options and directions for planning future investment in infrastructure in the Murray Basin region. It is based on a strategic view of infrastructure requirements and an economic evaluation of preferred options to address major issues in the region.

The project incorporates a range of inputs from councils and government departments in an overview of transport needs related to major commodity movements in the region. These freight movements make up a key component of the supply chain process of moving products to market and providing economic benefit to the region.

The report also provides a basis for evaluation of interstate movements of freight which impact other transport corridors and port infrastructure. Indications are that increased freight movements within the region will need access to a broader range of port facilities. For example, new port developments will be necessary to meet the capacity requirements for future mining outputs across the region.

The report seeks to provide a planning framework and infrastructure options to meet these new demand requirements.

## 1.3 Scope and limitations

This report and study examine the issues and constraints that may be present in the region and those issues which can be addressed by changes to infrastructure for the commercial, social and economic benefit of the region.

The study was commissioned to provide additional data and understanding of the freight movements and needs in the region and to assist in planning for future networks both in the region and in supply chain connections to relevant ports and markets.

The report presents data collected from consultation with government, industry and other relevant stakeholders as a basis for demand expectations in the region. The data is also supported by industry contacts and internet research to confirm scope and outputs where data was not otherwise available.

Data is included at a broad industry level to protect the commercial interests of companies and individual sources but is relied upon as the best information available to provide the scope of existing and future demand patterns.



The report utilises the obtained data to formulate infrastructure development options for comparison and evaluation as part of the assessment. This information has not been independently verified by GHD - except where possible against published material - but it does present the best available information on freight demand and outlook within the Murray Basin region.

## 1.4 Assumptions

As stated in **1.3** above, the information included in this report is sourced from a range of interviews and research into the freight volumes, infrastructure needs and usage provided in the context of a project consultation process.

It is assumed that data collected during a broad consultation process and meetings with Federal, State and Local Government, commercial parties and local industry groups is representative of the regional freight flows, and provides a consistent basis for infrastructure planning and directions.

It is understood that many of the industries that produce goods that form a significant part of the freight movements in the region are subject to seasonal conditions which impact their production and best efforts have been made to identify data which consider these variations and which are representative of the needs of industry.

Infrastructure options have been developed based on planning information and without site investigations or testing to assess site conditions. An environmental assessment of options has not been undertaken at this stage but was included as an option for consideration once preferred infrastructure options have been determined.

## 2. Regional Context

This study of freight demand and infrastructure requirements in the Murray Basin region (Victoria, south west New South Wales and eastern South Australia) has been undertaken to evaluate current and future infrastructure requirements including potential links between state networks and direct infrastructure needs within this region of Victoria. The study consulted with government departments federally and in three states plus councils and industry to assess likely sources of demand and major freight movements impacting the region.

### 2.1 The Region

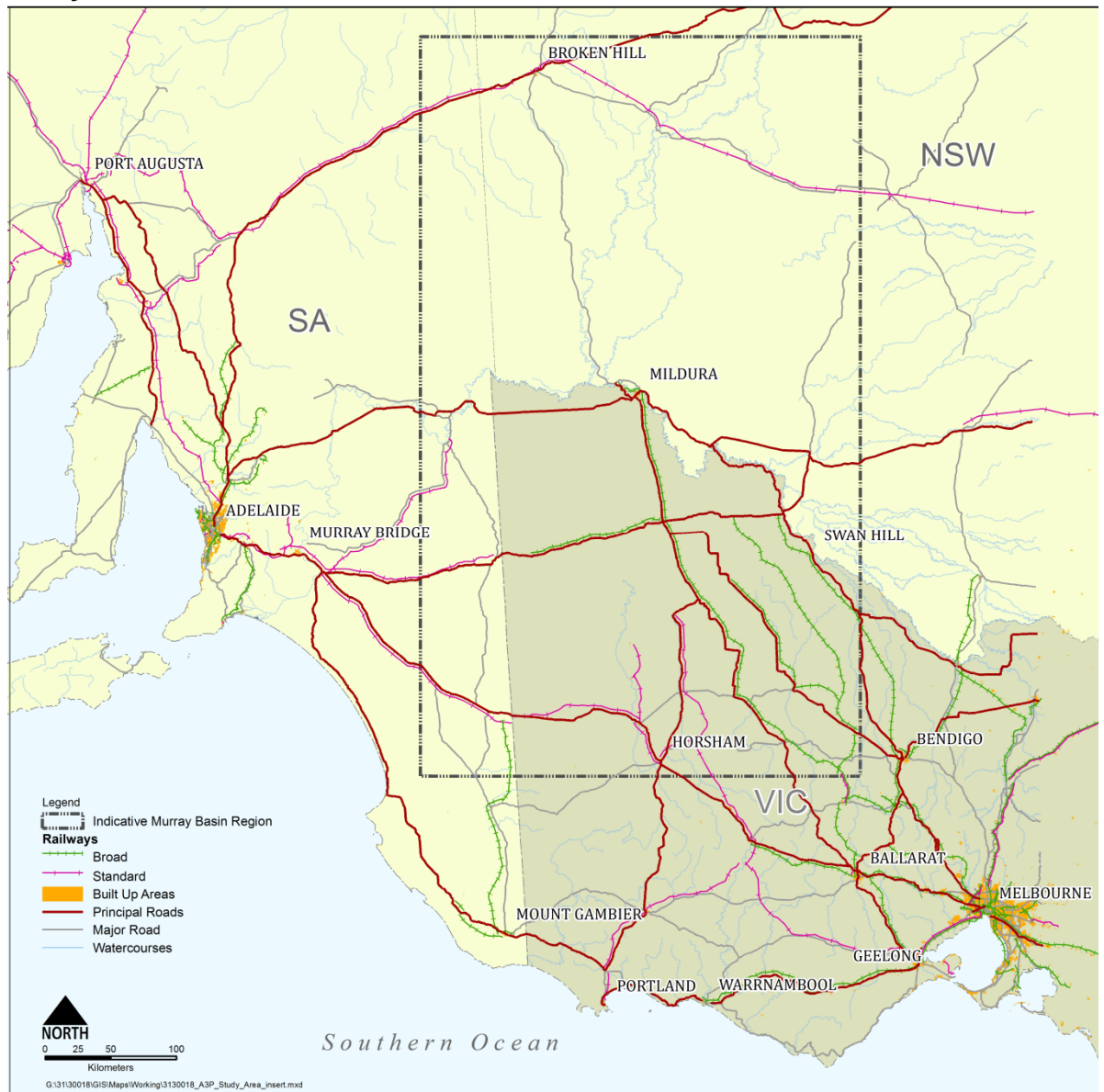
The Murray Basin region assessed within this study is broadly bounded to the south by Horsham city, to the north by Broken Hill to the east by Swan Hill and to the west reaching into network links and traffic flows into South Australia. The region has a number of regional centres which support surrounding industries including Broken Hill, Mildura, Horsham and Swan Hill.

The Murray River border dissects the region, providing irrigated food and wine areas in its vicinity and generally a northerly boundary for grain and dry crop production which extends further south across the region. To the north of the river mineral sands and other mineral deposits lie within a much drier landscape which is the subject of exploration for mining production. The existing mining in the Broken Hill area is ongoing, with processing facilities and potential links to new mining areas to its south west.

The Murray Basin region produces a range of export outputs including grain, heavy metal concentrates, mineral sands concentrates, fruit and vegetables, wine, meat and a wide range of products for domestic use. Transport requirements include distribution of product to all capital cities for domestic distribution and larger movements to ports in Victoria and South Australia for export.

Figure 1 Murray Basin Study Area

### Study Area



## 2.2 Federal Strategies

National transport planning includes the Mildura rail corridor as part of the national interstate network in recognition of its importance in linking this region to key port infrastructure and a potential future role with links to the national east west rail network near Broken Hill.

The relevance of road and rail transport networks and key ports of Melbourne, Geelong and Portland in Victoria and Port Pirie, Port Adelaide and other ports in South Australia to the export requirements of this region cannot be understated, as they provide the life blood of the regional economy and future economic potential. While the ports appear well recognised within the federal strategies the future demand expectations of mining outcomes and growth in grain outputs will require further focus and development to achieve efficient, competitive outcomes.

Mining expectations in the Braemar region and associated mineral exploration areas of South Australia and adjacent areas of New South Wales are likely to extend port demand requirements with a need for additional export gateway(s) to fulfil requirements.

Figure 2 Murray Basin Study Area in National Context



### 2.3 State Strategies and Studies

At a Victorian State level “The Freight State” document provides a Freight and Logistics Plan for Victoria on freight transport and ports to support supply chain outcomes including consideration of current and future potential Principal Freight Networks. This study specifically considers the key Murray Basin region and forms part of this plan in identifying the infrastructure needs and priorities to support industry and the community in this region.

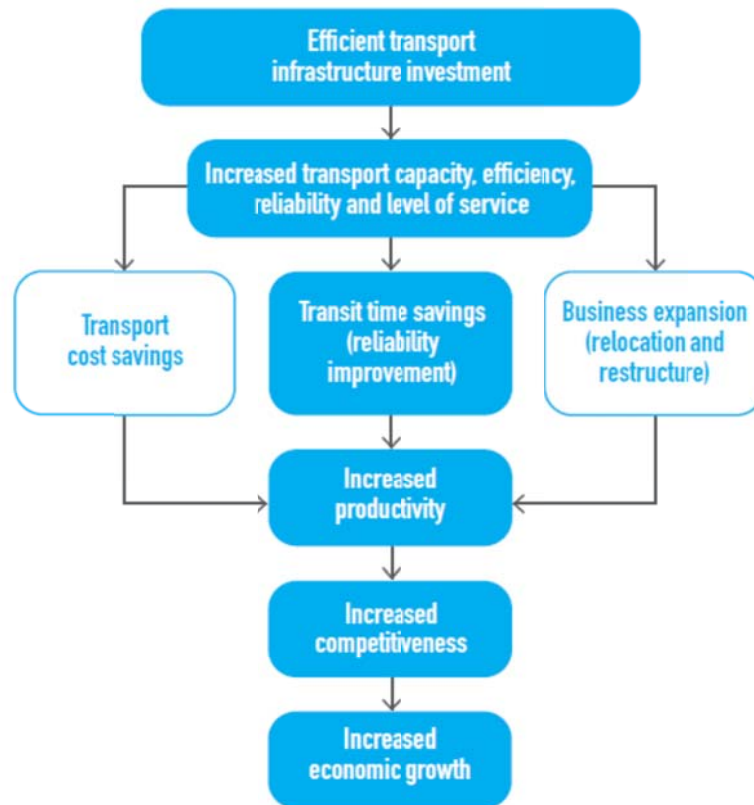
The Freight State includes a number of key recommendations relevant to its impacts on these networks.

- Priority 1: Ensure delivery of adequate port capacity for international container trades;
- Priority 2: Ensure delivery of adequate interstate rail terminal capacity;
- Priority 3: Ensure that cost-effective non-asset efficiency measures, designed to improve freight efficiency and productivity on the existing network, are implemented prior to progressing capital intensive network capacity upgrades; and
- Priority 4: Progress timely capital investment in new road and rail network links, particularly orbital and cross city links that complete the metropolitan network, where significant capacity constraints are identified.

With regard to regional Victoria the Plan highlights its role to provide for the global demand for safe and reliable sources of fresh food. It also highlighted that policies to manage the growth of Melbourne had led to an increase in the proportion of Victorians living in regional centres.

The plan recognises the roles of freight and logistics in the Victorian economy as follows:

Role of freight and logistics in the Victorian economy



A number of key directions have been described in the Plan, and those relevant to the Murray Basin Region Freight Infrastructure plan have been summarised in [Table 1](#) below:

**Table 1** The Freight State – a Freight and Logistics Plan for Victoria: Proposed Directions

Direction	Murray Basin region relevance
Direction 2: Working cooperatively with the private port operators to ensure efficient bulk and break bulk port capacity	The central role of the Ports of Geelong and Portland is supported at state level and is in line with regional and industry strategies
Direction 5 National Heavy Vehicle Reform	The Murray Basin is a key national producer of domestic and export products which are subject to interstate transport movements in all directions to major capital cities and regions. Inconsistent policies and regulations penalise the supply chain and reduce competitiveness.



Direction	Murray Basin region relevance
<p>Direction 6:</p> <p>Extend access to the freight network for HPFVs so that there are larger, safer and, more productive trucks on our road network. The HPFV network extension will require road network upgrades and 'first and last kilometre' routes for HPFVs to be identified.</p>	<p>Reinforcement and confirmation of identified HPFV routes in the Murray Basin region:</p> <ul style="list-style-type: none"> <li>• Henty Hwy between Portland and Hamilton; and</li> <li>• Calder Highway</li> <li>• Western Highway</li> </ul> <p>Minimise the impacts of HPFVs.</p>
<p>Direction 9:</p> <p>An efficient road freight network</p>	<p>Identification of the current status and fit of the road network.</p>
<p>Direction 10:</p> <p>An increased role for rail freight through development of a rail freight network strategy, annual maintenance and renewal works and working with industry and network managers to improve access arrangements and efficiency of intermodal operations at ports.</p>	<p>Gauge standardisation of rail lines in the Murray Basin region would provide a significant efficiency increase and lead to a mode shift to rail because of more flexible arrangements for rolling stock, lower costs, and access to the interstate rail network</p>
<p>Direction 11</p> <p>An efficient intermodal terminal network</p>	<p>Improved intermodal terminal connections due to gauge standardisation are important for the Murray Basin region.</p>
<p>Direction 14</p> <p>Identifying and protecting future freight precincts and corridors</p>	<p>The Mildura Bypass corridor and the Transcontinental link corridor in New South Wales; both need to be protected.</p>
<p>Direction 16:</p> <p>Address regional supply chain bottlenecks and network maintenance issues</p>	<p>Issues have been identified in the region and options are proposed for solution of these issues.</p>
<p>Direction 17:</p> <p>Promote efficient access for regional produce to international and domestic markets. This is through rail access improvements to the ports, improving orbital and cross city road connections through Melbourne and improving the cross-border supply chains.</p>	<p>The importance of the Ports of Melbourne, Geelong and Portland is in line with regional and local strategies</p>

Direction	Murray Basin region relevance
Direction 18: Enhance intra and cross-regional connections	Roads within the region mentioned included the Henty Highway as one example..
Direction 19: Promote improved rail network efficiency and increased network access for higher productivity vehicles	No specific rail links have been mentioned in this Direction that are within the Murray basin region, however this direction, is particularly relevant to the mix of road and rail transport options in the region.
Direction 20 Manage Freight amenity impacts for regional communities	The Murray Basin region aspires to put more freight on rail in order to enhance local amenity by removing heavy vehicles from local roads.

### *VicRoads Strategies and Objectives*

VicRoads Strategic Directions 2012 -2014 highlights a number of strategies which are important to the Murray Basin region and freight issues in this study. They include:

- A Vision – stating:
  - The road system helps make Victoria a terrific place to live and run a business. It keeps people connected to each other **and businesses connected to their customers**. Our actions now must contribute to a vibrant and prosperous future for Victoria....”
  - Freight vehicles can travel on defined routes, built to standards that meet their needs. This boosts productivity and keeps down the cost of goods.
  - While VicRoads has a big role in developing, operating and maintaining the road system. Other agencies also have responsibility for various parts of the road system including the Department of Transport (now the Department of Transport Planning and Local Infrastructure), local councils and bus and tram operators. We work with these agencies to ensure that the various parts of the road system are working together to deliver the best customer outcomes.
- Objectives include:
  - Operate and maintain the road system to help our customers travel easily and reliably...
  - A key part of this involves engaging with our customers to understand their needs and work out the best ways to balance competing needs. We also have to prioritise maintenance based on the relative benefits that assets provide, ensuring that we continue to meet our obligations under the Road Management Act 2004.
- A Key Challenge recognising that:
  - As our economy and population grows, so will the amount of freight carried on our roads. We need to keep road freight moving efficiently, reliably and safely.
- Additional VicRoads strategies include:
  - Linking Victoria (1996)
  - Calder Highway Strategy (1995)

- Moving More with Less
- Victoria's Road Safety Strategy and Road Safety Action Plan
- Victoria's Arterial Bridges
- Rest Area Strategy

## 2.4 South Australian Infrastructure

The South Australian government has responded to a broad infrastructure needs study undertaken by the Resources and Energy Sector Infrastructure Council (RESIC) which highlighted potential infrastructure requirements for future mining development in the region. The South Australian Government clarified their position on the development of infrastructure by recognising the need for investigations in the east of the state around the Braemar and Frome South areas (north east of Adelaide) and the required scope for an additional capesize vessel capable port and landside infrastructure.

A consulting report<sup>1</sup> for government by Deloitte Touche Tohmatsu Limited and SMEC also assessed infrastructure needs in the area, to inform the process.

The South Australian Government has now announced the Braemar Bulk Exports Project which will provide an infrastructure corridor for services and pipeline based product transfer to port locations in the Spencer Gulf.

Additional mineral exploration areas further north have not reached an equivalent phase of development and further infrastructure development is likely to be required to service this area.

## 2.5 New South Wales planning and Ports and Freight strategy

The New South Wales government Ports and Freight Strategy includes a number of items with relevance to the Murray Basin region. Planning for Sturt Highway improvements as a key connecting highway to the Murray Basin area and the broader network links between Adelaide, northern Victoria, southern New South Wales and Sydney are recognised. This is critical to many of the freight movements through the region with a particular focus on movements to and from Adelaide.

The Strategy also includes planning for Murray River bridge upgrades and replacements with initial funding of \$8.5 m for the Tooleybuc Bridge project under the Bridges for Bush project. Discussion with RMS indicates the importance of this link back to the Sturt Highway connection, but also as the preferred route linking the region to the south of Adelaide. This route provides a quicker connection to Adelaide's south with fewer towns to pass and avoiding the need to travel through the Adelaide city areas.

The growth and movement of mineral sands mining in region is also being addressed by RMS with options being developed with mining companies to improve north bound haul roads and potentially seal existing connections to the Ivanhoe area where rail loading can occur for freight movements to the Broken Hill processing plant. Future mineral sands developments in the Balranald area are likely to require diversion of mining traffic around the township dependent on the future freight volumes and intermediate infrastructure developments.

## 2.6 Regional and Local Strategies

Regional strategies and reports have identified a large number of local strategic gaps and initiatives related to road, rail, public transport, airport and port infrastructure and services that are highlighted for action from a regional perspective.

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<sup>1</sup> [www.infrastructure.sa.gov.au](http://www.infrastructure.sa.gov.au)

Many of these have been developed into infrastructure projects and included in current or future plans. However there is a need for them to be prioritised and ultimately funded and implemented.

The impacts of freight traffic on local and regional infrastructure has been a high profile issue in regional areas where several groups have prepared reports and information papers to identify key freight issues in the region. The following reports have been reviewed to identify the key transport issues/constraints relating to freight movements in the area and the proposed directions and/or projects to be implemented to reduce the impacts on freight.

The reports reviewed include:

- Mineral Sands Action Agenda, report for Victorian Minerals and Energy Council, February 2003, McLennan Magasanik Associates and GHD;
- Central-Murray Regional Transport Study (Victoria-New South Wales), 2011, Final Report;
- Arterial Road ('C' Route) Strategy, Wimmera Regional Transport Group, prepared by Driscoll Engineering Services, October 2009;
- 'C' Routes Detour Route Improvement Strategy, Wimmera Regional Transport Group, prepared by Driscoll Engineering Services, August 2011;
- "Grey Spot" Strategy, Wimmera Regional Transport Group, prepared by Driscoll Engineering Services, November 2012;
- "Bridges to Recovery" Strategy, Wimmera Regional Transport Group, prepared by Driscoll Engineering Services, August 2010;
- Transport Group Regional Freight Transport, prepared by Driscoll Engineering Services, May 2012;
- Ballarat West Employment Zone Master Plan, May 2012, AECOM; and
- Evaluation of Alternate Freight Hub Sites, prepared for the City of Ballarat by Sd+D Consult, June 2010.

The key issues that have been identified throughout these reports include:

- Road network maintenance issues i.e. pavement roughness, narrow road widths, vegetation management. This is a key issue, particularly on class 'c' roads where the pavement and construction of the road is not aligned to the current impacts of larger trucks and expected use;
- The number of B-Triple trucks able to be used and the parameters for use;
- Load limit restrictions on bridges, particularly across the Murray River;
- Limited overtaking opportunities particularly along the Sturt Highway;
- Freight routes passing through the centre of Mildura and Swan Hill townships;
- Differences in State regulatory regimes i.e. the use of road trains;
- Rail infrastructure and gauge standardisation;
- Road Safety; and
- Detour Route Strategy for towns along the major freight routes.

The key recommendations have consistently been identified through all reports. These include:

## Recommendations

- Investment in rail infrastructure and progressive gauge standardisation in order to make Victoria globally competitive;
- Streamlining the environmental legislation and approach to permitting new investment;
- The need to plan new urban freight by-pass routes, particularly in Swan Hill and Mildura;
- Use of the royalties gained from the miners to invest in infrastructure in the region;
- Road maintenance and upgrades to safely cater for the more widespread use of larger heavy transport vehicles;
- The renewal of a number of river crossing bridges and specific local bridges with capacity restrictions;
- Road upgrades - i.e. duplication of sections of roads, overtaking opportunities; intersection upgrades, sealed road widths, improvement of road alignments for road safety issues;
- Removal of rail level crossings progressively targeting key priorities;
- Implementation of clear and adequate routes for B-Doubles, HPFVs and HML vehicles within the area;
- Investigation of opportunities to develop intermodal terminals in the region to assist with the efficient movement of freight.



## 3. Freight Demand study

The freight demand study of the Murray Basin region has been undertaken using consultation with a range of Federal, State and local government agencies, local industry and commercial operators in the region as agreed with DTPLI. The study identified current and forecast future freight flows in the region with indications of transport routes taken, mode and vehicle types where these were available.

The region is a producer of a significant range of goods for local consumption, domestic distribution and export markets. These products include a variety of food based products, fruit and vegetables, wine grapes, wines, grains, mineral sands mining, other mineral mining and farm based produce.

The freight transport needs cover a range of origins and destinations across many industries and the freight transport requirements vary according to the product type, markets and available infrastructure on which they can most efficiently reach their destinations.

The smaller volumes of product are generally sourced and delivered locally with local road transport. Larger freight volumes are linked to the major transport networks and utilise containerised or bulk transport on road or rail to meet their transport needs. In many cases these commodities require staging in their production and/or supply chain to market which can lead to staged transport modes and several transport sectors along the supply chain.

### 3.1 Commodity breakdown of the task

Definition of the freight task in the Murray Basin region has been focused towards a range of commodity groups with similar transport needs and growth prospects to assist in providing a strategic view of the region. The larger commodities dominate the overall size of the task with smaller volumes brought together via local transport or through consolidation in intermodal or monomodal facilities.

The key commodity groups are:

- **Grains** - a major industry within the Murray Basin region based on farm products with significant variability in seasonal volumes. The size of the task is approximately 4.5 million tonnes across Victoria in an average year and the Murray Basin region contributes approximately 70% of the volume. Grain is transported by both road and rail to domestic sites and for export through nearby ports (Melbourne, Geelong, Portland and South Australian ports);
- **General Freight** – includes a range of business interests from larger companies with developing markets in wine, fruit and nuts markets to small to medium businesses with food based outputs. These products are transported to various markets locally and interstate or to ports for export. General product volumes and outputs are likely to escalate over time. These products are largely transported by local road operators or packaged and consolidated into containers for export. Transport to port is provided either by road or through an intermodal rail hub.

