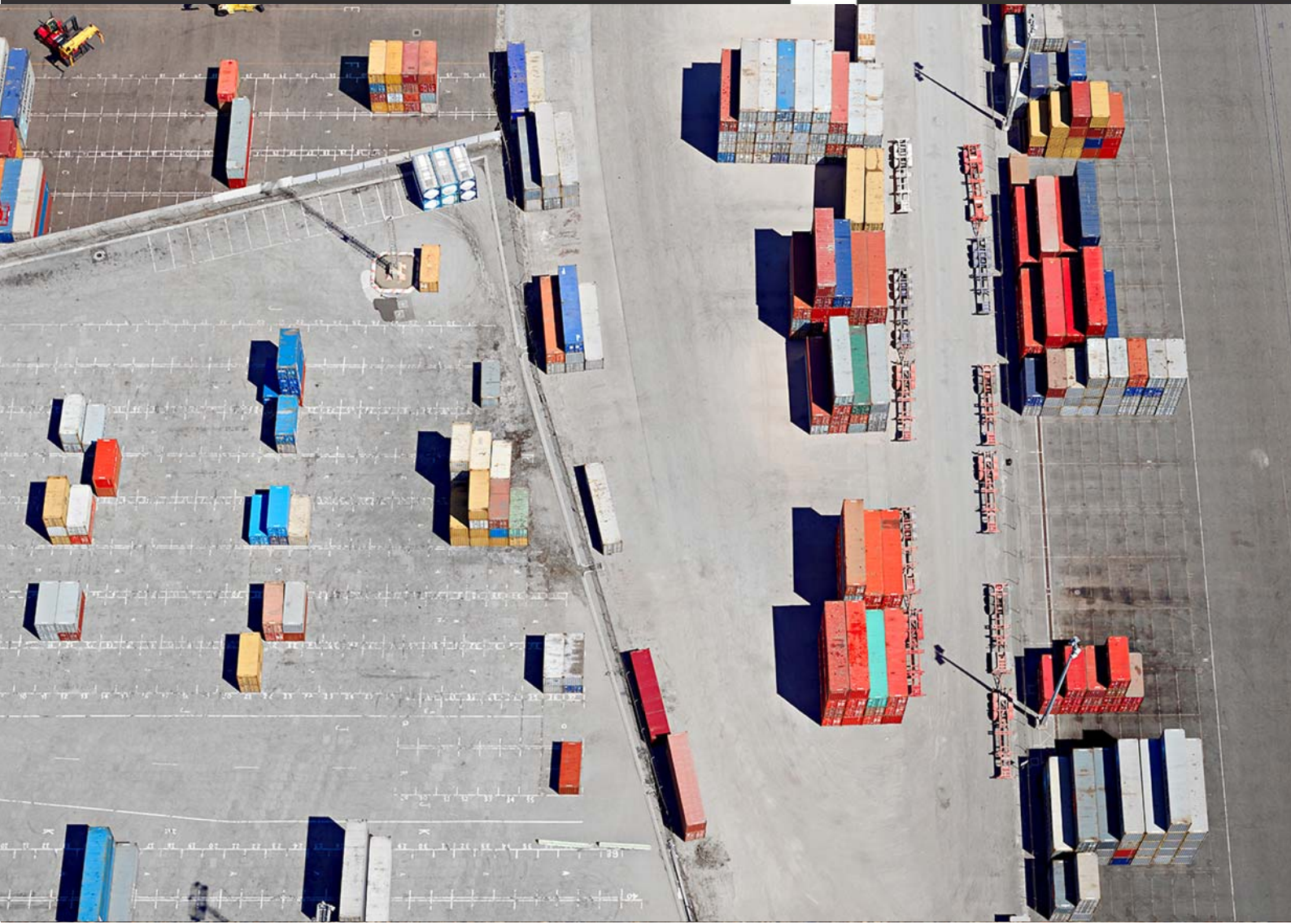
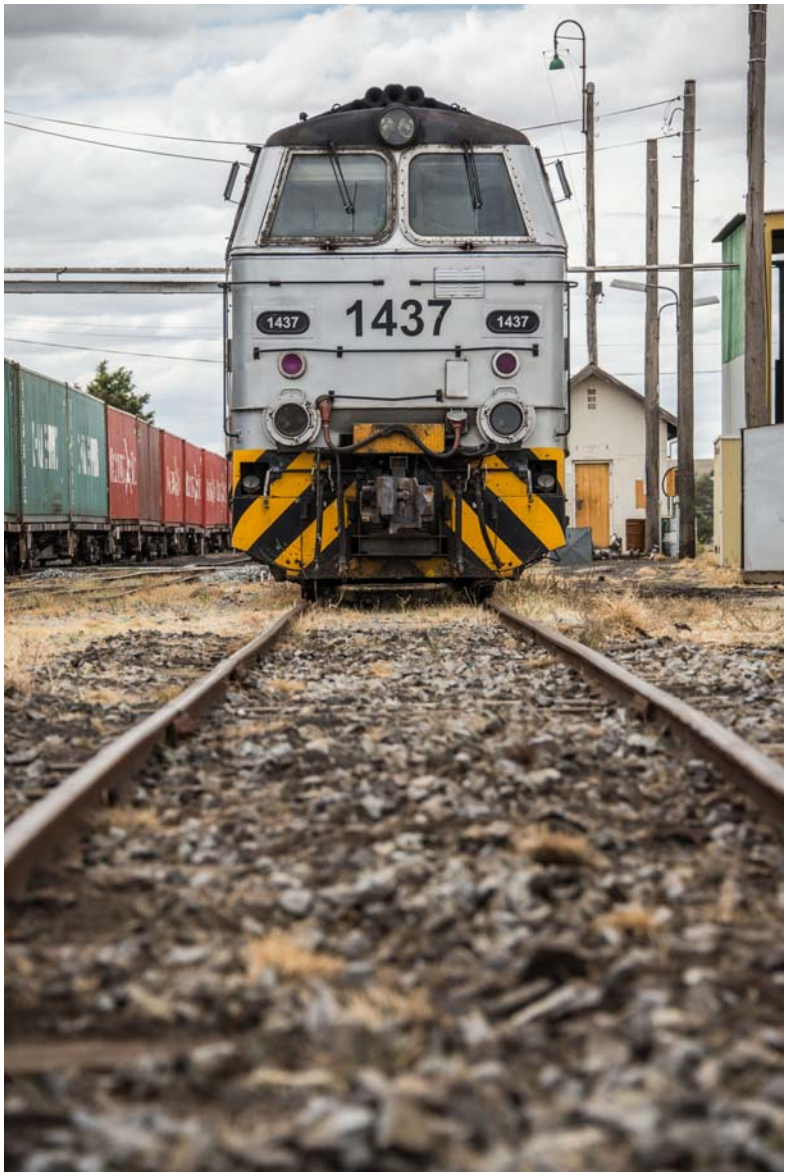
2015-2024 Sydney Metropolitan Freight Strategy

October 2015

ARTC





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1

Introduction

Context

On 5 September 2004 ARTC commenced a lease of the NSW Interstate and Hunter Valley rail network. At that time ARTC and the NSW Rail Corporation (now Sydney Trains), also signed a Deed of Agreement for the Metropolitan Freight Network (MFN) Lease and License.

In December 2008, ARTC commenced the first phase of the MFN lease, with the lease of the Port Botany Rail Yard. Subsequent leases for Enfield West to Sefton and Port Botany to Sefton Park Junction of the MFN were executed in July 2011 and August 2013 respectively.

The timing of the MFN leases generally coincided with major capital projects on or connected to the MFN, with the final take-up coinciding with the opening of the Southern Sydney Freight Line (SSFL), a dedicated freight track to separate freight and passenger services on the southern corridor into Sydney, which was constructed by ARTC and opened in January 2013.

ARTC's fundamental objective in the Sydney area is to facilitate the growth of rail freight in the short, medium and long term. It aims to achieve this by:

- providing the best possible operational environment,
- investing where it can commercially justify the investment,
- actively collaborating with its customers, and
- providing leadership within the rail industry in working with Government on policy initiatives that will help foster growth, including land-use planning and publicly funded infrastructure.

The primary purpose of this Strategy is to document and discuss the challenges, opportunities and the most effective solutions to achieve rail freight growth in Sydney so as to help provide direction both within the ARTC business, and for the supply chain participants.

To this end, this Strategy articulates ARTC's expectations of growth in volumes in the Sydney Metropolitan Area over the 2015-25 period, based on advice from customers, and identifies options for infrastructure that may need to be developed to maintain an efficient freight network.

While this Strategy considers all of the rail freight growth issues and opportunities in and through Sydney, cross-metro container shuttles represent the single biggest challenge and are a key focus of the document.

The Strategy also explores land use and future infrastructure to maximise the efficiency of the freight network in Sydney and to support the goal of maximising rail freight.

It is important to note that this Strategy represents a snapshot in time in the context of a constantly changing and evolving external environment, together with ongoing development of ideas and solutions to the challenges for rail freight in Sydney. As such it does not attempt to provide a comprehensive set of answers and recommendations. Rather, ARTC sees the document as providing a context for ongoing discussion and debate to ultimately reach an agreed way forward among key supply chain participants.

It is also important to note that much of the rail network within Sydney is controlled by Sydney Trains, the commuter passenger business of the NSW Government. While ARTC acknowledges the primary role of NSW with regard to freight services on its track, this Strategy aims to take an holistic view of rail freight in Sydney and as such makes comment around some of the issues associated with this broader network.

