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# *Containerised cargo demand assessment* Northern NSW

*Transport for New South Wales*

*Northern NSW Containerised Cargo Demand Assessment*

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# Executive summary

This report assesses current and forecast future demand for containerised cargo in Northern New South Wales (the region) with the purpose of examining the relationship between demand for containerised cargo and the capacity of infrastructure in the region to transport it.

Access to efficient freight networks into the future is critical to support economic growth in New South Wales. The region produces major export commodities and goods for domestic consumption. Producers of these commodities typically take prices from global markets. Transport costs in Australia influence their profitability and competiveness, and in turn economic activity in the region and NSW. The region also relies on efficient transport of inbound goods to support production and a high standard of living.

Road freight is currently the dominant mode of transport for containerised commodities to and from the region. The capital cities of Brisbane, Sydney, Melbourne and Adelaide, as well as their container ports, are all accessible via onward National Highway connections from the Newell and New England Highways.

The region is connected to the national rail line network, which provides connections to the ports of Newcastle, Sydney and Brisbane. There are also a number of branch lines connecting to the main line in the area, which are part of the NSW Country Regional Network.

Rail currently plays a strong role in the region for the export commodities of grain and cotton. There are currently four operational intermodal terminals (IMTs) in the region, which are operated by bulk handlers as part of dedicated commodity supply chains. Further, there are three inactive intermodal terminals in the region.

This report examines the potential future role of rail in the region. Using a contestability framework, commodity groups that are potentially contestable are identified, and their growth is modelled through to 2031. Geo-spatial analysis is used to assess this growth, and its implications for the infrastructure needs of the region.

In 2015, total containerised freight volumes in the study area were estimated at 82,000 TEU. With a forecast of approximately 18,000 additional contestable TEUs in the study area by 2031, PwC's geo-spatial analysis demonstrates that there is limited scope for additional terminals in the region in the future. Triggers for new infrastructure investment will most likely be growth in containerised grain exports or inbound mining freight. The location of new terminals will be critical to their success, as will a thorough business case assessment to align the location of terminals with the most attractive catchment areas.

PwC's modelling also indicates that in a business as usual case, the majority of freight growth in the period through 2031 in the region will be transported by road. To limit the growth of truck movements in the region through to 2031, additional storage and distribution infrastructure for inbound bulk commodities, such as fertiliser or mining inbound, could be examined.

# Contents

# 1 Introduction

## 1.1 Study aims

The purpose of this study is to investigate demand for transporting containerised cargo as there is a focus on moving more freight from road to rail.

The objectives of this study are to:

a) define the demand for containerised cargo over time

b) identify existing and potential future contestable flows of containerised cargo

c) identify existing intermodal terminals in the containerised cargo catchment, potential new competing terminals, and define the impacts of these potential terminals on transport behaviour

d) identify potential economic benefits in the study area arising from the development of intermodal terminals.

## 1.2 Study area

The study area is illustrated in Figure 1, which captures major rail and road infrastructure, and regional centres.

**Figure 1: Study Area**


Source: TfNSW, PwC 2015

As Figure 1 shows, the region is connected to both National Highway and National Railway networks. Section 4.1 and 4.1.2 discuss the region's rail and road infrastructure in more detail.

Key population centres in the region include Tamworth, Inverall, Gunnedah and Moree. The northern boundary of the study area is the NSW/Queensland border, and there are substantial flows of freight between the region and Queensland.

Local councils support the economic development of the region, deliver services and maintain infrastructure such as the local road network. There are 12 local government areas (LGAs), which broadly align with the Namoi JOC. These are detailed in Table 1. The JOC was instrumental in facilitating access to stakeholders in local government. In turn local government officers assisted with information and introductions to other stakeholders.

**Table 1: Study Area Regions and Statistical Local Areas**

| Local Government Area (LGA) | |
|---|---|
| Armidale Dumaresq | Liverpool Plains Shire |
| Glen Innes Severn | Moree Plains Shire |
| Gunnedah Shire | Narrabri Shire |
| Guyra Shire | Tamworth Regional |
| Gwydir Shire | Tenterfield Shire |
| Inverell Shire | Uralla Shire |

Source: TfNSW 2015

Data used in this report has been collected at the LGA statistical region level, according to the LGAs detailed in Table 1.

## 1.3 Structure of this report

The remainder of this report is structured as follows:

- Section 2: Details the commodities that underpin demand analysis in the region, and analyses supply chains to and from the region at a high level
- Section 3: Establishes a framework for contestability, which is applied to commodities transported to and from the region to isolate contestable containerised freight volumes
- Section 4: Details the existing transport networks in the study area, the role played by existing intermodal terminals and outlines future potential development of the networks
- Section 5: Details the modelling approach used to estimate containerised freight growth rates, and applies these growth rates to quantify future growth in the contestable containerised freight volumes identified in Section 3
- Section 6: Considers intermodal terminals that may potentially be developed in the future, given the growth in contestable containerised freight
- Section 7: Considers barriers for mode shift to rail freight
- Section 8: Details the high level primary and secondary economic benefits delivered by intermodal terminals generally in the study area

# 2 Containerised freight movements in the region

This section analyses current containerised freight flows, using stylised supply chains to provide a context for the movement of goods in and out of the region.

## 2.1 Total containerised movements in the region

The region generates substantial amounts of freight, with approximately six million tonnes a year flowing to the Port of Newcastle[1]. This movement and the supply chain that supports it is primarily bulk, including grains and mining products. The scope of this study is on containerised freight only, and so, the majority of this volume is excluded from the analysis.

Table 2 presents estimates of the current containerised freight flows in the region. These have been established using Bureau of Freight Statistics data and validated with stakeholders in the region.

**Table 2: Estimated 2015 containerised freight**

| Commodity | Volume (TEU and TEU equivalent) | Inbound (%) | Outbound (%) |
|---|---|---|---|
| Consumer Goods | 17,380 | 100% | 0% |
| Containers & General Freight | 830 | 0% | 100% |
| Cotton | 10,026 | 0% | 100% |
| Fertiliser | 4,374 | 100% | 0% |
| Flour & Starch | 9,647 | 0% | 100% |
| Fruit & Vegetables | 848 | 0% | 100% |
| Grains | 14,552 | 0% | 100% |
| Meat | 15,218 | 3% | 97% |
| Mining Inbound | 7,267 | 100% | 0% |
| Wool | 1,640 | 0% | 100% |
| Total | 81,784 | 36% | 64% |

Source: Bureau of Freight Statistics and PwC, 2015

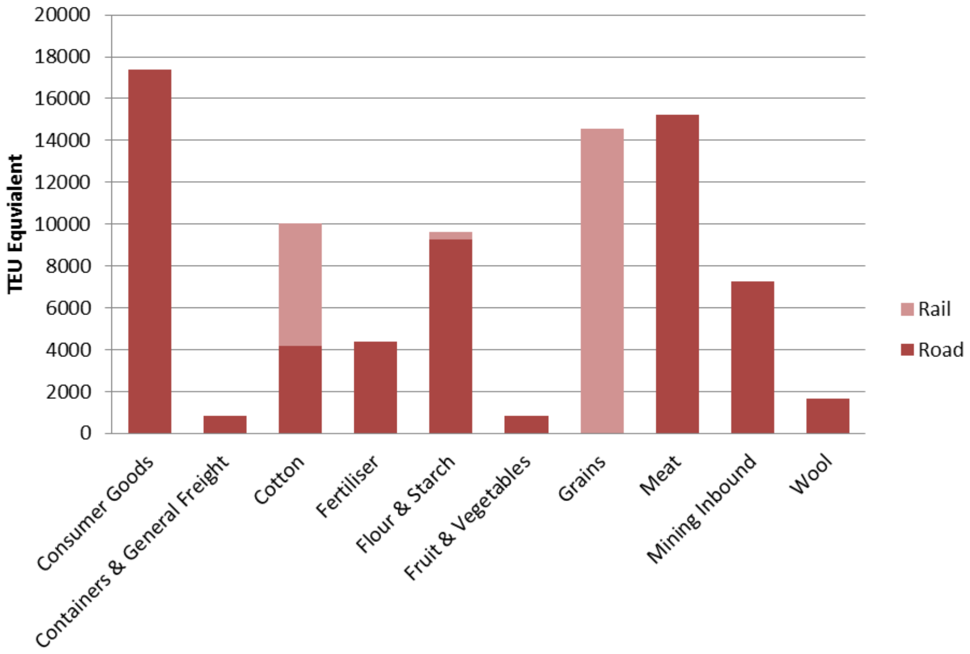
Table 2 shows that the region's major outbound containerised commodities are flour and starch, grains and cotton, while consumer goods dominate inbound containerised freight flows. The region is a net exporter of primary production, so outbound containerised freight flows, at 66 per cent, are larger than inbound containerised freight flows, 34 per cent.

Commodities such as food, forestry and wine are categories in TfNSW's containerised freight model. In the region, there is little evidence that these commodities are containerised, and so no volumes have been assigned.

[1] TfNSW, *NSW Freight and Ports Strategy*, November 2013

Figure 2 illustrates the estimated 2015 containerised freight volumes detailed in Table 2, with modal split.

**Figure 2: Estimated 2015 containerised freight**




Source: Bureau of Freight Statistics and PwC, 2015

As Figure 2 illustrates, modal split in the region strongly favours road freight, with seven of the 10 commodity groups travelling exclusively by road, and the majority of containerised flour and starch also travels by road. Grains are the most significant commodity in terms of containerised rail freight, accounting for close to 18% of all freight movements in the region. Reflecting the strong road connections to major markets, approximately 75 per cent of the region's containerised freight moves by road and 25 per cent by rail.

## 2.2 *Outbound containerised freight*

Table 3 details the containerised commodities transported out of the region, and their associated modal split.

**Table 3: Estimated 2015 outbound containerised freight**

| Commodity | Volume (TEU equivalent) | Road (%) | Rail (%) |
|---|---|---|---|
| Containers & General Freight | 830 | 100% | 0% |
| Cotton | 10,026 | 42% | 58% |
| Flour & Starch | 9,647 | 96% | 4% |
| Fruit & Vegetables | 848 | 100% | 0% |
| Grains | 14,552 | 0% | 100% |
| Meat | 14,794 | 100% | 0% |
| Wool | 1,640 | 100% | 0% |
| Total | 52,338 | 60% | 40% |

Source: Bureau of Freight Statistics and PwC, 2015

The region's major outbound containerised freight products are cotton, grains and meat, accounting for close to 75 per cent of all movements. As with Figure 2, a strong modal split is apparent in Table 3, with the majority of products leaving the region by road. Grains and cotton are the commodities that make up the majority of rail freight leaving the area.

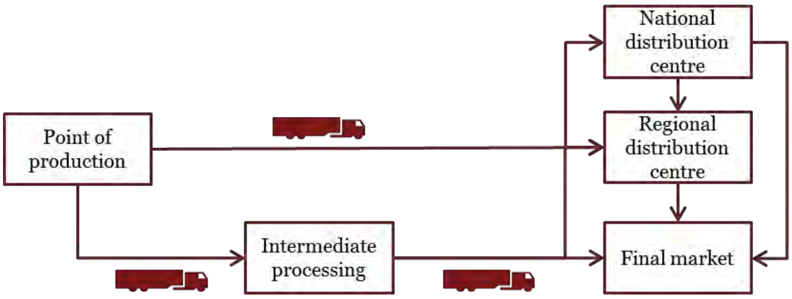
### *2.2.1 Stylised domestic supply chain*

Contributing to the pronounced mode split in outbound containerised freight are final markets for commodities. The region produces some goods (cotton, grains and meat) that travel on to export markets. The majority of containerised commodities produced in the region are transported by road to downstream supply chains.

Two stylised supply chains exist for outbound containerised freight, one for export commodities, and one for those travelling to domestic markets. The demand in these supply chains dictate transport decisions made by the region's shippers.

The preferred channel into domestic markets from the region results from fundamental characteristics causing material to be ill-suited to rail (fragility, perishability) and because of the need for alignment with complex domestic supply chains. A simplified version of this domestic supply chain is illustrated in Figure 3.

**Figure 3: Path to market, domestic**




Source: PwC, 2015

In Figure 3, goods move from the region directly, or via intermediate processing, and enter the supply chains of retailers and wholesalers. To align with the just-in-time practices of their buyers, shippers need to provide small, frequent shipments, meet tight delivery timeframes and serve diverse sites of delivery. Here, the supply chain to market is represented by two stages of distribution and a final market. In practice, shippers from the region send goods into all three levels of the supply chain, which may be geographically dispersed.

Road freight tends to suit domestic shippers better, as they can consolidate loads for multiple deliveries in one truck, and plan routes to minimise costs. For rail to be a viable option to domestic markets, the shipper and destination would both need to be located close to an accessible intermodal terminal and with sufficient service frequency and quality. The domestic markets for the region are too dispersed for this supply chain model to freight significant volumes of outbound containerised freight. Bulk rail is used to transport goods from the region on to intermediate processing sites, but as the movement is bulk materials these volumes do not contribute to containerised cargo demand.