The size of the task indicated through consultations includes inwards transport needs to local areas and processing plants of approximately 650,000 tonnes, with outward product flows of 450,000 tonnes at the current time. This commodity group in particular is difficult to capture the total task due to the diversity of products and providers.

- **Mineral Sands** - specific mining ventures have developed in the region with developing future markets and a range of mine locations. Mineral sands deposits vary in type:
  - Some coarse grain deposits have a relatively short mining life span at each site (approximately 5 to 7 years), requiring relocation of resources to another site when each deposit is exhausted. Indications are that opportunities in excess of a 50 year operational life are available by moving to new sites across the region. These products are part of the current freight flows in the region; and

Fine grain sands are generally in larger deposits with longer mining life potential within a concentrated area. A similar 50 year mining life is anticipated.

As stated above, the coarse grained deposits have a shorter mine life for individual deposits and this creates challenges to meet infrastructure needs from different sites within the region. Smaller grained deposits are progressing through development issues that need to be resolved prior to progressing to production. Both local road and rail transport are used to complete the supply chain from pit to processing plant to port.

The size of the task is approximately 1.7 mtpa at the current time although proposed changes indicate that this will grow during the planning period.

- **Regional Intermodal/containerised products** – includes significant food and wine based products which are transported to ports for export. Some bulk materials including mineral sands and grains are also transported in this way where it aligns with the supply chain requirements and container packing facilities are available. Road and rail transport is used, mainly to ports, for these products;

The size of the task identified in consultations is approximately – 6-700,000 tonnes with a split of volumes of approximately 350,000 tonnes in the north of the region – and with a similar volume in the south at the current time.

NB. It is recognised that container traffic is not always defined into commodity or product groups and will be included in the regional container traffic, although there is clearly some cross over to the General Freight commodity group;

- **Interstate traffic** – includes the transport of interstate intermodal containerised product between Perth and Melbourne and other products including defence and supplies to other states. Capacity constraints are expected on the Adelaide corridor in or about the mid 2020's requiring an alternative rail bypass of Adelaide. The Mildura corridor linking into the east west transcontinental rail corridor provides an effective bypass and a viable option for this Melbourne - Perth traffic; and

**Other Mining interests in the Murray Basin region** - this commodity group provides limited outputs in the region at the current time with Bentonite mining in the area north east of Wentworth and heavy metals mining in the Broken Hill area. However, significant planning stage initiatives are underway with the expectation of major freight volumes from the south west area of New South Wales and the north east area of South Australia. This includes magnetite and iron ore, and a number of ventures investigating other mineral deposits for future development. Inwards freight flows through the Murray Basin area from major cities to support these future ventures also need to be considered. Current mining outputs total approximately 350,000 tonnes although development is occurring quickly and this will be subject to change. Some of the current miners process large volumes locally in the north of the region, however heavy metal outputs (after processing) are lower volumes.

The total freight demand in the region is largely a consolidation of these individual commodity groups, understanding their interactions and the requirements for specific origin and destination outcomes.

Therefore an examination of each of the supply chain requirements with likely freight routes, origins and destinations forms a key to future infrastructure plans.

Figure 3 Commodity Groups

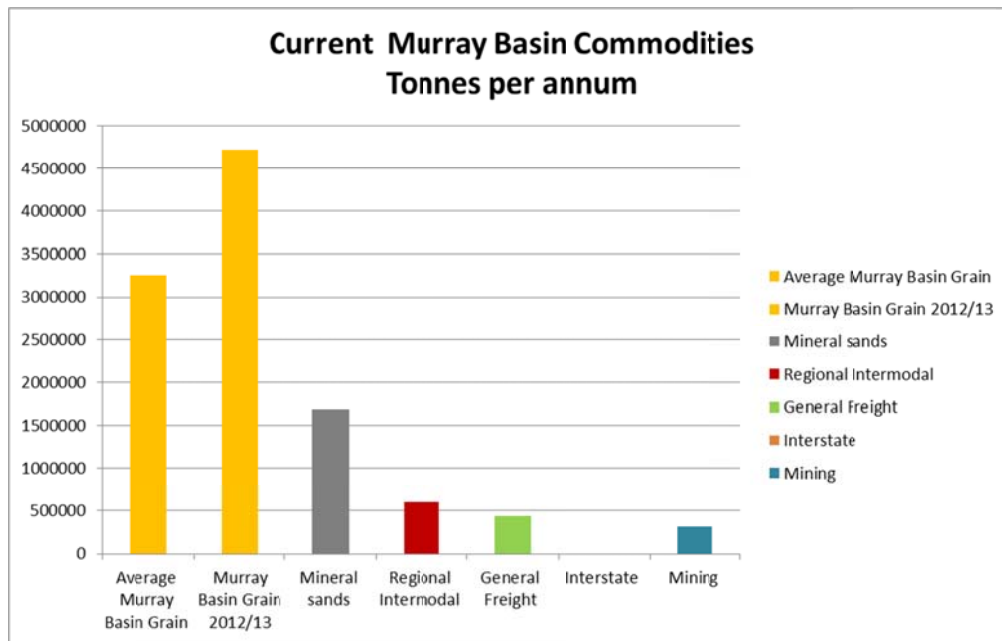


### 3.2 Demand Overview

Many of the existing commodity groups in the Murray Basin region are all impacted by seasonal conditions and these provide a variable scope for each harvest year. The commodities graph in Figure 4 below indicates the annual tonnages for the commodity groups with both the 2012/13 grain figures for the region and the average annual figures for each other commodity group. Grain in this region is estimated at 70% of the Victorian harvest on average at 3.2 million tonnes pa.

During larger volume harvests the grain volumes can grow by over 50% above the average output; with an example of 4.7 million tonnes shipped from the region in 2012/13.

Figure 4 Current Freight Commodity Volumes

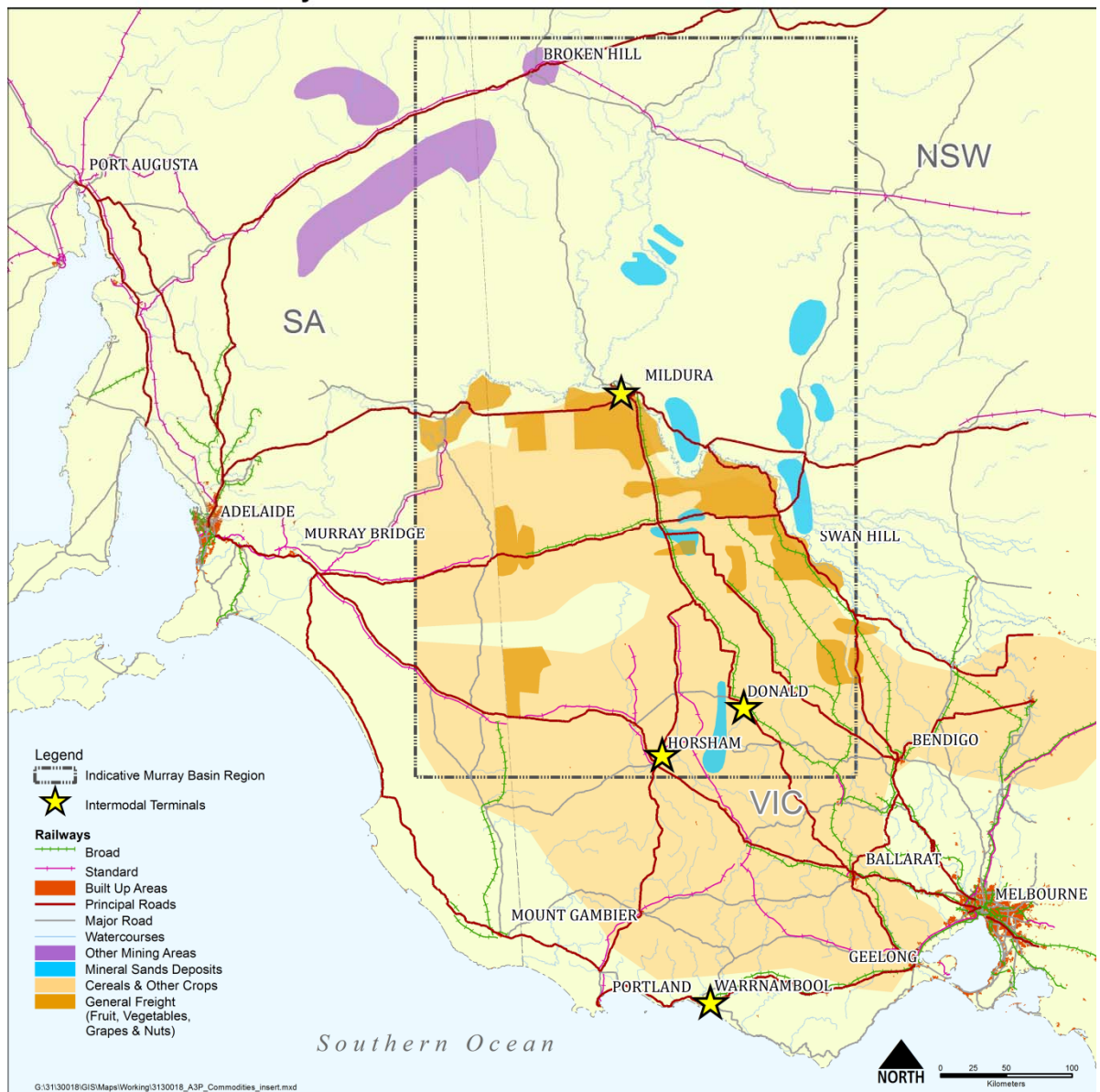


The region has a variance of agricultural conditions from winter crop pastures, to irrigated river lands and dry desert areas. The Murray River defines a large part of the region with the Darling and Murrumbidgee rivers impacting from the north.

A large proportion of the region’s foodstuff products are produced either along the riverland areas or across the wide area of grain cropping as indicated in the following map.

Figure 5 Indicative areas of major commodity production

**Current Commodities by Area**



The wide expanse of grain crop production forms a light shadow across the figure and is indicative of its influence in the region at the current time and its influence on the Victorian economy. There is limited production north of the Murray River in this region although major rice production lies further to the east outside of the region.

Mineral sands locations indicated in blue in Figure 5 above provide a number of supply chains moving product north and south from the region by different mining companies. The current regional production is essentially developed by two companies with one company processing materials in Broken Hill and exporting through Adelaide and the other processing product in Hamilton and exporting via the port of Portland.

General freight in mustard tones has a focus on irrigated areas although some specific fruit and nut development is occurring in specific areas.

Regional containers are moved from intermodal terminals located at Merbein, Donald and Dooen in the region as indicated by yellow stars.



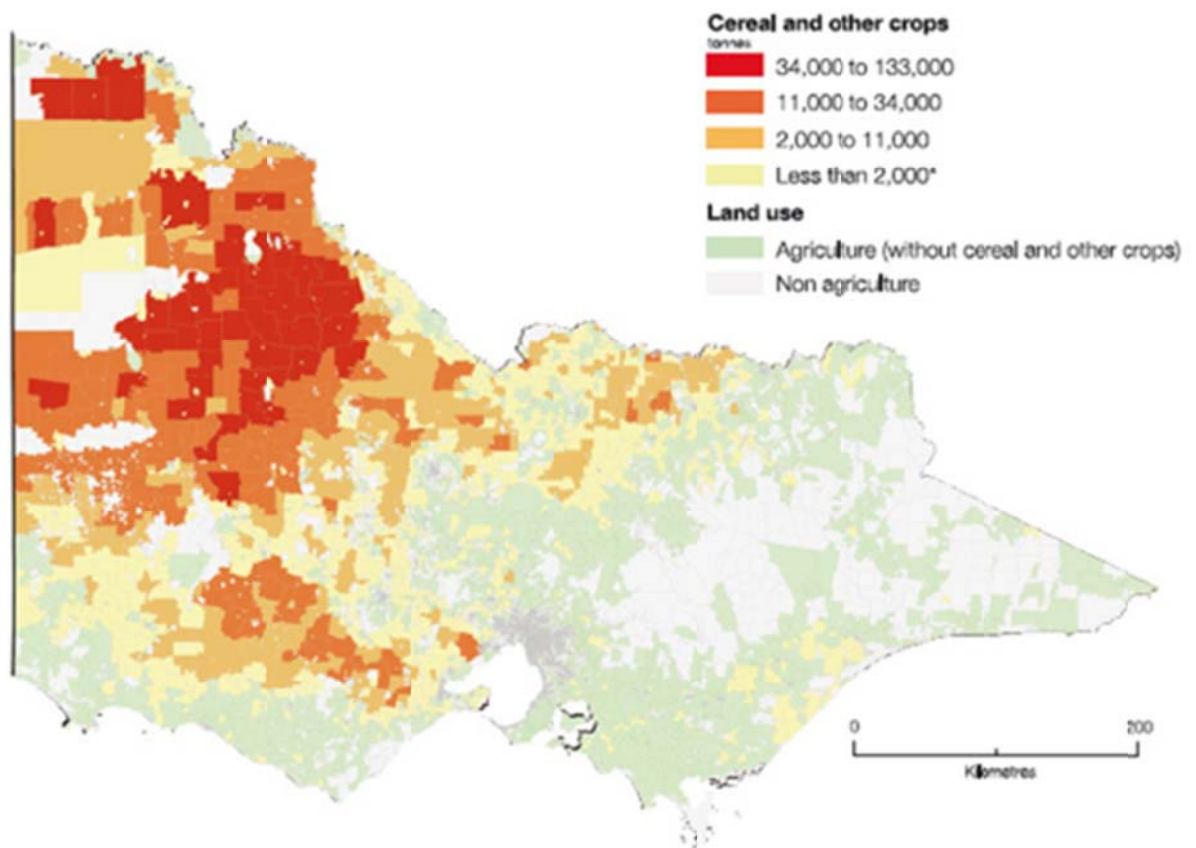
Current mining activities (separate from Mineral Sands) focus on the Broken Hill area where an established heavy metal mining industry provides outputs to South Australian and New South Wales ports. Although the mining activities are substantial, heavy metal export needs are limited with lower volume transport after processing to move concentrates to port compared to other major bulk products.

The large mining deposits indicated south west of Broken Hill indicate major mineral deposits in the Braemar mining region to the south of the Barrier Highway. Other mineral exploration areas north of the Barrier Highway are indicating major growth and outputs in future years. Start up development is occurring in these areas with substantial potential indicated. Some miners have long lead times while others are indicating start up as early as 2016/17.

The concentration of commodities in the region is also a key factor considered in the study with a number of products concentrated in specific areas of the region. Fruit and grape production along irrigated riverlands is an example of this point.

Although grain production is widespread it also has areas of concentration as indicated on the map from the Victorian DEPI website (see Figure 6 below). Over the past five years the value of Victorian wheat exports has increased by a factor of five. Victoria accounts for 16% of the Australian grain exports in 2010/11<sup>2</sup>.

Figure 6 Grain production concentration



Source: [www.depi.vic.gov.au](http://www.depi.vic.gov.au)

<sup>2</sup> DEPI website

### 3.3 Supply Chain Movements – Domestic and Export

Supply Chain movements vary substantially across commodity groups and the markets which they address. This is also relevant to the transport mode selected to reach markets, ports and processing facilities.

The general freight commodities of fruit, vegetables, nuts and wine grapes are largely moved by road with substantial domestic (Australian) markets. These products move in all directions from the region to markets in capital cities in South Australia, Victoria and New South Wales. Processing facilities in the region also provide a focus point for inwards movement of raw products for wine and nut processing prior to distribution movements to domestic markets and export ports. Wine production has strong links to South Australian facilities and outward movements tend toward Adelaide, although some exports move to the Port of Melbourne.

Grain supply chains provide for a range of domestic and export markets. The seasonal variability of production year to year creates a situation where storage of grains is used to ensure domestic Australian use needs are met while export opportunities are also attractive based on current world prices. While a total Murray Basin region volume is difficult to confirm, a share of the Victorian grain market is more achievable. The Murray Basin region provides approximately 70 % of the Victorian volumes of 4.5 million tonnes of grain with a value in excess of \$1.2b<sup>3</sup>. The Victorian harvest volume increases to over 7.0 million tonnes in peak years providing additional export opportunities.

While domestic demand remains reasonably stable in the range of 2.5 m<sup>4</sup>tonnes of the Victorian volumes, the export volumes increase to take advantage of available production. Much of the production used for domestic purposes is moved by road to local businesses including:

- Food processing /manufacturing;
- Milling companies;
- Seed grain; and
- Feed grain providers.

Regular rail deliveries for domestic use are also made to major millers and general domestic distribution facilities.

Export grains are moved to ports by road and rail modes. The mode share varies according to harvest size and market conditions from 55% road and 45% rail, to 45% road and 55% rail. As harvest size increases there is a general trend toward increased rail mode share to service export deliveries to ports, and to take advantage of world prices during the early months of the year when northern hemisphere grain stocks are at their lowest.

Movements by road and rail to the port of Geelong and to the port of Melbourne represent a large percentage of the export task although grain from the western areas of the region also flow through to the ports of Portland and South Australian ports.

Mineral Sands production volumes are directed as export products through the ports of Portland and Adelaide. Products move both north and south from the region based on individual company processing points and facilities. Processing facilities in Broken Hill and Hamilton (Victoria) are the staging points for product refinement prior to export movements through the ports. The supply chain movements are preferred by rail. However, the current distances from mines to the rail head result in substantial road movements to rail connections. In the case of southbound movements to the port of Portland this also requires access to standard gauge rail resulting in a longer road journey due to the inefficient mixed gauge rail network within Victoria.

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<sup>3</sup> Depi.vic.gov .au

<sup>4</sup> www.depi.vic.gov .au

Regional containers travel by both road and rail modes substantially to the Port of Melbourne and Port Adelaide (from the north of the region). Consolidation points at Intermodal terminals at Merbein, Donald and Dooen are indicated in Figure 5 above. Donald and Mildura containers are relevant to the infrastructure in the north west of the state, while Dooen traffic is linked to the western interstate main rail line.

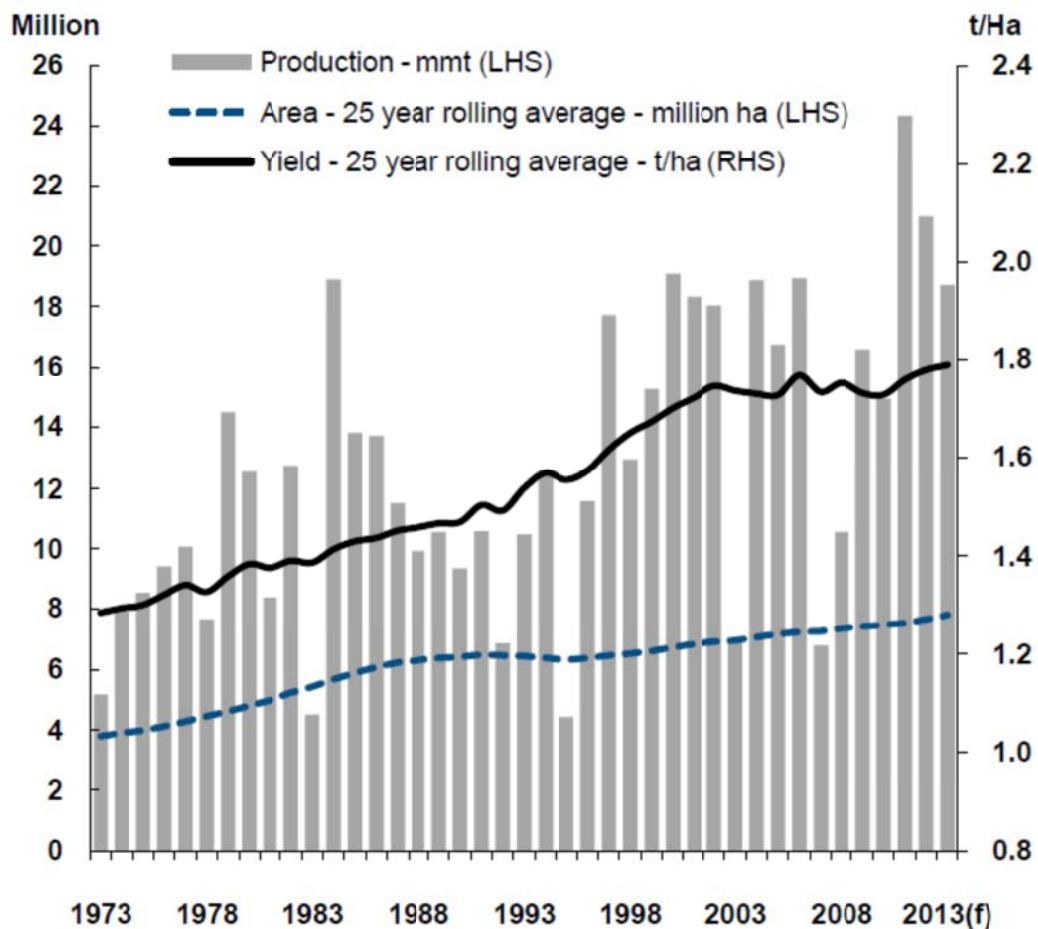
General freight traffic and regional containers are present in some of the same markets and may be carried as palletised loads or loaded in a container to port, dependent on the packing location. Accordingly, there is an opportunity for mode shift between the two commodity groups as a result of increased efficiencies.

### 3.4 Forecast growth in current products

Current commodity volumes for the region are dominated by Grain and Mineral Sands although general freight and containers remain substantial drivers of the economy. Grain volumes continue to grow with contribution from both additional areas being sown and from increased yields.

The following graph from the Graincorp website indicates long term growth trends in the Australian Grain industry as a 2 to 2.5% rolling annual growth in productions and a 0.5 - 0.8% rolling yield improvement over a 40 year period.

Figure 7 Australian Grain Production History



Source Graincorp.com.au (with reference to ABS & ABARES data).

There are some questions being discussed in relation to climate change impacts on these trends however, a grain growth figure of approximately 3% is indicated.

Mineral sands forecasts are more reliant on mine site movements in the region and staged development. New companies developing mines in fine grain sands are the triggers for additional stepped market growth in volumes. Consultation responses indicate that the scope for regional deposits and viable mine sites will drive long term markets in these products (30 years+).

Regional container and general freight volumes are growing with some crossover into grain and other commodity groups (packaged in containers). Growth expectations of 3-5% are based on feedback within the consultation phase of the study and/or relevant CPI based growth.