The Sydney Metropolitan Area

The Sydney Metropolitan rail network (see Figure 1-1) is an intensive and complex network of rail lines that each have their own unique set of characteristics, challenges and issues. The network can be described as follows:

- The Metropolitan Freight Network (MFN) is the core of the Sydney freight system. It extends from

1. While ARTC has taken a lease of a large proportion of the MFN, Sydney Trains retains the line from north of Chullora Junction to Lidcombe / North Strathfield.

2. The MFN is traditionally considered to include the line between Marrickville and Botany, but to allow greater granularity of analysis this part of the network is separately defined as the Botany line for this document.

Lidcombe / North Strathfield[1] in the north to Sefton Park Junction in the west and Marrickville in the south / east[2]. This network is double track and dedicated to freight (though it shares a corridor with passenger trains on the Bankstown line). The Chullora terminal, the new NSW Ports Enfield ILC and the Enfield marshalling yards sit on this network. This part of the network has a wide range of train types taking a number of different routes. However, the dominant flows are coal trains between the west and Illawarra, interstate intermodal trains between the south and north and import / export container trains between the north, west and south and the Botany line. This part of the network generally has ample capacity.

- The Botany line links from the MFN at Marrickville to the container port at Botany. The Cooks River terminal, which is used extensively as a hub for empty containers, also lies on this line. The line is used almost exclusively for import / export containers though aggregate trains run to a terminal at Cooks River. The line has reasonable capacity for the short to medium term.

- The northern line extends northwards from an interface with the MFN at North Strathfield, effectively to Broadmeadow in central Newcastle where it connects to the ARTC Hunter Valley network. This line is dominated by passenger services, particularly as far as Berowra. This corridor sees a diverse range of freight including intermodal, coal, import / export containers, grain and flour. The Australian and NSW Governments have jointly funded a project on this corridor to add significantly to the path capacity available for freight trains, which is described in more detail later in this document. With the completion of this project there will be a good number of paths

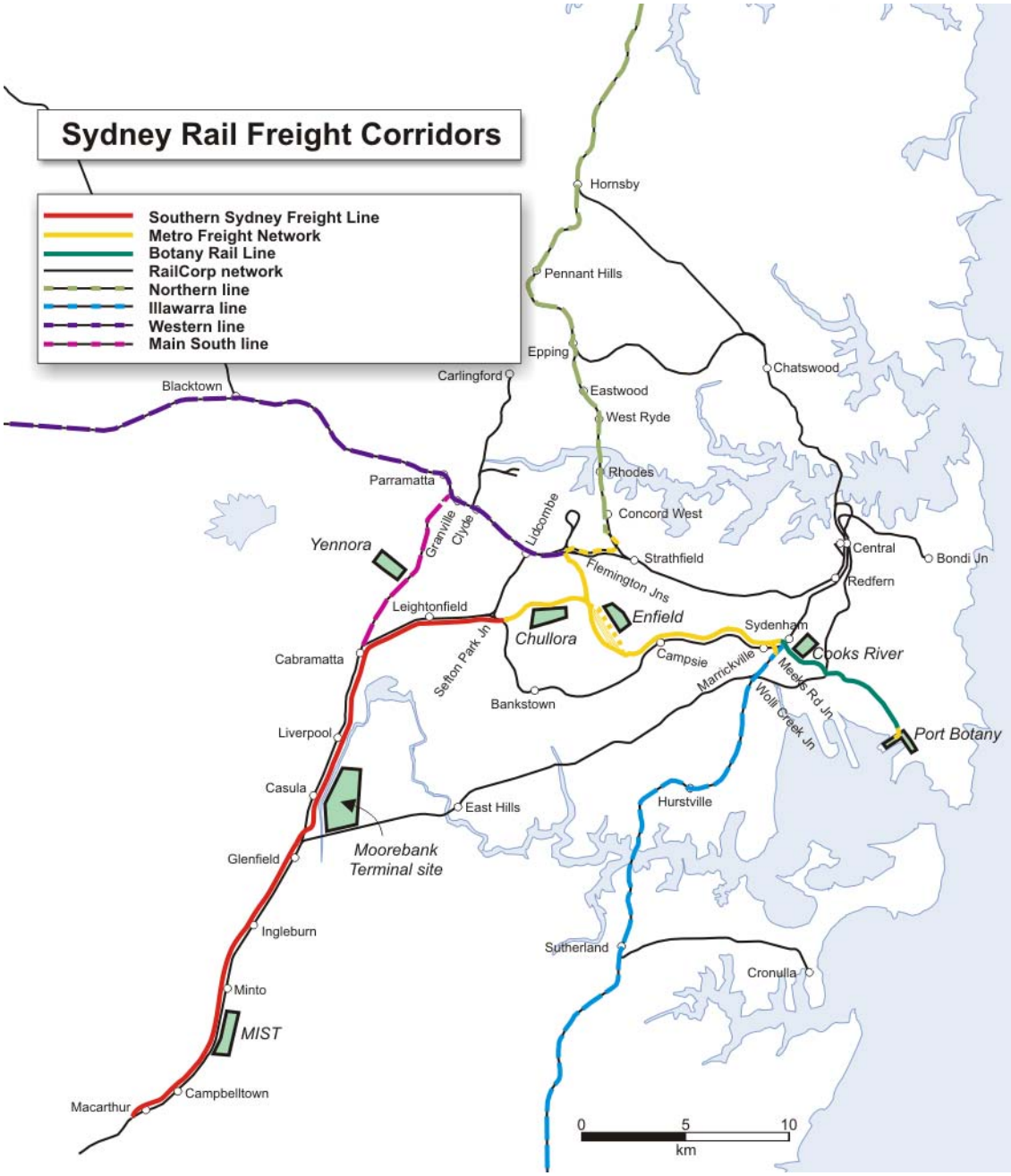


Figure 1-1: Sydney Metropolitan Rail Network

available for freight at times that should be market attractive. Specifically, the works will significantly reduce the impact of the peak period freight curfews.

- The western line extends westward from an interface with the MFN at Lidcombe effectively to the limit of electrified passenger services at Lithgow. The line beyond Lithgow is part of the Country Regional Network owned by the NSW Government. This line is also dominated by passenger services. Freight volumes are dominated by coal with a small amount of intermodal, grain and minerals. Passenger growth on the suburban part of this line will present major challenges for Government. This is likely to have flow-on impacts on both the capacity and flexibility of freight paths. While capacity is not currently a major issue, freight already suffers from limited flexibility of pathing due to the peak period freight curfews.

- The Southern Sydney Freight Line extends from an interface with the MFN at Sefton Park Junction to beyond Macarthur, which is the limit of the Sydney suburban network. At Macarthur it connects to ARTC's Main South line. The SSFL is a dedicated single track freight line and provides adequate capacity for current volumes while removing the constraints of shared operation with passenger services, particularly the peak period curfews. The current MIST facility, Leightonfield yard and proposed Moorebank intermodal terminal are on this corridor, though MIST does not connect to the SSFL. The major challenge for this corridor is the effect of the proposed Moorebank terminal on capacity.

- The Illawarra line is a shared passenger and freight line that extends down the south coast from an interface with the MFN at Marrickville (Meeks Road Junction). This line provides the connection to Port Kembla and also interfaces with ARTC's Unanderra – Moss Vale line that provides access between the Main South and Port Kembla. The Illawarra line is similar to the western line in that suburban passenger services already constrain flexibility for freight, and passenger growth will represent a major challenge for future capacity. The challenges of enhancing capacity on this line are such that there may be a case in the medium term for removing freight services (other than during the night) to provide adequate passenger capacity.

Southern Sydney Freight Line

ARTC completed a program of works in 2012 to improve the efficiency and cost-effectiveness of rail freight services along the North-South Rail Corridor between Melbourne, Sydney and Brisbane. A key element of this program was the Southern Sydney Freight Line. Previously, a major bottleneck in the rail freight network existed in southern Sydney, where freight trains were required to share existing rail lines with the Sydney metropolitan passenger services and there was a curfew during morning and afternoon peak periods where freight services were not permitted to run. As a result, freight services could not arrive or depart Sydney at the optimum times (6hrs per day).

To alleviate this bottleneck, ARTC constructed the Southern Sydney Freight Line, a dedicated freight line for a distance of 36 kilometres between Sefton Park Junction and Macarthur in southern Sydney. The SSFL provides a third track in the rail corridor specifically for freight services, allowing passenger and freight services to operate independently and makes an end-on-end connection to the MFN.

Port Botany Rail Link Stages 1, 2 and 3

ARTC developed a staged upgrading program for the MFN and Port Botany line to meet projected growth in demand for container transport by rail as a potential candidate for funding from the Nation Building Program 2009-2014. The funding proposal was successful and the works have proceeded as the Port Botany Rail Link (PBRL) project in two phases. A third phase has now been funded under the current Infrastructure Investment Programme.

Stage 1 works delivered major re-configuration and upgrade of the Port Botany Rail Yard delivering Arrival and Departure Roads at the interface between the rail network and the Stevedore port loading facilities, reducing congestion and increasing port capacity.

Stage 2 works included construction of new staging roads at Enfield Yard and introduced signalling into Botany Yard, along with signal control separation from Sydney Trains at a number of locations along the PBRL network to provide ARTC network control of the MFN.

Stage 3 works include a full track upgrade of the PBRL between Botany and Sefton Park Junction with re-sleepering, rerailing and formation reconditioning. This track upgrade will bring all of the PBRL track up to ARTC current standard. A Capacity Study looking at potential future enhancements to the MFN, Botany line and Southern Sydney Freight Line (SSFL) to accommodate increased freight traffic to Port Botany to 2030 including the future Moorebank Intermodal also forms part of this stage with the results of this analysis reflected in this Strategy.