Table 4 details commodities travelling from the region to domestic markets.

**Table 4: Estimated 2015 outbound containerised domestic freight, TEU equivalent**

| Commodity | Volume (TEU equivalent) Road | Volume (TEU equivalent) Rail |
|---|---|---|
| Cotton | 4,169 | 0 |
| Flour & Starch | 9,287 | 0 |
| Fruit & Vegetables | 848 | 0 |
| Meat | 2,916 | 0 |
| Total | 17,221 | 0 |

Source: Bureau of Freight Statistics and PwC, 2015

The commodities in Table 4 travel to connect with domestic supply chains, illustrated in Figure 3. Potentially, some of these goods may go on to export markets. In this case, as the export supply chain does not extend to sites of production in the region, road freight is the mode used for transport to connect with it.

For the flour and starch, cotton and meat volumes in Table 4, dual channels to domestic and export markets result in a split between road and rail. For example, cotton volumes are comprised of cotton lint, an export product, and cotton seeds[2], which have both export and domestic markets. For both flour and starch and cotton, it has been assumed that containerised road volumes from the region represent the share of produce transported within domestic supply chains. Associated rail volumes for these commodities are detailed and discussed in Section 2.2.2.

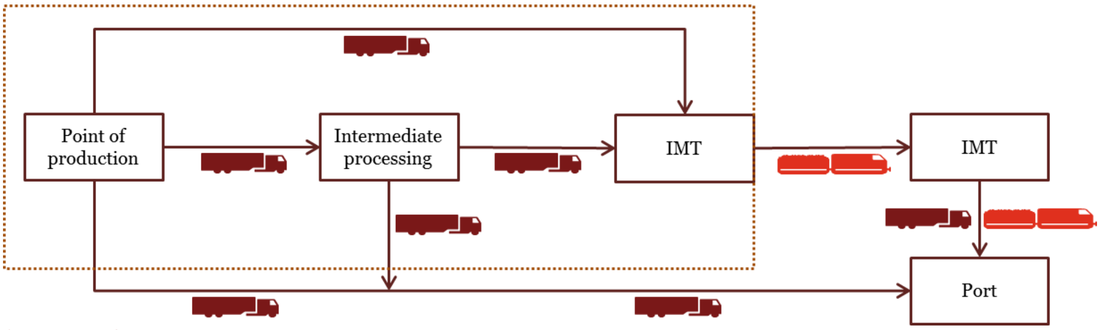
## 2.2.2 *Stylised export supply chain*

This section examines how supply chain features determine modal split for exporters in the region. On distance alone to port (Port of Botany or Port of Brisbane), rail is regarded as a viable option for the region. Rail is considered a cost competitive option at distances greater than 300 km from port[3]. Additional factors explored in this section, such as the location of secondary processing, determine mode choice.

### Where rail is competitive

Figure 4 illustrates a stylised path some export commodities take to port from the region. Rail and road freight are included as mode choices.

**Figure 4: Path to market, export, with aggregation in the region**




Source: PwC, 2015

[2] Cotton seeds, typically 60 per cent of the processed volume of cotton (ABARES Crop Report, June 2015), have domestic and international markets. The final destination for cotton seeds depends on market conditions in a given year. Based on stakeholder consultation in the region, cotton products travel by rail to export markets. The volumes of containerised cotton transported by road in the study area (22.3 per cent or close to 740 TEUs) are considered to be cotton seed. This volume is not considered to be contestable containerised freight.

[3] SD&D Consulting, *Sea Freight Council of NSW 2004 Regional Intermodal Terminals – Indicators for Sustainability*

The dotted rectangle in Figure 4 above illustrates a scenario where production, processing and aggregation of freight volumes for export occur in the region. This model is conducive to the use of rail, as the higher payload of rail becomes more attractive when larger volumes are to be shipped. Large volumes also support regular services, which in turn reduce barriers to rail use, such as service frequency, supply chain connectivity and take or pay fee structures.

Table 5 details the commodities which are aggregated in the region, for transportation to port.

**Table 5: Estimated 2015 outbound containerised export freight, TEU equivalent**

| Commodity | Volume (TEU equivalent) Road | Volume (TEU equivalent) Rail |
|---|---|---|
| Cotton | 0 | 5,858 |
| Flour & Starch | 0 | 360 |
| Grains | 0 | 14,552 |
| Meat | 11,878 | 0 |
| Total | 11,878 | 20,770 |

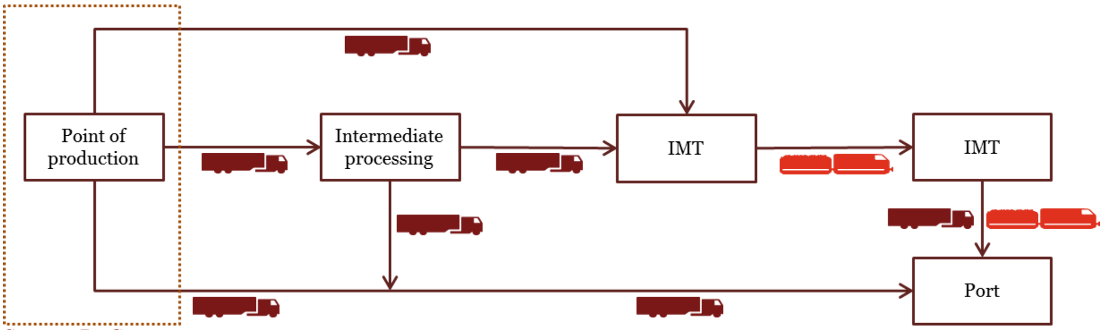
Source: Bureau of Freight Statistics and PwC, 2015

The commodities in Table 5 mostly travel by rail. The exception is meat, which currently travels in refrigerated containers to port via road. The perishability of the commodity and expense of cold storage, combined with existing service frequency and cycle times in the region contribute to the use of road freight for the transport of meat. Section 7 discusses these, and other, barriers to the use of rail in the region in more detail.

### Where road is competitive

Figure 5 represents the same stages in the supply chain to port as Figure 4. The difference between the two diagrams is that in Figure 5, only primary production occurs within the region, the boundary of which is represented by the dotted rectangle.

**Figure 5: Path to market, export, with aggregation of volumes outside of the region**




Source: PwC, 2015

The supply chain illustrated in Figure 5 features flows of containerised freight from dispersed sites of production to processing facilities outside of the region. With many small shipments, variability in, and diverse sites of production, road freight is a better fit for many shippers. Rail freight is an option for some commodities further down the supply chain, after processing, but not from the region.

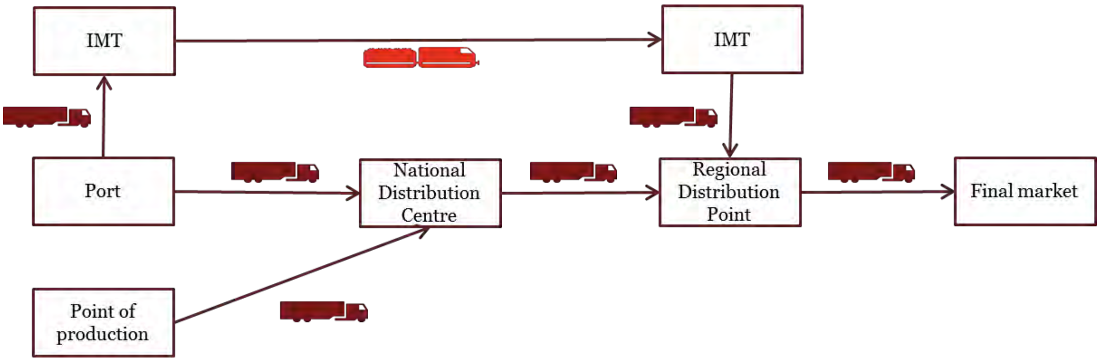
The wool supply chain follows this pattern, with aggregation of wool volumes occurring at the point of processing rather than in the region. An estimated 1,640 TEUs of wool will leave the region by road in 2015, with none travelling by rail.

## *2.3 Inbound containerised freight*

Supply chains into the region contain the same elements of outbound supply chains, that is, connections to port and domestic sites of production, as well as intermediate distribution.

These stages are illustrated below in Figure 6.

**Figure 6: Path to market, inbound containerised freight**




Source: PwC, 2015

Table 6 depicts the potential for rail and road freight movements into the region from port, and road freight movements from other sites of domestic production.

The rail supply chain from port into the region is considered viable from the Port of Botany when imports arrive at port packaged and labelled to travel directly to the region. Further steps in the supply chain, such as de-stuffing and repacking of containers, require additional movements at port, the cost of which are likely to make rail uneconomical. The flexibility of road freight by contrast supports intermediate movements in the supply chain to the region.

The rail supply chain from port into the region is not considered viable from the Port of Brisbane. The indirect connections to the region by rail suggest that it is unlikely to be economic. Road connections between the region and port are more direct, and so are anticipated to be the preferred channel for shippers.

Conceivably, domestic production aggregated in Sydney could flow into the port originating supply chain, which is assumed to be majority imports. The circuitous rail routes into the region and the lack of inbound rail freight indicate that this is unlikely to be occurring at present.

Table 6 details the observed mode of transport for goods into the region.

**Table 6: Estimated 2015 inbound containerised freight**

| Commodity | Volume (TEU equivalent) Road | Volume (TEU equivalent) Rail |
|---|---|---|
| Consumer Goods | 17,380 | 0 |
| Fertiliser | 4,374 | 0 |
| Meat | 424 | 0 |
| Mining Inbound | 7,267 | 0 |
| Total | 29,446 | 0 |

Source: Bureau of Freight Statistics and PwC, 2015

Table 6 shows that all inbound freight travels to the region by road.

With limited storage up country, dispersed local populations across vast distances and numerous sites of primary production, central distribution in the region is often uneconomic for shippers. These factors, and the relative complexity of rail connections into the region compared to road, contribute to the use of road for all inbound freight.

With the right infrastructure in place in the region, it is conceivable that major inbound containerised volumes of generic productions could be transported by rail in the future. Fertiliser and mining inbound commodities meet these criteria.

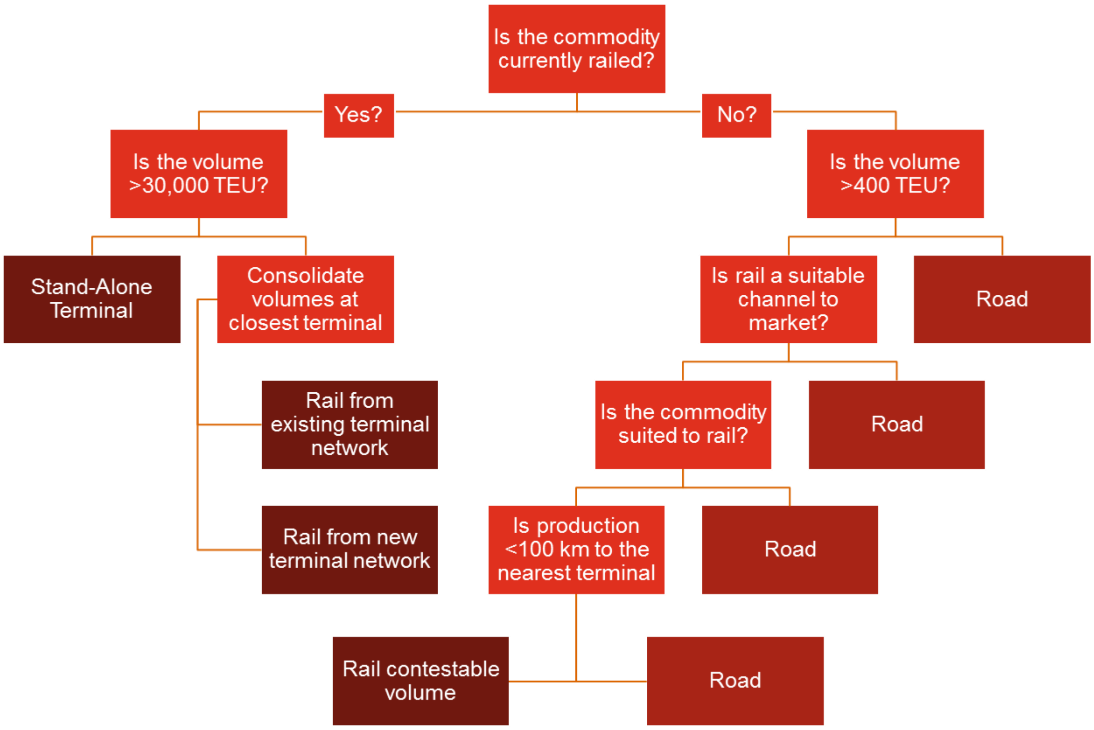
# 3 *Contestable containerised freight*

This section builds upon the supply chain analysis in Section 2 to establish current contestable volumes in the study area.