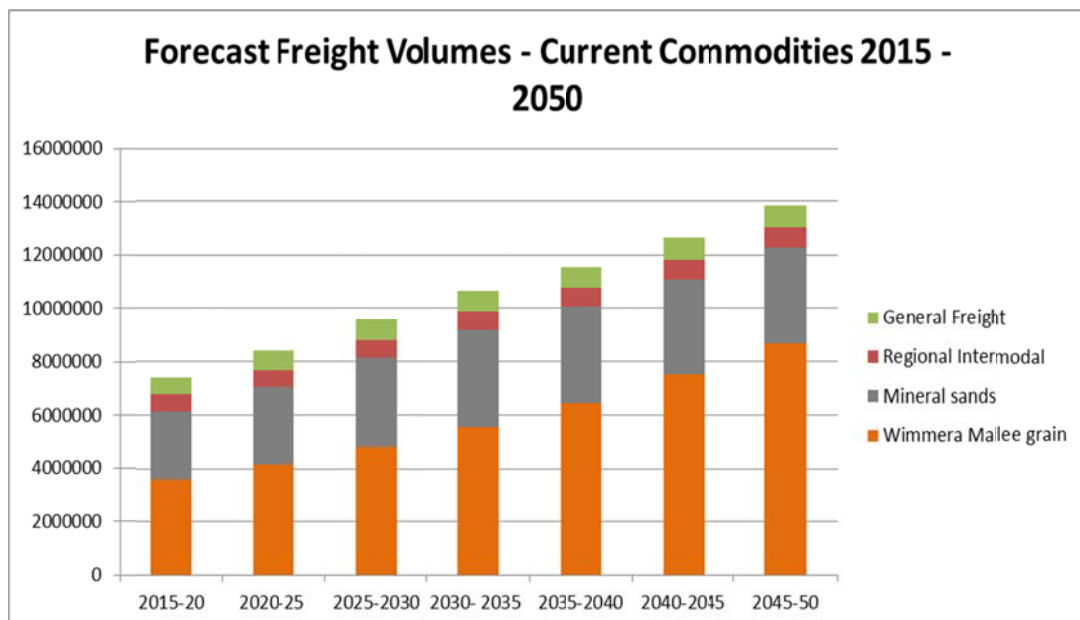
Trends across each commodity group have been established through identifying demand expectations and allowing their future potential movements across a timeline of change of the order of 30 years - i.e. to 2045-50.

An overview of the outbound freight volumes for current major commodity groups is given below in **Figure 8**. The grain movements dominate existing movements in the region based on average year expectations. While lower volume years are a reality with seasonal variances the need to provide for peak season requirements is also an important part of the planning of transport infrastructure.

Mineral Sands traffic across the region has increased substantially over recent years with further deposits to come on stream over the next 5-10 years. The volumes now being transported create significant impacts on the infrastructure networks and close management of the road maintenance task on the specific road routes will be needed to provide for growing long term needs.

Overall the significant growth outcomes in Grains and Mineral Sands are the driving factors in the region. The graph below indicates forecast growth during the period of the study.

**Figure 8 Forecast Commodity Growth - Existing Commodities**

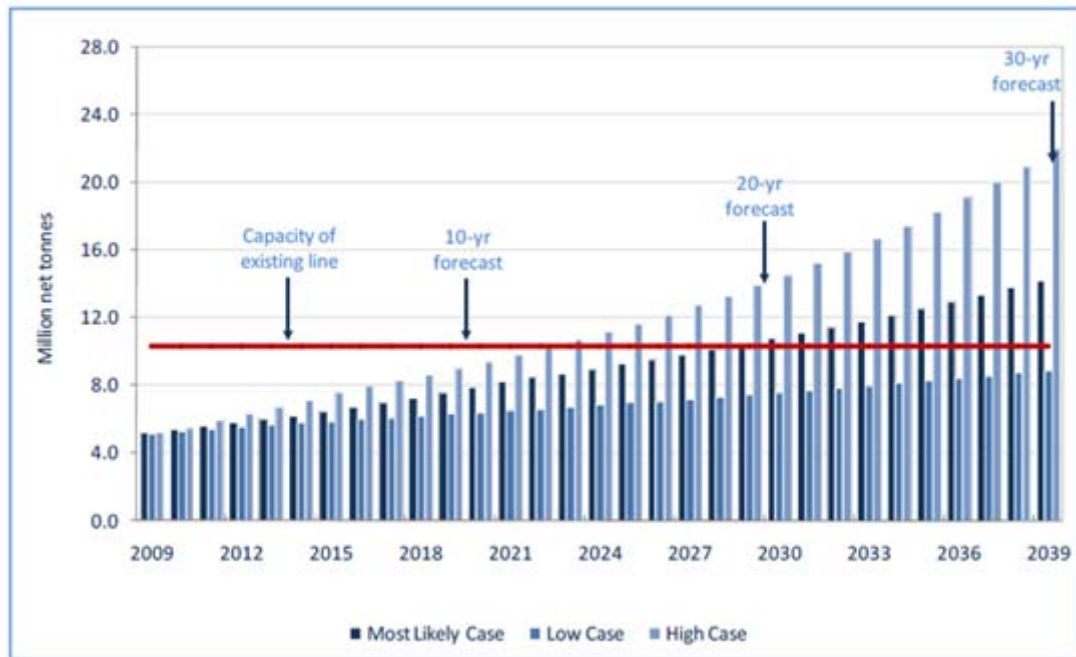


### 3.4.1 Future Interstate requirements

The constraints on the Melbourne-Adelaide rail corridor over time, with significant increases in forecast intermodal container traffic, lead to the need for consideration of a rail freight bypass of Adelaide. This traffic is then relevant to the Murray Basin options as identified in the AusLink frameworks, in particular the “Transcon” Link between Mildura and the Broken Hill east west rail corridor. The constraints on the Adelaide line restrict double stacking through the tunnels in the Adelaide Hills, and other areas have restricted opportunities for track duplication.

The forecast rail freight capacity through Adelaide as indicated in the 2010 report to the Department of Infrastructure, Transport, Regional Development & Local Government (see Figure 9) indicates constraints in the area in approximately the mid 2020’s leading to a need for alternative capacity options.

Figure 9 Rail traffic forecast through Adelaide 2009-2039



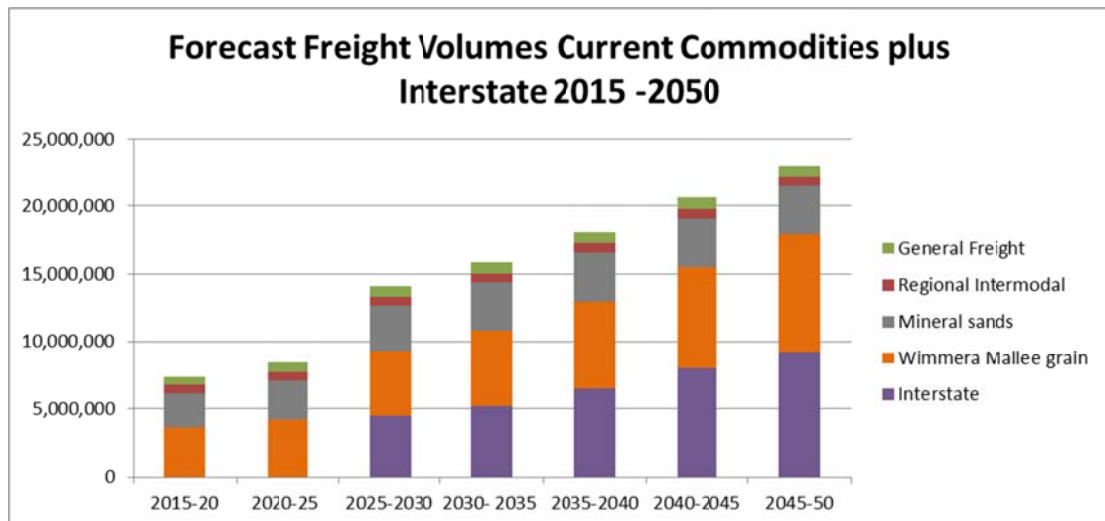
Source: GHD, 2010

Source: Department of Infrastructure, Transport, Regional Development & Local Government (DITRD LG), Canberra, in 2010

The inclusion of the Melbourne-Perth component of this traffic in the future options for the Murray Basin area provide a basis for alternative access for Perth traffic and capacity relief in the Adelaide area. The first level demand evaluation includes the Melbourne to Perth container traffic from a period in the mid 2020’s with significant increases beyond this period. The comparative impact of the Melbourne - Perth Intermodal traffic is included in the graph in Figure 10 below.

Alternate options have been considered to address capacity issues by way of a broader bypass of the Adelaide area however high capital costs were indicated to be a restriction on this option. Alternative double stacking options would also be supported by future development of a Western Interstate Freight Terminal in the Melbourne area relocated from the Dynon site and removing the current restrictions in inner Melbourne.

Figure 10 Inclusion of Interstate Intermodal Traffic



The final commodity group included in the future demand within the Murray Basin region is the 'Other Mining' development including Iron Ore (Magnetite) and other mineral deposits in the region. There are a number of companies developing mining operations in the area south west of Broken Hill and into South Australia where major magnetite deposits are located. These companies are in varying stages of development, with some seeking financing for their ventures and others that have progressed to seeking planning, development and environmental approvals prior to the commencement of operations.

Initial operations of the more developed miners are planned for 2016/17 bringing new freight requirements to the region and a significant change to the nature and volumes of product to be transported within the region.

The South Australian Resources and Infrastructure council (RESIC) has undertaken a study to identify future infrastructure needs to meet the challenges and opportunities provided by mining development throughout the state. The South Australian Resources and Energy Infrastructure Demand Study 2011 examined the required statewide energy, water and infrastructure which may be required by mining activities.

This study identified likely road traffic in the Yorke Peninsula and Braemar Region to require 6000 tonnes pa of inward freight and 500,000 tonnes<sup>5</sup> of outward freight pa in a range of truck sizes from rigid trucks to B Triples.

Due to the stage of development of many projects there were many respondents who indicated transport requirements were not yet settled.

Potential rail movements in this region are also provided, indicating most likely and potential demand. Most likely demand is indicated at 20-25 mtpa<sup>5</sup> by rail to port in the timeframe 2014 - 21 with potential demand of 30-50 mtpa in the 2014-21 period where companies have not finalised or confirmed their transport requirements. The report raises some concerns on the level of detail some proponents were able to provide on the proposed transport needs.

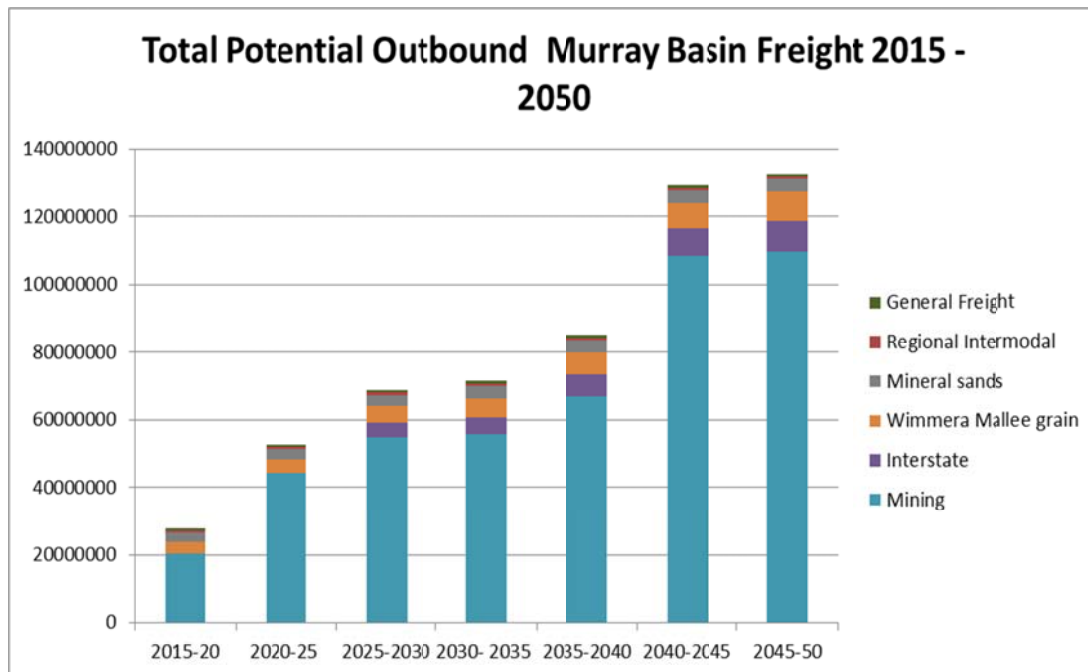
Port requirements for the Yorke Peninsula and Braemar region are indicated at 110 mt in the 2014-21 timeframe with further potential demand adding a further 40-50 mtpa. At this stage limited test plants and smaller operations are developing but no significant freight flows have occurred.

<sup>5</sup> RESIC assessments and reports



These volumes far outweigh the current freight movements in the region and will test the capacity and capabilities of the transport infrastructure. The need for port capacity to meet these needs is a critical issue with accessibility for larger (“Cape” size) shipping a high priority for these ventures. The significant paradigm shift in overall freight volumes in the region is indicated by the potential mining volumes in Figure 11 Potential Freight Volumes Including Mining. below.

Figure 11 Potential Freight Volumes Including Mining.



The significant impact of potential mining operations in eastern South Australia and south western New South Wales indicates major changes in export and ports requirements. The relative location of the majority of these mining ventures, adjacent to the existing east west rail corridor, will drive initial transport planning options towards the closest ports – Port Pirie or Adelaide. The scale of potential growth has been a driver for investigation of new port options in South Australia and this is a key factor in future directions.

## 4. Infrastructure Issues and Options

There are clear opportunities for timely improvement and development of transport networks, linking of key nodes and gauge standardising the rail freight lines to facilitate economic outputs from the region and to improve access to ports and markets.

### 4.1 Current Infrastructure use and directions

The demand evaluation of freight movements in the Murray Basin area has indicated a dynamic picture of changing requirements in line with recent climate, market ownership and supply chain changes. The products moving within the Murray Basin are changing and volumes vary responding to seasonal impacts and destination requirements.

The dynamic nature of moving product in the region to meet commodity market changes has been highlighted in recent years. Some of these changes are described below:

- Grain transport has undergone a number of changes which impact the infrastructure used, transport mode and port selection. The changes include:
  - An increase in the number of marketers competing for grain and selling to new markets;
  - The increased containerisation of grain products as export grain reaches out to new markets;
  - Industry ownership changes. This has led to preferred port selection for improving efficiency or to utilise port handling facilities aligned to the new ownership;
  - Increased on-farm storage and local management of grain storage (through consolidation businesses) to take advantage of variable pricing opportunities in the market. This has led to increased road mode share as smaller “parcels” of grain are transported, often directly from the farm by heavier vehicles;
  - Development of grain wholesale businesses with consolidation storage to package and transport bulk or containerised grain consignments to or on behalf of marketers;
  - The use of larger road vehicles which is impacting local and arterial roads and creating increased maintenance needs particularly on local Class ‘C’ roads;
  - Rail mode share is focussed towards the larger and faster throughput facilities therefore creating a greater focus on road transport to these key hub locations;
- The mineral sands industry has developed significant export markets and grown to utilise the scope of the available resource across the region. The mineral sands deposits vary in product type and deposit size, creating dynamic changes to transport needs over time:
  - Many of the currently mined products (representing the majority of the current transport need) are in localised deposits which are mined over a period of 7-10 years before relocating to a deposit which may have different transport needs;
  - Fine grain mineral sands are currently in the development phase but provide larger long term deposits in one location;
  - Transport needs are directed to company owned processing plants and preferred export ports close to processing plants. This results in the overall mineral sands task taking alternative routes for export from the region;

- The industry has a significant future life in the region with proposed relocation to new mining locations as the local deposits are exhausted. Processing plants are located in areas close to initial mine sites but new sites are moving further away. Locating the transport task and processing points closer to the port is the preferred option for the companies. The movement of product in both bulk and containers also impacts the infrastructure requirements;
- An overall long term industry requirement appears to have been established with new players looking to add to the size of the task;
- General freight products have seen a growth in fruit, wine, produce and nuts (as an example). These products have also been impacted by industry and market changes leading to the consolidation of the task within the region. Some markets are under pressure from cheaper imported products while new products are being developed within the region to suit the climate:
  - Industry groups and larger companies have consolidated many of these markets resulting in more concentrated distribution points which impact the surrounding infrastructure;
  - Consolidation and processing facilities are often located away from highways with restricted access where truck deliveries need to travel across a widespread area of local roads. The processed outputs however, are larger consolidated loads highly focussed on movements to markets and ports;
  - The location of some packing facilities is sometimes out of the region and closer to ports and capital cities therefore generating additional trips.
  - The general freight commodity provides a peak load of freight which is focussed on a number of key processing and distribution nodes in the north west of Victoria;
  - This results in:
    - Increased use of local roads to consolidate products;
    - Increased use of larger truck configurations to gain available efficiencies;
    - Some increasing use of containerised intermodal facilities to gain access to ports. However, the competitiveness of road and rail options remains tight.
- Regional Container traffic is providing a range of products inclusive of grain and hay packing, some mineral sands, wine and produce. This commodity group has been separated to reflect its different supply chain focus and consideration of any specific transport networks changes:
  - Consolidation to a central terminal brings some congestion and impacts on local roads. However, overall impacts on roads in the region are reduced.
- Interstate Freight considerations include the transport of cross border north south traffic and highlight the potential future demand and capacity restrictions likely to impact interstate container traffic between Melbourne and Perth, together with Darwin/Melbourne opportunities and mining supply issues in the region.
  - Interstate container traffic between Melbourne and Adelaide is likely to reach a capacity limitation on the main interstate rail line to Adelaide in future years and this study considers the impacts and opportunities for these products;
  - Additional mining and other input supplies from Victorian ports also add some consideration of supply chain requirements;

- Other mining activities in the region are driving interest for future medium term outputs of significant volumes of 10-20 mtpa to 100 mtpa with studies in South Australia exceeding this volume:
  - Existing companies in the Broken Hill area have established supply chains and volumes moving to several ports in South Australia and New South Wales;
  - New companies are developing in the south west of New South Wales and east of South Australia; for example in the “Braemar” region highlighting a key potential development area for magnetite iron ore. Initial outputs through South Australia are anticipated in 2016-17;
  - Overall assessment of these products will require some risk assessment to highlight likelihood of overall volumes and ports which will drive the infrastructure needs; and
  - Port capacity will be a key feature for these miners and will drive likely directions for freight flows in the region. The ability of ports to meet the capacity needs of the mining developments needs to be monitored over the next 2-5 years to assess the alignment of capacity and demand. Appropriate investments can be considered once magnitude of outputs can be confirmed. Limitations or lack of capacity in South Australian ports would exacerbate the supply chain constraints.

#### 4.1.1 Road networks

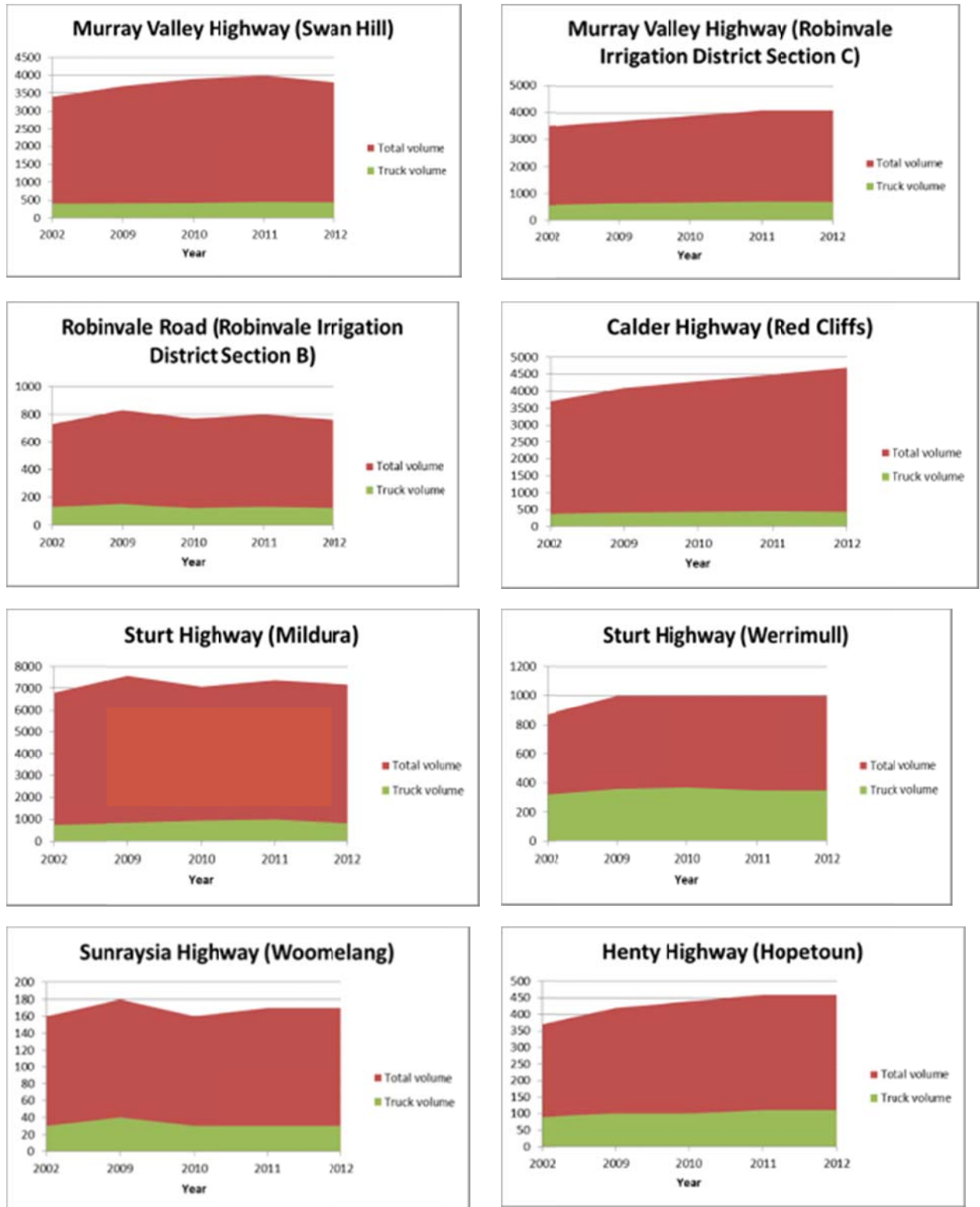
To identify the road network constraints for the Murray Basin region 8 key routes have been identified as the key arterial road connections which could be used to transport material to and from the Murray Basin. These routes are not the exclusive options used by Industry but are the key routes considered important to the range of transport needs in the region. They include:

- The Henty Highway - Mildura and Horsham areas to the Port of Portland;
- The Sturt Highway NW Victoria to Adelaide and Sydney with overriding through traffic;
- The Calder Highway – Mildura and NW Victoria to Bendigo and Melbourne;
- The Murray Valley Highway – NW Victoria along the Murray River to connect with north/south and east/west connectors;
- The Sunraysia Highway - Mildura and NW Victoria to Ballarat and the Port of Geelong;
- The Barrier Highway - Broken Hill to Port Pirie and Adelaide;
- The Mallee Highway Ouyen to Adelaide; and
- The Silver City Highway - Mildura to Broken Hill.

The routes have been assessed against the applicable State Governments road authority heavy vehicle requirements to identify any issues or constraints which are evident at the current time.

Available current traffic movement records from VicRoads have also been assessed to identify key usage patterns at available locations. The overall traffic volumes indicated by these graphs vary in size and the graphs indicate the volume of heavy vehicles compared to total volumes for each road. The graphs indicate no key capacity issues. However, where the truck traffic percentage of overall traffic exceeds 25-30% additional impacts are expected. These vehicle volumes need to be aligned to the road conditions and construction type to cater for the volume and weight of the traffic. Some consideration may be necessary to assess the safety and capability of the road to cater for the task. Particularly where this applies on Class ‘C’ roads there may be issues for upgrade treatment and this has been highlighted in several of the background reports reviewed as part of the project.