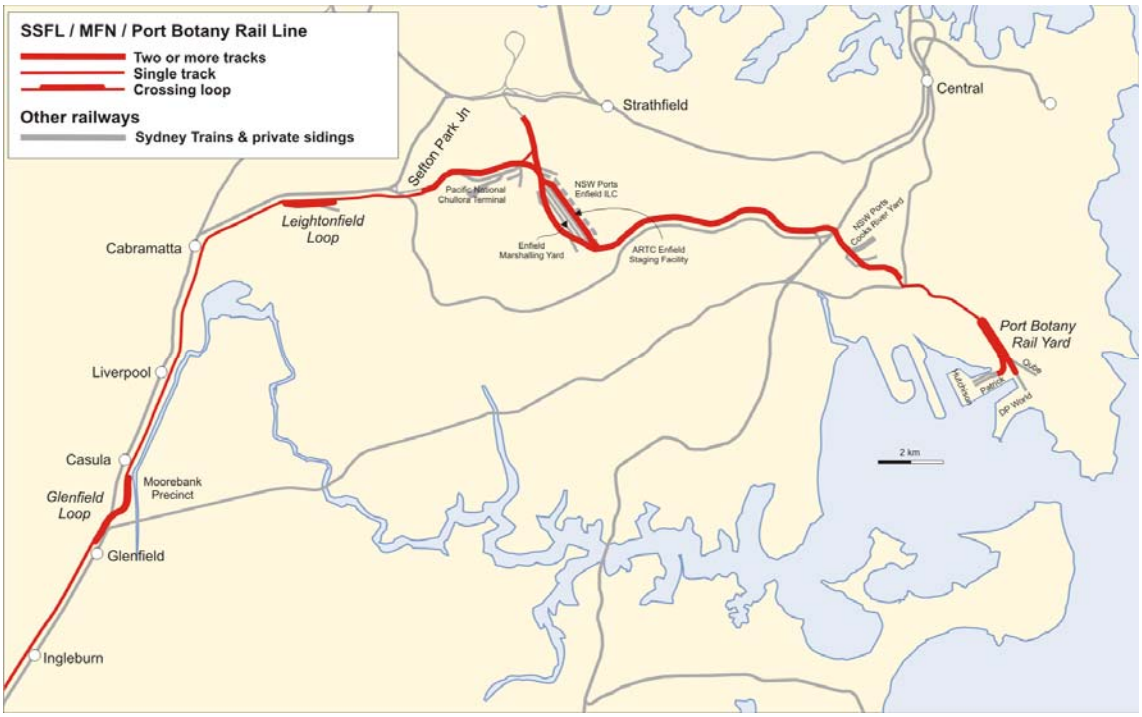


Figure 1-2: SSFL and MFN

Port Botany

Port Botany is owned by NSW Ports under a 99 year lease from the NSW Government and is the major container port in NSW and second largest in Australia. Port operations are undertaken by three stevedores.

The Port Botany Expansion Project entailed the design, construction, procurement and eventual awarding to Hutchison Port Holdings of the 3rd Stevedore contract. This part of the Project has now been completed and Hutchinson commenced operations from the 3rd Terminal in 2014.

In conjunction with the award of the 3rd stevedore contract an additional area, known as the knuckle, was leased to Patrick stevedores, allowing the expansion of its terminal.

NSW Ports is the long-term custodian of the major port assets and believes that increased usage of rail is an important factor in achieving efficient port operations that can cater for forecast trade demands. Increased use of rail will reduce the growth in port-related truck movements, managing the volume of trucks on the shared road network.

NSW Ports has begun investigating future requirements at the Port Botany Rail Terminal to receive a greater number of train movements. Investigations include the future construction of multiple Rail Mounted Gantries (RMG's).

Port Kembla

Port Kembla is also owned by NSW Ports under a 99 year lease. Port Kembla is essentially a secondary port for Sydney and specialises in non-containerised freight including motor vehicles, coal and grain as well as servicing the BlueScope steel plant.

The Port Kembla Inner Harbour Project completed in 2008 transformed it from a port that mainly handled bulk cargoes such as coal, iron ore and grain to the vehicle importing hub for NSW. Improvements to facilities in the Inner Harbour have also allowed it to diversify into niche container and break-bulk cargoes.

NSW Ports is planning for the development of the Outer Harbour at Port Kembla, which will provide additional land and berthing facilities to cater for future trade growth. While the recent Inner Harbour development provides facilities to cater for the growth of existing trades, this new development has the potential to address the needs of new industry.

The Outer Harbour development has been designed with an intention that it may in future handle large volumes of containers. This Strategy has assumed though that Sydney will be able to accommodate all of the container growth within the planning horizon.

Port of Newcastle

The Port of Newcastle has also recently been privatised by way of a 99 year lease. Newcastle is

dominated by coal exports with small operations in grain, ores and other bulk cargoes.

The Mayfield Development Site is a 90 hectare parcel of port-side land, located within the 152 hectare Mayfield Precinct. Part of the former BHP Steelworks site, the Mayfield Development Site has been extensively remediated and now represents the largest vacant port land site on the eastern seaboard of Australia.

Together with the direct water frontage and potential for deep water berthing, it represents a significant opportunity for growth within the Port of Newcastle.

Port of Newcastle is seeking to develop the Mayfield Development Site for port related activities in order to accommodate a diverse range of cargo handling infrastructure and the promotion of trade.

There have been proposals over a long period of time for Newcastle to develop as a secondary container port for Sydney, potentially using the Mayfield site. The challenge is the distance containers would need to travel to and from Sydney. Proponents generally argue that transfer between Sydney and Newcastle would be by rail. However such trains would need to find capacity on the already heavily used Sydney – Newcastle line and it would require further investment in Sydney intermodal terminals.

This Strategy has assumed that Port of Newcastle will not be a significant competitor to Port Botany within the timeframe of the Strategy. To the extent that it does compete, which is more likely to be in the export container market, it would reduce demand at Port Botany allowing potential capacity enhancements to be deferred.

Inland Rail

The Australian Government has committed $300 m in the forward estimates for construction of the Inland Rail line linking Melbourne and Brisbane and made an initial allocation of $33 m to ARTC to progress planning and development of the project. The project will complete a new rail connection between Melbourne and Brisbane, via Wagga, Parkes, Moree and Toowoomba.

The new line will be a faster, more efficient route that bypasses the Sydney rail network entirely and will enable the use of double stacked trains along its entire length. Inland Rail would see the diversion of most, or all, Melbourne – Brisbane, Brisbane – Perth and Brisbane – Adelaide freight from the coastal route via Sydney, significantly altering the pattern of freight operations through Sydney.

ARTC has been tasked with developing a ten year program to deliver the project, under the guidance of the Inland Rail Implementation Group.

Capacity Analysis

This Strategy looks in detail at capacity on ARTC's network within Sydney. ARTC uses a set of principles for the practical utilisation of track to analyse capacity on its network. Capacity is calculated using headways. On single track the headway is defined as the time the front of a train enters a section between loops until the time that the rear of the train clears the turnout for the loop at the other end of the section. The longest headway between two loops on a section of track defines the capacity limit for that section. This is then adjusted to reflect practical rather than theoretical capacity using an adjustment factor of 65%. On double-track, the headways are calculated on the basis of a 'double-green' principle. Under this principle both the next signal and the one after are at green, meaning that the driver will never see a yellow signal. This ensures that drivers should always be able to drive at full line speed.

On single track there is also a transaction time applied to recognise the time incurred by trains executing a cross, specifically signal clearance time, driver reaction time, acceleration and delays to the through train when it approaches the loop before the train taking the loop has fully cleared the mainline. Simultaneous entry loops and passing lanes reduce this transaction time by reducing both the probability and time delay from both trains arriving at the loop at around the same time. This Strategy has adopted a transaction time of 5 minutes for a standard crossing loop, 4 minutes where a simultaneous entry loop is involved and 3 minutes where a passing lane or the start of double track is involved.

Saleable paths are calculated as a percentage of practical paths. The adjustment needs to cover any maintenance losses, train cancellations and natural variation in volumes.

For the purposes of this Strategy, an adjustment of 75% is made to get from practical paths to saleable paths. Hence, the number of saleable paths is effectively 49% of theoretical capacity for single track.

On the Sydney Trains network, where operations are dominated by passenger services, different considerations determine the ability to provide freight paths. In essence, it is necessary to be able to identify a path whereby a freight service can reasonably fit between passenger paths recognising the passenger paths tend to operate at different speeds to freight and will generally operate on a repeating 'clockface' pattern, thereby limiting flexibility for freight. To meet passenger reliability requirements it is also necessary to provide a significant number of surplus paths for freight to allow freight trains to access the network if they are running late. ARTC does not undertake analysis of the Sydney Trains network and does not seek to provide a view on its capacity, other than on the northern line where specific freight path capacity has been contracted with ARTC.

How this Strategy has been Developed

ARTC is in a unique position of being the one organisation that has significant operational involvement in import / export container logistics while not having conflicting commercial interests. Specifically, ARTC's only interest is in maximising rail volumes, not maximising port volumes or competing with other like service providers. Within this context ARTC considers that it can play a useful role in gaining alignment between industry participants, notwithstanding that it is one step removed from the market itself.

ARTC's aim is to use this document as a mechanism to work toward gaining such alignment. The focus is on ensuring that behaviours and practices are effectively matched to current and future infrastructure.

As such, this document will largely spell out ARTC's understanding of some of the current challenges and opportunities and discuss options for how these might be progressed, rather than advocating specific solutions.