Contestable containerised freight volumes are made up of commodities that could travel either by road or rail. This study considers commodities that are currently travelling by rail, and commodities which are contestable in that they currently travel by road, but could travel by rail, now or in the future. Forecast growth in commodities that currently travel by rail will form future contestable volumes, contributing to demand for rail infrastructure.

PwC has developed a framework to assess containerised freight contestability, illustrated in Figure 7 below. The framework sets out criteria of volume, channel to market (building on the discussion in Section 2), commodity characteristics and proximity to infrastructure that influence modal split. These factors are used to identify freight that could potentially travel by rail, but is not an assessment of what will be transported by rail in the future.

**Figure 7: Contestability framework**




Source: PwC, 2015

## 3.1 Volume

Freight demand or volume is the first criteria to consider for contestability, as it influences cost significantly. As Figure 7 indicates, substantial volumes (over 30,000 TEUs per annum) are considered necessary to support stand-alone services. At lower volumes (approximately 15,000 TEUs per annum) hubbing or shuttle models with existing services are supported.

At lower volumes still (less than 15,000 TEUs per annum), containerised freight may still move by rail, but only if producers are within the catchment area of open access terminal infrastructure. Shippers with lower volumes face additional barriers to the use of rail.

Some of the key volume based disadvantages that rail presents to these shippers are:

- inability to effectively sustain a take or pay arrangement with a service provider. This is particularly difficult for agricultural producers generating low volumes and who are at risk of being affected by seasonality

- potential to be bumped from service when clients with larger volumes require additional capacity

- loss of flexibility that road-based transport provides, which can be critical to end customers in low volume operations.

According to data from the Bureau of Freight Statistics, the lowest known outbound rail volume in the region, approximately 400 TEUs per annum, is shipped out of Gunnedah. It is assumed that this is the floor volume for using outbound rail services. At volumes lower than this, shippers are assumed to favour road regardless distance or other factors.

No floor has been applied to single shipments of potentially contestable inbound commodities. With the appropriate infrastructure, inbound volumes could be consolidated at a central site for storage and distribution for the region. So the total volume of inbound product is considered in the modelling exercise.

## 3.2 Channel to market

Rail is a competitive mode of transport for transporting sizable volumes of freight over large distances to centralised locations. So in considering contestability, the destination for containerised freight flows is critical.

As the discussion in 2.2 details, the supply chain for commodities is influential on mode. Commodities travel to centralised locations like ports for export, while domestic markets can be dispersed throughout the nation and within each state. This:

- dilutes the threshold volumes required for a shipper to utilise rail

- has a significant impact on the cost of transporting TEUs. In a rail context, shipping to dispersed final destinations can involve second and third moves between modes and destinations. Containers may need to be deconsolidated in warehouses and products transported on to final destinations. These additional stages increase handling costs. Rail can then become unfavourable when compared to road, which allows for loading multiple consignments for multiple destinations without additional lifts or materials handling.

Due to issues of cost and access to rail, if a product is transported to multiple destinations outside Melbourne, Sydney and/or Brisbane, it is assumed the shipper will continue to use road. Rail is unlikely to be a cost effective component within these supply chains. The same principle holds for inbound containerised freight, that is, if a product originates from a central location but travels to dispersed locations in the region, road is the likely mode.

## 3.3 Containerised freight characteristics

The characteristics of each commodity will have an impact on whether it is suitable for rail transport. General characteristics of containerised freight such as fragility, time sensitivity, predictability of production and history of transport have a bearing upon their suitability for rail.

If a product is evaluated as having characteristics making it unsuitable for rail then it is assumed that these volumes will remain on road.

#### Fragility

The first consideration is the physical fragility of the commodity. This affects whether additional lifting and ride quality on rail (steel on steel) may damage the goods. This can be a factor in the transport of wine, although wine is successfully transported by rail out of the Riverina area of New South Wales.

#### Time sensitivity

Perishability, or time sensitivity of the commodity, is a second characteristic. Perishable products may not be suited to existing rail service frequency.

#### Variability of production

The variability with which a commodity is produced also influences its suitability for rail. Rail operators have less flexibility in adapting to spikes and troughs in demand than road operators, as paths and trains need to be booked well in advance of services. Rail operators face a risk that the fixed cost of their services will not be met by demand for transport, and pass this risk on to shippers through take or pay contracts, or higher fees. This can make rail a more expensive option for shippers with variable freight flows.

From a shipper's point of view, existing rail services may not be sufficient to handle high production volumes, so additional road services may be required, increasing complexity. For these reasons, commodities with highly variable or intermittent production are suited to road transport, such as forestry products, discussed in Section 3.3.1. Up country storage for commodities with strong seasonality, such as cotton or grains, allows for the use of rail.

#### Legacy of rail transport

The final characteristic is how the good is traditionally shipped. When a commodity has a history of being shipped by rail, infrastructure is often in place to handle these goods. For example, grains have a long history of being transported by rail and an existing network of silos and rail heads in the region bear witness to this.

### 3.3.1 Forestry products

Forestry production can be considered to be highly variable. That is, production can stop, start or shift in focus quickly, based on international competitiveness. Given the uncertainty of production, shippers are often reluctant to fund long term investments in their supply chain, for example, in intermodal terminals. Instead, when they are active, their output can be considered a windfall for existing operators who attract the volumes.

While all exporters make production decisions based on market prices, the higher capital investment tied up in other forms of production, for example, cotton or grains, compared to forestry products, provides greater predictability to the associated freight flows. As forestry products are unlikely to support the development of new terminals, potential outbound flows of forestry products have been excluded from the modelling process.

Stakeholders identified forestry resources in the region could be economic to harvest and process, with an efficient supply chain. The Nundle State Forest and forests in the Hanging Rock area are the main sites of forestry reserves in the region. The Forestry Corporation of New South Wales reports that the Nundle State Forest has significant logging activity[4].

Stakeholder consultations revealed that significant volumes of forestry products (~200,000 tonnes of containerised logs) could become contestable in the future. Currently, these volumes move by road in specialised vehicles. If containerised, they would correspond to approximately 7,200 to 12,000 TEUs per annum by rail, according to the project proponent.

These containerised volumes are considered unlikely to attract new investment on their own, but could potentially travel by rail when combined with other emerging freight flows in the region. The maximum potential rail volume, 12,000 TEU, has been included in the modelling of contestable freight in Section 5, and is included in the discussion of current contestable freight below in Section 3.4.

It should be noted that a proponent is discussing the commencement of a service out of a proposed terminal in West Tamworth based on these 7,200 TEU with Tamworth Council. The proponent is able to offer this service without relying on a take or pay agreement given the financing agreement they have struck for locomotives and wagons, under which the risk of not running a service is born by the financier. The proponent bears the risk of operating the service at sub profitable volumes. A key element to striking this bargain is that supply of rolling stock outweighs demand in the market at present. Once the market returns to equilibrium these terms may be harder to sustain.

## 3.4 Contestable containerised freight flows

Applying the first three criteria - volume, channel to market and containerised freight characteristics - from the framework in Figure 7, the volumes detailed in Table 7 and Table 8 have been identified as contestable.

These include existing rail volumes, and containerised freight currently travelling by road that could move to rail. In the case of Mining Inbound, it is likely that not all of the volume considered in this report will be contestable. True contestability will depend on the characteristics of individual projects that emerge in the future.

As discussed in Section 3.3.1., potentially contestable forestry product volumes have been included.

**Table 7: Estimated 2015 contestable containerised outbound volumes**

| Commodity | Contestable volume (TEU equivalent) | Rail volume (TEU equivalent) |
|---|---|---|
| Containers & General Freight | 830 | 0 |
| Cotton | 0 | 5,858 |
| Flour & Starch | 0 | 360 |
| Forest Products | 12,000 | 0 |
| Grains | 0 | 14,552 |
| Meat | 11,878 | 0 |
| Total | 19,900 | 20,770 |

Source: Bureau of Freight Statistics and PwC, 2015

[4] Nundle State Forest, http://www.forestrycorporation.com.au/visit/forests/nundle

**Table 8: Estimated 2015 contestable containerised import volumes**

| Commodity | Contestable volume (TEU equivalent) | Rail volume (TEU equivalent) |
|---|---|---|
| Fertiliser | 4,374 | 0 |
| Mining Inbound | 7,267 | 0 |
| Total | 11,641 | 0 |

Source: Bureau of Freight Statistics and PwC, 2015

The 2015 potentially containerised volumes identified in Table 7 and Table 8 account for close to 52,310 TEUs, of which close to 60 per cent are currently travelling on road. Existing outbound rail volumes are currently drawn into active intermodal terminals in the region, which are discussed further in Section 4.1.2.

In terms of potentially contestable volumes, the major opportunities lie in outbound meat and inbound freight. Containers & General Freight as a commodity group is typically made up of small, ad-hoc shipments. In other regions of New South Wales with more frequent services, these volumes are drawn into the rail supply freight network. So Containers & General Freight volumes are considered to be contestable, but this is likely contingent on service expansion.

Growth in the volumes represented in Table 7 and Table 8 above are modelled in Chapter 5 and access to potential future open access infrastructure in Chapter 5. Given the contestable volumes identified in Table 7 and Table 8, and the forecast growth in these volumes, Chapter 6 addresses potential infrastructure needs for the region.

Through consultations, emerging containerised freight flows have been identified in the region, which are considered in Section 3.5. They are analysed to show where the greatest variance to forecasts established in this report is likely. Emerging containerised freight flows have not been included in the core modelling approach.

## 3.5 Emerging outbound containerised freight flows

Through consultation, trends in containerised freight types and volumes were identified that could shape future demand for containerised freight. These containerised freight flows are contingent on producers in the area changing their practices or developing projects currently under application. As such, they have not been included in the modelling approach.

As a caveat, it is important to note that volumes transported by exporters will depend on their international competitiveness in a given year. It is foreseeable in the forecast period to 2031 that structural changes to Australia's export competitiveness could promote higher export volumes. For example, recent agreements with China, Japan and South Korea, will enable greater access to these markets for meat exporters in the forecast period. Depending on how producers respond, this could increase export volumes.

### Grains

Grains have traditionally travelled to port via established bulk rail networks. In the past five years though, there has been growth in containerisation of grains in the region, for export to port in TEUs. This has diverted grain volumes from the established bulk supply chain to the containerised. Grain industry stakeholders report that containerisation can reduce handling costs over the supply chain to delivery in export markets, making it an attractive transport option for some operators.

In the future, more grain exporters may develop facilities to containerise grains in the region for export. To model containerised freight movements in the future, it has been assumed that current volumes of containerised grains on rail continue to grow. The movement of grains from bulk networks to containerised networks has not been forecast, that is, no additional shift from bulk to containerised rail is included in the core modelling approach.

Projects exist in early stages of development in the region that could contribute to growth in containerised grains. Primary Food Company has lodged a development application with the New South Wales Department of Planning and Environment for a prospective grain refinery in Tamworth. The application states that the grain refinery would include grain storage, wet and dry milling plants, alcohol and glucose plants and associated infrastructure[5].

A Secretary's Environmental Assessment Requirements (SEARS) has been prepared and issued to the project proponents. The project proponents will need to respond the SEARS and complete four additional stages to gain approval. In the media, council and project proponents have stated that the site could pack containerised grains for export, and speculated that the volumes could help support the development of an intermodal terminal[6].