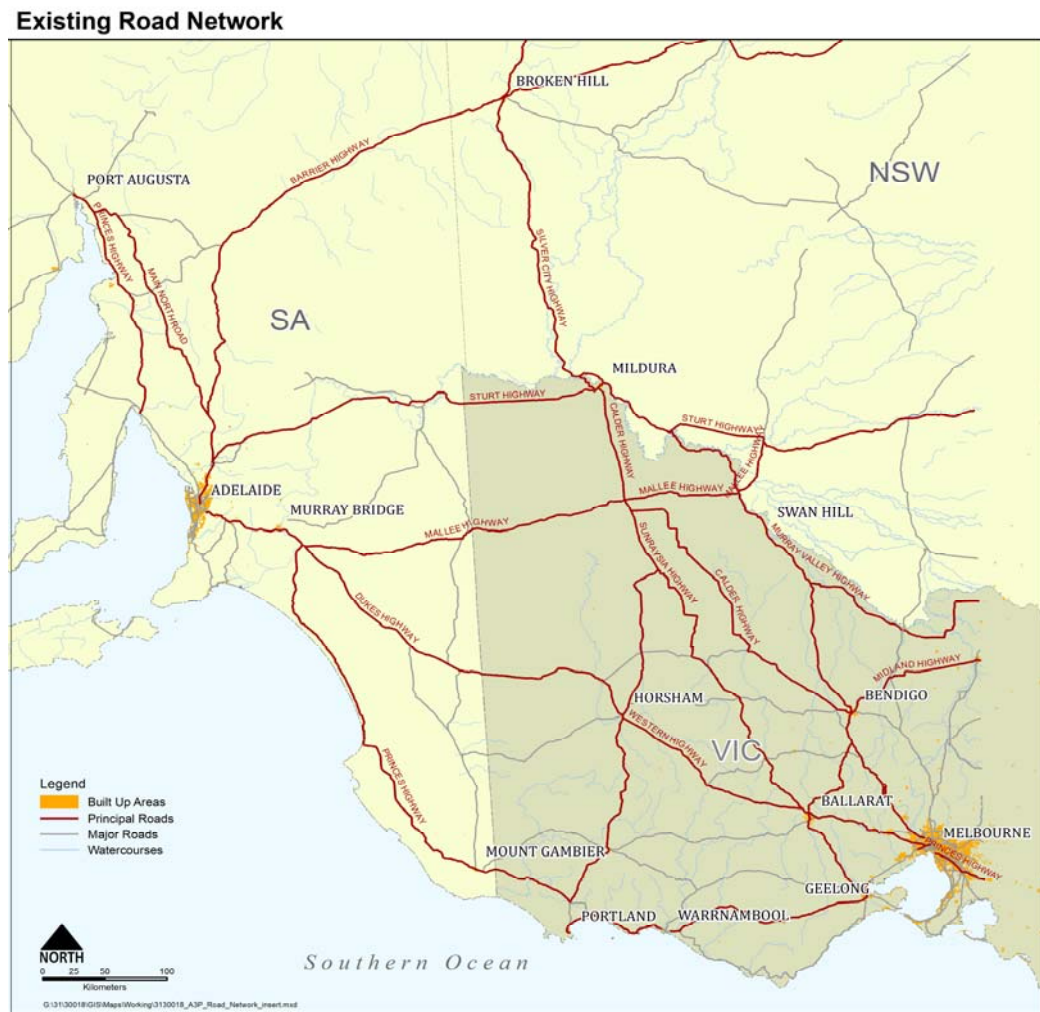
Figure 12 Road usage examples



Data Source: vicroads.vic.gov.au

The demand data provided indicates that impacts on the road network are related to key freight nodes in the area. Key freight nodes are centred on production and distribution facilities, but also include on farm storage covering the broad areas of the region.

Figure 13 Existing Road Network



The current road network provides access to key areas of the region and provides the only connections between the Mildura and Broken Hill areas. The road networks are not limited by capacity but in many cases local roads are under pressure from limited capability to sustain the impacts of larger and heavier vehicles. The truck capacity increases have driven significant efficiency in the supply chain. However large volume use across local roads at Class ‘C’ level and similar is impacting the maintenance task. The need to improve road structures and surfaces to cater for higher capacity is a current catch up process for existing road managers with limited budgets.

Data collected on road usage in the region does not allow us to define all road movements across the broad Murray Basin area. However, origins and destinations do provide a basis for the allocation of freight to major routes and corridors including advised current tasks and peak load tasks over the planning period.

Table 2 below indicates current and forecast peak load tonnages for transport links from consulted companies in the region. These tonnages do not represent total volumes or tonnage of all vehicles or freight on these connections but an indication of growth projections from companies consulted in the study. It provides an indication of relative growth on these routes.



Table 2 Indicated study road volume increases (non grain)

Transport Link	Current indicated tonnages ('000 t/pa)	Forecast peak load tonnages during the planning outlook ('000 t)	% increase Consulted companies
Sturt Highway to Adelaide	288	646	124
Sturt Highway to Sydney	118	248	110
Calder Highway to Melbourne	1,289	1,556	21
Silver City Highway Mildura to Broken Hill	783	1,362	74
Sunraysia Highway	1375	1518	10
Balranald - Ivanhoe Road	Minor	450	900
Henty Highway	1376	1668	21
Buronga – Silver City Highway connection	30	300	900
Robinvale - Hattah road	215	280	30

The likelihood of pressure points across the networks is highlighted by demand information and provides drivers for infrastructure attention. Pressure points are likely to include:

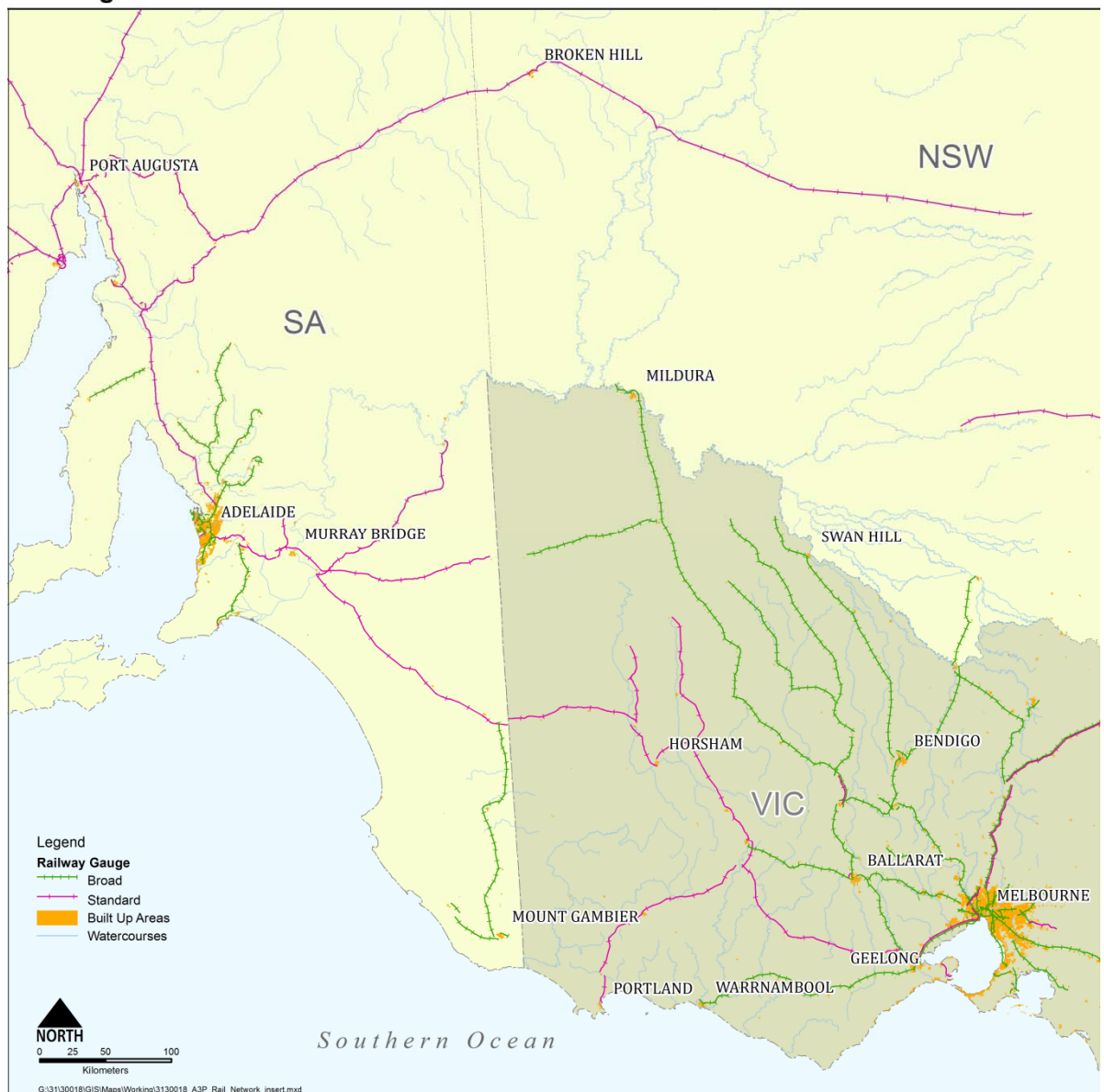
- Mildura and fruit and wine growing areas with a particular focus on harvest time impacts on local and major road links. There are key focus areas for freight around processing facilities at Karadoc, Redcliffs, Carwarp, Buronga, Merbein and the Robinvale areas. Most major road links provide for these needs but local roads are being adversely impacted by the heavy vehicle capacities;
- Grain requirements in an environment of 3% growth over the planning outlook and the necessity of ensuring that the current networks provide for capacity and efficiency to add value to the industry and competitive export needs; This increases the likelihood of road impacts and peak queuing/congestion around major consolidation points - eg Beulah, Murtoa, Dooen, Birchip and Piangil/Woorinen. Impacts will be more significant where road classes are low (particularly Class 'C' and local roads)
- Road impacts are showing through at a local level and need to be addressed based on road class and impact assessments;
- Long term freight movements for mineral sands are indicating a consistent direction of task however specific developments may extend areas of use.. Providing the most efficient outcome with least impact on transport networks is a key to this commodity. This includes rail access to the Broken Hill and Hamilton processing areas and ports;
- Magnetite mining exports are the largest long term task and have significant needs for inward and outwards transport. Aligning best option networks and ports across a total supply chain will be the challenge. The scope of current projects currently appears to leave a transport gap which needs to be filled to maximise export opportunities.

#### 4.1.2 Rail Network and use and constraints

The rail network relevant to the study area includes the broad gauge lines from Gheringhap to Ballarat to Yelta and Maryborough to Manangatang and Sea Lake. The standard gauge Hopetoun and Rainbow lines together with the main western line linking Melbourne, Adelaide and Perth are also relevant as two separate rail networks of different gauges operate alongside each other in the north west of Victoria. These networks provide key connections to ports for Victoria's export products but also create restrictions based on their gauge differences and the inflexibility caused by the break in gauge. The key reason for development of this rail network was the movement of grain to ports and markets.

Figure 14 Existing Rail Networks

##### Existing Rail Network



The areas covered by standard gauge rail have access to all ports but areas within the broad gauge network are restricted in access to some ports and rail transport flexibility is restricted in the region as a result. This is also relevant to the adjoining South Australian network (on standard gauge) which finishes at Pinnaroo just short of a broad gauge line from Ouyen to Murrayville.

These rail networks provide the link for many of Victoria's key food product exports which form a significant part of Victoria's State Product.

These rail lines currently carry three key products which all need access to ports. They are:

- Grain products (wheat, barley canola etc);
- Mineral sands (with forecast increasing volumes); and
- Regional container services for export products to the Port of Melbourne.

Each of these products requires efficient port access and a need to provide an efficient supply chain to remain competitive with overseas markets.

Bulk cement products are also carried from Geelong to Mildura on a regular service to support development activities in the region.

The operation of two separate networks in the region on Broad Gauge and Standard Gauge provides a number of inefficiencies and limitations which flow through to industry and customers:

- National rail companies need to operate a separate fleet of rolling stock on a relatively small network with variable volumes. This reduces flexibility and utilisation of rolling stock driving up the cost of services;
- Investment in new rolling stock for Broad Gauge operations is almost non-existent as returns are limited and change may occur within the asset life cycle. Compared to investment returns on large coal or mineral railways the broad gauge railway cannot compete with restrictive investment options;
- There are limited rail operators with broad gauge equipment and there is little attraction for new entrants, limiting competition; and
- Rail operating companies have reduced their market exposure in these conditions by negotiating only "take or pay" arrangements with customers passing volume risk issues to the customer.

Issues raised within the study indicate nearly all parties consulted in the project view the rail network as being maintained with little regard to the need for consideration of the competitiveness of the markets in which the main commodities compete. Issues raised include:

- The gauge differences in the state lead to industry often choosing road mode for many trips, passing a higher maintenance burden to the road managers;
- Few rail providers are interested in providing services on the broad gauge network due to limited return on investment and available rolling stock. This restricts competitiveness and efficiency;
- Low speeds available on the network; due to limited maintenance;
- Long train cycle times for trains to make a return journey to the region due to speed restrictions and safety restrictions;
- Impacts caused by interaction with passenger services; where passenger priority is applied;
- Axle load limits compared to other networks (including the main interstate line); and
- Lack of investment and innovation to improve the network compared to road vehicle productivity improvements.

There have been limited efficiency gains in the network over recent years and the gauge differences are potentially restricting investment in above-rail rolling stock and equipment which could also contribute to the competitiveness of business.

The Victorian broad gauge network is largely funded and maintained on a low cost basis involving a minor works approach with a need for cyclical “tie renewal” maintenance programs to replace approximately 1 in 4 sleepers every 5 years. This approach tends to lead to a cyclical improvement followed by a period of degradation over following years until the next maintenance cycle becomes available.

Investment levels have not always kept pace with these cycles and investment will need to increase to retain operation of the current networks at their present capacity and current scope. A further maintenance cycle is now due on the network and this provides the opportunity to maximise benefits by combining other works on the network at the same time, such as gauge standardisation, using the same work deployment.

#### 4.1.3 Port Options relevant to the Region

The ports available to industry (and their relevance to the industry task) in the Murray Basin region are a key driver of freight movements. The “cost to market” is a critical element of the competitiveness for products from the region. This is particularly relevant in export products and commodities where producers compete in global markets with high competition and relatively low margins.

The commodity groups indicated in the demand section of this report require different port facilities for bulk, containers and “break bulk” activities. They highlight the significant levels of dry bulk products or containerised movement for export and this brings a focus to access and connections to port requirements for their export.

Existing products focus their supply chain movements to either Victorian or South Australian ports although there are some lower volume specific products moving to Port Kembla and Newcastle from the region.

Victorian ports at Geelong, Portland and the Port of Melbourne all provide for bulk products. Containerised exports are managed through the Port of Melbourne with intermodal and road connections. These ports are the closest ports to the southern part of the Murray Basin region driving direct movements and minimum costs to port from these areas.

- The port of Geelong is currently the major grain port for Graincorp in South East Australia and draws product from as far away as Griffith in the Riverina of New South Wales. It also imports fertiliser, cement products and fuels which move to the region to support industry. It is served by road access and both broad and standard gauge rail networks;
- The port of Melbourne is the main container port for the region with intermodal terminal connections within the region. It also has a bulk grain facility owned by the Emerald group (recently taken over by Sumitomo) It is served by road access and both broad gauge and standard gauge rail networks; and
- The port of Portland provides export facilities for grain and mineral sands from the region as well as other bulk products including woodchip from a green triangle area closer to the port; and is serviced by road and the standard gauge rail network. There is no broad gauge rail at the port.

The following diagram, Figure 15, indicates the location of Victorian ports and transport connections:

Figure 15 Victorian Ports relevant to the Murray Basin region

### Victorian Ports



South Australian ports also have key links to the region with growing relevance to the potential east west movements from the region and mining outputs forecast south west of Broken Hill. The South Australian ports already source products from the region, mainly by way of road transport including grains, fruit and vegetable produce, grapes and wine products.

South Australia has a number of ports linked to different industries and these are scattered around the Spencer Gulf and Port Vincent zones. Ports relevant to the Murray Basin region are generally to the east of the Gulf due to the need to reduce distance and costs to port.

Ports in Adelaide provide the closest port facilities to the northern areas of the region and have serviced Broken Hill and south western New South Wales for many years.

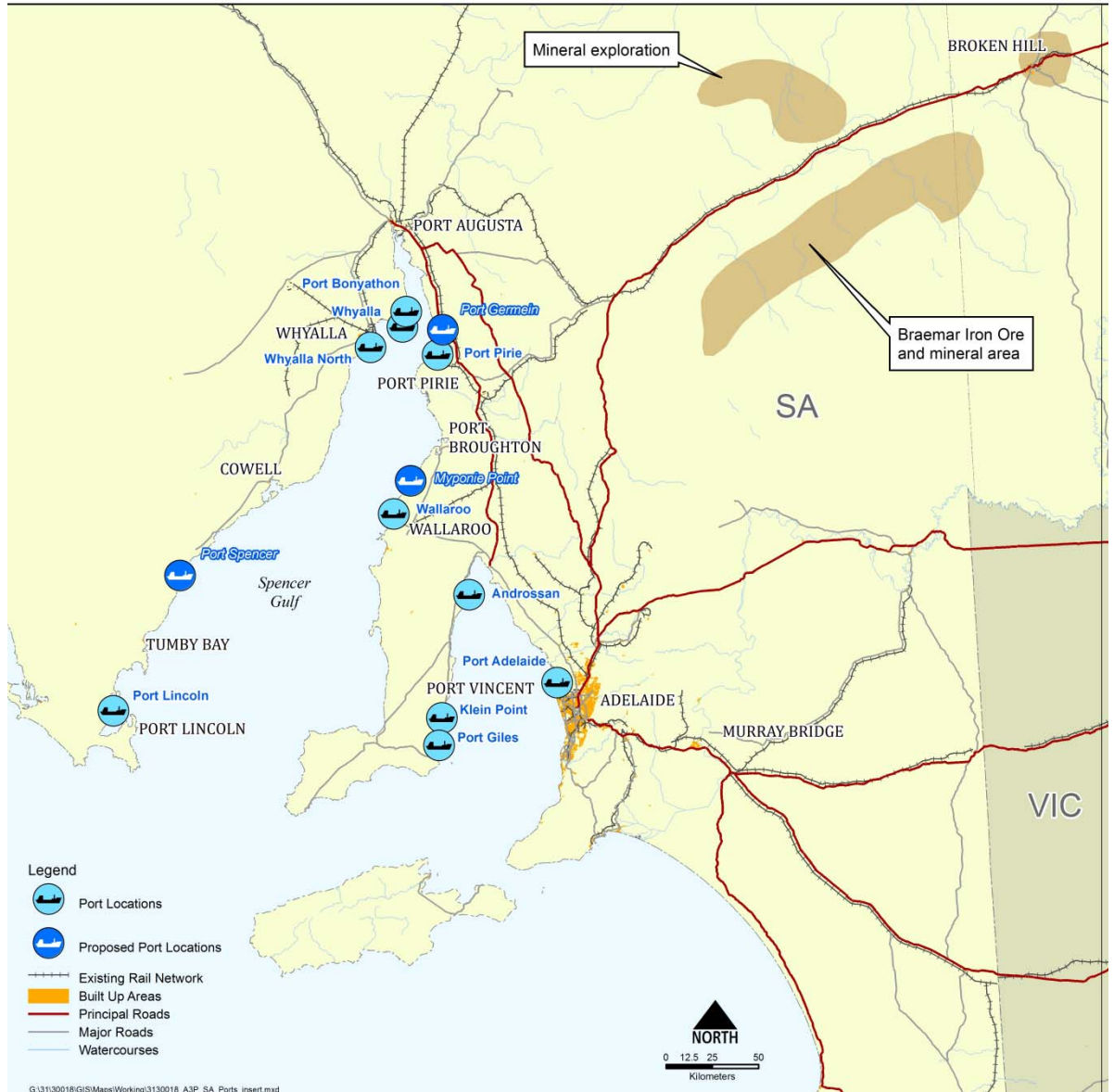


The changes in grain handling company ownership have resulted in several South Australian ports now owned and operated by the Glencore group and this potentially provides a focus for increased movements to these ports within the ownership of the transport and storage provider.

The following map of current and potential ports in South Australia indicates the range of facilities available and their relevance to the future needs of the Murray Basin to the east.

Figure 16 South Australian Ports relevant to the Murray Basin region

### South Australian Ports



Key ports relevant to the region include:

- Port Adelaide which provides a large scale range of port services for containerised and bulk products serviced by road and rail in both the inner and outer harbour areas. Channel deepening has provided for Panamax loaded ships with a draft of 14.2 metres;
- Port Pirie 225 km north of Adelaide services current mining activities from the Broken Hill area and general grain traffic. It has 11 berths and is serviced by road and standard gauge rail. The current approach channel to/from Port Pirie is dredged to a depth of 5 to 6 m and extends approximately 15 km from the Port. It is approximately 20 km from the end of the existing approach channel to deep water (to approximately 20 m);



- Port Giles situated on the western side of Gulf St Vincent services grains and seed. It is accessed by road but has no rail facilities. The existing port facility caters for a single berth suitable for vessels up to Panamax size. The current approach depth into the port is 13.5 m below Chart Datum. The current facility can handle Panamax vessels up to 75,000 tonnes;
- Wallaroo is located on the eastern side of the Spencer Gulf 160 kms north of Adelaide. It services mainly grains, seed and fertiliser products by road with no current rail connection. Wallaroo has a 90 m wide channel providing access to the port facilities. The depth of the channel is 8.4 m below Chart Datum. Existing berth depths are around 7.3 to 8.7 m in depth. The current port facilities are suitable for Handy/Handymax size vessels but are not suitable for Panamax vessels;
- Klien Point Located just north of Point Giles is a limestone port exclusively. The existing port facility caters for a single berth suitable for vessels up to partially laden Handy/Handymax size. The current approach depth into the port is 6.5 m below Chart Datum with the depth at berth also being 6.5 m below Chart Datum;
- Androssen is located to the north of Gulf St Vincent and exports dolomite and grains; and The Port has a declared depth of approximately 9.2 m in the channel and at the berth. The maximum size vessel that can access the port is a Handy/Handymax vessel; and
- Whyalla on the western side of Spencer Gulf services steel products. Whyalla's port has five berths capable of handling vessels up to 40,000 tonnes deadweight for bulk discharge, and vessels up to 65,000 tonnes deadweight for the loading of iron ore. Located at the shallow northern end of the Spencer Gulf, Whyalla is a shallow port. Water greater than 20 m in depth is located approximately 10 km offshore to the southeast.

While there is a broad range of ports in South Australia which may assist in servicing the future needs of the Murray Basin region indications are that volumes are likely to require additional developments to cater for mining opportunities in the Murray Basin and from other areas of South Australia.