This Strategy has adopted a structure as follows.

Firstly it considers the volume growth implied by the aspirational volumes of known cross metro shuttle projects together with growth in other background train numbers through Sydney.

It then uses these growth forecasts to assess what the capacity constraints may be on the rail network as a result of that growth including constraints within terminals, in particular the stevedores.

In this context it also looks at options to achieve the best possible performance from the rail infrastructure both now and with enhancement.

This document also aims to take a longer term view, recognising that rail projects can have a very long lead time and that both the rail industry and Government could arguably have performed better in putting in place long term strategies to achieve efficient freight movement. The Moorebank terminal for instance was first proposed in 2003 while the SSFL, completed in 2013, was first proposed in 1985. Land-use planning, which has equally long time horizons, also needs to be clearly assessed and Governments need to be made aware of the long term consequences for freight of their land-use planning decisions.

2

Sydney Intermodal Terminals

This section provides a summary of the current and planned intermodal terminal facilities in Sydney.

Yennora Intermodal Terminal

Yennora Intermodal Terminal is located in the Western suburbs between Granville and Liverpool. Total storage capacity for these facilities combined is in excess of 5,000 full and 9,000 empty containers. Yennora has two rail sidings 530m long. Yennora is on the main southern line, and rail services to Port Botany are restricted to outside the morning and afternoon peak passenger periods.

Yennora is primarily oriented toward the port market, though Aurizon also uses Yennora as its Sydney interstate terminal. The absence of any yard capacity however, means that Aurizon attaches / detaches its Melbourne – Brisbane loading at Glenlee (16 km away), necessitating the use of shuttle trains.

This terminal was originally developed as the central wool warehouse facility for NSW but has been gradually redeveloped as an integrated multi-user intermodal terminal / warehouse facility and is owned by Stockland. Qube is the operator of the facility.

Enfield Intermodal Logistics Centre

NSW Ports' Enfield Intermodal Logistics Centre (ILC) is a 60 hectare site located in an industrial/commercial area connected by the MFN to Port Botany. The development consists of:

- A 14.4 ha intermodal terminal approved for 300,000 TEU to be transported by rail to/from the site. These containers will be moved on and off trains and trucks utilising two 920 metre rail sidings and the adjacent through line;
- 175,000 m^2 of land for warehousing and transport logistics operations within the ILC ;
- A light industrial and commercial area, comprising up to 40,000 square metres.
- Two road access points linking to Roberts Road and the Hume Highway through industrial areas;
- Empty container storage areas; and
- On-site traffic management and queuing.

Figure 2-1: Yennora Intermodal Terminal

Figure 2-2 Enfield Intermodal Logistics Centre

Construction works for the intermodal terminal are expected to be complete in 2015.

Chullora Intermodal Terminal

Pacific National's Chullora facility is the main interstate terminal. This terminal was acquired as part of the purchase of National Rail. While it is geographically close to the centre of the city, the drift of freight intensive activity to the west and south means that it is effectively to the east of the major industrial concentrations. Its loading roads are around 650 metres.

Pacific National commissioned two new rail mounted gantries earlier in 2015, increasing the capacity of the terminal from 300,000 to 600,000 teu. At the same time they announced an intention to also use the terminal for import / export containers.

Located immediately to the north of the terminal is the Sydney Operations Yard. This facility can receive 1500 metre trains for break-up and shunting into the terminal itself. There are some options for expansion of the terminal. However, these are complicated due to the presence of endangered species around the site and interaction with the RailCorp facilities to the east.

Macarthur Intermodal Shipping Terminal (MIST)

The Macarthur Intermodal Shipping Terminal (MIST) site located at Minto is a 16 hectare intermodal facility which has an annual throughput capacity of up to 200,000 TEUs.

In 2012 Qube acquired MIST from the Independent Transport Group (ITG). As part of the transaction Qube acquired the freehold property at Minto with warehousing and its rail terminal. Qube also acquired locomotives and wagons from ITG.

The current MIST - Botany shuttle services (approx. 4 per day) currently operate on the Sydney Trains network between Minto and the connection to the MFN at Sefton Park Junction as there is no connection between the SSFL and the Sydney Trains network.

Cooks River Intermodal Terminal

The Cooks River Rail Depot and Empty Container Park (ECP), at St Peters receives empty containers from importers to be cleaned, stored and repaired before being sent for export loading or empty export.

Figure 2-3: Chullora Intermodal Terminal

During 2012 work was undertaken to upgrade and expand the Cooks River facility. This has included the extension of existing rail sidings to allow for trains of 600 meters in length. The maximum site capacity has now increased from 11,500 to 14,500 Twenty Foot Equivalent Units (TEUs).

Cooks River terminal is owned by NSW Ports and operated by Maritime Container Services Pty Limited (MCS).

Villawood Terminal

Villawood (more commonly known as Leightonfield for the purposes of rail operations) is owned by Toll and is used for steel distribution. It also operated as an intermodal terminal for export containers for a number of years up to 2012/13. The terminal connects to the SSFL and has two main rail sidings, currently 300m in length.

In July 2015 Toll and DP World announced a 50/50 joint venture to redevelop Villawood and operate it is an import / export terminal for up to 185,000 teu commencing in 2017.

Moorebank Intermodal Terminal

The Australian Government has been pursuing the development of a major intermodal terminal facility at Moorebank incorporating capacity for both a cross-metropolitan container shuttle service and an interstate intermodal facility, together with integrated warehousing. A project development agreement has now been signed with the Sydney Intermodal Terminal Alliance (SIMTA), led by Qube Holdings and partnered by Auziron.

Advice has been provided from SIMTA regarding the likely IMEX volumes over time from the proposed Moorebank facility which has led to the following assumptions being adopted for the purposes of this Strategy:

Figure 2-4: Macarthur Intermodal Shipping Terminal (MIST)

Figure 2-5: Cooks River Intermodal Terminal

- Port Botany IMEX shuttle services to and from Moorebank will commence operation in 2017 at 250,000 TEU capacity and will have an ultimate capacity of 1.05 million containers (twenty foot equivalents or TEU's) per year in IMEX freight by 2028; and

- Moorebank Intermodal, servicing the interstate market, is predicted to start-up in 2020 with steadily increasing volumes and an ultimate capacity of 500,000 interstate containers per year by 2028.

Pacific National has stated that it intends to remain at its Chullora terminal despite the availability of Moorebank as a common user terminal. The capacity analysis in this Strategy has adopted this position as a base case assumption.

Terminal Capacity

ARTC's understanding of current / potential terminal capacity is as represented in Table 2-1. Note that the terminal capacities stated include all container movements and not just container movements to Port Botany.

Figure 2-6: Yennora (Leightonfield) Terminal

Location	Operator	Capacity TEU's	Comments
Chullora	Pacific National	600,000	Announced in 2015 increasing from 300,000 to 600,000.
MIST	Qube	200,000	Capacity as stated on Qube website.
Cooks River	MCS	500,000	NSW Ports advice.
Botany	Qube	180,000	Sydney Haulage site. Qube advice regarding volume.
Yennora	Qube	200,000	Qube advice.
Leightonfield	Toll/DP World	180,000	Toll / DP World announcement.
Enfield	NSW Ports	500,000	Planning approval for 300,000. To commence operations in 2015.
Moorebank	Qube	1,550,000	Planned to commence operations in 2017. IMEX and interstate.
Total		**3,910,000**	

Table 2-1: Summary of Intermodal Terminal Capacity

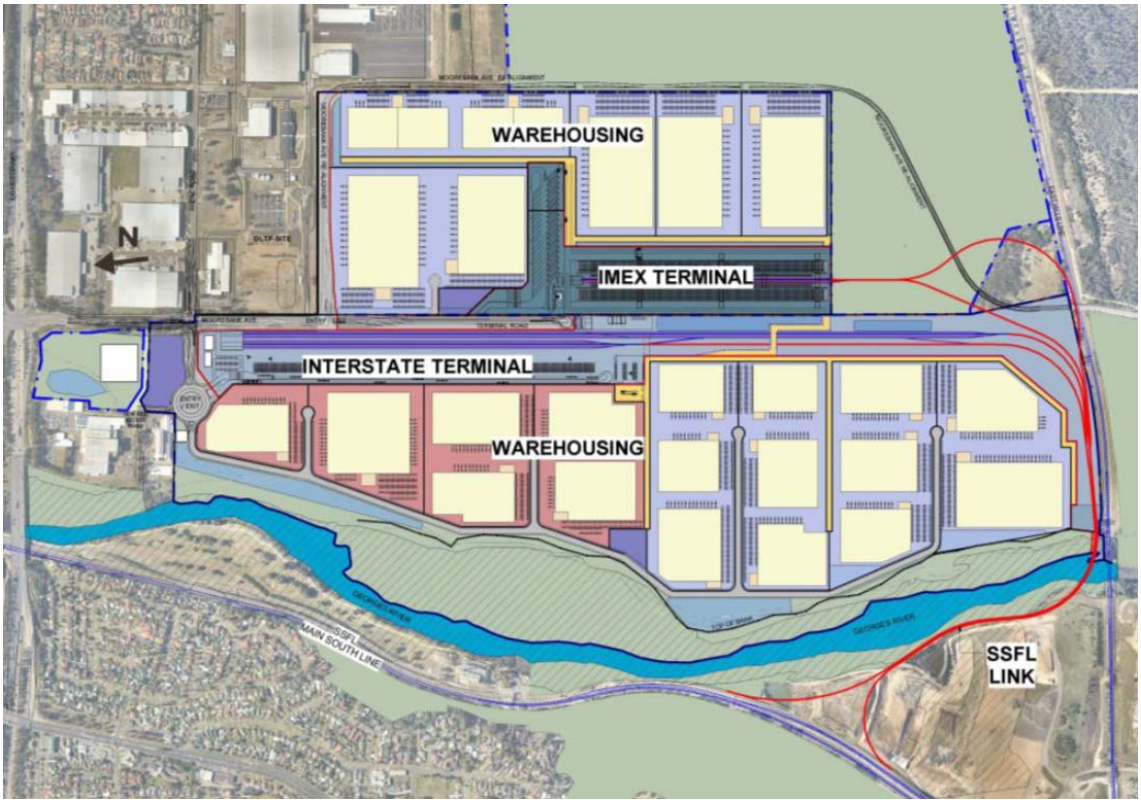


Figure 2-7: Moorebank Precinct artists impress (above) and masterplan (below)

3

Cross Metro Shuttles

Context

Reducing the impact of road movements of import / export freight through the development of cross metropolitan rail container shuttles has been an important focus for the Federal and NSW Governments for some years.