[5] New South Wales Department of Planning and Environment, *Proposed Tamworth Grain Refinery Site - Tamworth Grain Refinery*, http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=5936

[6] The Land, *Grain refinery a job boost for Tamworth*, June 15 2015, http://www.theland.com.au/news/agriculture/general/news/grain-refinery-a-job-boost-for-tamworth/2735082.aspx

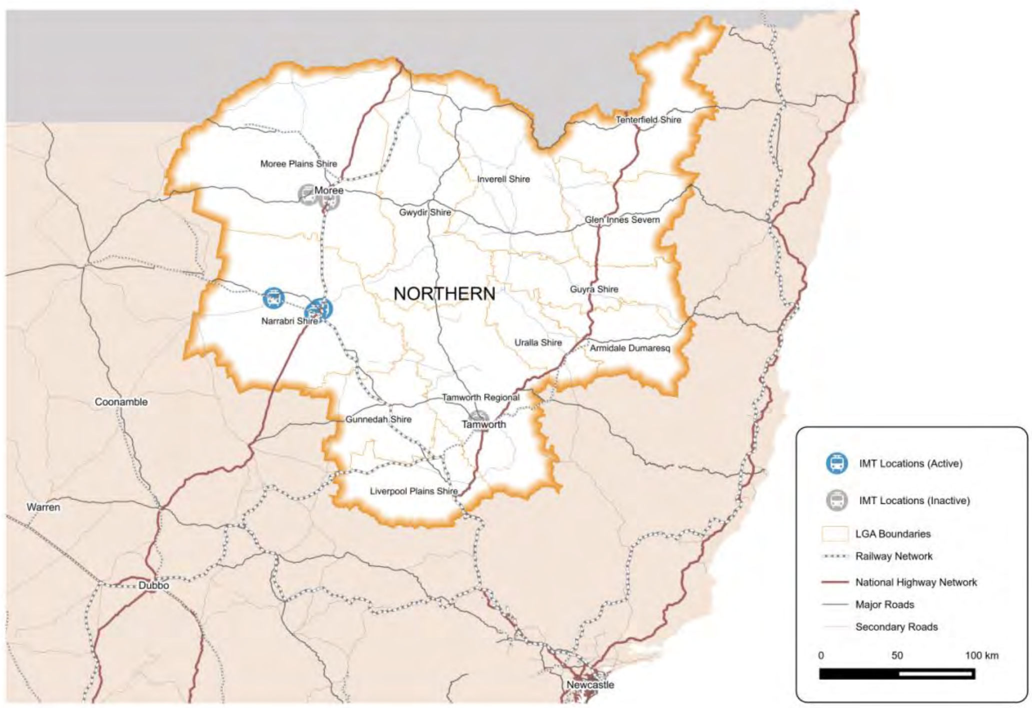
# 4 Existing infrastructure

This section details the exiting road and rail networks in the region and current access to rail through intermodal terminals. Potential future developments affecting the rail network are outlined, ahead of consideration of growth in contestable containerised freight in Section 5, and assessment of potential future infrastructure needs in Section 6.

## 4.1 Network

The region is connected to capital city markets and ports through the national railway and highway network, illustrated in Figure 8 below.

**Figure 8: National Rail and Highway Networks in the region**



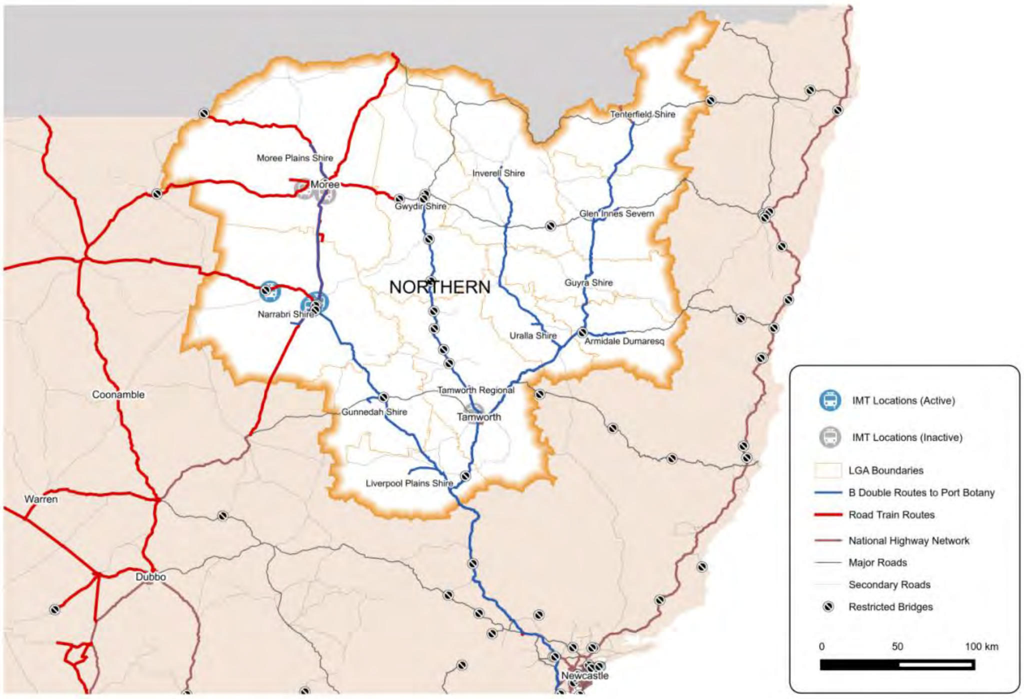

Source: TfNSW and PwC, 2015

### 4.1.1 Road network

As Figure 9 shows, connectivity from the region is strong into the north, with links to Tamworth and Brisbane. The New England Highway runs through LGAs to the east of the region, linking them to Brisbane and to Sydney via Newcastle. The Newell Highway in turn crosses through the west of the study region. It connects shippers to Melbourne, to Brisbane via Goondiwindi and Toowoomba, and into Sydney via Dubbo and Bathurst.

Figure 9 below illustrates the accessibility of the Port of Botany from the region by road, and road train routes into the west of the region.

**Figure 9: Road network, with B-double access to Port Botany**




Source: TfNSW and PwC, 2015

As Figure 9 shows, in the region, the Newell Highway serves as a dividing line of vehicle access in the region, with road trains permitted to the west of the Newell, but access for only B-doubles and smaller to the East. Numerous HML restricted bridges are in the region, and on routes out of the region. For example, access for larger vehicles is limited into Sydney, with B-double routes traversing HML limited bridges. Additionally, limits on vehicles over the Toowoomba ranges constrain access on the Newell Highway heading north in Queensland.

In the region, HML restricted bridges affect the productivity of routes available from some LGAs, notably Gunnedah and Tamworth. Some shippers identified barriers to the use of road trains (such as network connections and the needs for permits) as limiting their use of the road network.

### *4.1.2 Rail*

The region's rail linkages to major markets are less direct than road linkages, as Figure 10 illustrates.

**Figure 10: New South Wales rail network, by operator**


Source: TfNSW and PwC, 2015

The region is connected to interstate routes via ARTC operated track, as shown in Figure 10, but the connections are mostly less direct than comparable road linkages. The region's rail connections to port are most direct to the Port of Newcastle, which currently handles bulk commodities only. The Inland Rail project would improve the rail connections from the region to major markets, and is discussed in Section 4.1.3.

ARTC track runs south from Boggabilla through Moree, Narrabri, Gunnedah and Werris Creek, connecting to interstate routes to the south west and the Port of Newcastle to the south east. Through Newcastle, the region is connected to the North Coast Line, which runs north to Brisbane and south to Sydney. Through Parkes to the south west, the region is connected to Perth, Melbourne and Adelaide by rail.

The Country Regional Network runs north through Tamworth, Uralla, Armidale, Glen Innes and Tenterfield. It connects these LGAs in the north and east of the region to the interstate network at Werris Creek.

## Intermodal Terminals

There are five operational container freight intermodal terminals in the region, all connecting via branch lines to the Main North Line. An additional two terminals in the region are currently non-operational.

The four active terminals in the region handle volumes from a single user. These primary users have typically developed rail supply chain infrastructure to achieve a competitive advantage in transport costs. This is an advantage they are unlikely to share with direct competitors, and providing containerised freight services to third parties can introduce unwanted complexity for some operators. Terminals with a single primary user are considered closed access unless stakeholder consultations have established evidence to the contrary.

**Table 9: Intermodal terminals in the region**

| LGA | Operators | Primary Users |
|---|---|---|
| Moree | Agripark, McGregor Gourlay Agricultural Services | Non-operational |
| Narrabri | Auscott, Narrabri | Auscott |
| Narrabri | Louis Dreyfus | Louis Dreyfus |
| Moree | Louis Dreyfus | Non-operational |
| Wee Waa | Namoi Cotton | Namoi Cotton |
| Narrabri | Viterra | Viterra |
| Tamworth | Non-operational (owner is Pacific National) | Non-operational |

Source: TfNSW and PwC, 2015

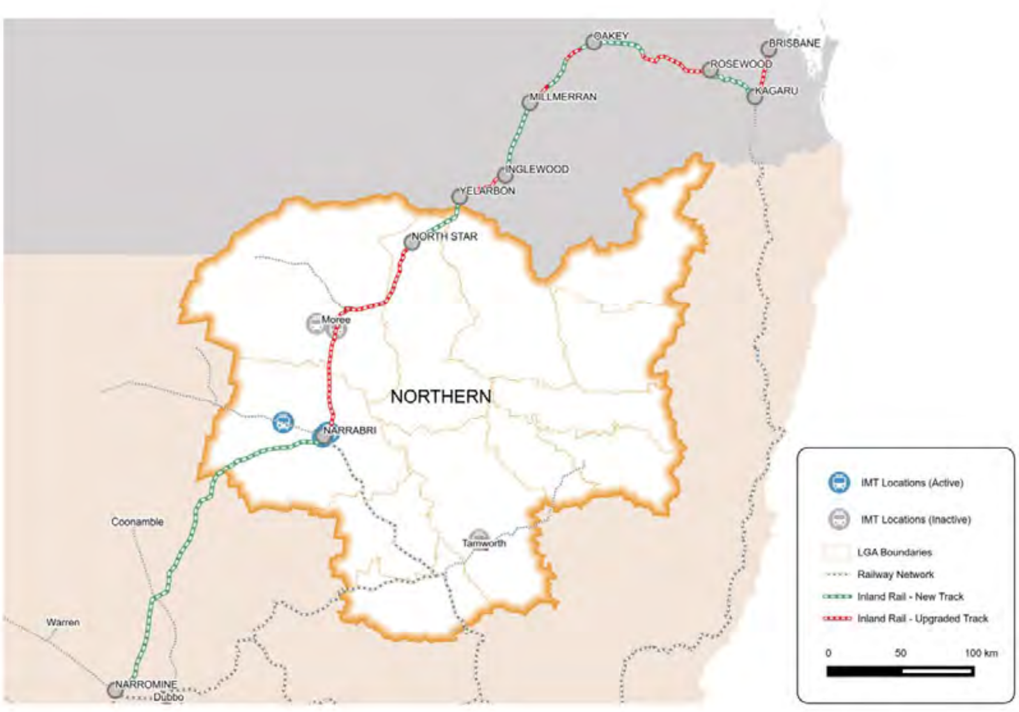
## *4.1.3 Planned development for the region's freight networks*

Federal and state government are planning improvements to the rail and road networks in the study region.

### Inland Rail

The Inland Rail is a multi-government project led by the ARTC which is designed to strengthen the rail connection between Melbourne and Brisbane by upgrading existing infrastructure and constructing new track to fill gaps in the route. When complete, upgrades to existing rail track in the region, and the increased north south rail connectivity are anticipated to increase the attractiveness of rail. Although the full effects of the project will be realised when the entire alignment is operational. The region is anticipated to benefit from progress towards completion, in particular, the completion of the Moree to Brisbane route.

**Figure 11: Inland rail provisional alignment**




Source: TfNSW and PwC, 2015

As Figure 11 shows, the proposed alignment of the inland rail project traverses the study area from north to south, with the potential for stops at Narrabri, Moree and Boggabilla. The project would involve upgrades to existing track between Narrabri and Moree, and the construction of new track between North Star and Yelarbon in Queensland.

The timelines for the complex and expensive project is unclear. At the time of writing, tenders had been issued for initial planning work concerning the Parkes to Narromine and Narrabri to North Star sections. ARTC has also been tasked with developing a ten year delivery model for the project.[7] It is possible that the full route could be completed in the period through to 2031. Due to the uncertainty of project timelines and impacts on containerised freight, it has not been considered in the modelling process.

The anticipated effects of regional rail are some diversion of existing containerised rail freight flows to Melbourne and Brisbane, away from current destinations in New South Wales. Improved infrastructure and connectivity from the region to market could also support greater use of rail, and increased containerisation in the region.

If the project results in growth in containerised freight volumes, or diversion of existing volumes to new routes, this could support the construction of new terminals in the region. Existing terminals are not expected to re-locate. As Figure 10 shows, active closed access intermodal terminals in the region are currently clustered on the line between Moree and Narrabri, near the proposed inland rail alignment.

### NSW Freight and Ports Strategy

Developments are currently being progressed through the NSW Freight and Ports Strategy that will improve the ability for exports to reach NSW ports, such as Port Botany and Port Kembla, by rail over time.

Key developments that are currently underway include:

- investigations into the reopening of disused rail lines in the country rail network: the Cowra Lines project will identify the capacity of the private sector to restore, operate and maintain non-operational rail lines on a commercially sustainable basis, without NSW Government funding
- TfNSW's "Fast-tracking Freight" and "Fixing Country Roads" initiatives, which are aimed at unlocking productivity for freight in the regions, with a focus on enabling intermodal hubs to accept Higher Productivity Vehicles in their catchments
- metropolitan IMTs, i.e. Enfield, Moorebank, Chullora, Western Sydney, Leightonfield (to be reopened) and others that will provide triangulation and staging opportunities for rail
- the Enfield Rail Precinct comprises a planned intermodal site, a rail marshalling yard and ARTC staging roads. The marshalling yard has good potential to enable regional trains to split, hold and shuttle to the port terminals. TfNSW are looking to actively manage this yard and institute rail Operational Performance measures. This would improve rail performance, part of which would be represented by improved cycle times for regional trains.
- new dedicated freight infrastructure, i.e. ARTC works and improvements to the Southern Sydney Freight Line, Metropolitan Freight Line and Botany Rail Yard
- planned future projects, which include, and are not limited to, a duplication of the Port Botany Rail Line, capacity upgrades to the Main West Rail Line, a new Western Sydney Freight Line and intermodal terminal, and completion of the Maldon to Dombarton Rail Link.