Potential new port locations are also in Figure 16 highlighting points of interest and investigation by industry and the South Australian Government to meet future needs. These new ports include:

- Port Bonython – at the northern end of the Spencer Gulf – an existing port which may be further developed to cater for bulk minerals and commodities. The site has current road access but no rail links at the current time;
- Myponie Point area located on the eastern side of the Spencer Gulf and north of Wallaroo. There is no port currently at this facility but opportunities for the site have been considered; and
- Point Germein - Located on the eastern shore of Spencer Gulf with road access and close to the ARTC main rail line. It has also been considered for development but does not have port facilities at the current time.

## 4.2 Key issues arising from demand consultations

### 4.2.1 Priority local issues on freight infrastructure

The flow of major product supply chains is based on access to relevant export ports within the region and the relative efficiency and competitiveness of these supply chains in the commercial markets.

Reports and consultations with local transport groups and council representatives have raised a number of issues at a local level with a consistent message across wide areas of the region. The impact of freight traffic on local and regional infrastructure has been a high profile issue in regional areas with costly impacts for road conditions and the maintenance budgets of local road managers. Key freight issues in the region include:

- Local road impacts with class 'C' roads being impacted significantly. This is because the constructed standard of these roads is not in alignment with current truck combinations and the loads they are being required to carry. Rough ride impacts and surface breaking at the edges of the sealed surfaces are impacting the safety of these roads, with additional truck trips further adding to the concerns;
- Road Managers are seeking further funding allocations from government or additional revenues from industry but the lack of a priority system and limited available funds are restricting the allocation of funds to the areas of highest need;
- Improvement priorities for bridge maintenance, upgrade and replacement are also called for in the region. These issues relate to both higher capacities for freight traffic and the development of alternative location options which would redirect traffic to Bypass options around larger centres; and
- The need for improved management and upgrading of the existing rail network to draw a closer alignment to the needs of industry. Progressive gauge standardisation of the broad gauge network is needed to deliver more flexible and competitive access to export ports. This in turn will create mode shift and reduce some of the impacts currently being suffered on the road network.

Local councils consulted within the Murray Basin region consistently raised the issue of impacts of larger trucks and the challenges of catering for these vehicles with restricted budgets and limited controls. Grain as the largest freight task is identified as the major contributor to the issue.

As further mineral sands locations are developed in southern New South Wales and relocations of sites occur, further pressure will be applied to local unsealed roads between the Victorian border and Broken Hill. While the development is supported in these areas for its economic benefits, many of the roads in the area are closed in wet periods due to unsafe travel and access.

Access for mining haul roads will require mining inputs and approvals from road managers (councils and RMS) for increased tonnages. The allocation of agreed truck routes for the mining task is a key approach to ensure road impacts are minimised. The New South Wales RMS is working with these companies to address specific issues in this area.

#### 4.2.2 Broader Infrastructure issues across the region

The issues raised locally were extrapolated across the region highlighting broader strategic issues impacting the alignment of infrastructure networks to industry needs. The following issues have been identified as key drivers for the focus change initiatives:

- The shift to larger road based transport has had a major impact on roads within the region with increasing quantities of bulk product seeking the most efficient option available to port within existing infrastructure constraints. Productivity improvements in truck configurations have driven a level of mode shift but efficient rail options are now being sought by major operators to drive down the impacts and increase bulk handling efficiency;  
In the grain industry this is likely to result in an investment strategy towards larger sites with the development of fast throughput and efficient turnover through limited shunting and maximized wagon utilisation at each site. These factors will lead to effective improvements to the competitiveness of the overall supply chain to ports;
- The impact of these larger trucks has placed pressure of the budgets and maintenance task of road managers who are seeking relief by way further funding or mode shift to rail;  
The forecast growth in grain production is a critical factor to consider in the scope of future transport needs with growing impacts in the community through infrastructure costs and congestion issues (including seasonal consolidation transfers and port access);  
The current trends indicate this growth will continue to test the road networks in Victoria with resultant cost increases and impacts on state and local government budgets. The need to address these issues in the short to medium term to reduce longer term costs is a key driver for change in the region;
- The growth of mining products in the north west of the region creates a paradigm shift in the transport needs and the creation of new port facilities to meet the volume expectations of miners in the area. The road and rail links from Broken Hill to South Australia provide key links for these freight volumes, commencing with the use of existing ports during the first stage of development but moving quickly to the need for further port development based on demand;  
A recent South Australian Government announcement of an infrastructure corridor for roads, slurry pipelines and energy connections within the Braemar Bulk Exports Project which would provide an additional main corridor for the freight flows from the mining areas and reinforce options for the movement of this freight to the Spencer Gulf area;  
Consideration of other ports in New South Wales or Victoria would only be considered if South Australian port capacity does not meet demand requirements as the industry develops or other more efficient supply chains and infrastructure to other ports was available;
- Expansion and relocation of Mineral Sands locations throughout the region will continue with movements to processing plants and ports both to the north and south of the region. Increased activity in the Balranald area and further north is anticipated with large truck combinations using a haul road and access northward to rail in the Ivanhoe area, and to the south to link with rail options to Hamilton and ports. Road trips to rail connections will increase, impacting a wider part of the road network in New South Wales with increased cost implications;  
The impact of these major movements will need close management and agreed routes to ensure road maintenance impacts can be funnelled to specific roads. The development of

this supply chain highlights the opportunity to maximise rail mode from the closest point where alternatives to road options can provide further longer term savings.

### 4.3 Future Port requirements

Changes to the major freight movements across the region will be heavily influenced by the need for future port capacity which will in turn impact the routes and direction of major export supply chain movements. Forecast port infrastructure requirements are detailed below.

#### 4.3.1 Mining sector Port Requirements

Mining commodities (apart from Mineral sands) generated in the Braemar and Frome South areas of the Murray Basin region are predominantly dry bulk products (iron ore magnetite with further development in other minerals). Volumes are forecast to include 1 - 5 mtpa within 3 - 5 years from more than one miner and up to 10 - 20 mtpa or more from individual mines in the medium to longer term. Up to 50 mtpa total is anticipated during 2020 - 2030 period requiring major capacity options to develop during the intervening period.

##### **Port Options short to medium term (phase 1)**

The realistic options for the transportation of smaller volumes of iron ore (1 - 5 mtpa) or other product in the short term are those with existing infrastructure, or spare capacity that can be accessed quickly, namely Port Pirie, Port Adelaide and Port Giles. All other port options were seen as requiring infrastructure development or investment that inhibits their short term use.

The South Australian Government has now approved the Major Braemar Bulk Export project to provide an infrastructure corridor for slurry pipelines to the Spencer Gulf north of the Wallaroo area and the use of the existing ports in the initial stages of the project will be dependent on the take up and timing of this project. While this project will provide for many of the initial miners there is a need to assess requirements on a company by company basis.

##### **Port options during Phase 2 (10+ mtpa)**

Of the ports preferred for Phase 1, development options for Port Giles and the Myponie Point have the ability to handle the larger volumes of 10+ mtpa. Port Bonython and Port Germein are also considered as feasible options for consideration and development.

The announcement of the Braemar Bulk Export Project is likely to bring forward a preferred transport option via slurry pipeline to the Spencer Gulf, close to the proposed Myponie Point area with options for offshore product transfer. Development of dewatering and product transfer options at or about the site may develop as the scope and size of the task increases with multiple operators seeking access and efficient transfer of product.

As indicated above New South Wales and Victorian ports would only provide a relevant option if there was a lack of viable capacity in South Australian ports.

#### 4.3.2 Mineral Sands Port requirements

The port requirements for forecast Mineral Sands volumes will grow with new entrants and increased mining volumes across new areas within the Murray Basin. The forecast growth estimates are likely to result in the expansion of current facilities within the existing port locations and additional ship calls to meet the increased throughput by new parties.

Existing loading and handling arrangements are likely to cater for increased volumes. However, there will be a need for segregation of products from different companies and potentially for flexible approaches to supply chain options. Existing bulk products include both Heavy Mineral Concentrates (HMC) and ilmenite which require different levels of processing. Consideration of

different supply chain approaches for each product may be appropriate to seek a more direct access to ports although a consolidated approach generally provides for greater flexibility and utilisation. If supply chains were separated at the product level additional ports may be used.

The use of altered transfer practices in the mineral sands supply chain could include the use of rotonner options to minimise double handling and bulk transfers. This has the potential to also reduce costs but would require additional equipment and land areas at the ports and appropriate agreements in place.

#### 4.3.3 Grain Port Requirements

Grain, being the most substantial current export, has its own specific needs and these are well catered for at a number of ports relevant to the Murray Basin region. The range of grain terminal facilities at ports and their operators are shown below:

Table 3 Grain Ports and Volumes

Port	Terminal Operator	Estimated Port Throughput pa 2012/13
Melbourne	Emerald Grain	1,400,000 t
Geelong	Graincorp	1,900,000 t
Portland	Graincorp	6-700,000 t
Port Adelaide (Inner and Outer Harbour)	Viterra	1,299,518 t
Thevenard,	Viterra	338,040 t
Wallaroo,	Viterra	748,222 t
Port Giles	Viterra	799,372 t

Ownership of grain facilities at ports has developed into an important part of the grain supply chain with vertically integrated ownership of elements of the supply chain driving the movement of marketers' grain to their own facilities with whole of supply chain advantages from a cost and ownership perspective.

Ports are also subject to regulatory access arrangements providing options for all companies to choose the appropriate port to meet the supply chain needs. Both market prices and whole of supply chain decisions constantly impact these movements.

The size of the harvest during improved seasons also opens up additional facilities and changes to priorities as additional export product uses increased rail mode share with port capacity and shipping planning impacting the task.

The efficiency of ports is a factor in their use and priority for marketers and grain handlers to provide their best value supply chain alternatives. The port of Geelong is the focus of Graincorp throughput in southern Australia with more efficient equipment and infrastructure with support as required from the port of Portland for capacity and flexibility, particularly in peak harvest seasons.





The increased use of on farm storage and smaller transport loads together with domestic supply chain needs has driven a move towards road transport particularly for domestic uses. However, the rail network remains a key part of the export supply chain and attention to its efficiency is required to maintain competitiveness in export needs required by the industry.

Grain packing into containers in the port precincts has also been increasing with secondary transfers to container ports. Industry is also continuing to highlight the need for improved facilities and port terminal operators are developing infrastructure to meet these needs:

- The port of Geelong in conjunction with government have recently progressed rail improvements at a network level and within the port, ongoing development is expected to meet the growing needs of the industry;
- At the recent Regional Ports Conference in Geelong, Graincorp representatives indicated redevelopment of the Geelong grain facility was proposed to reconfirm it as the primary Graincorp port in southern Australia; and
- Emerald Grain at the Port of Melbourne has also indicated a proposed growth in grain throughput from the existing 1.4 mtpa to grow to 2.5 – 2.8 mtpa in the medium term (7 - 10 years)

Capacity issues at existing ports appear well under control with utilisation figures indicating no short to medium term need for further port facilities. The improvement of port throughput linked to road and rail supply chain inputs is the key opportunity for port improvement and efficiency gains.

Despite relatively low utilisation of grain ports, efficient competitive export facilities are now being developed in Newcastle and Port Kembla (for example) to challenge existing owners and grain port providers.

#### 4.3.4 Container Port Facilities

Container port facilities for the region are well catered for at the ports of Adelaide and Melbourne with plans in place for port expansion and capacity for the planning period. Containerised movements are supported by intermodal terminal locations at Merbein and Donald with an additional major terminal at Doon to the south. Consideration of an additional facility in the north east area of the region closer to Swan Hill and Kerang has been considered, but there is a need for a core product load and/or a viable operator on which the terminal would base its financial viability.

Container traffic is shared across road and rail modes with a substantial flow of containers moving from the region by road to Adelaide and supported by shipping company incentives based on the limited shipping calls to the port of Adelaide.

Container movements to the port of Melbourne from Doon, Merbein and Donald support a range of customers and include facilities for grain packing at each of these locations.

The existing port facilities provide for the capacity and growth of the regional container task and planning is in place for expansion and additional facilities to further build this capability.

The key issues for container movements are indicated to be the rail network related constraints rather than access at the ports.

These traffics were under some pressure during drought years with reduced outputs; but market changes to new export locations, many without bulk handling facilities are bringing further growth and a need for potential improved access;

#### 4.4 Mineral Sands Supply Chain requirements

There are a number of Mineral Sands miners operating within the Murray Basin region. The supply chains for mineral sands are quite complex with alternative product outputs based on the type of mineral sands and the level of processing undertaken.

The larger operations at the current time operate in Northern Victoria in the Mittyack area and in southern New South Wales, west of Pooncarie. Products produced are largely Heavy Mineral Concentrates (HMC) which requires further processed through mineral separation plants to extract zircon, rutile and ilmenite prior to export. Some ilmenite is extracted at mine sites and this is available for export directly through ports (possibly through a separate supply chain). Operators currently use their own processing plants for HMC processing at Hamilton (ex Mittyack) and Broken Hill (ex Pooncarie).

Rail is the preferred mode of transport for these products due to product weight and more efficient handling of bulk loads. However, current sites are some distance from rail connections. In Victoria the closest rail connections are broad gauge with no connection to the Hamilton processing plant which lies on the standard gauge network. Accordingly, HMC product is moved by road some 78 km to Hopetoun on the standard gauge network to load to rail for the remaining journey to Hamilton for processing. Once processed, product moves by rail to the port of Portland for export. This generates approximately 43 million net tonne km (ntk) of traffic on roads in the area with a further 190 million ntk on rail connections.

HMC product and ilmenite from the Pooncarie sites move 200 km north by road to mineral separation processing in Broken Hill before a rail journey to Port Adelaide. These staged moves generate 130 million ntk on road connection and a further 370 million ntk on rail to the port of Adelaide.

A total of 1.4 million tonne of mineral sands is transported to export through these supply chains generating nearly 900 million net tonne km over transport networks today.

Relocation of mine sites over the next 3-5 years, with increased outputs and planned new entrants to the market will bring further change and impact on networks as a result.

- Freight movements for current operators moving south to Victorian Ports by road will increase from 39 million ntk to 120 million ntk impacting road conditions. Freight movements by rail would remain constant under this scenario;
- Freight movements for new entrants in the south of the region anticipate production at the end of this period generating a potential 6 million ntk on roads and 129 million ntk on rail to port; and
- Freight movements to the north of the region through Broken Hill and Adelaide will increase by a further 60 million ntk on roads and 400 million ntk on rail to the port. New road development sealing an existing unsealed road to the rail connection is an important part of this project.

Additional production volumes are anticipated during the following 10 year period.

The significant increases in ntk's will further impact roads in particular where tonnages will travel longer distances to the rail connection. An alternative to this position is to increase flexibility on rail and reduce road impacts and costs. Access to the standard gauge network closer to the mineral sands locations can reduce impacts and the cost of the export supply chain.

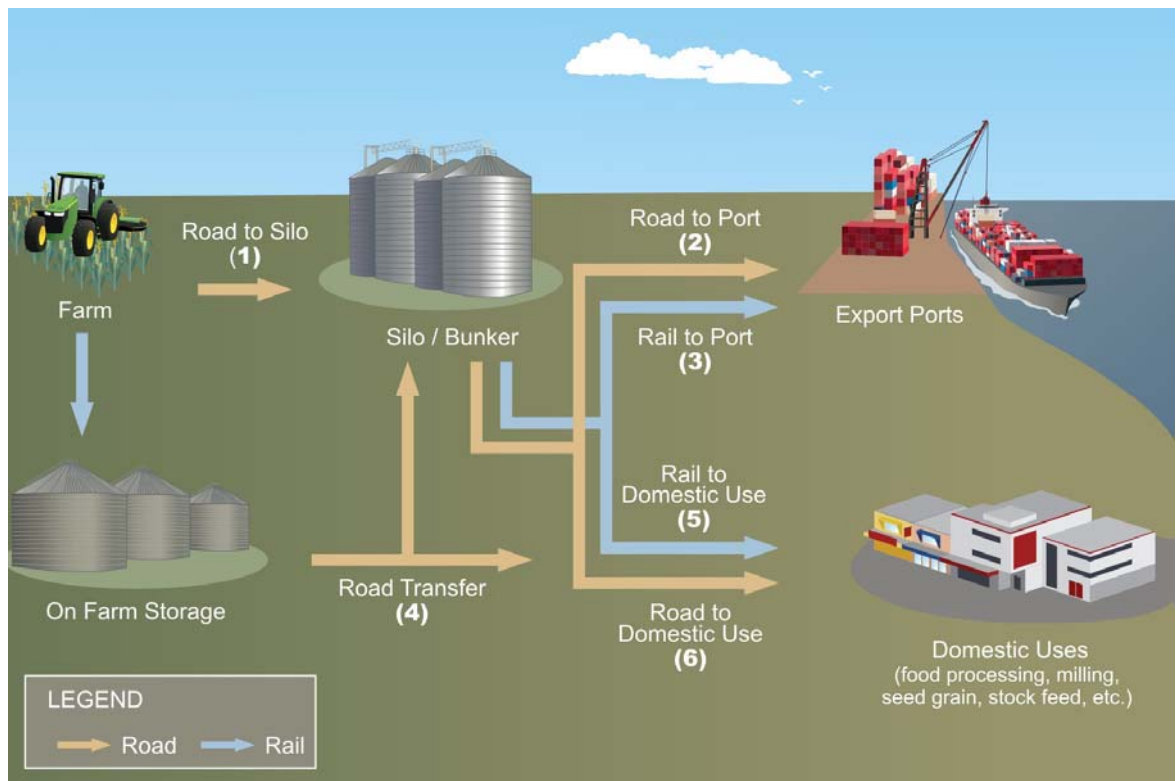
The current double handling of products and increased road legs result in additional cost and inefficiencies in the supply chain.

## 4.5 Grain Supply chain requirements

The existing Grain supply chains utilise road and rail movements to export ports and local facilities for domestic (Australian) use. The growth and impact of the supply chain is growing to meet increased production and reaching out for increased efficiencies to compete effectively in international markets.

The diagram in Figure 17 gives an overview of the Grain supply chain with flexible options on road and rail to market. There has been significant investment in productivity improvements in the road mode in recent years without a comparable improvement in the rail mode.

Figure 17 Grain Supply Chain



The size of the task is significant with the above diagram indicating major movements with relevant trip numbers associated with the task.

Consultation within the study indicates that the number of road trips to silo or to a consolidation point in Victoria (1 above) is over 180,000 trips of approximately 25 net tonnes per delivery. This generates approximately 160 million ntk with return trips (empty) doubling the number of trips to 360,000 across local roads.

Grain is consolidated for larger volume transfers to market with a further 80 - 90,000 road trips (2 and 6 in Figure 17 above) from silos and consolidation points to export ports or domestic locations. These trips are usually with larger trucks of approximately 35 tonne per net load, generating approximately 900 million ntk on road transfers. Return trips result in a doubling to 160 - 180,000 trips across the State's roads. Return trips are sometimes used for fertiliser transport from the port although this does not apply in most cases.

Rail trips to port and domestic customer sites number approximately 800-1000 trips pa with much larger loads of approximately 1800 - 2400 tonnes and a similar amount of 900 million ntk on the rail network. The rail mode share provides a reduced impact on community and state budgets, and also provides a further level of efficiency in loading and port receipts. An increase in rail mode share has the capacity to improve overall loading and unloading efficiency and reduce road traffic/congestion and impacts in the port areas.

Closer management and attention on how these trips impact our road and rail networks can improve efficiency and reduce impacts. There is a need for a collaborative approach between Government, industry and councils to achieve the best use of efficient trucks with minimised impacts on local infrastructure. This will include assessment of truck size, appropriate routes and the alignment of capabilities to achieve greater efficiency

Supply chain links and landside road and rail networks significantly impact grain movements, mode share and the overall efficiency of the grain supply chain.

Aligning the landside infrastructure at both ports and silo/ bunker locations with road and rail priorities is important to infrastructure directions. This includes improved network links to the port precincts (last km connections) and improved traffic flows (both rail and road) to reduce congestion and improve throughput efficiency. The consideration of dedicated freight connections for both modes provides potential for greater improvement in these areas. Further potential developments are proposed at the port of Geelong (rail connectivity and throughput capacity) and port of Melbourne to meet grain capacity needs.

Consistent longer term planning of infrastructure networks and a focus on their flexibility to meet the needs of different industry owners will support efficient decision making in the grain supply chain and enhance grain port needs.

Peak harvests have always been challenging with the current infrastructure and the anticipated industry demand growth over future years needs to be considered within the infrastructure planning timescale. Peaks have now risen above 7.0 million tonnes pa for the Victorian harvest and expectations are that these peaks could rise to over double, over the next 30 years. Both the port capacity and the current landside infrastructure networks will be tested and options to develop the most efficient outcomes are essential to industry and government infrastructure investments.

On current trends these volumes will increase a further 30% over the next ten years with resultant impacts on the transport networks unless interventions are made to provide change and relief.

The most suitable option for this change appears to be increased utilisation of the rail network therefore reducing road impacts yet allowing for increasing volumes over time.

# 5. Addressing key transport needs of the Region

## 5.1 Strategic View

As the region covers parts of Victoria, South Australia and New South Wales, the infrastructure base is focussed on individual state developments and needs in each of the states.

Infrastructure connections east west through the north of the Region are quite strong with the national intercontinental railway from Sydney to Perth and road networks linking Sydney and Adelaide through either Broken Hill or Mildura. These important connections are crucial to through traffic but also provide major supply chain avenues from the region to these cities.. Forecasts of freight traffic growth also particularly impact the Sturt Highway with a potential doubling of traffic.

Freight transport demand is mixed by commodity and export or domestic market focus which drives the direction of freight flows and the infrastructure needs related to the region.

Mining developments in the region have the potential to change the scope and size of the infrastructure needs overall. The ongoing growth of current agriculture and mineral sands products are also in need of progressive change to ensure that the export values and competitiveness in international markets is maximised.

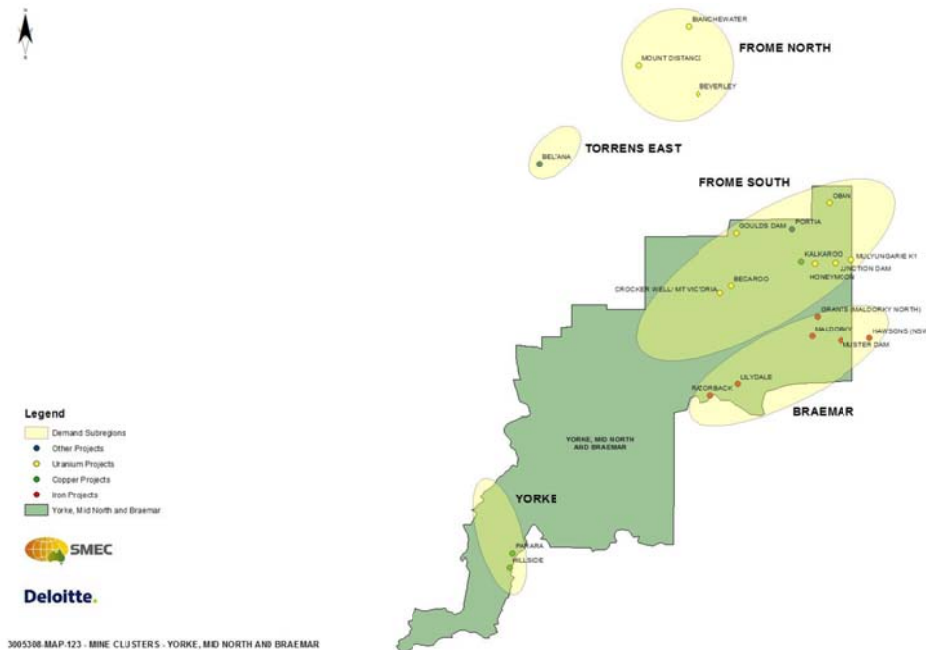
Recognising the scope and needs of the mining developments the South Australian Government has implemented projects to identify and develop infrastructure for water, power and transport needs into the mining areas of Braemar and South Frome bordering the Murray Basin region and has recently approved a \$5 billion Braemar Bulk Export Project to support iron ore resource requirements and provide a connection corridor with the upper Spencer Gulf area (north of Wallaroo). The corridor will provide four underground iron ore slurry pipelines, four water pipelines, plus roads, electricity transmission and fibre optic communications to the mining areas.