The NSW Government has publicly indicated its support for greater use of rail and has previously indicated it wants to see a doubling of the freight carried on rail by 2020 which would be a 28% market share of volume on rail by 2020. More recent strategy documents have not restated this objective but have reiterated the importance of rail as an element of government policy.

The Australian Government has also identified that it wants to see more freight carried to port on rail and it has supported this objective through the provision of funding for a number of upgrades to the capacity and condition of the MFN and Port Botany lines.

The objectives of both the State and Federal Government are aligned with the objectives of the rail industry itself, with both ARTC and major operators being active in and supportive of cross-metro container shuttle operations.

NSW Ports, rail operators and stevedores are investing heavily in cross-metropolitan rail operations in Sydney on the basis that rail can be a competitive option as part of providing a total logistics solution. This is supported by the evidence that Qube and its predecessors have been operating rail shuttles in Sydney for many years and other operators are now actively engaged in setting-up similar operations.

History of Cross Metro Shuttles in Sydney

For this strategy Cross Metro Shuttles have been defined as short haul import / export (IMEX) container train operations between an existing or future inland intermodal terminal and a dedicated or shared port terminal facility. The short haul distance varies anywhere from 15km to 100km.

Cross-metro container shuttles have a relatively long history in Sydney. They first appeared in the late 1990's with the FreightRail PortLink shuttle initiative, which serviced Yennora and Camelia (just north of Clyde). Shuttle services have operated pretty much continuously since then. The Camelia service ended in 2010, but services have been added to Minto and (intermittently) Leightonfield.

Road congestion in and around Port Botany reached a critical juncture a few years ago when the vast majority of trucks arrived during business hours and lined up, sometimes for kilometres, along Foreshore Drive creating significant congestion issues there and along surrounding roads. As a way of mitigating this congestion, the NSW Government over 2010 and 2011 introduced the Port Botany Landside Improvement Strategy (PBLIS) which included the development of pre-booked time slots for dropping off or picking up containers and penalties for non-performance. It also built a truck marshalling area for early arriving drivers to wait off-road with their rigs for their assigned drop-off or pick-up time. Much of the scheme was ultimately implemented through regulation as it was not possible to get voluntary commitment to the scheme.

PBLIS has had the impact of making road transportation more efficient and significantly reduced congestion around Port Botany. Anecdotally this had the effect of making rail less competitive. Interestingly train numbers before and after the introduction of PBLIS have remained relatively constant, though the growth in rail volumes expected prior to the introduction of PBLIS has not materialised, with the improvement in road performance potentially being a significant reason.

PBLIS also included a rail reform stream that was to be implemented following the road related reforms, but is not yet in place.

Analysis of cost competitiveness

Concerns have been expressed by various groups over a long period of time that there is not a compelling commercial proposition in all cases for cross-metropolitan container services.

Analysis suggests that there is a wide range of cost differentials between rail and road depending on container size, origin / destination and empty container handling requirements. While rail can provide a competitive option, it is not likely to be competitive for a majority of the total freight market in the Sydney metropolitan area.

Critical to an understanding of cross-metro rail operations is the logistics chain for IMEX containers.

Sydney has a significant imbalance between loaded import and export containers. In 2013/14 there were 1.11 million loaded import containers but only 432,500 loaded export. A large proportion of loaded export containers originate in regional areas.

To help manage this issue, there is a large demand for empty container parks, and these are generally located within or relatively close to the port, including the Cooks River area.

The container handling cycle typically consists of:

- A loaded container arriving at the port and, after customs clearance, being sent to either an unpacking facility or the end customer's premises.
- The now empty container being returned to an empty container park, where it is likely to be put into a storage stack.
- A proportion of the empty containers, particularly 20' containers, being loaded onto a train for regional areas or a truck for closer locations, and hauled to an export facility.
- The balance of containers being held at the empty container park for a period until sent to the stevedores, which may be planned in advance or opportunistic following cancellation of loaded export container bookings.
- Loaded export containers being hauled by road or rail direct to the stevedores.

Rail already has most of the loaded export market from regional areas. The challenge for rail in growing its market share therefore relates primarily to capturing loaded imports and the associated return of an empty container to the stevedores.

Looking at this cycle, there are six primary potential operational solutions as detailed in Table 3-1.

A further variable is the number of containers hauled by each truck. A B-double can carry up to 3 x 20' containers or one 20' and one 40'. Super B-doubles, which can access certain locations on a limited permit, can handle 4 x 20' containers or 2 x 40', though maximum axle loads may constrain how many containers are actually carried. Truck operating costs are a major cost component for road and being able to amortise that fixed cost across multiple containers significantly reduces the cost per container.

The cost of each of the six operational solutions has been analysed for 20' and 40' containers and for different numbers of containers per truck, assuming an IMEX terminal 35 km from the port. Note that for solutions with a rail leg it is assumed that they travel an extra 10 km due to the route being necessarily less direct, though this assumption may be pessimistic. The results are as per Figure 3-1.

Logistics solution	Key characteristics
Rail outbound & inbound via ECP	Rail outbound to an IMEX terminal and then road to and from the customer. Rail to an empty container park near the port and final transfer by road to the port.
Rail outbound & inbound direct to port	Rail outbound to an IMEX terminal and then road to and from the customer. Empty container storage at the IMEX terminal and rail direct back to the port.
Rail outbound & road inbound	Rail outbound to an IMEX terminal and then road to the customer with road direct back to an empty container park near the port and final transfer by road to the port.
Rail with co-located warehousing	Rail to and from an IMEX terminal with warehouses co-located and empty container storage at the IMEX terminal and rail direct back to the port.
Road only—direct	Road to and from the customer with empty container storage near the port and final transfer by road to the port.
Road only—via depot	Road to and from the customer with loaded containers held for a period at a depot to align delivery with customer preferences. Empty container storage near the port and final transfer by road to the port.

Table 3-1: Container Cycle Solutions

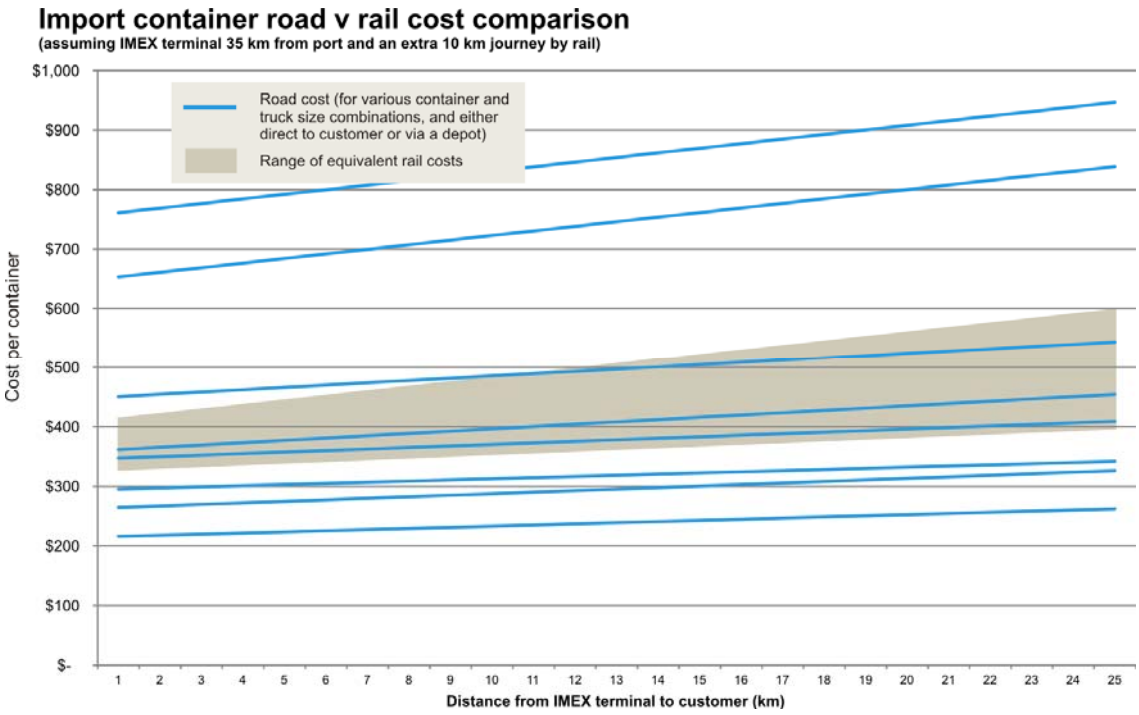


Figure 3-1: Road vs. Rail Costs

As can be seen, there is a significant degree of variation between scenarios. Rail is highly competitive where trucks are hauling a single 20' or 40' container but road and rail costs are of similar orders of magnitude, or rail is more expensive, for most other combinations.