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[7] Minister for Infrastructure and Regional Development, *First Inland Rail tenders open tomorrow*, press release, March 2015. http://minister.infrastructure.gov.au/wt/releases/2015/March/wt072_2015.aspx

TfNSW is also investigating a range of options under the Container Rail Share Improvement Program to meet the NSW Government's 2021 objective to "double the proportion of containers moved by rail through NSW's ports by 2020".

The NSW Cargo Movement Coordination Centre (CMCC) began on July 1, 2014 and subsumes the Port Botany Landside Improvement Strategy. The CMCC has established a Rail Operations and Coordination Committee (ROCC), which will improve the reliability and efficiency of rail through the Port Botany supply chain. Moreover, an Operational Performance management regime similar to the successfully integrated regime for road is being investigated.

Further, there may also be greater private investment potential for regional rail infrastructure from the private NSW Ports owner following refinancing.

### Fixing Country Rail

The NSW State Government allocated a $400 million reservation under Restart NSW for the Fixing Country Rail program to provide funding for upgrades that improve the productivity of regional freight rail in the 2015/16 State Budget.

# 5 Growth in contestable containerised freight

This section of the report details the approach used to forecast growth in the containerised freight task in the region to 2030-31. Forecast growth in all containerised freight, and then in contestable containerised freight is analysed to build a picture of future containerised freight demand. To support the modelling of demand for rail infrastructure in Section 6, growth in contestable containerised freight is further broken down into commodity groups and LGAs.

## 5.1 Method

PwC's growth forecasts, developed using economy-wide modelling data, capabilities and experience have been used for the purpose of this report.

PwC's model database is sourced from the Australian Bureau of Statistics (ABS) input-output tables, National and State Accounts, and other ABS data sources. Modelling assumptions for growth are based on:

- ABS's population projections;
- Commonwealth Treasury's terms of trade forecasts;
- Commonwealth Treasury's 3-Ps framework (population, productivity and participation); and
- Industry productivity assumptions.

The following methodology was followed to establish a baseline, forecast industry outputs and then validate these results:

1. *Establish a baseline* - To establish a baseline of commodity volumes produced in each LGA within the region, volumes were obtained from the BFS Strategic Freight Model and then validated through industry consultation.
2. *Produce independent output forecasts* - Economic output forecasts were generated by PwC for 38 industries for the Northern NSW region, which were then matched to TfNSW's product groups exported by the region (contained in BFS Strategic Freight Model). These forecasts are detailed in Appendix A.
3. *Validate results through consultation* – Industry stakeholders were consulted in relation to the reasonableness of both PwC's and TfNSW's industry output forecasts. Stakeholders consulted are detailed in Appendix B.

In the remaining parts of Section 4, forecast future volumes estimated using this methodology are presented and analysed.

## 5.2 Forecast growth in total freight

To forecast TEU volumes out to 2030-31, growth rates from PwC's model have been applied to existing volumes. The results are presented below in Table 10 and 11. A visualisation of total freight growth is provided in Figure 12.

## Table 10: Forecast growth in outbound containerised freight

| Commodity | 2015 outbound volume (TEU equivalent) | 2021 outbound volume (TEU equivalent) | 2031 outbound volume (TEU equivalent) |
|---|---|---|---|
| Containers & General Freight | 830 | 961 | 1,205 |
| Cotton | 10,026 | 10,707 | 12,153 |
| Flour & Starch | 9,647 | 10,397 | 11,276 |
| Fruit & Vegetables | 848 | 927 | 1,057 |
| Forest Products | 12,000 | 13,780 | 17,644 |
| Grains | 14,552 | 15,427 | 17,008 |
| Meat | 14,794 | 16,025 | 17,768 |
| Wool | 1,640 | 1,767 | 1,922 |
| Total | 64,338 | 69,990 | 80,033 |

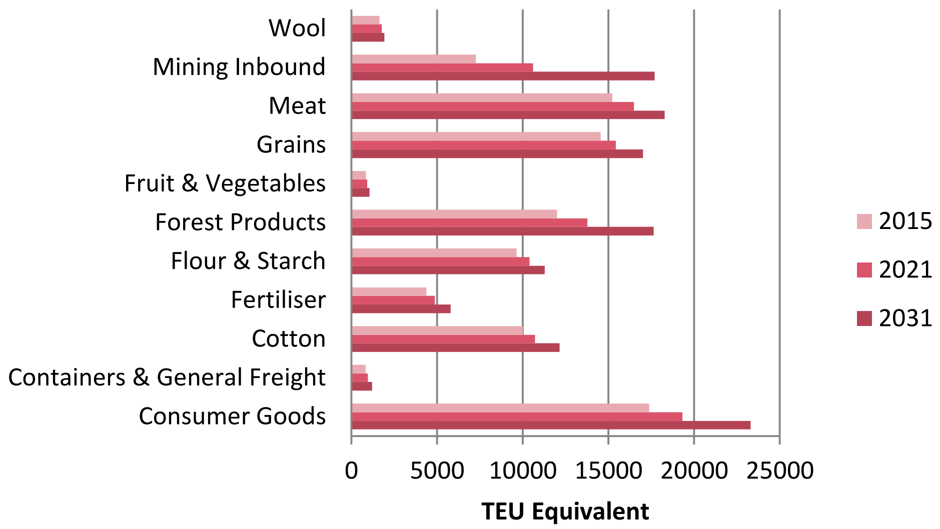
Source: Bureau of Freight Statistics and PwC, 2015

## Table 11: Forecast growth in inbound containerised freight

| Commodity | 2015 inbound volume (TEU equivalent) | 2021 inbound volume (TEU equivalent) | 2031 inbound volume ( TEU equivalent) |
|---|---|---|---|
| Consumer Goods | 17,380 | 19,320 | 23,302 |
| Fertiliser | 4,374 | 4,870 | 5,795 |
| Meat | 424 | 459 | 509 |
| Mining Inbound | 7,267 | 10,601 | 17,692 |
| Total | 29,446 | 35,251 | 47,300 |

Source: Bureau of Freight Statistics and PwC, 2015

## Figure 12: Estimated growth in containerised freight




Source: Bureau of Freight Statistics and PwC, 2015

Total containerised cargo volumes are forecast to grow by approximately 33,500 TEUs between 2015 and 2031, to 127,333 TEU as illustrated in Figure 12. Table 10 and Table 11 demonstrate that growth is forecast to be higher for inbound volumes than outbound.

The region's outbound freight is dominated by primary production. The growth in major outbound commodities like cotton and grains is constrained by access to scarce resources, such as water and land. By contrast, demand for many inbound commodities depends on population and economic growth, and is forecast to grow at higher rates. Consequently, by 2031, inbound and outbound containerised freight flows are more evenly split in the region than in 2015.

The slower growth of major outbound commodities like grains and cotton, compared to other commodity groups, has implications for future mode share. Higher growth forecast for outbound commodities travelling by domestic supply chains, and inbound commodities currently travelling by road means:

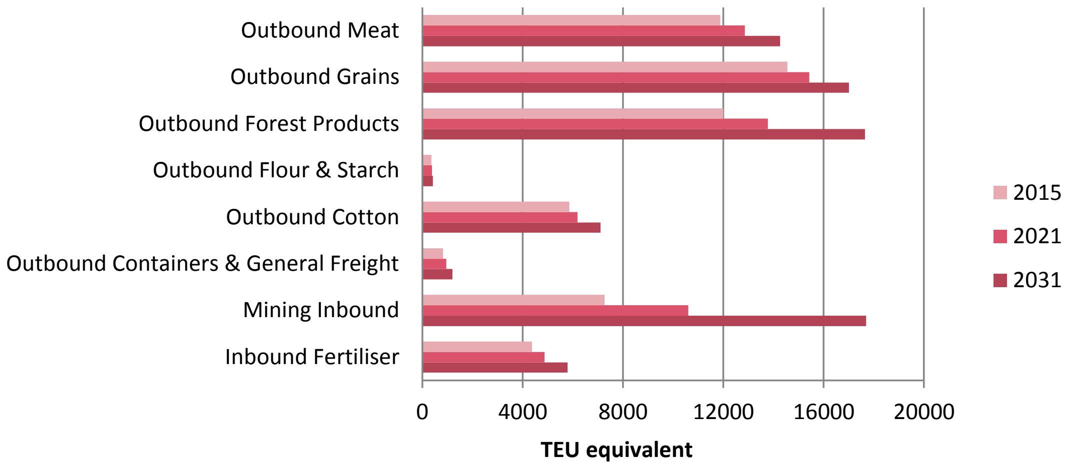
- inbound freight volumes are forecast to grow by close to 18,000 TEU, while outbound containerised freight increases by 15,000 TEU
- approximately 29,800 extra TEU are anticipated to travel by road, with approximately 3,800 forecast to travel by rail to and from the region. In the years to 2031, the share of containerised freight carried by rail is forecast to fall from approximately 22 per cent to 19 per cent.

## *5.3 Growth in contestable containerised freight*

This section of the report examines the growth in contestable freight in detail, by movement, commodity and location. In the years through 2031, total growth in contestable freight, at close to 24,000 TEUs, is forecast to make up close to 70 per cent of the total growth in total freight.

Figure 13 illustrates the decomposition of this forecast growth in contestable containerised freight, by commodity.

**Figure 13: Estimated growth in total contestable containerised freight**




Source: Bureau of Freight Statistics and PwC, 2015

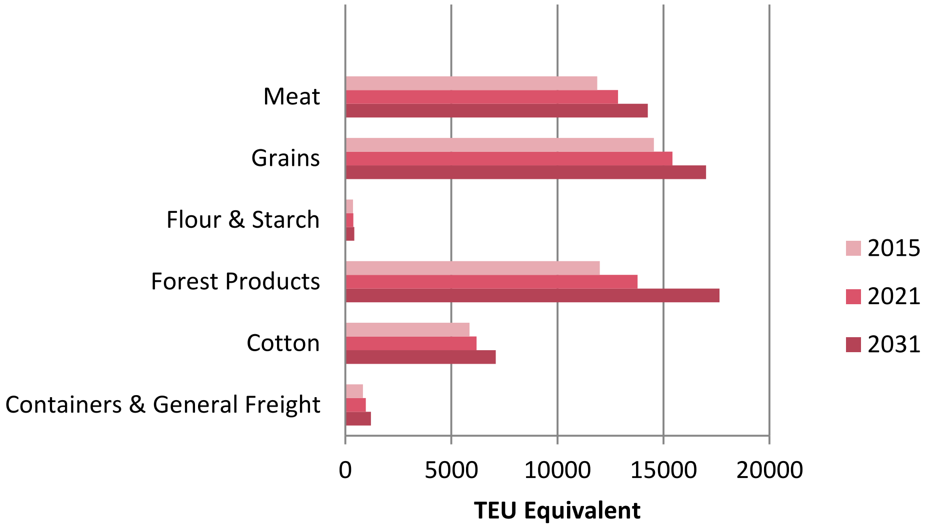
As Figure 13 shows, the four major contestable containerised commodity flows are outbound meat, grains and forestry products, and mining inbound. These are forecast to continue to hold large shares of total volumes into 2021 and through to 2031. Total contestable containerised freight is forecast to amount to 81,131 TEUs in 2031.

In contestable freight, the effects of lower than average growth in agricultural commodities traditionally carried by rail, discussed in Section 5.2, are also evident. Stronger growth in inbound contestable containerised freight compared to outbound results in the inbound/outbound split for contestable freight re-balancing by 2031, from 1:3.9 to 1:2.5. So, a driver of growth for contestable volumes in the future is growth in commodities that currently travel by road, and could travel by rail.

### *5.3.1 Outbound contestable containerised freight growth, by commodity*

Outbound contestable containerised freight underpins existing intermodal terminals in the region, with limited backhaul on rail observed. Figure 14 illustrates the growth in outbound contestable containerised freight, forecast through to 2031.

**Figure 14: Estimated growth in outbound contestable containerised freight (TEU & TEU Equivalent)**




Source: Bureau of Freight Statistics and PwC, 2015

As Figure 14 shows, outbound contestable containerised freight is comprised of a limited number of commodities. Of these, grains, meat and forestry products are the most substantial. Total outbound contestable containerised freight is forecast to amount to 57,643 TEUs by 2031.

Grains transport is forecast to account for close to 30 per cent of all contestable volumes in the region in 2031. This reflects the long history of grains production and transport by rail in the study area. Increasing containerisation of grains, a trend over the past five years, has diverted grains from bulk freight networks in the region to containerised flows into the Port of Botany.