Ship loading of initial slurry outputs are planned to be offshore on floating platforms at this stage but further port development options are still to be assessed.

Timeframes for this project are still under development and the proposed scope appears to align to the needs and supply chains proposed by early developers in the region. It provides a vehicle for development of appropriate infrastructure to meet mining needs. However, as the area develops there may continue to be a range of mining and other supply chains with a wider scope of needs.

While the South Australian Government project provides a significant step forward to meet the needs of miners, the size and scope of projects in the region is likely to continue to drive further port development. Mining companies will continue to be a major factor of demand pressure in the planning outlook, particularly in view of their import and export requirements.

Figure 18 Indicative mining areas north east of Adelaide.



Source: [www.infrastructure.sa.gov.au](http://www.infrastructure.sa.gov.au)

Supply chain needs for mining companies in the region will continue to grow and all options for incoming and outwards freight flows will continue to be investigated.

Addressing the capacity demand requirements of interstate freight remains a key issue in the Melbourne Perth corridor and with opportunities to link to the north south Darwin corridor.

The Melbourne/Perth needs in particular can be accommodated via a rail link between Mildura and the Broken Hill area taking pressure off the Melbourne/Adelaide link while providing options for double stacking efficiencies.

Mineral sands developments are growing with planned new locations and additional entrants in development of finer grade sands, contributing to a substantial stepped increase in demand as new sites and facilities come on stream. These increases will impact both northbound volumes to Broken Hill/Adelaide and southbound movements to Victorian processing and ports.

Growth in the Victorian markets with grain expecting to grow by 3% per annum will also drive the need for further change in facilities and the supply chain to maximise efficiency and boost economic benefits.

Further development and flexibility of infrastructure links in the region are key elements to meet the needs of forecast demand and create efficiencies required to improve competitiveness in export and domestic supply chains. To provide this improvement there is a need for change in the Victorian rail network. There is a need to progress gauge standardisation and improve network axle loads to provide competitive productivity improvements which align to the interstate main lines at 23 tonne axle loads. This can provide substantial productivity improvements but requires investment and development by rail operators and network owners to achieve the best results.

A stepped approach to this aim will allow for a lower cash flow approach and a more realistic alignment of changes required while still accessing productivity improvements of approximately 15-18%. These changes, include rolling stock upgrades and other equipment replacements throughout the supply chain.



Accordingly, a stepped approach from 19 to 21 tonnes axle load is considered achievable in the short term with an increase to 23 tonnes axle load over the next 5 - 10 years as an achievable goal. Gauge standardisation with axle load improvement to 21 tonnes will drive initial change and provide opportunities for competition with the prospect of a 23 tonne network with potential new entrants and upgraded rolling stock.

The forecast growth in supply chains for grain and mineral sands and future directions for mining and interstate traffic are the basis of a staged approach, being aware of current industry changes and focusing on the major demand factors progressively over the planning period.

This approach will focus recommendations towards direct action in the areas of greatest demand and planning for future changes in other areas of the region. Development of a progressive plan will address major industry issues while continuing to monitor and progress planning in other areas.

## 5.2 Interstate connection options

A number of infrastructure options for improvement of infrastructure networks in the Murray Basin region were developed, including options for the rail network to be extended between Mildura and the main east west trans-Australian rail link through Broken Hill.

An interstate connection linking Broken Hill area and Mildura (the "Transcon Link") has the potential to provide value to supply chains in the supply of goods to mining facilities and for future interstate traffic including Melbourne/Perth container traffic. The demand study has identified significant growth in mining across this area and current mineral sands miners who operate in the area north of Mildura would benefit from enhanced connections with ports and manufacturing industries within Victoria.

The link also provides opportunities for:

- Defence supply chains linking back to Victoria;
- Freight connections Melbourne-Darwin and major mining developments; and
- Future additional developments in the area through the linking of state networks and providing new corridor connections.

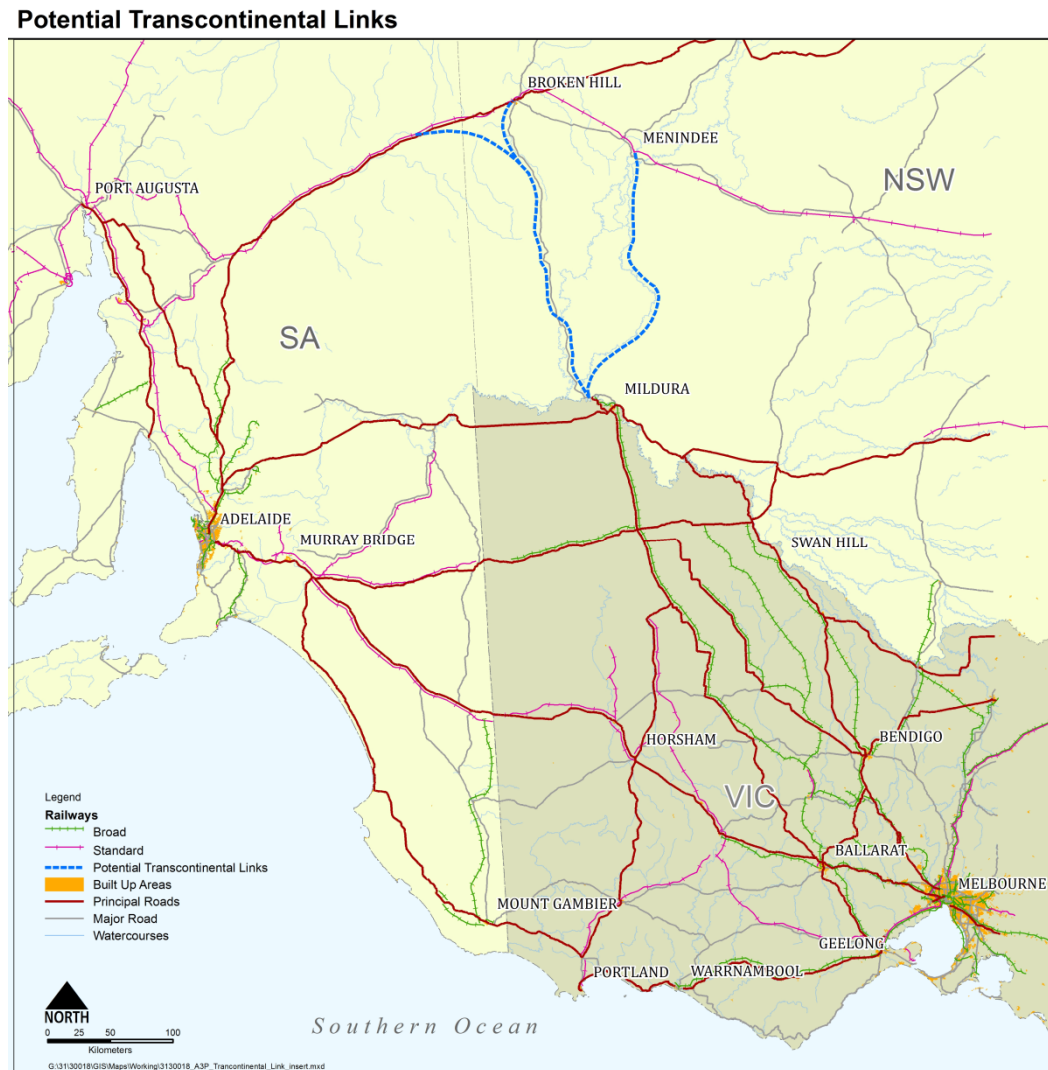
The current freight demand in the region with direct demand for this link is approximately 600 - 800,000 tonnes pa from the Pooncarie area together with a latent demand inclusive of defence plus supplies and materials for mining groups. The developments in the region coupled with broader interstate opportunities are likely to change the demand profile significantly over the coming years with additional benefits presenting for the Transcon Link.

Much of the future demand for this link is likely to come from interstate connections to the north and west of Australia, driven by constraints on the current Melbourne/Adelaide main line through the Adelaide Hills and suburban areas. A 2010 report for the federal Government investigated options for a bypass east of the Adelaide Hills, but this was considered too expensive for this task alone. The opportunity to link interstate demand with regional demand to create a new access east west across Australia provides a rare opportunity for national benefits to support long term interstate development in the region. On a broader scale cheaper options for double stacking capabilities between Melbourne and Perth can also be achieved via this link.

A number of mining companies have indicated interest and a likely use of the link if it was developed, for the supply of inwards equipment and products to support operations in addition to export opportunities. As export volumes grow the option of further port development by the mining companies (in South Australia) will be compared with options and links to current ports to utilise any available existing facilities.

The extent and scope of development in the north Murray Basin region coupled with future interstate market opportunities should be considered as the appropriate driver for further planning and alignment investigation to establish this connection in the future.

Figure 19 Potential Transcontinental Links



Several alignments, as indicated on **Figure 18** above, were considered including:

- An alignment along the Darling River to Menindee
  - This alignment provides a shorter route with some near direct access for mineral sands traffic but adds distance to the route to the west;
- An alignment adjacent to the Silver City Highway
  - This alignment provides for linkages to some of the minerals sands traffic and reduces travel time and distance for traffic to/from the west of the connection; and
- A similar alignment to the Silver City alignment providing a link to Broken Hill but further maximising the efficiency of traffic to the west which is considered the major demand source.

The link adjacent to the Silver City Highway is most favoured at the current time with a change from previous assessments based on the opportunities associated with mining developments in the region and additional interstate traffic to the west. This alignment will reduce travel time and cost compared to a more easterly link. While a number of respondents to the study highlighted their interest in the link, a period of development in the region and areas further north will assist in assembling a critical mass to support the case. It is anticipated to cost approximately \$600 - 800 million with a bypass of Mildura being an important consideration. The Mildura Bypass could eliminate 22 level crossings, including some which may be considered for grade separation at a similar cost to the bypass option (approximately \$100 m).

Detailed planning on the alignment and planning discussions with the New South Wales government will be required to finalise a viable option focused on likely demand for approximately 2025. Lead times for development would suggest that a further level of discussion with relevant parties will be required in the short to medium term.

The timing of development should remain a matter for periodic review with an indicative time frame of the mid 2020's for Transcon Link operations. This provides sufficient time for detailed planning and agreements to be established in advance of the planning approvals and construction lead times for such a connection. This timing also aligns to likely capacity constraints on the existing Melbourne to Adelaide rail corridor.

This link also requires standardisation of the Mildura line in the Victorian network, providing a staged development for the connection. Development of the standard gauge Mildura link within the Victorian network will provide the initial elements to meet the Transcon Link requirements while addressing major freight demand volumes in the north west of Victoria.

Planning for the Transcontinental Link will require the following:

#### ***Progress Planning for 2025 timescale***

Planning for the future Transcon Link requires inputs and agreements between the New South Wales and Victorian governments and clarification of management issues for the connection. Discussion and progress on this level of planning needs to occur in the next 2-3 years to enable further planning and development to occur for demand expectations

Options for discussion may include bringing the corridor into operation based on progressive demand outcomes or at an earlier date if a business case can be proven.

#### ***Undertake further detailed alignment planning***

Undertake further detailed alignment planning of environmental and physical aspects of the link, bridging scope and flooding histories to inform the route alignment and reduce costs.

#### ***Develop a concept design for the Interstate link***

Progress design planning for the interstate link to a concept level, to more clearly refine development issues/costs inclusive of river crossings, flood mitigations and alignment opportunities along the route.

#### ***Continue to Monitor Demand Growth***

The scope and speed of development of mining options in the Murray Basin region is progressing quickly with several miners investigating sites and funding options. Accordingly, there is potential for relatively quick change in the situation where several parties may develop in the same timeframe placing pressure on the export supply chains. Regular monitoring of the demand growth and developmental progress will place Governments in a position to respond to demand requirements more directly when required.

### 5.3 Victorian Infrastructure Considerations

Once a view was established that interstate rail connections were not economically viable or immediately necessary based on current demand, the second focus of the study became the assessment of issues and opportunities relative to the demand trends and forecasts within Victoria.

The Victorian needs are quite evident, with major industries in the Murray Basin region providing key inputs to the Gross State Product and national food supply chains.

The issues being raised within the consultation process and through the reports indicated in Section 2.4 highlight the impact of mode shift to larger trucks and inactivity in investment in rail, driving an increasing community cost and potentially reduced economic outcome.

This is not to suggest that the larger trucks should not be a key part of the supply chains, but rather there is a need to achieve the best outcome across both modes and the best overall outcome for optimum supply chains domestically and for export. At a time where many Australian produced products are moving offshore to cheaper production entities we need to continue to optimise our supply chains to ensure that these core longer term export revenues remain strong to support the state economy.

The value of these Murray Basin exports has increased substantially over recent years with the region's grain exports representing \$1.54 billion or 70% of Victoria's export value of \$2.2 billion<sup>6</sup> in 2012/13 and Mineral Sands export values in excess of \$1.0 billion. It is essential that we do not lose the value of these products through reduced efficiency or lack of improvements to our infrastructure. Addressing the issues identified and further developing a balanced road and rail network can boost our future opportunities and improve the competitiveness of these products which underpin rural and state economies.

### 5.4 Road Network Issues

The region's road network provides a suitable array of linkages between local towns and broader access to ports and markets in Victoria and Interstate. The usage levels indicate there are few capacity issues on the road network other than specific mass limits on bridges which impact flexibility of road links and traffic flows through larger towns, where road by-pass alternatives are being considered at some locations.

These include by-pass options at Swan Hill, Mildura and Horsham with cross river bridge assessment options at Tooleybuc, Mildura/Karadoc and Swan Hill. RMS has funded an initial project on Tooleybuc and VicRoads have planning processes currently in place to assess by pass needs on the Victorian side of the border. The current forecast freight traffic trends indicate further growth in heavy vehicle trips at these locations. However, more specific investigations will be required, inclusive of passenger trips, to justify relevant businesses cases for these projects. Current assessments by VicRoads and RMS figure should drive these local projects. The freight traffic indicated in regional road figures examined is not sufficient to justify replacement options at this stage.

The broader strategic issue in this study is the capability of road surfaces to cater for larger truck configurations and the cost of additional maintenance which flows to road managers.

This is of particular concern on Class 'C' and local roads where the road designs have not included a capability for heavier mass vehicles which now have access to these roads. These lesser class roads typically have no centre line or shoulders and this leaves them vulnerable to damage to the edge of the road surface and weaker parts of the sealed surface. In some cases rutting can occur reducing ride quality and increasing safety concerns.

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<sup>6</sup> Depi.vic.gov.au. Victorian grain export value

Reporting of measured impacts not achieving common road authority standards for roughness, rutting and general road conditions is evident in some locations and indications of limited maintenance funds to address the issues. All of the local government groups consulted indicated issues in this area which was resulting in increased road maintenance costs and shortfalls in budget outcomes.

Of the commodity groups identified within the consultation process, grain and mineral sands are the largest and have greatest impact. However, overall increases in truck productivity across the industry flow through to general freight in the form of fruit and vegetables, grapes and wine and other retail products which also provide a substantial impact around major centres. The seasonal consolidation of grains and general freight in particular provide impacts during harvest periods with a somewhat reduced impact at other times.

Specific impact areas identified by vehicle trips between origins and destinations during the study include consolidation nodes within the freight network. For example:

- Local production facilities eg Karadoc, Carwarp;
- Major transport terminals or depots eg Merbein, Dooen;
- Grain consolidation facilities (Silos and bunkers eg Beulah, Dooen, Donald); and
- Major bulk freight transport corridors linking to rail.

The movement of grain is now spread throughout the year with a substantial peak for harvest transfers to storage and movements to port and domestic locations consistently during the remainder of the year. Peak period consolidation and regular transport legs to port need further development on a local level to ensure a balance is achieved between, least impact and best efficiencies for the supply chain. While the road network delivers the flexibility of movements across the region in almost any direction the impact of increasing grain volumes over time is resulting in the class 'c' and local roads being damaged at an ever faster rate. Both increased truck capacity and more sustained use appear to be impacting this infrastructure. The lack of investment in the rail network is driving a movement towards additional road mode share and increasing road maintenance cost as the average size of the grain crop increases.

There is now a need for a strategic approach to the management of these movements to consider minimisation of impacts and reduction of regional road maintenance costs. The following actions need to occur:

- A detailed audit and assessment of road use in the Murray Basin region is required with data collected within a strategic framework which provides balanced criteria on which use and condition of roads can be aligned and compared to clearly understand priority issues which can be addressed on the network. This is not anticipated to be undertaken on the whole road network but rather on designated agreed important links which can be identified in the process. This can also build on earlier work undertaken in most municipalities in conjunction with the Municipal Association of Victoria.
- Outputs of the audit should be used to bring together major industry operators, VicRoads, Industry) councils and DTPLI planners to redefine key routes and align road use and impacts with appropriate maintenance standards. Industry changes can influence these decisions and the Grain Logistics Task Force and local transport groups could also assist in this process and potentially suggest changes in road class and treatments where appropriate. Balanced assessment criteria can provide for a priority of need to be established and more focused outcomes.

- Consolidation of road movements (where possible) to higher class roads where construction standards are more aligned to the current use and changes to appropriate links. This will require some discussion with industry and councils to confirm heavy vehicle routes and parameters for use.
- Aligned to this approach, rail network investment planning now needs to be progressed within a network strategy approach aligned to demand requirements and addressing the priority areas of highest need. Flexibility and capability aspects of the network also need to be given priority.

This approach would provide an improved balance of road and rail mode share which allows the advantages and efficiencies of both modes but addresses total cost, benefits and impacts to the community. The focus is to reduce cost to market for industry and to improve flexibility and community amenity.

## 5.5 Rail Network Issues

The north western network in Victoria is essentially maintained for grain transport and provides an avenue and access to markets, but currently fails to add value and flexibility to the State's grain product. Rail infrastructure has been maintained based on cost affordability rather than business needs. As a result the speeds available on the network and track condition, while maintaining a safe network, do not provide for required competitive efficiencies and productivity levels to support the industry. While rail provides the most efficient supply chain option to port, road mode has grown, based on the lack of productivity on the rail network.

Significant capacity exists on the rail network and the opportunity to utilise this capacity will provide relief options for roads and release additional capacity from existing networks.

The split of the broad and standard gauge networks restricts flexibility and pushes mode share to road. The efficiency of the network is also restricted by the current axle load limits and available cycle times to ports adding cost on the broad gauge network. Freight demand for the rail network is focused in an area greater than 200 km from the ports and beyond current passenger networks in the region, Access to these areas is currently via the passenger network (which has priority) creating further restrictions on supply chain efficiency and competitive links to export ports.

There is a need to bring a stronger alignment between the rail network and the areas of greatest demand, creating greater flexibility and links to the standard gauge network and port access. This in turn provides an opportunity to increase axle loads and efficiency on the Victorian network, utilising the western main line (which is already at a higher axle load) to leverage increased efficiency at a lower cost. It is recognised that the grain harvest is seasonal and varies from year to year. This means investment returns vary and justification of investment is more difficult. The alignment of transport infrastructure with one of our most significant state product groups can provide increased benefits to regional Victoria and economic benefit to the state.

There is a need for improved access to both the port of Portland and to the port of Geelong to maximise export and transport flexibility and cost reductions available to the market on rail. The opportunity for progress on gauge standardisation of the rail network and entry of additional rail suppliers will provide the basis for increased flexibility for utilisation of rolling stock and value add propositions.



The competitive position of the rail mode has been eroded over recent years with productivity improvements in road vehicles and regulatory changes providing for increased capacity and truck configurations. By comparison, the state owned rail network has remained static in its axle load limitations, available track speeds and flexibility to meet changing market needs. The mixed rail gauge across the Victorian network further limits the access and flexibility of supply chain alternatives to ports. The break of gauge limits rail opportunities across the state and results in additional road use and impacts.

The mineral sands supply chain is a good example of this and forecast changes will add to the impacts if changes are not applied. The limitations create a need for additional cost through longer journeys, road alternatives and additional external costs for the community.

The rail gauge issue, with limited remaining broad gauge areas and the need to standardise much of the network, provides a disincentive for investment in new rolling stock for rail operators and reduces competition (as new entrants are constrained by investment options in the limited size if the broad gauge network) and further limiting supply chain improvement.

As the grain industry continues to grow (anticipated 3% pa), the Industry stakeholders are indicating a strong preference to increase the use of rail including investment in developing new rail sites. However, the current limiting issues need to be addressed to improve the competitiveness of rail to lower the overall cost to market for exporters.

The increased focus on links to ports for these supply chains makes them ideally suited to the rail mode and point to point journeys to market. These products are also higher value exports which support Victoria's Gross State product and economic growth.

Rail provides both an overall cheaper and lower community impact option for the transfer of large bulk materials compared to road. Based on improved outcomes, it can provide the most effective supply chains to port, a critical issue in larger volume harvest years where a larger percentage of grain moves to export. It also enables larger loads to be delivered at one time with cheaper handling costs to meet shipping schedules.

This also allows marketers to take advantage market variations in the early months of the year where Australian grain products are more competitive in world markets, when available northern hemisphere stocks are at their lowest.

### **Key options for improvement**

The rail issues raised during consultation highlighted the comparative investment levels in the road and rail networks and vehicles. While road vehicles have advanced to a new productivity level, very limited investment has been applied in rail, with an older fleet and little investment in the broad gauge rolling stock. Network investment has also been based on maintenance of the current performance levels rather than seeking improvements to assist customers. A range of options for improvements of the rail network and connections were considered in further detail in the Victorian context. These options focused on the improvement of key areas including:

- Gauge conversion to standard gauge to open up the market to other rail operators and to create a more flexible environment for rolling stock to move in and out of this region;
- Improvement of axle loads ( perhaps staged) to create immediate productivity improvements and efficiencies;
- Addressing of key gauge shift issues and access to ports by rail;
- Addressing of viable train cycle time improvements (speeds and safety issues at level crossings);
- Provision of a more solid planning environment to allow the region's industry to plan future investments inclusive of rail directions;

- Providing improved access and links to export ports to improve the flexibility and efficiency of the network. Provision of improvements that consider the need to cater for the future standard gauge link between Mildura and the Broken Hill area; and
- Options to provide maximum overall benefit for the various freight commodity groups although it is recognised that different groups operate different supply chains to meet their specific market needs.

These improvement areas break down to more specific issue including gauge standardisation and axle load improvements, treatment of level crossings, rolling stock improvement and local infrastructure changes, grade separations and other factors which will all contribute to the overall improvement of the network.

Taking a strategic view of the network and considering these issues, four key options for change were identified as providing viable change within the rail network and delivering best fit outcomes. A key aspect of change was the focus on major demand areas and where the best value options created the highest overall benefits.