Rail is most cost effective where the warehouse receiving the container is co-located with the IMEX terminal. Being able to use the inland terminal for empty container storage and to then rail the empty containers direct to the stevedores also provides significant cost benefits. Although not modelled, it would also be highly effective to use the inland terminal as the departure point for empty containers going to regional terminals for loading exports.

Under any scenario there may be other supply chain considerations that make road or rail more or less attractive. Clearly rail is a good option where a loaded container would otherwise be taken to a depot under a road solution.

It is also important to note that the assumed cost of container lifts is a key input in this analysis, noting that a container can easily be lifted more than 10 times on a typical round trip from the port and back, including lifts at the port, with rail typically incurring 4 more lifts than road.

A further consideration is the impact of a rail option on the effective use of port land. Wharf space in Sydney is constrained and as volumes grow the ability of rail to move large volumes of containers out of the stevedores quickly should allow for a reduction in the proportion of containers awaiting pick-up, thereby facilitating increased throughput on the same wharf footprint.

From this discussion four aspects of cross-metro container movements stand out as being important for rail competitiveness:

- The inland terminal needs to be able to function effectively as an empty container park and be able to deliver empty containers direct to the stevedores.
- Warehouses should ideally be located within the inland terminal precinct, which maximises rail's competitiveness by allowing the PUD to be within the terminal.
- Container lift costs / charges are an important cost element and finding ways to minimise lift costs significantly improves rail competitiveness.
- Every opportunity needs to be taken to get costs out of the rail based supply chain.

Economic Considerations

The discussion above has focussed on the direct financial costs of road and rail.

It is widely recognised that rail offers significant externality benefits in terms of reduced pollution, better road safety and general urban amenity. These benefits do not accrue to the rail industry.

In this context there is frequently a case for Government support to achieve a mode shift from road to rail.

Industry Consultation

ARTC has consulted with Industry to understand some of the impediments that need to be overcome in order to commercially operate cross metro shuttles. This consultation included rail operators, intermodal operators and stevedores. Some of the themes, which in many ways reflect the discussion above, are summarised below.

Efficient Supply Chain

"Building exports containers first is a good fit for a future cross metro shuttle services and the easiest way to make the model work. A 40% backload of full imports would make it successful with a better way to manage empties."

"Rail shuttles are not cheap enough to compete with road unless there is a very efficient supply chain. Shuttles needed to be quick and carry large volumes. "

"The size of the shuttle train should be determined by the volumes and therefore how many turns (train cycles) can be achieved with the fixed costs and assets. Top up volumes can be transported via road. As volumes increase more train service can be triggered. This ensures the most efficient operations on a unit cost basis."

"It is critical to locate DC's close to Intermodal terminals to make the logistics chain more efficient and cut transaction time."

Charging

"A handling fee is charged for containers at Port Botany regardless of how many times the box is lifted. Stevedores have surplus labour capacity at the rail interface, so the focus shouldn't be on the number of lifts but rather on labour utilisation per TEU."

"Industry is 'locked' into traditional charging for logistics. This needs to change as the charging models don't promote an efficient supply chain. There is no carrot or stick to encourage efficient rail operations."

Flexibility

"Operators would like to utilise rail assets better but there are insufficient windows and paths to operate trains. Vertical integration is the key and service needs to be reliable and seamless to the shipper with a set train schedule. Train operations need to provide flexibility to match the just-in-time models."

"The rail industry has more industrial relations constraints than the trucking industry, which impacts flexibility and competitiveness."

Perception

"There remains a perception among the wider logistics industry, perhaps justifiably, that rail is more expensive and less reliable than road transportation. Industry believes that an efficient rail supply chain can be successful, but that rail needs to be better sold as an option."

Commercial Alignment & Incentives

As already noted, rail market share of Botany container movements has stagnated despite the aspirations of many stakeholders to see the share grow. Ultimately, to achieve the desired growth in rail market share there is a need for there to be an alignment of commercial interests and the right incentives to make rail a worthwhile option.

A key issue is that there is no direct relationship between rail operators and stevedores despite this interface being one of the most critical areas for achieving efficient rail operations. Rail operators are generally contracted by freight owners, while the stevedores are sub-contractors to the shipping lines who in-turn have the relationship with the freight owner. As such, the rail operators and stevedores are only connected indirectly and via a large population of freight owners who individually have little market power.

Stevedore Handling

At present, all rail containers incur an extra lift in the port relative to road operations. Typically, terminals are designed to take a container from a road vehicle and place it in a stack, or vice versa. For a rail movement, a truck or intra-terminal vehicle is used to take the container to and from the rail siding with this vehicle then processed essentially as a truck movement would be. This, of course, then requires another lift to or from the train.

Effectively the rail operation within the stevedores is designed as an adjunct to the road operation. The additional handling that this necessitates places rail at a disadvantage.

As discussed previously though, rail offers stevedores potentially significant gains in site efficiency. At present it is understood that import containers sit in the yard for an average of around 2.5 days, where with a rail option most containers could be moved on the day of arrival subject to customs clearance. This would allow significant increases in throughput on the same land footprint.

Also, with rail market share at current low levels it is rational for stevedores to treat rail as a secondary function and maximise the efficiency of road. As rail

volumes grow there should be a strong case to increase the efficiency of rail. There are infrastructure and operational solutions that could be developed that would streamline the handling of rail containers, which in turn should make rail even more attractive.

The concept of a common user terminal has also been proposed in the past as an alternative mechanism to increase rail handling efficiency. Both Melbourne and Brisbane have common user terminals. Given that the stevedores are already double handling containers there is a logic in minimising this handling cost and maximising rail efficiency through a well designed high throughput terminal. However, this may not achieve the same efficiencies as better container handling within the stevedore's.

Ultimately this is a matter for the stevedores and NSW Ports. ARTC will continue to engage on this issue though to encourage the adoption of the most cost effective solution for rail.

Slot Management

Over a decade ago, the rail industry moved to a slot management system at the stevedores as a response to the introduction of above-rail competition. This was a step forward at the time and improved efficiency compared to the previous operational practices.

The slot management system provides negotiated time periods for a particular operator to place a specific train at the stevedores. There are multiple shortcomings with the current system:

- In practice, trains frequently carry more or less containers than assumed for the size of their window. This creates either a loss of capacity and stevedore inefficiency if the train is underloaded, or congestion if it is overloaded, and hence delays and inefficiencies.
- In some instances when trains are loading/unloading containers at multiple stevedores, the windows allocated are not aligned. This requires trains to be parked in Botany Yard which is inefficient and consumes track capacity.
- The system struggles to accommodate late running trains, which impacts stevedore efficiency.
- Some train paths, particularly for regional trains, are not well aligned with the stevedore windows, creating inefficiencies for the train operator.
- Disruptions on the network or in the stevedores sometimes lead to trains needing to depart without fully loading or unloading, generating significant inefficiencies.

It is also worth noting that at present each stevedore has a window for a train that gives that train exclusive occupancy at the stevedore. As a consequence, only a single track is often used even though SICTL and Patrick have two tracks and DP World three (short) tracks.

There appears to be broadly two options for how to address these problems.

One option would be to move to a system of dynamic windows. This would require an increase in short term (24—48 hour) planning and potentially increased live-run

coordination, similar to but smaller in scale than the Hunter Valley Coal Chain Coordinator. This approach would work well for rail operators, particularly for regional trains which tend to suffer from greater disruption than cross-metro shuttles. The biggest challenge with this approach is likely to be limitations on the ability of stevedores to reschedule at short notice.

The second option is to put in place measures to reduce variability in train arrivals into Botany. A disciplined approach where trains arrived with a high level of reliability and there was minimal variation in train loading would allow the stevedores in particular to optimise both efficiency and capacity. However, such an approach is likely to require changes to regional rail operations.

At present regional trains make up around half of the throughput of Botany and improving the rail / stevedore interface through better coordination is likely to be desirable as a minimum. As cross-metro volumes grow though and regional trains become a minority of the volume it is possible that the greatest benefit to the logistics chain as a whole would come through the second approach of minimising variability.

Transport for NSW, through the Rail Cargo Movement Coordination Centre (Rail CMCC), is currently ramping up its capability to undertake a coordination role around real-time management of variability.

ARTC is supportive of increased coordination as a necessary initiative to achieve better performance outcomes. ARTC looks forward to the establishment of a clear and industry supported charter for the Rail CMCC and will be carefully following its progress to assess whether this initiative is achieving the necessary improvements in coordination, and actively contributing to the growth of rail volumes.

Window Administration Fee

The stevedores currently charge rail operators a $15 window administration fee for rail containers, with this charge being controlled through regulation by the NSW Government.

It has been variously argued that this fee covers administrative costs, that it is compensation for the double-handling of containers by stevedores, and that it is an incentive for the efficient use of the available stevedore rail windows by creating a disincentive to over-book.

The fee is more than is charged for road booking administration notwithstanding that the administrative task for rail bookings is an order of magnitude less onerous. Accordingly, if it is an administrative charge it is arguably excessive.

Shipping lines already meet the full cost of the stevedore handling function. To the extent that there is additional handling of rail containers this appears to be an active choice by the stevedores in the way in which the terminals have been configured and are operated. As previously noted, the aim should be to eliminate the need to double handle rail containers, rather than to in some way compensate the stevedores for the additional handling.