Into the future, grains transport is anticipated to remain a key element of demand for containerised rail services, as the large existing volumes underpin infrastructure investment and service frequency.

Meat is forecast to hold a slightly smaller share, 25 per cent, of containerised contestable outbound freight in 2015 and travels by road. Unlike grains, meat does not have established channels to market via rail, but it does present an opportunity to achieve stronger mode share for rail.

Forestry products currently travel in custom vehicles on road, and so volumes are not currently containerised. Figure 14 illustrates that these flows could be as significant as major existing containerised commodities like grains and meat.

## *5.3.2 Growth in contestable outbound containerised freight, by LGA*

The location of volume growth is a key when considering mode shift, and where infrastructure may be needed to accommodate growth. Table 12 details contestable containerised outbound volumes for LGAs in the region, by commodity.

**Table 12: Estimated growth in contestable outbound containerised freight, by commodity and LGA**

| LGA | Commodity Name | 2015 | 2021 | 2031 |
|---|---|---|---|---|
| Gunnedah Shire | Containers & General Freight | 830 | 961 | 1,205 |
| | Flour & Starch | 360 | 382 | 421 |
| Moree Plains Shire | Cotton | 475 | 501 | 576 |
| Narrabri Shire | Grains | 14,552 | 15,427 | 17,008 |
| | Cotton | 5,383 | 5,681 | 6,524 |
| Tamworth Regional | Meat | 11,878 | 12,866 | 14,265 |
| | Forestry Products | 12,000 | 13,780 | 17,644 |
| Total | | 45,477 | 49,597 | 57,643 |

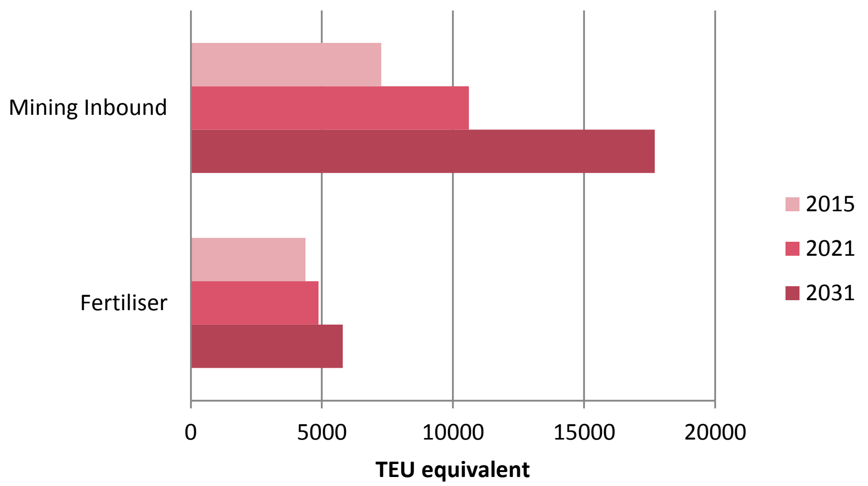
As Table 12 shows, through to 2031, contestable outbound containerised freight is forecast to grow by close to 12,200 TEUs.

Currently, contestable containerised freight volumes are concentrated in Narrabri and Tamworth, which account for close to 96 per cent of all contestable outbound containerised freight. These volumes support a number of intermodal terminals and rail services out of Narrabri, as detailed in 4.1.2. The clustering of containerised freight in these two LGAs is expected to remain stable through 2021 and 2031, with concentration decreasing only slightly.

## *5.3.3 Inbound contestable containerised freight growth, by commodity*

All inbound containerised volumes considered contestable currently travel by road, and so it is possible that additional scale is required to make rail a viable option. Figure 15 illustrates the forecast growth of these volumes through to 2031.

**Figure 15: Estimated growth in inbound contestable containerised freight (TEU and TEU equivalent)**




Source: Bureau of Freight Statistics and PwC, 2015

As Figure 15 shows, inbound contestable containerised freight is forecast to grow strongly, to reach an estimated 23,500 TEUs in 2031. PwC modelling indicates that containerised freight flows relating to mining have the potential to grow the strongest through to 2031 of all commodity groups. In the case of inbound mining, this translates to just over 75 per cent of inbound volumes by 2031. As the scale of this containerised freight task increases, rail may become more attractive for shippers.

### *5.3.4 Growth in contestable inbound containerised freight, by LGA*

Three LGAs estimated to handle increasing volumes of mining inbound in the forecast period: Gunnedah Shire, Liverpool Plains Shire and Narrabri Shire. Table 13 details this growth, alongside the more dispersed growth in fertiliser forecast in the years to 2031.

**Table 13: Estimated growth in contestable inbound containerised freight, by commodity and LGA**

| Local Government Area | Commodity | 2015 | 2021 | 2031 |
|---|---|---|---|---|
| Armidale Dumaresq | Fertiliser | 54 | 60 | 72 |
| Gunnedah Shire | Mining Inbound | 2,587 | 3,773 | 6,297 |
| | Fertiliser | 162 | 180 | 215 |
| Liverpool Plains Shire | Fertiliser | 3,564 | 3,968 | 4,722 |
| | Mining Inbound | 1,601 | 2,336 | 3,898 |
| Narrabri Shire | Mining Inbound | 3,079 | 4,492 | 7,497 |
| | Fertiliser | 540 | 601 | 715 |
| Tamworth Regional | Fertiliser | 54 | 60 | 72 |
| Total | | 11,641 | 15,471 | 23,488 |

Source: Bureau of Freight Statistics and PwC, 2015

Of the growth in inbound containerised freight detailed in Table 13, it is mining volumes that are the most significant. If these volumes eventuate, a limited number of mining project proponents would be expected to make mode choice decisions, potentially over medium and long term project lives. Growth in mining inbound could be significant enough to warrant investment in new or existing rail infrastructure.

Fertiliser by contrast has dispersed final markets across the study area. As Table 13 shows, this pattern is expected to be maintained in a business as usual case. Expanded use of rail in the region, or the development of up country storage sites, could increase the attractiveness of rail for shippers of fertiliser in years through to 2031. By 2031, inbound fertiliser volumes are forecast to reach close to 5,800 TEUs, a volume too small to support a stand-alone service (see Section 3.1 for a discussion of volume requirements for rail). Fertiliser may have potential as backhaul for shippers in the region.

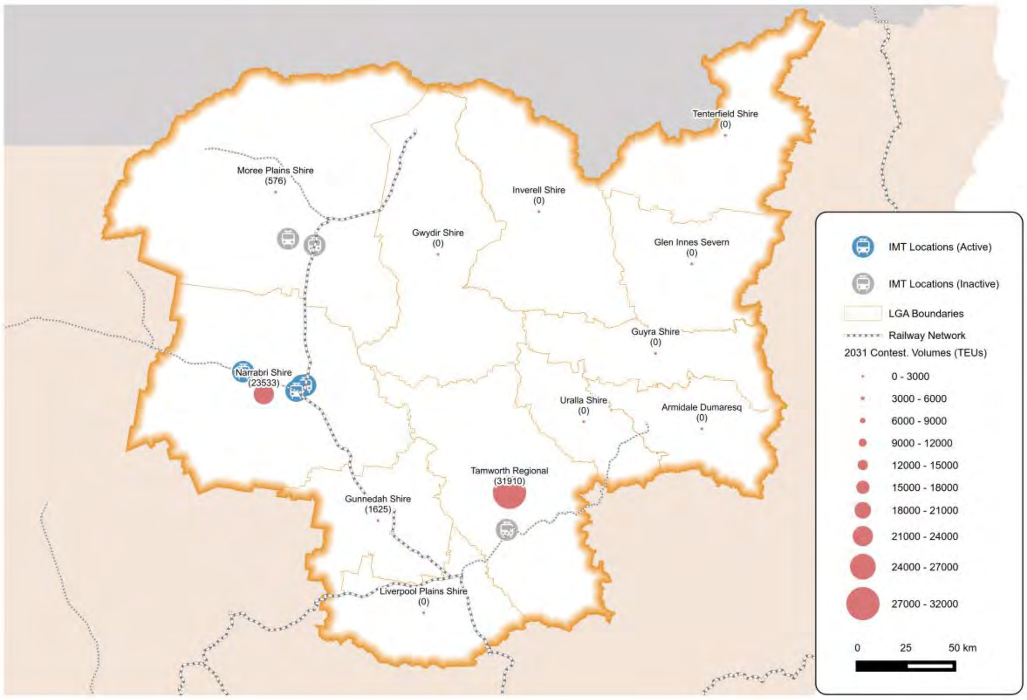
# 6 Potential infrastructure needs

This section assesses the potential viability of new terminals in the region in the future, given forecast growth in contestable containerised freight to 2031 established in Section 5.

## 6.1 Spatial distribution of forecast contestable freight growth

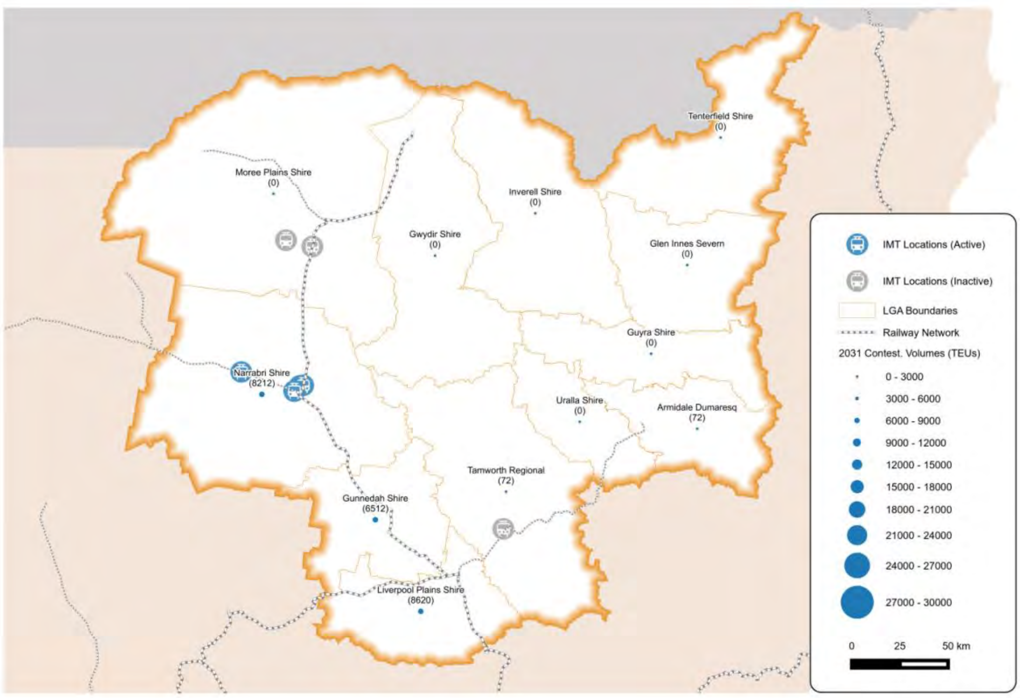
Figure 16 and Figure 17 represent spatially the forecast future contestable containerised inbound and outbound volumes established in Section 5.3.

**Figure 16: Forecast 2031 outbound containerised contestable freight**




Source: TfNSW and PwC, 2015

**Figure 17: Forecast 2031 inbound containerised contestable freight**




Source: TfNSW and PwC, 2015

Figure 16 and Figure 17 illustrate how dispersed potentially contestable containerised freight is in the region. Even with the growth forecast through to 2031, volumes are anticipated to be unlikely to underpin new rail infrastructure in most LGAs. As the contestability framework in Figure 7 and discussion of volumes in Section 3.1 outlined, stand-alone rail services are considered to require volume throughput of around 30,000 TEUs per annum for commercial viability. Whereas, volume demand of around 15,000 TEUs per annum is considered supportive of hubbing or shuttle rail services.

## 6.2 Potential new terminal sites

Figure 16 and Figure 17 highlight substantial contestable containerised demand in Narrabri Shire, and potentially sufficient containerised demand in Tamworth Regional.

There are currently no active intermodal terminals in Tamworth Regional, although there is an inactive terminal site. Section 6.3 considers the catchment area of Tamworth Regional and the forecast contestable containerised cargo volumes contained within. Section 6.3.1 outlines a proposed development at Tamworth.

There are currently three active closed access terminals at Narrabri, operated by grain bulk handling companies. Total contestable containerised demand at Narrabri is forecast to be just over 30,000 TEU equivalents in 2031. It is expected that existing capacity at Narrabri will be sufficient to absorb additional contestable volumes, although it is possible that growth in freight volumes will attract commercial interest in the area. New entrants are considered likely to cannibalise the market share of existing participants. While competition between open access terminals is likely to benefit shippers, it may not result in net additions to the number of terminals active in the area, as the more cost competitive terminals could replace rather than add to infrastructure in the region. For the purpose of considering net new infrastructure needs in the region, Narrabri has not been considered.