A staged approach to change is seen as important in this regard and options were developed with this focus.

Two of these options (Options 1 & 2) propose major corridor alignment changes to develop a standard gauge spine to the Mildura area, while the other options are based purely on use of the existing network.

Options considered for rail change are:

- Option 1** - ***A new rail link Lascelles to Hopetoun (approx. 27 km) plus gauge standardisation Lascelles to Yelta;***
- Option 2** - ***A new rail link Litchfield to Minyip (approx. 35 km) plus gauge standardisation Donald to Yelta;***
- Option 3** - ***Gauge standardisation Gheringhap to Yelta plus the Sea Lake and Manangatang Branch Lines (approx. 936 km); and***
- Option 4** - ***Gauge standardisation of Maryborough to Yelta plus the Sea Lake and Manangatang Branch Lines (approx. 859 km) and Maryborough to Ararat Refurbishment.***

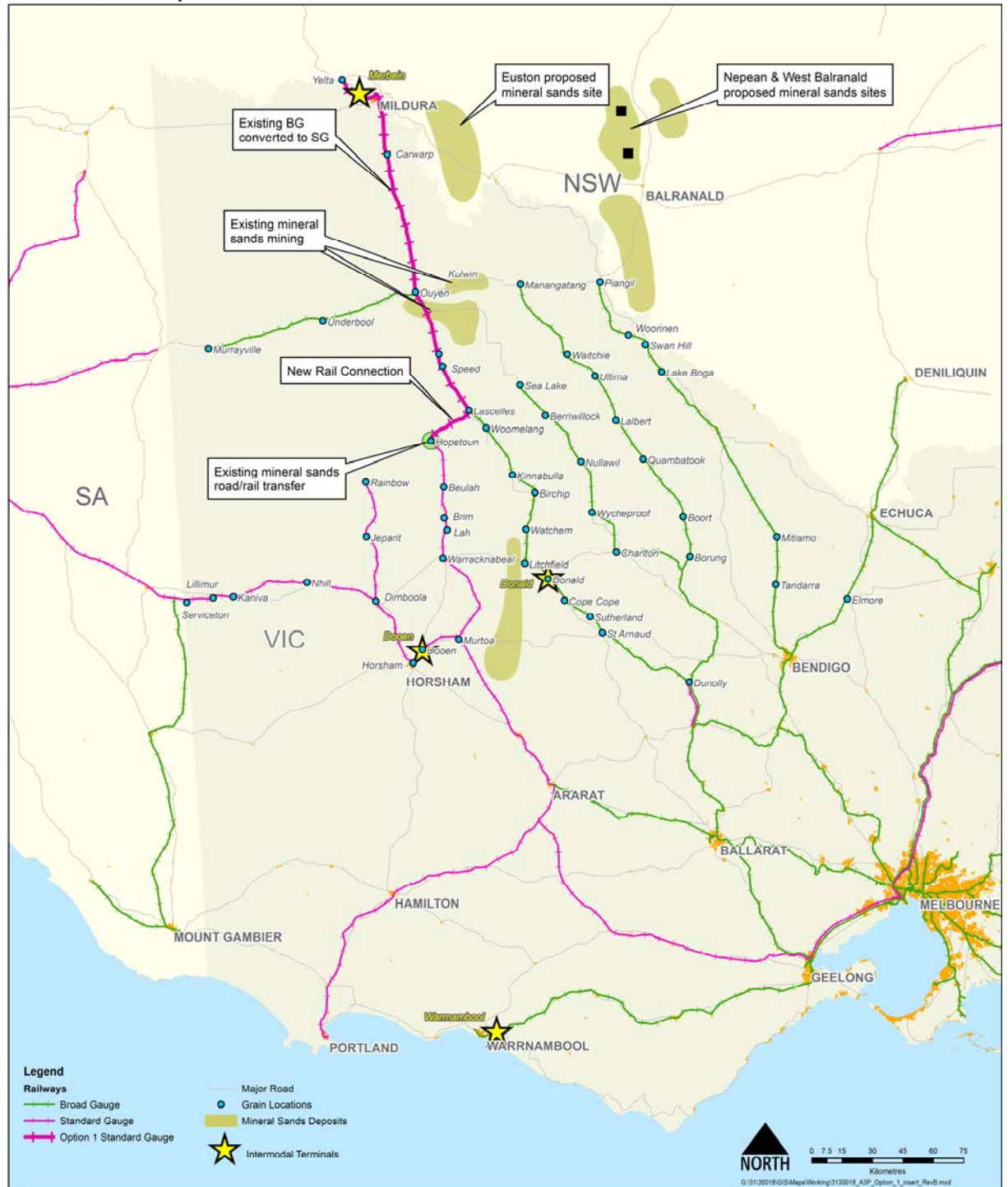
Each of these options is assessed in further detail below.

In each of the rail options, the Ouyen to Murrayville corridor has been shown as out of service. This is based on the assessment of value and return of the continued operation of rail to this corridor which produces approximately 30,000 tonnes per annum with approximately 66% of production moved by road.

Minor works have kept this line open at minimal speeds for many years. The cost of standardisation is approximately \$13.6 million plus additional works to achieve a higher axle load. In addition, a regular expenditure of over \$8.0m in tie cycle maintenance every 4 to 5 years would be required to maintain the line to higher operating levels with more effective productivity and speeds. This expenditure cannot be justified against grain volumes of approx. 30,000 tonnes of grain on rail each year even with a potential increase through mode shift.

## Option 1 - A new rail link Lascelles to Hopetoun (approx. 27 km) plus Gauge Standardisation Lascelles to Yelta

### Infrastructure - Option 1



### Description of key outcomes

This option provides benefits for grain and mineral sands north of Lascelles and creates more direct access options to the port of Portland that previously did not exist for the Mildura line. It also provides access to South Australian ports on the interstate line which previously needed to travel to Gheringhap (near Geelong) for this access. Mineral sands products can be loaded closer to the mine site, thereby reducing the road leg to standard gauge rail and reducing overall cost. This option makes the Hopetoun line a main line access to Mildura reducing traffic through Ballarat and interactions with the passenger network.

Grain north of Lascelles and on the Hopetoun line together with Mildura container traffic have direct access to the standard gauge network and potential axle load improvement options utilising the main western interstate corridor which is already at 23 tonne axle loading.

Efficiencies are created for Mildura line traffic by avoiding the passenger network from Maryborough and through Ballarat.

Staging of changes by using this option does not preclude further changes on the Manangatang and Sea Lake lines but will create less interruption to services across the network compared to a total network upgrade.

Commodity	Changes	Benefits
<b>All</b>	<ul style="list-style-type: none"> <li>Creates an efficient link to use as a first stage of an interstate connection</li> <li>Direct access to standard gauge, Hopetoun and Mildura line (north of Lascelles) with improved axle load limits to 21 tonnes.</li> <li>Interactions with the passenger network are removed for the Mildura Line traffic north of Lascelles</li> </ul>	<p>Future interstate container traffic has an option for connection with the main east west corridor at Murtoa.</p> <p>Grain locations on the extended standard gauge area may be consolidated</p> <p>Future options for increased axle load (23 tonne is available at a lower cost by leveraging the main western line)</p>
<b>Grain</b>	<ul style="list-style-type: none"> <li>Hopetoun line and areas north of Lascelles on the Mildura Line have standard gauge access with axle load improvement to 21 tonne</li> <li>Mode shift from road to rail by 5-10% north of Lascelles and a limited scope (up to 2%) between Lascelles and Donald as a broad gauge access remains</li> <li>Train cycle times to port improvements available</li> </ul>	<p>Increased axle load provides 15 -18% productivity improvement</p> <p>Mode shift reduces road impacts in the region.</p>
<b>Mineral Sands</b>	<ul style="list-style-type: none"> <li>Option provides a standard gauge rail link closer to mining sites</li> <li>Reduced road trips and a larger mode share to rail – reduced supply chain cost</li> <li>Opportunity to consolidate rolling stock to one gauge and achieve benefits from a combined logistics task.</li> </ul>	<p>Reduced road transfers of 49.5 million ntk off local roads(one direction)</p> <p>Reduced costs</p>
<b>Regional containers</b>	<ul style="list-style-type: none"> <li>Access to standard gauge rail and increased competitiveness in rail operators</li> <li>Potential train cycle time options with no interaction with passenger network</li> <li>Access to 21 tonne axle load</li> <li>Efficiencies provide further mode shift to rail</li> </ul>	<p>Overall reduced cost offerings</p> <p>Reduced operational costs</p> <p>Economies of scale in operations – reduced costs</p> <p>Additional rail traffic</p>

Commodity	Changes	Benefits
<b>General freight</b>	Increased rail efficiencies bring mode shift (5%) to rail.	
<b>Interstate transfers</b>	Improved connections to South Australian ports via Murtoa and the main line.	

## Potential Constraints

### Grain

- The Ouyen to Murrayville line (where the majority of grain has been moved by road) provides little justification for network investment. A capital and/or ongoing funding proposal by the grain industry would be required for the line to be considered as an ongoing operational freight line. Any upgrade should also include connection to Pinnaroo with South Australian government support.
- Manangatang and Sea Lake Lines remain on broad gauge for the time being. No change – except for some possible mode shift to rail on the Mildura line where viable.

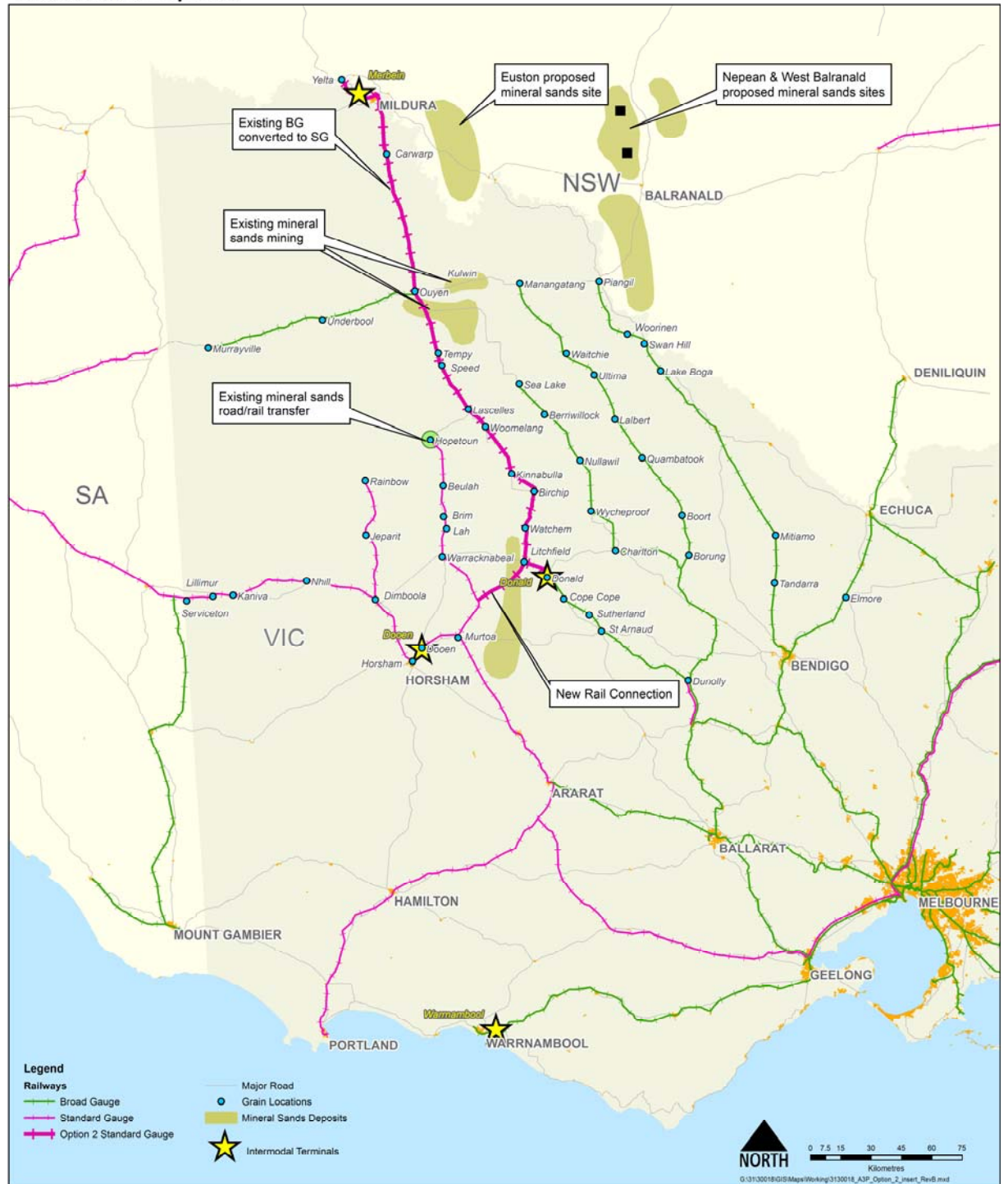
### Donald Containers

- Donald containers require an additional road trip to link to container services at Dooen or will utilise a road journey. Donald lies at a distance where road and rail costs are marginal by comparison and options would need to be addressed on a commercial basis.



## Option 2 - A new rail link Litchfield to Minyip (approx. 35 km) plus Gauge Standardisation Donald to Yelta

### Infrastructure - Option 2



### Description of key outcomes

This option provides a similar outcome to Option 1 but with greater benefits for grain and mineral sands north of Donald providing options for an additional 3-400,000 tonnes pa of grain to access standard gauge rail and 21 tonne axle loads to port. The option creates more direct access options to the port of Portland and also provides easier access to South Australian ports.



Mineral sands products can be loaded closer to the mine site, thereby reducing the road leg to standard gauge rail and reducing overall cost. This option will also run directly through an area of development of fine grain mineral sands with potential future rail loadings to Portland which can almost eliminate future road connections to the rail link.

Grain north of Donald and on the Hopetoun line together with Mildura container traffic will have direct access to the standard gauge network and potential axle load improvement options utilising the main western interstate corridor which is already at 23 tonne axle loading for access to ports in Victoria and South Australia.

Efficiencies are created for Mildura line traffic by avoiding the passenger network from Maryborough and through Ballarat. Staging of changes by using this option does not preclude further changes on the Manangatang and Sea lake lines but will create less interruption to services across the network.

Commodity	Changes	Benefits
All	<ul style="list-style-type: none"> <li>An efficient standard gauge link is provided to use as a first stage of an interstate connection</li> <li>Direct access to standard gauge, Hopetoun line and Mildura line (north of Donald)</li> </ul>	<p>Future interstate container traffic has an option for connection with the main east west intercontinental rail corridor. Future options for increased axle load (23 tonne is available at a lower cost leveraging the main western line)</p>
Grain	<ul style="list-style-type: none"> <li>Areas north of Donald on the Mildura Line have standard gauge access with axle load improvement to 21 tonne, providing 15 -18% productivity increase. This includes areas not in Option 1 and an additional 3-400,000 tpa with direct access to standard gauge</li> <li>Mode shift from road to rail should result. 5-10% north of Lascelles and 12-15% for areas from Donald to Lascelles Further mode shift from the Sea Lake line up to 5 %.</li> <li>Train cycle times to port can leverage the Western ,main line speeds</li> </ul>	<p>An additional 3-400,000 tonnes (Compared to Option 1) with access to standard gauge rail Improved rail operator competition on standard gauge. And opportunity for improved utilisation of the network</p> <p>Reduced operating costs</p>
Mineral Sands	<ul style="list-style-type: none"> <li>Option provides a standard gauge rail link closer to mining sites</li> <li>Reduced road trips and a larger mode share to rail – reduced supply chain cost</li> <li>Near direct access to future mining sites in the Minyip area to cater for significant future volumes to Portland.</li> </ul>	<p>Reduced road transfers = 49.5 million net tonne km off roads</p> <p>Reduced costs</p>
Regional containers	<ul style="list-style-type: none"> <li>Access to standard gauge rail and increased competitiveness in rail operators</li> <li>Less interaction with the passenger network</li> </ul>	<p>Overall reduced cost offerings</p> <p>Reduced operational costs</p> <p>Increased loading capacities</p>

Commodity	Changes	Benefits
	<p>may drive improved cycle times.</p> <ul style="list-style-type: none"> <li>• Access to 21 tonne axle load</li> <li>• Efficiencies provide mode shift to rail</li> </ul>	<p>and cost reductions</p> <p>Economies of scale in operations – reduced cost</p>
<b>General freight</b>	Increased rail efficiency brings mode shift to rail (5%)	
<b>Interstate transfers</b>	Improved connections to South Australian ports via Murtoa and the main line.	

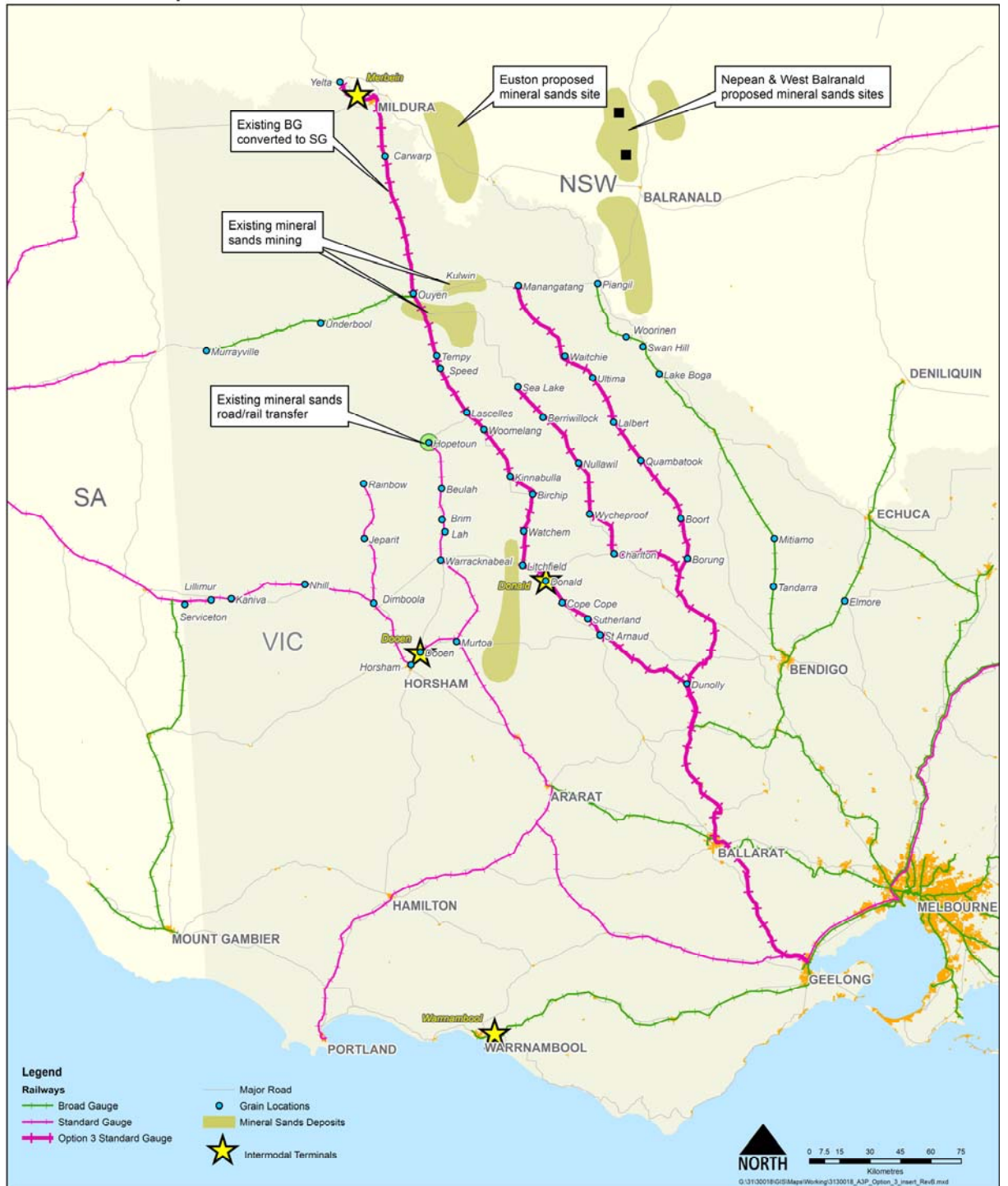
### Potential Constraints

#### Grain

- Manangatang and Sea Lake lines remain on broad gauge for the time being; and
- The Ouyen to Murrayville line (where the majority of grain has been moved by road) provides little justification for network investment. A capital and/or ongoing funding proposal by the grain industry would be required for the line to be considered as an ongoing operational freight line. Any upgrade should also include connection to Pinnaroo with South Australian government support.

## Option 3 - Gauge Conversion Gheringhap to Yelta plus Branch Lines (approx. 936 km)

### Infrastructure - Option 3



### Description of key outcomes

This option provides standard gauge connection to the entire current north western network through Ballarat. It provides current access to ports for grain but provides no improved access to processing for mineral sands resulting in ongoing road movements. Additional grain areas have access to standard gauge and higher axle load but at a higher cost. Any further axle load improvements involve a higher cost as they require upgrade to Gheringhap. There is no change to access to the port of Portland as Hamilton is still not directly linked to the former broad gauge network.

Grain locations and Mildura container traffic would have direct access to the standard gauge network but interactions with the passenger network would remain. Ballarat rail maintenance facilities will have access to the standard gauge network.

Commodity	Changes	Benefits
<b>All</b>	<ul style="list-style-type: none"> <li>A standard gauge link is provided to use as a first stage of an interstate connection</li> <li>Direct access to standard gauge, via Ballarat</li> </ul>	Future interstate options are supported by a standard gauge line to Mildura
<b>Grain</b>	<ul style="list-style-type: none"> <li>All of the existing network has standard gauge access with axle load improvement to 21 tonne, providing 15 -18% productivity</li> <li>Mode shift from road to rail should result in existing broad gauge areas est.5-10% across the board with additional mode shift in some areas.</li> </ul>	<p>Access for a potential additional 1.2 m tonnes of grain (compared to Option 1) with access to standard gauge rail and additional competition</p> <p>Mode shift increased due to wider scope of standardisation.</p> <p>Reduced operating costs</p> <p>Reduced road traffic and related cost impacts</p>
<b>Mineral Sands</b>	<ul style="list-style-type: none"> <li>Key Heavy Mineral Concentrates of 550,000 tpa remain with a road transfer to Hopetoun to access standard gauge rail to Hamilton and Portland. After 2016 the mine sites move increasing the road leg to approximately 240km. This results in 132,000 million net tonne kms to the task of the road network.</li> <li>Ilmenite products will travel 120 km to Manangatang from a new mine from 2017 to move by rail to the port of Geelong.</li> </ul>	<p>Some benefit with access to Geelong on standard gauge for Ilmenite – reducing road trip by 180 km</p> <p>The larger volume product HMC will continue by road to Hopetoun and offset any gains</p>
<b>Regional containers</b>	<ul style="list-style-type: none"> <li>Access to standard gauge rail and increased competitiveness in rail operators</li> <li>Access to 21 tonne axle load</li> <li>Efficiencies provide mode shift to rail</li> <li>Donald containers have access to standard gauge and 21 tonne axle loading</li> </ul>	<p>Overall reduced cost offerings</p> <p>Increased loading capacities and cost reductions</p> <p>Economies of scale in operations – reduced costs</p>
<b>General freight</b>	<ul style="list-style-type: none"> <li>Increased rail efficiencies bring mode shift (5%) to rail.</li> </ul>	
<b>Rolling stock maintenance</b>	<ul style="list-style-type: none"> <li>Ballarat rail vehicle maintenance facilities can be utilised for standard gauge rail vehicle maintenance increasing competition in the market and creating employment in the region.</li> </ul>	

## Potential Constraints or Limitations

### All

- Implementation cost is higher than Options 1 & 2 and does not cater for mineral sands needs; and
- Future options for increased axle load (23 tonne) are more costly for the entire existing network and cannot leverage the western main line which is already at this axle load.