The use of a window administrative fee to provide incentives for efficient use of the windows does appear to have merit though. In fact, there may be opportunities to fine-tune the arrangements to further discourage underutilisation of windows, perhaps by introducing a minimum train size.

Regulation

As well as regulating rail charges, the NSW Government also imposes a minimum lift rate of 36 lifts per hour for rail windows, though there is a perception that this has become a standard, with no incentive to achieve better than this rate.

Proposals have been raised to introduce other regulatory provisions, including an incentive / penalty regime, similar to the regime applied to road. Conceptually, the regulatory approach is driven by the lack of commercially aligned incentives discussed above.

The issues raised by potential regulation are complex. The first question is what operational outcomes should be achieved and the second is whether regulation is the most effective way to achieve them. It is worth noting though that the successful road reforms required the use of regulation.

ARTC is open-minded on a regulatory approach and is engaging with other stakeholders to develop an informed view as to whether it is likely to be a desirable way forward.

Bonded terminals

For many years the option has been discussed of bonded movements of import containers out of the port to intermodal terminals, allowing them to perform effectively as inland ports. This would have the effect of allowing better production loading of import containers, transferring storage to lower cost land at the inland port and allowing an Inland Port to provide additional value add services. It would be necessary for achieving rail movement of containers on the day of arrival.

It is understood that both the Enfield ILC and Moorebank terminal are working toward becoming bonded terminals.

4

Demand Forecasts

Current Volume

Train services that utilise some part of the Sydney network as at 2015 are shown in Table 4-1. This table also includes a nominal train length and the train occupancy on the network in the up and down direction.

Figure 4-1 shows the number of trains per month over the past 3 years arriving into Port Botany. On average 325 trains per month arrived into Port Botany over this period which equates to approximately 11 services per day. On a weekday there is on average 15 trains per day arriving at Port Botany. Of this average number of services each month approximately 18% of the trains are longer than 650m.

Volume Growth

Forecasts for all existing traffics assume modest market share growth in intermodal services and steel growth roughly in line with GDP. Grain, general freight, passenger and other services are generally assumed to remain constant unless there are known increments in demand.

Figure 4-2 shows predicted volumes for the main corridors within Sydney. While volumes are relatively flat on the western corridor, steady growth is observed for the Southern and Northern corridors. This is mostly attributed to expected growth in Melbourne to Brisbane freight. In 2025 volumes drop significantly on account of Inland Rail being assumed to be operational. In the Sydney Metro volumes increase significantly over time. This is principally on account of the cross metro trains from Moorebank, Chullora and Enfield to Port Botany. Figure 4-3 shows the growth in terms of train paths in one direction for each of the corridors.

Note that volume on the Main South is taken at Glenlee and includes Southern Highlands passenger services.

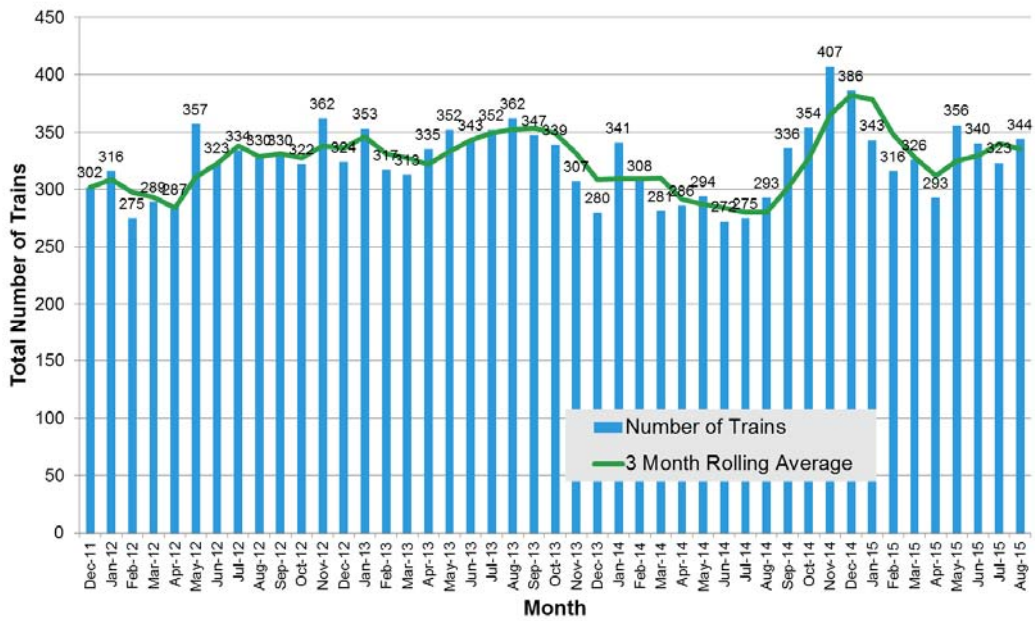


Figure 4-1: Trains Arriving into Botany Yard (Monthly)

Coal Growth

There is currently a substantial flow of coal trains from the coalfields around Lithgow west of Sydney, via the Sydney Trains network, to Port Kembla south of Sydney. These trains use the MFN while transiting through Sydney.

Coal traffic in the Sydney Metropolitan Region has been reasonably stable over a long period but can also change materially and abruptly due to circumstances. Recent years have seen a number of mine closures and Centennial Coal recently adjusted paths operated by Southern Shorthaul and Pacific National to route to NCIG at Kooragang instead of Port Kembla.

Current thermal coal prices are unlikely to encourage growth in coal volumes from the western fields to Port Kembla in the near or medium term. In addition, coal from the western coalfields has a relatively long haul length and uses relatively inefficient trains.

There is also a risk that as current mines are exhausted they will not be replaced by new mines.

On this basis ARTC has assumed a constant volume of coal trains.

Cross Metro Container Growth

Port Botany is Australia's second busiest container port, handling around 5,000 containers on average per day worth over $60 billion annually. The Port's container trade is expected to increase from 2.1 million TEUs in 2012-13 to an estimated 3 million TEU per annum by 2021 (Source: BITRE: Research Report 138).

Based on NSW Ports forecast future load rate of 2.5 TEU per truck and the predicted Port volume growth, if rail maintains its current 14% market share there will be an additional 310,000 truck movements through the Port Botany precinct each year by 2020.

Figure 4-4 shows rail volumes and rail market share at Port Botany as implied by the assumed train numbers and configurations in this analysis. This volume includes assumed volumes based on public statements as follows:

Service	Length (m)	Track Occupancy		Round Trips (day)
		Up	Down	
Import - Export Freight (IMEX)				
Yennora	650	Botany Yard	Yennora	4.0
Leightonfield	650	Botany Yard	Leightonfield	1.0
Minto (MIST)	650	Botany Yard	Minto	4.0
West Regional (exc Manildra)	900	Botany Yard	Lithgow	2.0
Illawarra (Manildra to Enfield)	900	Botany Yard	Marrickville (via Enfield)	0.5
Enfield (Manildra shuttle)	650	Botany Yard	Nowra	1.0
Newcastle & North West	900	Botany Yard	Broadmeadow	4.0
Superfreighters				
Melbourne - Sydney	1800	Chullora	Moss Vale	2.6
Perth - Sydney	1800	Chullora	Moss Vale	0.8
Perth - Sydney	1300	Chullora	Lithgow	0.3
Brisbane - Sydney	1500	Chullora	Broadmeadow	2.3
Adelaide - Sydney	1800	Chullora	Moss Vale	0.3
Steel				
Sydney - Melbourne	1500	Chullora	Moss Vale	1.5
Sydney - Brisbane	1500	Chullora	Broadmeadow	1.6
Sydney – Port Kembla	1500	Chullora	Port Kembla	11.0
Other Intrastate				
Westons Grain	750	Enfield	Moss Vale / Lithgow	1.0
Manildra Flour	600	Broadmeadow	Nowra	1.0
Cadia Minerals	600	Lithgow	Port Kembla	0.5
Coal via Illawarra	800	Lithgow	Port Kembla	11.0
Coal via north	800	Lithgow	Broadmeadow	1.0
Marulan aggregates	800	Enfield	Moss Vale	2.0
Dunmore Ag (M'ville-Enf'd)	600	Dunmore	Enfield	2.0
Dunmore Ag (Enf'd-Cooks)	600	Enfield	Cooks River	2.0
Bombo ballast	600	Chullora	Bombo	2.0
Harefield	1000	Botany Yard	SSFL Diverge	1.0

Table 4-1: Current Trains on the MFN and SSFL

- Moorebank (Qube) – 1,050,000
- Enfield (NSW Ports) – 300,000
- Chullora (PN / Patrick) – 135,000
- Villawood (Toll / DP World) - 180,000
- Existing (Yennora, Leightonfield, MIST, Regional) – 300,000

- The rate of ramp-up to these volumes has been based on ARTC's assessment of the objectives of the operators.

Should this IMEX volume materialise this would represent a rail market share peaking at 42% in 2028, up from current levels of 14% in 2014.