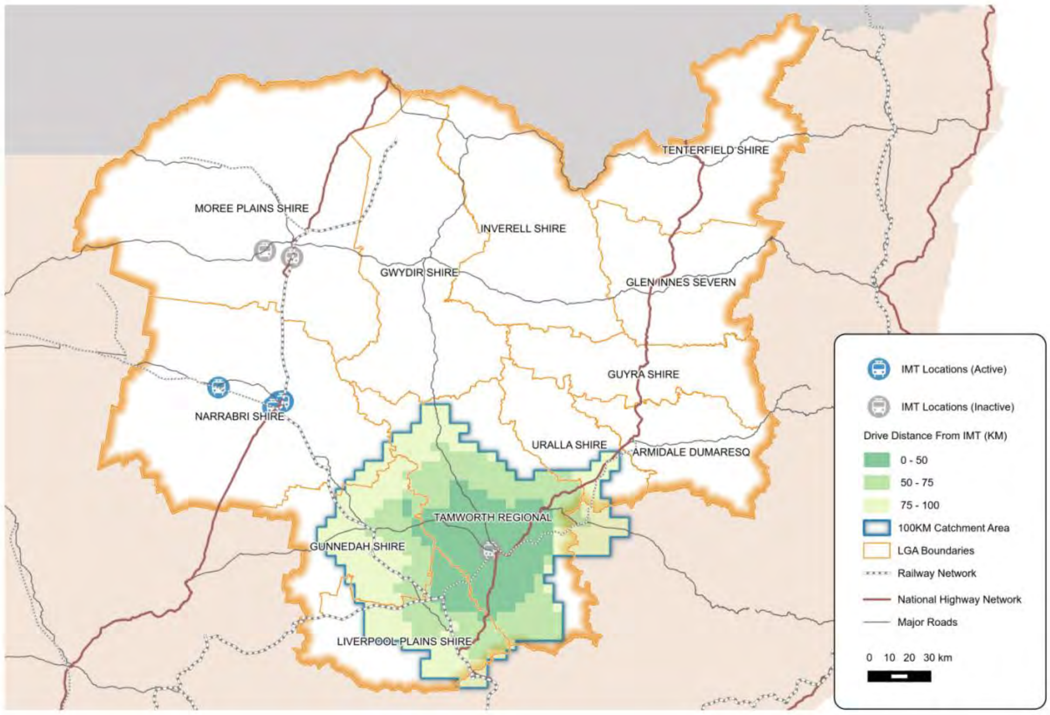
### Catchment areas and transport cost to terminal

The cost of pick-up and delivery to the terminal is also a key factor in whether a shipper will choose to use rail. Generally, regional intermodal terminals have a service catchment of approximately 100 km. When a shipper has to move their goods via road for more than 100 km the cost effectiveness of rail is eroded and it is most probable that the shipper will continue to use road based transport to the destination.

Therefore, if a shipper has to transport their goods greater than 100km by road to reach the nearest intermodal terminal it is assumed the product will continue using road to reach its destination.

Figure 18 illustrates the 100 km road based catchment area around Tamworth. The catchment area has been mapped based on access via the existing road network.

**Figure 18: Tamworth catchment area (100 km by road)**




Source: TfNSW and PwC, 2015

## *6.3 Tamworth*

As Figure 18 illustrates, the practical catchment area for Tamworth extends into Gunnedah Shire to the east, the borders of Tamworth Regional to the north and west, Uralla shire to the east and Liverpool Plains Shire to the south.

Taking 100km as a limit, the catchment area is estimated to encompass 11,700 outbound contestable containerised TEUs in 2015 (containerised and general freight, flour and starch forestry products, and meat), 23,700 including forestry products and 9,200 inbound (mining inbound, fertiliser).

The LGA is characterised by:

- strong connections to existing transport road networks, such as the New England Highway, although access into Tamworth from the north is constrained by HML bridges

- connections to existing transport rail networks, with connection through the regional network to the ARTC National Railway at Werris Creek

- existing, albeit, inactive terminal infrastructure.

As a caveat, forecast future inbound contestable containerised TEU volumes are dominated by mining inbound. These volumes are a forecast only, as the true contestability of mining inputs required in the region will depend on the characteristics and locations of projects that proceed in the region.

### *6.3.1 Proposed development in Tamworth*

Figure 19 illustrates likely sites within Tamworth for development of terminal infrastructure, based on the location of existing assets and patterns of land use.

**Figure 19: existing rail infrastructure in Tamworth**


Source: PwC

As Figure 19 shows, there are two likely sites for development in Tamworth. These are the former Pacific National intermodal terminal site at West Tamworth station, and the rail spur extending into the Glen Artney industrial site. Both sites are well connected to the road network in the catchment area.

Parties in Tamworth are working with council and TfNSW to progress a proposal to develop terminal infrastructure in Tamworth and run rail services to the Port of Botany.

Stakeholder consultations have indicated that the project is characterised by:

- a daily rail service to the Port of Botany of 1.2 kilometres in length

- demand from forestry product transport, to fill the majority of capacity, sufficient to underpin a weekly service and make up a 900 metre train

- demand from food manufacturers and processors in the catchment area, to fill remaining capacity
- flexibility in fee structures from the rail operator, with services to be provided on a fee for transport basis, not a take or pay arrangement with shippers
- lease of locomotives and wagons to be used in the service by the rail operator from a third party
- developing existing sites in Tamworth to support the new service.

At a high level, the project presents the following advantages for stakeholders in the catchment area:

- an alternative path to market for shippers in the catchment
- investment in infrastructure in Tamworth
- likely future employment in the catchment area to support the service.

At a high level, the project delivers only a marginal cost advantage compared to existing rail services. This leaves the project open to the following vulnerabilities which may affect viability:

- dependence on forestry volumes, which can be highly variable
- dependence on support from additional shippers in the catchment area to fill services to capacity
- dependence on current ease of access to locomotives and favourable terms from owners
    - the market for locomotives and wagons is currently oversupplied, so corrections in supply or increases in demand would likely increase the costs of running the service
- suitability of loading area at the existing sites and available shunting area for trains of 1.2 kilometres in length.

As noted in Table 9, Pacific National owns an intermodal terminal in Tamworth that is non-operational at present. If sustainable demand for an intermodal terminal can be demonstrated by a service proponent, it may be worth investigating the potential to reactivate this terminal (potentially under Council's ownership) as opposed to developing a greenfield site. While there are likely to be some operational issues with the amount of loading interface at the terminal and the need for shunting, the key advantages of a brownfield site are:

- avoided capex for a greenfield site, although this would be offset by any acquisition or upgrade costs at the brownfield site
- avoidance of two non-operational terminals in the event that rail demand is not sustainable in the long term.

# 7 Inhibiting factors for rail adoption

This section identifies factors that inhibit the use of rail freight in the region. Stakeholder consultations revealed that many shippers avoid rail because of negative perceptions of service reliability, frequency and cost. This section examines inhibiting factors as they relate to supply chains, above rail services and below rail capacity, to identify where and how these perceptions act as barriers to the use of rail freight.

The planned developments for the region's freight rail networks, discussed in Section 4.1.3, are anticipated to address some of these concerns when implemented.

## 7.1 Supply chain

As discussed in Section 2, rail is currently used to transport export commodities to port. Exporters face a number of challenges when integrating rail into their supply chains, which apply in most cases equally to importers.

### Container flows repositioning/demurrage

To containerise freight, shippers need access to shipping containers. Shipping containers are typically hired from shipping lines, on terms as short as seven days, although larger shippers may be able to secure terms of 10 to 20 days. If the shipping container is not re-positioned, or de-hired, to another user in the supply chain within the lease timeframe, the shipper is then liable for demurrage fees.

Limited opportunities to reposition up country mean that seven days is a tight timeline for many shippers. For example, an exporter would need to transport a potentially empty container to the point of origin, pack, and then return the container to port within seven days. With a rail cycle time of up to 48-72 hours and low service frequency, demurrage fees can be a considerable expense for shippers.

### Ship receival windows

With multiple freight and passenger services running on the region's rail networks, freight rail paths are typically confirmed well in advance. The fixed nature of rail timetables is not able to cater well to variability in ship arrival times, which are confirmed close to the time of ship arrival. When shippers miss a receival window, it increases their costs considerably, as they then need to pay for transport and storage of their cargo at port.

The extent that ship receival windows affected the decisions of shippers varied with the size of the cargo. As a general principle, smaller shippers experienced less flexible terms with shipping lines, and so were more exposed when they did miss a shipment.

### Infrastructure at Botany

Stakeholders consulted highlighted that infrastructure at port, rather than infrastructure in the region, was a barrier to the use of rail.

The ease of access to the port via road, with a slot booking system in place, was compared unfavourably with rail. The need to transit through intermodal terminals, and to break up long trains for handling at Port, were identified as additional steps in the supply chain for rail that increase cost and complexity. The lack of choice in stevedores, and a perception of a lack of productivity improvement in stevedoring services, where also identified as inhibiting factors.

Additionally, importers identified current customs and quarantine procedures as inhibiting factors. Organic commodities travelling west of the Great Dividing Range require clearance from customs. The cost of clearing individual TEUs was compared unfavourably to de-stuffing, clearing larger volumes and re-packaging at port. This second approach then favours the use of road freight, as additional movements back to intermodal terminals then make rail freight a more costly choice. Some stakeholders had sought to address this barrier by working with customs at port to develop special working arrangements.

## 7.2 Above rail factors

Three main factors in above rail services were identified through consultations.

### Take or pay

Take or pay contracts commit a shipper to purchasing a certain amount of capacity on a service, which the shipper will then pay for whether they use it or not. Take or pay structures allow rail providers to manage their demand risk and high capital costs. Shippers of variable or seasonal freight struggle with the lack of flexibility in the structure, which compares unfavourably to road freight.

As discussed in Section 3.1, smaller shippers may not have the volume to enter into take or pay arrangements. In that case, access to rail comes through freight forwarders, or terminal operators who are prepared to consolidate small loads with their other volumes.

### Cycle time

The amount of time a train takes to travel from origin to destination and back again is known as cycle time. It is a large factor in how well the services will align with the supply chain for a commodity. Cycle time has implications for container re-positioning and reliability, especially in terms of meeting ship receival windows. The quality of the track and congestion on the line influence cycle times, as well as the distance from port.

### Pathing

Pathing refers to the ability of trains to access routes to their destinations. In terms of the region, competition with coal trains for access to routes heading east to the Port of Newcastle was identified as a barrier to using rail.

Stakeholders also highlighted the challenges in traversing the congested Metropolitan Sydney passenger and freight network to port. The route into port is slowed by a lack of capacity for freight on the shared rail network. This is pronounced during peak periods for passenger rail, which effectively prohibits the movement of freight during these times, as passenger rail services have priority use of the network which is enshrined in legislation.

Capacity constraints can affect a service as it enters into Sydney, and again at points like the Enfield freight precinct, increasing cycle time.

## 7.3 Below rail factors

Below rail factors influence the productivity, and therefore cost, of rail services to shippers.

### Track possessions

Track possessions occur when a part of a network is closed for maintenance, repair of upgrades. Necessarily, possessions disrupt scheduled services, which effects reliability. Possessions are more disruptive when they arise through an emergency or on short notice. It is also possible that the flow of information between below rail operators, above rail operators and shippers is not smooth, especially when the possession effects, but does not occur in, an area. Major shippers observed a lack of coordination between below rail operators as to the timing of possessions, which limited their ability to re-route.

### Axle weight limits

The condition of the track on some routes limits the amount of freight that can be safely carried, or affects the speed at which a train can travel. Both constraints limit the productivity of rail services.

# 8 Economic benefits of rail

This section of the report provides a high level discussion of the potential economic benefits and dis-benefits from potential new IMTs in the study area. In a standard cost-benefit analysis framework one would quantify the costs and benefits from a particular defined investment – in this case, it would relate to a specific investment into an IMT. However, the context of this study was not of a single investment, but to broadly investigate the economic benefits of several potential new IMTs for the region. As a result, in pursuing that objective and given the limited information, a broader high level and qualitative assessment of the benefits and dis-benefits of investment into IMTs had been undertaken.

This assessment is not designed to quantify the costs and benefits of an investment into a specific IMT. Rather, it details potential benefits and dis-benefits of IMTs, which could then be applicable to the specific IMT. When individual projects are proposed, the standard cost-benefit analysis framework would then be a useful tool to determine the net benefits of investment.

## 8.1 Assessment framework

The assessment approach is to analyse the first and second order economic benefits and dis-benefits of the identified potential new IMTs in the study area, and also any relevant sustainability matters. This approach provides a framework to consider both the economic and sustainability effects of potential new IMTs.