### Grain

- The Ouyen to Murrayville line (where the majority of grain has been moved by road) provides little justification for network investment. A capital and/or ongoing funding proposal by the grain industry would be required for the line to be considered as an ongoing operational freight line. Any upgrade should also include connection to Pinnaroo with South Australian government support; and

### Mineral sands

- No change to access to Hamilton and Portland. Proposed relocation of the mineral sands mine results in more road use and impacts in north west Victoria. Increased road trips and a larger mode share to road – impacts on local roads.

### Passenger Services

- The implementation of this option would include either dual gauge through the Maryborough to Ballarat Section or conversion of the passenger services to standard gauge. Costs have been prepared on the basis of dual gauging this section.

### Staging of Gauge Standardisation

This option has greater operational impacts on the network during construction as it effectively closes down the north west lines during the construction stage.

### Remaining broad gauge rail corridors.

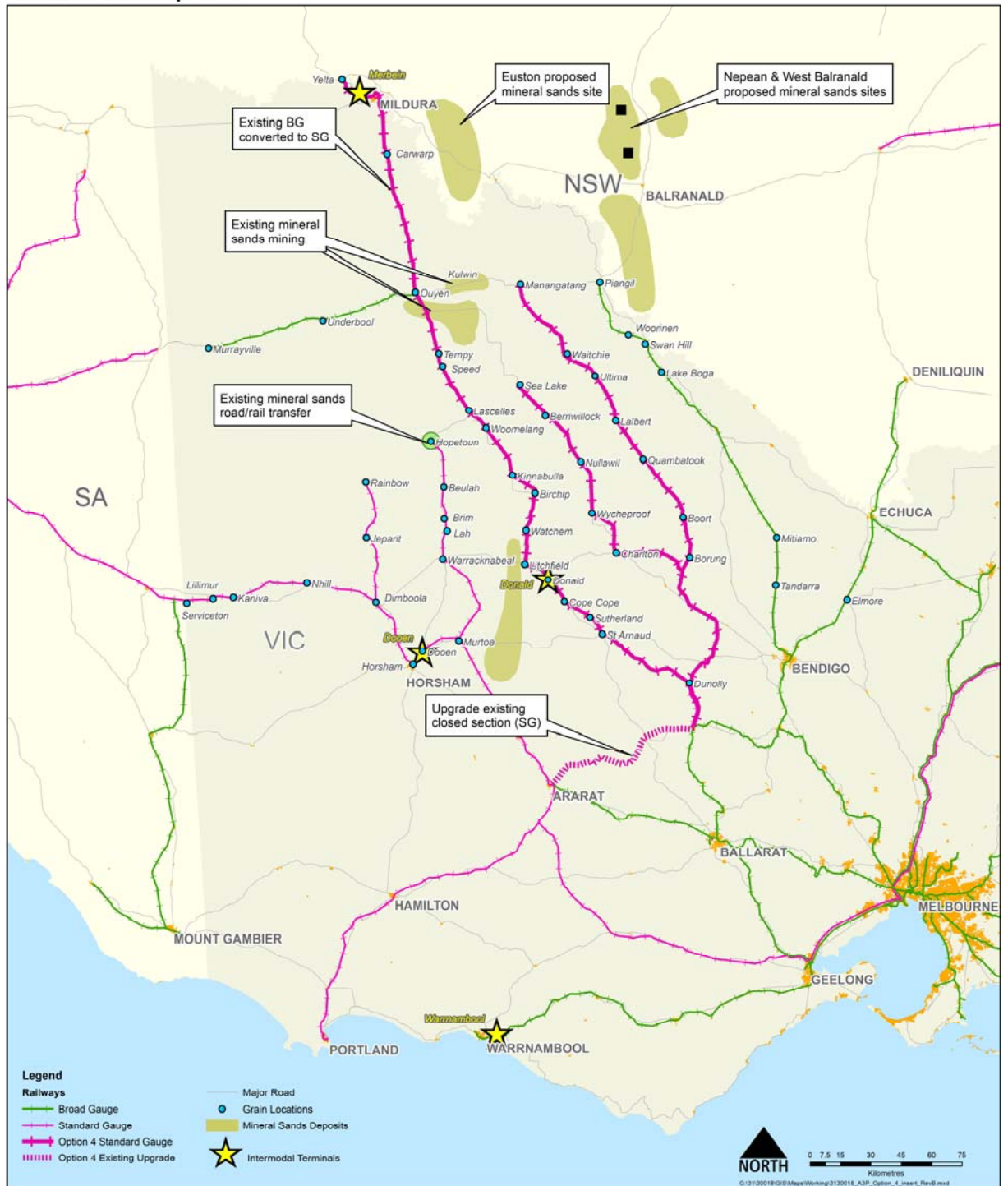
As the broad gauge areas of the network reduce, the viability of Victorian broad gauge rail operations reduces and the need for step change is required. Rail Operators will find it harder to obtain utilisation of rolling stock with increasing costs and further diminishing the value of rail operations on broad gauge. Deniliquin and Tocumwal lines (through Shepparton) would be the only remaining freight lines on broad gauge under this option.

Consideration of action on these lines (outside of the Murray Basin) also needs to be considered in the broader plan.



## Option 4 - Gauge Conversion Maryborough to Yelta plus Branch Lines (approx. 859 km) and Maryborough to Ararat Refurbishment

### Infrastructure - Option 4



### Description of key outcomes

This option provides a standard gauge connection to all of the current north western network through Maryborough and Ararat, thereby avoiding the passenger network. This option utilises an inactive standard gauge rail line between Maryborough and Ararat that would be upgraded to connect with the western main line. It provides access to the ports of Portland and Geelong but the distance to Geelong is increased by 130 km therefore reducing efficiencies.



Freight services no longer interact with passenger services. Mineral sands have access to Hamilton and Portland but the additional distances are likely to impact benefits. Road options may remain cheaper. All commodities have access to higher axle load (21 tonne).

Commodity	Changes	Benefits
All	<ul style="list-style-type: none"> <li>The standard gauge link provided takes a significantly longer route which restricts opportunities for an interstate link to remain efficient.</li> <li>The option is more costly than Options 1, 2 and 3 as additional route distance and travel times restrict competitiveness with road options.</li> </ul>	<ul style="list-style-type: none"> <li>This option provides a standard gauge link to support interstate options but the longer route would reduce efficiency benefits when compared to Options 1-3</li> </ul>
Grain	<p>The existing network has standard gauge access with axle load improvement to 21 tonnes, providing 15 -18% productivity improvement. This is offset by additional travel distance which reduces competitiveness with road mode share.</p> <ul style="list-style-type: none"> <li>A mode shift from road to rail would be limited. Productivity savings of 15 -18% mode shift from road to rail should also result in 5-10 % across the board - a lower figure than Option 3 due to additional distance of travel.</li> </ul>	<ul style="list-style-type: none"> <li>Reduced operating costs but these are also offset by additional rail distance which adds costs to the rail mode.</li> </ul>
Mineral Sands	<ul style="list-style-type: none"> <li>Mineral sands products can access the Hamilton processing plant, the port of Portland and the port of Geelong on standard gauge. This provides for a potential reduced road trip to standard gauge rail at Manangatang.</li> <li>Provides the option of a consolidated loading point for both HMC and Ilmenite products to port with cost reductions.</li> </ul>	<ul style="list-style-type: none"> <li>The larger volume product HMC and Ilmenite can move to loading on to rail at Manangatang</li> <li>Reduced road trips and a larger mode share to rail – can reduce road maintenance impacts by 49.5 million net tonne km</li> </ul>
Regional containers	<ul style="list-style-type: none"> <li>Access to standard gauge rail and increased competitiveness in rail operators</li> <li>Train cycle times are impacted by longer distances although interaction with the passenger network is removed.</li> <li>Access to 21 tonne axle load</li> <li>Efficiencies provide mode shift to rail</li> <li>Donald containers have access to standard gauge and 21 tonne axle loading</li> </ul>	<ul style="list-style-type: none"> <li>Overall reduced cost offerings from rail providers</li> <li>Reduced operational costs with axle load improvements offset by additional rail distance.</li> <li>Increased loading capacities bring up to 15-18% productivity options</li> </ul>
General freight	<ul style="list-style-type: none"> <li>Increased rail efficiencies bring mode shift (5%) to rail.</li> </ul>	
Interstate transfers	<ul style="list-style-type: none"> <li>Access is provided from the NW network to Portland and to the South Australian Ports.</li> </ul>	

## Potential Constraints

### All

- Additional distances to the port of Geelong and to the port of Melbourne where most of the freight is going. The option adds distance and costs to the rail leg of the journey; and
- Future options for increased axle load (23 tonne) include the entire existing network and cannot leverage the western main line which is already at this axle load. Costs for this option are higher.

### Grain

- The Ouyen to Murrayville line (where the majority of grain has been moved by road) provides little justification for network investment. A capital and/or ongoing funding proposal by the grain industry would be required for the line to be considered as an ongoing operational freight line. Any upgrade should also include connection to Pinnaroo with South Australian government support; and
- Increased road trips and a larger mode share to road – impacts on local roads.

### Mineral sands

- The improved access to standard gauge rail involves a longer distance making this option marginal compared to road.

### Staging of Gauge Standardisation

- This option has greater operational impacts impact on the network during construction as it effectively closes down the north west lines during the construction stage.

### Remaining broad gauge rail corridor impacts.

As the broad gauge areas of the network are reduced, the viability of the Victorian broad gauge rail operations reduces and the need for step change is required. Rail Operators will find it harder to obtain utilisation of rolling stock and their costs will therefore increase. This will further diminish the value of rail operations on broad gauge. Deniliquin and Tocumwal lines (through Shepparton) would be the only remaining freight lines on broad gauge under this option.

Consideration of action on these lines (outside of the Murray Basin) needs to be considered in the broader plan.

## 5.6 Comparison of Options

The four rail change options provided above have been compared to assess potential benefits, and financial impacts. Their comparative costs are indicated in the following table, outlining capital costs of standardisation, new construction and axle load improvement to 21 tonne.

The right hand column also indicates the additional investment required for a further productivity step to upgrade each option to 23 tonne axle load. This column provides an important aspect of decision making for preferred options. The opportunities for development to 23 tonne axle load would require further change by rail operators and a separate business case would be required for justification of the expenditure, if a first step to 21 tonne axle load is progressed.

Table 4 Rail Option Cost Comparisons

Option		Murtoa Hopetoun Corridor \$M	Gheringhap - Mildura Corridor \$M	Dunolly Korong Vale Corridors (Sea Lake Manangatang) \$M	New Rail construction \$M	Additional line upgrade costs required \$M	Total \$M	Future axle load upgrade costs 23 T \$M
Option 1 – New SG Hopetoun to Lascelles plus SG Lascelles to Mildura & Yelta	Standardise Lascelles to Yelta		19.4				19.4	
	New track construction Hopetoun to Lascelles				84		84	
	Other required line upgrade costs	12.1					12.1	
	<b>Total</b>						<b>115.5</b>	<b>45.6</b>
Option 2 – New SG Minyip to Litchfield plus SG Litchfield to Mildura & Yelta	Gauge standardise Donald to Yelta		30.6				30.6	
	New track construction Minyip to Litchfield				110.5		110.5	
	Other required line upgrade costs	12.1					12.1	
	<b>Total</b>						<b>153.2</b>	<b>31.4</b>
Option 3 – SG Gheringhap to Mildura/Yelta plus branch lines	Gauge standardise Gheringhap to Yelta, Dunolly to Korong Vale, Sea Lake and Manangatang, Dual gauge Maryborough - Ballarat		91.7	48			139.7	
	New track construction							
	Other required line upgrade costs	12.1		28.5			40.6	
	<b>Total</b>						<b>180.3</b>	<b>116.1</b>
Option 4 - Upgrade Ararat to Maryborough plus SG to Mildura/Yelta plus branch lines	Gauge standardise Dunolly to Yelta, Dunolly to Korong Vale, Sea Lake and Manangatang		45.6	48			93.6	
	Upgrade out of service SG line Maryborough Ararat					34.1	34.1	
	Other required line upgrade costs	12.1		37.7			49.8	
	<b>Total</b>						<b>177.5</b>	<b>215.7</b>

In addition to the figures in Table 4 it is assumed that the existing \$20 m of Major Periodic Maintenance (MPM) funding is utilised on the network and a further allocation of \$40 m MPM funding is required for the Mildura and Hopetoun Lines. Table 4 figures do not include any costs associated with the Ouyen to Murrayville line.

Financial/economic assessment was undertaken to establish the viability of a business case and to provide further comparative outcomes between the options.

# 6. Strategic Planning and Priority Directions

## 6.1 Long term strategic view

The longer term strategic view in the Murray Basin region must cater for increased freight traffic between Victoria and other states which will require an improved link to access input supplies and services to mining developments, provide efficient access for Western Australian container traffic and the potential for links to northern states.

The staging of network development towards this long term goal is essential and needs to be considered in current planning and investment considerations.

The impact of current growth forecasts into the future highlight the need for these interstate links but also drive consideration of Victorian infrastructure needs.

Grain and Mineral Sands volumes will provide priorities for the short to medium term with the need for interventions to balance the investment inputs for road and rail to achieve the best outcomes and benefits for the state and industry with appropriate investments focused on the efficiency of the export and local supply chains progressively over the planning period.

## 6.2 Addressing priorities

Key priorities for the Project are based on the provision of a framework for longer term outcomes and the immediate needs of industry and competitiveness in local and international markets.

### **Priority 1** *Create flexibility in the areas of greatest need*

- Create more flexible access and reliability to ports for Mineral Sands and Grain supply chains as a result of standard gauge implementation; and
- Flexibility for greater access to rail on standard gauge reduces the use of road connections and impacts on road.

### **Priority 2** *Improve efficiency in supply chains*

- Provide increased axle load options on the standard gauge rail upgrades to give a 15 to 18% productivity improvement; and
- Introduce new alignments provide faster access to ports on the Western standard gauge main line and upgraded areas of the new connections.

### **Priority 3** *Address major cost impacts*

- Balance the investment needs of the road and rail networks providing for best use of network capacities and maximise use of the best mode for the best task; and
- Give priority to mode shift to rail which reduces pressure and cost on the road network and releases longer term capacity.

### **Priority 4** *Increase supply chain reliability*

- Standard gauge options on the network will provide a more consistent line quality and under some options will avoid the passenger network; and
- Under Hopetoun line options (option 1 & 2) access to higher line speeds will apply for much of the journey therefore enhancing delivery options to the Ports of Geelong, Melbourne and Portland. Overall reliability will be improved.

## 7. Next steps - Confirming the broader plan and directions

### 7.1 Interstate connections

#### ***Recommendation 1 Progress Planning for the Transcontinental Link with an indicative timeframe of the mid 2020s for demand to reach relevant levels for operation***

DTPLI should engage in discussions with the other relevant jurisdictions. Options in the planning process may include bringing the corridor into operation at an earlier date if demand increases and allows a business case to be proven. Regular monitoring of developments in the Mildura to Broken Hill corridor and, in particular, the Braemar area, should be carried out by DTPLI in conjunction with the South Australian and New South Wales authorities.

#### ***Recommendation 2 Undertake further detailed corridor alignment planning and develop a concept design for the Transcontinental Link***

DTPLI should assess the proposed alignments of the Transcontinental Link corridor in coordination with other jurisdictions including the New South Wales authorities, Australian Rail Track Corporation and the relevant Commonwealth Government Departments. The concept design would include environmental and physical aspects of the link, inclusive of river crossings, flood histories and flood mitigation. The concept design would permit a clear definition of issues and costs associated with the link.

### 7.2 Victorian Infrastructure Recommendations

#### 7.2.1 Rail Network Issues

#### ***Recommendation 3 Identify a preferred standardisation option and produce a business case for Government consideration and funding allocation.***

Based on all four rail options having an initial positive benefit cost ratio further work is required to finalise a preferred option and develop a detailed business case for Government consideration. The development of a preferred option should include consideration of construction costs, supply chain efficiencies to industry including cycle times; network capacity, timing of construction, asset rolling stock utilisation, and integrated transport network outcomes, including associated road network impacts. Consideration should also be taken into account any environmental and social impacts in the development and construction of a modern standardised rail operation. Any assessment should include an increase in the axle load rating to 21 tonnes, as a minimum.

If the preferred option is to standardise the Mildura line only, then gauge standardisation of further rail lines in the Murray Basin region should be considered in stages subject to a positive result from an assessment of two full years of operation of the standardised Mildura line. This will permit DTPLI and industry to assess the actual degree of mode shift to rail and to confirm the effectiveness of the improvements.

## 7.2.2 Road Network Issues

### ***Recommendation 4 Conduct a detailed audit and assessment of road usage and road conditions to help assess important links in the road network***

DTPLI should coordinate with VicRoads, industry groups and local government to establish working parties based on the locality of freight usage. A detailed audit and assessment of road use in the regions is required with data collected inside a strategic framework which provides balanced criteria on use and condition of roads. This will give a clear understanding of priority issues which can then be addressed through funding programs.

This can also build on earlier work undertaken in most municipalities in conjunction with the Municipal Association of Victoria.

### ***Recommendation 5 VicRoads, local government and industry groups should work together to plan feeder routes to rail terminals***

Outputs of the audit in ***Recommendation 5*** above should be used to bring together VicRoads, industry groups, local government and DTPLI planners to redefine feeder routes to rail terminals and to align road use with appropriate road safety and maintenance standards. The Grain Logistics Task Force and local transport operators could also assist in this process and potentially suggest changes and treatments based on use where appropriate. This recommendation is consistent with utilising road and rail to maximise benefit of both transport networks.

### ***Recommendation 6 VicRoads, local government and industry groups should work together on the designation, consolidation and management of heavy vehicle routes***

It is recommended that road movements be consolidated (where possible) to higher class roads where construction, road safety and maintenance standards are more aligned to the current and future road use by heavy vehicles, HPFVs (High Productivity Freight Vehicles) and similar. This work will complement any future rail terminal infrastructure upgrades, and improve the efficiency of the road/rail logistic supply chain.



## 8. References

Regional Mining and Infrastructure Planning Project - Yorke and Mid-North Braemar, Interim Report for Public Consultation, Deloitte Touche Tohmatsu Limited, 2013;

Victorian Department of Environment and Primary Industries website, Grain Industry profile, updated January 2013;

Mineral Sands Action Agenda, report for Victorian Minerals and Energy Council, McLennan Magasanik Associates and GHD, February 2003;

Victorian Rail Freight Network Review, "Switchpoint: The Template for Rail Freight to Revive and Thrive !" State of Victoria, 2008;

Central-Murray Regional Transport Study (Victoria-New South Wales), Final Report, 2011;

Adelaide Rail Freight Movements Study; report prepared by GHD for the Commonwealth Department of Infrastructure, Transport, Regional Development and Local Government; June 2010;

Transcontinental Rail Link Feasibility - The Barkindji Corridor; Mildura Development Corporation Infrastructure Australia Submission, 30 October 2009;

Transcontinental Rail Link - Mildura to Menindee, Technical Feasibility and Economic Analysis; report prepared by GHD and Meyrick for the Mildura Rural City Council and the Ballarat City Council, January 2009;

Rail Freight Impact Study - Mildura Derailed; report prepared by GHD for the Sunraysia Mallee Economic Development Board; September 2008

Arterial Road ('C' Route) Strategy, Wimmera Regional Transport Group, prepared by Driscoll Engineering Services, October 2009;

'C' Routes Detour Route Improvement Strategy, Wimmera Regional Transport Group, prepared by Driscoll Engineering Services, August 2011;

"Grey Spot" Strategy, Wimmera Regional Transport Group, prepared by Driscoll Engineering Services, November 2012;

"Bridges to Recovery" Strategy, Wimmera Regional Transport Group, prepared by Driscoll Engineering Services, August 2010;

Transport Group Regional Freight Transport, prepared by Driscoll Engineering Services, May 2012;

Ballarat West Employment Zone Master Plan, AECOM, May 2012;

Evaluation of Alternate Freight Hub Sites, City of Ballarat, Sd+D Consult, June 2010;

Mildura Transport Plan for Long Term Regional Development; report prepared by GHD and commissioned by Mildura Airport Management Advisory Committee with the support of the Sunraysia Mallee Economic Development Board, May 2005.



# Appendices

# Appendix A – Consultation/Stakeholder list

Company/Institution
Adelaide
SA Department of Transport SA Department of Transport ARTC Australian Zircon Australian Zircon Genesee and Wyoming
Armidale
Acting Cross Border Commissioner ( NSW )
Ballarat
Ballarat City Council Committee for Ballarat Alstom Transport UGL Rail
Balranald
Balranald Shire Council
Brisbane
Carpentaria Mining
Broken Hill
Broken Hill Council Barrier Industrial Council Perilya Limited
Canberra
Department of Infrastructure and Regional Development Department of Infrastructure and Regional Development Department of Resources, Energy and Tourism Department of Regional Australia, Local Government, Arts and Sport Australasian Railway Association
Carwarp
Olam Orchards Australia (Almonds)*
Geelong
Port of Geelong Iluka Resources Limited
Gingko Mine
Cristal Mining Australia Limited (formerly Bemax Resources Limited)
Horsham

<b>Company/Institution</b>
Horsham Rural City Council Wimmera Development Association
<b>Melbourne</b>
Victorian Department of Primary Industries Victorian Department of Transport, Planning and Local Infrastructure Viterra (Glencore Grain ) AWB (Cargill Australia Limited ) Cargill Emerald VicTrack Treasury Wines (ex-Fosters) VicRoads Victorian Farmers Federation
<b>Menindee</b>
Tandou
<b>Merbein</b>
Wakefield Transport
<b>Mildura</b>
Rural City of Mildura Mildura Development Corporation Murray Valley Citrus Board Australian Table Grape Growers Association Dried Fruits Australia Murray Valley Winegrowers Inc GTS Freight Management Seven Fields (Mandarins, Table Grapes) Lamattina Produce (carrots, beverages) Sunbeam Foods (dried fruit) Best Bottlers Mildura Development Corporation Arumpo Bentonite Pty Ltd VicRoads
<b>Minyip</b>
Donald Mineral sands (Astron Limited)
<b>Port Adelaide</b>
South Australian Freight Council Port Pirie (Flinders Ports)
<b>Portland</b>
Port of Portland
<b>Swan Hill</b>
Swan Hill Rural City Council Central Murray Regional Transport Forum Group (VIC/NSW)

<b>Company/Institution</b>
Sydney
Broken Hill Prospecting Limited (Cobalt) Qube Logistics GrainCorp
Wagga Wagga
NSW Premier's Department NSW Roads and Maritime Services
Wentworth
Wentworth Shire
Wilcannia
Central Darling Shire Council
Miscellaneous
GG Renewable Energy Pty Ltd



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