This high level qualitative assessment has been primarily guided by the Transport for NSWs guidelines for the economic appraisal of transport investments (the Guidelines).[8] The following reference material has also been used:

- road and rail freight: competitors or complements, by BITRE[9]
- freight transportation – improvements and the economy, by US Department of Transportation [10]
- the value of Rail Intermodal to the U.S Economy, by T.Brown and A.Hatch[11]
- regional intermodal terminals – indicators for sustainability by SD&D[12].

## 8.2 Benefits of potential new IMTs

Overall, from the qualitative analysis and within the scope of benefits identified and analysed, it is unclear that the potential new IMTs are likely to generate more benefits than

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8 Transport for NSW, *Principles and Guidelines for Economic appraisal of Transport Investment and Initiatives,* March 2013

9 Bureau of Infrastructure, Transport and Regional Economics, *Road and rail freight: competitors or complements?,* Information sheet 34

10 US Department of Transportation (federal highway administration), *Freight Transportation Improvements and the Economy,* June 2004

11 Thomas R Brown and Anthony B Hatch, *The value of Rail Intermodal to the U.S Economy,* 19 Sept 2002

12 SD&D, *Regional Intermodal Terminals - Indicators for Sustainability,* January 2004

dis-benefits. A summary of the assessment of first and second order benefits, and sustainability matters are found below, and are discussed in greater detail in turn:

- First order benefits – There are benefits from reductions to overall transport vehicle operating and capital costs and safety benefits, but these are offset by an increase in cargo handling costs. It is unclear whether there are positive reliability and time benefits;
- Second order benefits– A range of benefits will be generated, driven by a likely reorganisation of the freight supply chain driving greater cost efficiency and more efficient and productive use of existing land; and
- Sustainability benefits – Likely reduction to air pollution, noise and congestion. There is the potential for these to be offset by a reduction in heritage land.

### *8.2.1 First order benefits*

First order benefits represent the benefits derived from the immediate impact of new IMTs on economic behaviour. As discussed and shown earlier, there are two effects from the potential new IMTs:

- Firstly, current users of road transport may transfer their goods to rail transport. The potential volume shift would depend on the interaction between a new terminal and existing closed access terminals in the region.
- Secondly, a reduction in the truck travel distance from the production region to the nearest IMT.

Put alternatively, there is likely to be an overall reduction in the number of net tonne kilometres travelled by truck, offset by an increase in rail transport.

From these effects, a range of benefits as described in Table 14 has been identified.

**Table 14: High level qualitative assessment of first order benefits from potential new IMTs**

| Benefit | Comment |
|---|---|
| Vehicle operating and capital cost savings | There is likely to be an overall cost reduction driven by two factors. First, there is a substitution of trucks with trains. Given that research has shown that on average it costs less to transport a tonne kilometre by rail than by road, there is likely to be an overall cost reduction.[13] Second, the new IMTs are likely to be closer to production regions, and therefore there will be fewer tonne kilometres for trucks to travel to each IMT. |
| Safety benefits | Transport by rail has a lower probability of accidents. For each net tonne kilometre travelled, rail is a third less likely to cause either an injury or fatality. [14] This results in savings in relation to medical and vehicle repair costs. |

[13] Thomas R Brown and Anthony B Hatch, *The value of Rail Intermodal to the U.S Economy,* 19 Sept 2002

[14] Thomas R Brown and Anthony B Hatch, *The value of Rail Intermodal to the U.S Economy,* 19 Sept 2002

| Benefit | Comment |
|---|---|
| Transport reliability | There is likely to be a reliability dis-benefit caused by modal transfer because road transport is generally more reliable door to door than rail. [15] However, this may be more than offset from an increase in reliability because production areas are closer to the new IMTs than existing ones, reducing truck travel times and distances. |
| Time costs | There is likely to be a time dis-benefit as road transport takes less time door to door than rail.[16] Again, this may be more than offset from a reduction in travel time for production areas that are closer to the new IMTs than those in the existing network. |
| Handling costs | There is likely to be a dis-benefit regarding handling costs as cargoes that substitute from road to rail transport will need to be double-handled. |

Source: PwC analysis, Consultation

### *8.2.2 Second order benefits*

Second order benefits are distinguished from first order benefits in that they are benefits experienced further in time and are the result of the reorganisation of the industry. After some time, and under the new operating environment, the supply chain is likely to begin to re-organise itself, shift the way its capital is deployed, and optimise itself based on the new operating conditions.

If there is a substantial shift from road transport to rail, which implies greater volumes of cargo at receiving intermodal terminals, it is likely that the logistics supply chain will shift from dispersed distribution centres to large centralised distribution warehouses.

From this analysis, three potential second order benefits have been identified as shown in Table 15.

**Table 15: High level qualitative assessment of second order benefits from potential new IMTs**

| Benefit | Comment |
|---|---|
| Consolidation of warehousing facilities | Rural producers may be able to reorganise their supply chains and, through the consolidation of production and warehousing facilities, reduce their costs. For example, given that more cargo is being transported by rail, it may be feasible for a common user warehouse facility to handle warehousing services and therefore, through economies of scale, reduce the overall cost of warehousing. This may be offset by potential increases in transport costs from the new consolidated warehouse. |

15 Bureau of Infrastructure, Transport and Regional Economics, *Road and rail freight: competitors or complements?,* Information sheet 34

16 Bureau of Infrastructure, Transport and Regional Economics, *Road and rail freight: competitors or complements?,* Information sheet 34

| Benefit | Comment |
|---|---|
| Land use change | The relocation of IMTs, or the reorganisation of the transport supply chain, results in either increases to available land due to facility consolidation, or land being made available for greater productivity uses. The former occurs through the economies of scale of a larger warehouse/production facility, and the latter from relocating an IMT that uses valuable urban land to lower cost rural land. |
| Increase in demand for final goods | Due to lower supply chain costs, which are likely to lead to lower prices of goods, there is likely a subsequent increase in demand and therefore output of products. |

Source: PwC analysis, Consultation

### *8.2.3 Sustainability matters*

Sustainability matters relate to environmental issues due to potential new IMTs, either due to the construction of the IMT or its short term impact. Several of these matters have been identified, which are explained in further detail in Table 16.

**Table 16: High level qualitative assessment of sustainability matters from potential new IMTs**

| Benefit | Comment |
|---|---|
| Reduction in air pollution | There are likely to be benefits from a reduction in air pollution, driven by fewer tonne kilometres travelled by road, with some proportion substituted by rail. [17] |
| Reduction in noise | There are likely to be benefits from fewer net tonne kilometres travelled by road, reducing overall noise. In particular, there are fewer urban net tonne kilometres. [18] |
| Reduction in congestion | Given that there are fewer net tonne kilometres travelled by road, there are fewer trucks and therefore lower congestion. |
| Heritage land | There may be dis-benefits from potential reduction to heritage land. This depends on the extent to which heritage land is needed to develop the new IMTs. |

Source: PwC analysis, Consultation

It is noted that the construction of any new IMT is likely to cause a temporary increase in air pollution, noise and congestion.

[17] SD&D, *Regional Intermodal Terminals - Indicators for Sustainability,* January 2004

[18] SD&D, *Regional Intermodal Terminals - Indicators for Sustainability,* January 2004

# *Appendix A: Forecast containerised freight growth rates*

The growth rates used reflect the forecast growth in Gross Value Added (GVA) for production of each of the commodities travelling to and from the study area. The growth in containerised freight volumes generated is assumed to be commensurate to the growth in industry GVA.

Growth rates have been forecast for Northern NSW, for each year of the outlook through to 2031. Forecast volumes have been modelled for intervals in this period, namely, 2015, 2021 and 2031. The applicable compound annual growth rates (geometric average) for these three periods are presented in Table 17 and Table 18 below. As these tables show, over the longer term forecast growth rates taper, and tend towards average long term economic growth.

**Table 17: Forecast Growth Rates (annual), Northern NSW**

| Commodity | 2011-2015 | 2011-2021 | 2011-2031 |
|---|---|---|---|
| Consumer Goods | 2.48% | 2.01% | 1.95% |
| Containers & General Freight | 3.44% | 2.79% | 2.53% |
| Cotton | 1.81% | 1.52% | 1.30% |
| Fertiliser | 2.60% | 2.07% | 1.90% |
| Flour & Starch | 1.97% | 1.50% | 1.13% |
| Food Products | 2.12% | 1.78% | 1.65% |
| Forest Products | 3.12% | 2.59% | 2.55% |
| Fruit & Vegetables | 1.97% | 1.65% | 1.48% |
| Grains | 1.97% | 1.50% | 1.13% |
| Meat | 1.98% | 1.55% | 1.28% |
| Inbound Mining | 7.20% | 6.73% | 5.95% |
| Wine | 2.12% | 1.78% | 1.65% |
| Wool | 1.90% | 1.46% | 1.14% |

Source: PwC, 2015

# Appendix B: Stakeholders contacted

**Table 18: Stakeholders consulted**

| Stakeholder Group | Name | LGA |
|---|---|---|
| State Government | Department of Premier & Cabinet | n/a |
| Local Government | Inverell Shire Council | Inverell Shire |
| Local Government | Walcha Shire Council | Walcha Council |
| Namoi JOC | Gunnedah Shire Council | Gunnedah Shire |
| | Gwydir Shire Council | Gwydir Shire |
| | Moree Plains Council | Moree Plains Shire |
| | Narrabri Shire Council | Narrabri Shire |
| | Tamworth Regional Council | Tamworth Regional |
| | Uralla Shire Council | Uralla Shire |
| Freight Originators | Agriex Australia Pty Ltd | n/a |
| Freight Originators | Auscott Limited | Narrabri Shire |
| Freight Originators | Australia Milling Group | Narrabri Shire |
| Freight Originators | Broadbent Grain | Moree Plains Shire |
| Freight Originators | CBH Group | n/a |
| Freight Originators | Cotton Seed Distributors | Narrabri Shire |
| Freight Originators | Thomas Foods International | Tamworth Regional |
| Freight Originators | Viterra | Narrabri Shire |
| Shippers | Crawfords Freightlines | n/a |

Source: PwC, 2015

# Appendix C: Questionnaire for government agencies

***Government Agencies Consultation – Indicative questions***

1) *Government agency name*

2) *Contact person and title*

***Current situation***

1) *Confirmation of the current location of production, product, volume, destination, domestic or export and mode of transport for containerised cargoes*

| *Location of production* | *Product/ Commodity* | *Tonnage (TEU conversion)* | *Destinations for products* | *Domestic/ Export (%)* | *Current mode of transport* |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

2) *For your jurisdiction, can you indicate the uppermost vehicle access limits? (please add rows as required)*

| *Shipper* | *First Move (Farm)* | *Second Move (Gin, Mill Other)* | *Third Move (Terminal, Destination)* |
|---|---|---|---|
| | | | |

3) *Is the hierarchy of producers (high volume to low volume) likely to change in the future? If so why?*

4) *Are other commodities being considered for transportation that have yet to be captured? If so, what are their planned locations and forecast expectations?*

5) *What modes of transport are being considered for these new commodities?*

6) *What percentage reduction in rail costs do you think is required to shift from road to rail?*

7) *Are there current limitations on the use of existing IMT locations in the region?*

8) *Do you have plans or thoughts on desirable locations for future IMTs, why are they preferred?*

# *Appendix D: Questionnaire for shippers*

***Shippers Consultation – Indicative questions***

1) *Company name*

2) *Contact person and title*

***Current situation***

1) *Confirmation of the current location of production, product, volume, destination, domestic or export and mode of transport for containerised cargoes*

| ***Location of production*** | ***Product/ Commodit y*** | ***Tonnage (TEU conversion )*** | ***Destinations for products*** | ***Domestic/ Export (%)*** | ***Current mode of transport*** |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

2) *What is the main commodity supplied from your company? Do you think this will change in the future, if so why?*

3) *What proportion of commodities received or supplied by your company are currently non-containerised? How might this change in future?*

4) *What major routes do you use for rail or road? Who makes the logistical decision?*

5) *Are there alternatives to the routes described above (e.g due to bad weather, traffic, greater loads)?*

6) *What factors affect mode choice? Please fill in the following:*

| Factor | Importance from 1 to 6 (1 the most important) |
|---|---|
| Destination Market | |
| Travel time | |
| On time performance | |
| Other logistic costs | |
| Risk of loss or damage | |
| Geographic coverage | |
| Other (specify) | |

7) *What are the current costs per tonne of the transport option? Does the cost reduce with demand?*

8) *If known, what is the rail equivalent transport cost?*

9) *What percentage reduction in rail costs do you think is required to shift from road to rail? Is there a volume minimum needed for particular commodities?*

10) *Besides costs, are there any other barriers to shifting to rail?*

11) *All things being equal (such as costs, transport time, risk), would you prefer to use rail?*

12) *Are there new technologies to move road to rail that would be beneficial? Will this adjust to demand fluctuations?*

13) *What commodity currently transported by road could potentially be moved to rail with the right factors such as increases in demand and infrastructure changes?*

14) *Any other comments?*