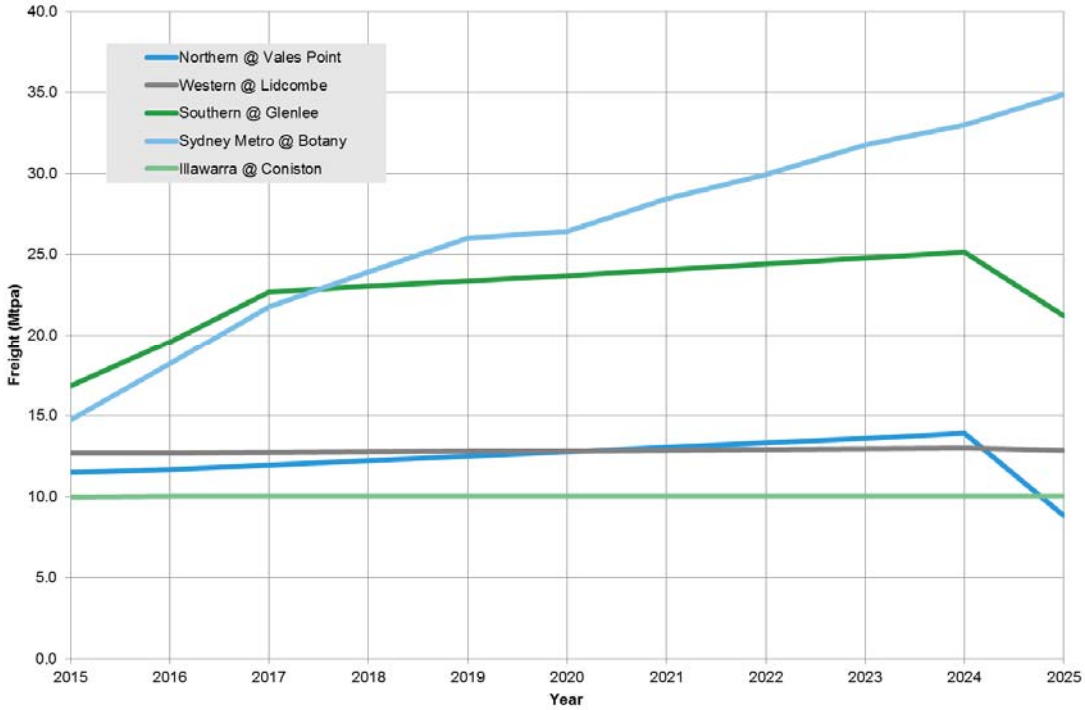


Figure 4-2: Corridor Volume Growth (2015-25)

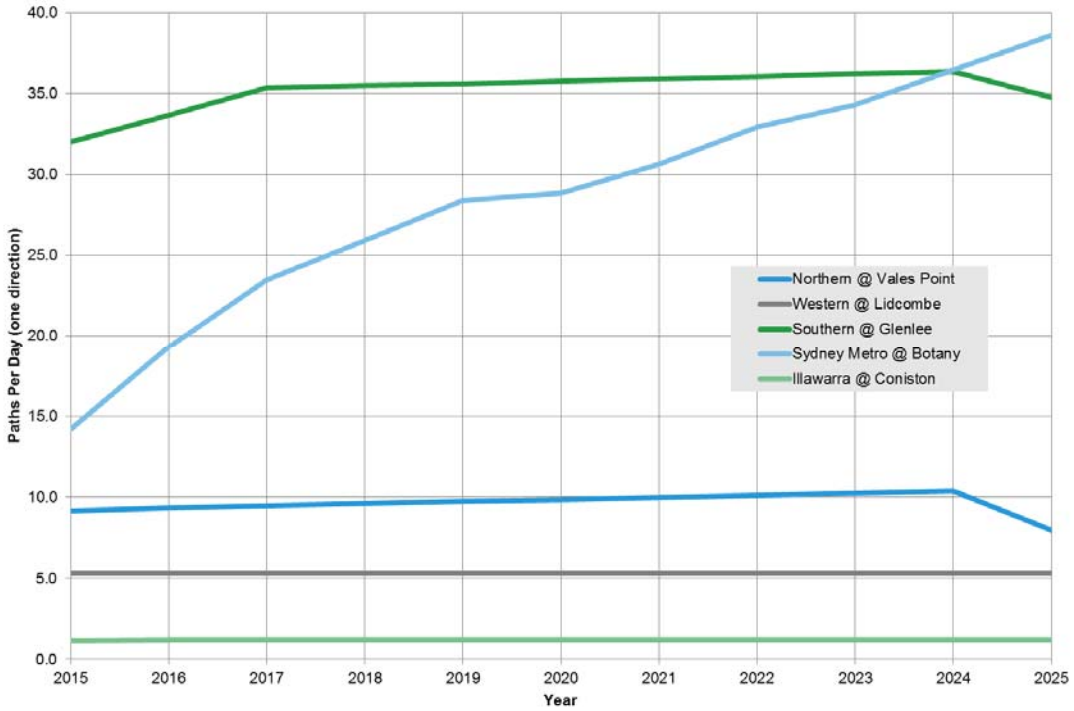


Figure 4-3: Corridor Train Path Growth (2015-25)

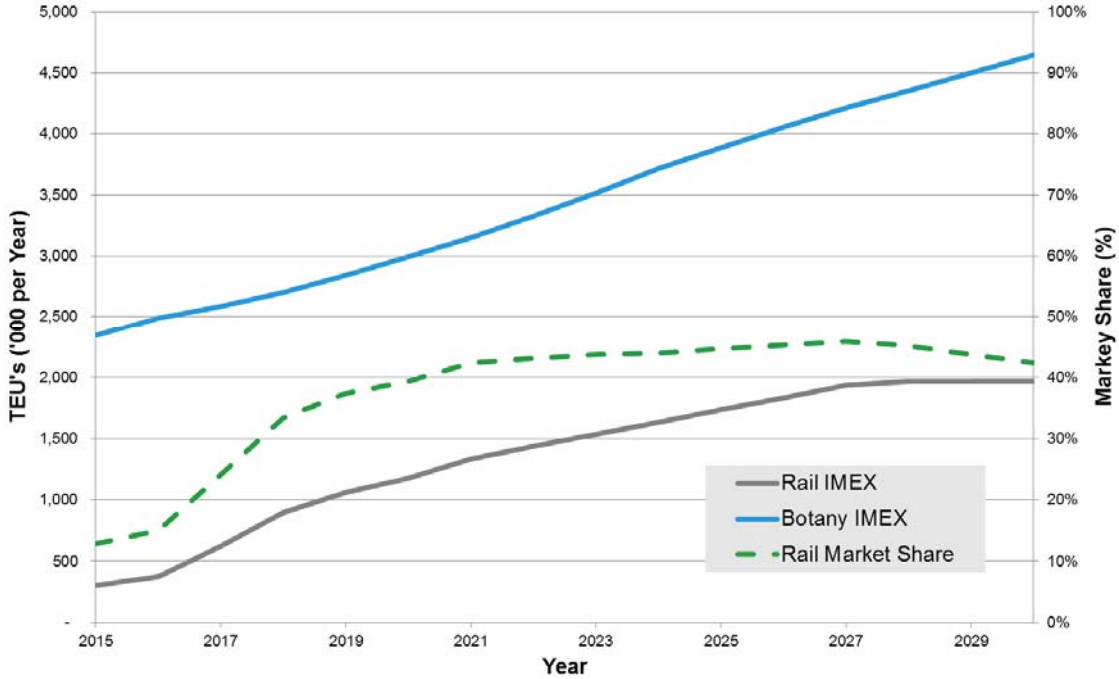


Figure 4-4: Total port throughput, rail volume and rail market share

5

Ensuring Efficiency and Capacity at Port Botany

Context

Port Botany is the centre of operations for the import / export container supply chain and as such its efficient operation is critical to creating an effective supply chain. Despite being central to the operating environment, it is important to note though that Botany itself supports very limited rail functions. There are no rollingstock provisioning or maintenance facilities, and it is not used for general wagon storage or holding. Trains essentially operate in, load / unload, and depart.

The track layout of Botany is shown in Figure 5-1.

Table 5-1 details the train services that currently terminate at Port Botany represented as an average per weekday.

Current Operations and Challenges

There are a number of important features to note about Botany.

The length of the overall area is quite long, extending 4 kms from the start of the yard area to the end of the SICTL sidings. The layout has quite a long, linear form, with the effect that operations tend to be over relatively long distances, making some types of operation quite time consuming.

Between 2008 and 2012 significant infrastructure was built at Port Botany. This infrastructure included additional arrival and departure roads along with signal upgrades. In line with the recommendations of the 2005 Freight Industry Advisory Board report on metropolitan container operations the infrastructure was designed on the premise that future train operations would be configured as push-pull terminating at dedicated stevedores, which represents the most efficient way for trains to enter and exit Port Botany.

Given this, ARTC has been working toward 650 m push-pull container shuttles operating to a single stevedore. However, operators have indicated to ARTC that they are not able to operate trains in a push-pull configuration due to higher operating costs. Furthermore, for many services, customers are not prepared to be restricted to a single stevedore. Approximately 50% of train movements visit more than one stevedore. Many trains, particularly regional services, also operate at greater than 650 m and need to continue to do so for efficiency reasons.

ARTC has recently indicated to customers that it is supportive of moving away from the push-pull concept. This means that future operations will continue to require a run around movement of locomotives on the arrival roads and propelling of the train into the stevedore sidings. Splitting trains between stevedores also means propelling will be required for both arriving and departing trains.

Within this context, ARTC's key objective is to identify an operational solution for Port Botany Yard that allows the yard to be operated efficiently and safely at current and future volumes. ARTC continues to work with our customers to identify the optimum operations solution recognising commercial constraints.

Service	Length (m)	Service	Round Trips (day)
Yennora	650	Shuttle	4.0
Minto (MIST)	650	Shuttle	4.0
West Regional (exc Manildra)	900	Regional	2.0
Enfield (Manildra shuttle)	650	Shuttle	1.0
Newcastle & North West	900	Regional	4.0
Harefield	950	Regional	1.0
Fletchers	1,100	Regional	0.5
Total			**16.5**

Table 5-1: Current Train Services to Port Botany

ARTC

Botany Yard & Stevedores

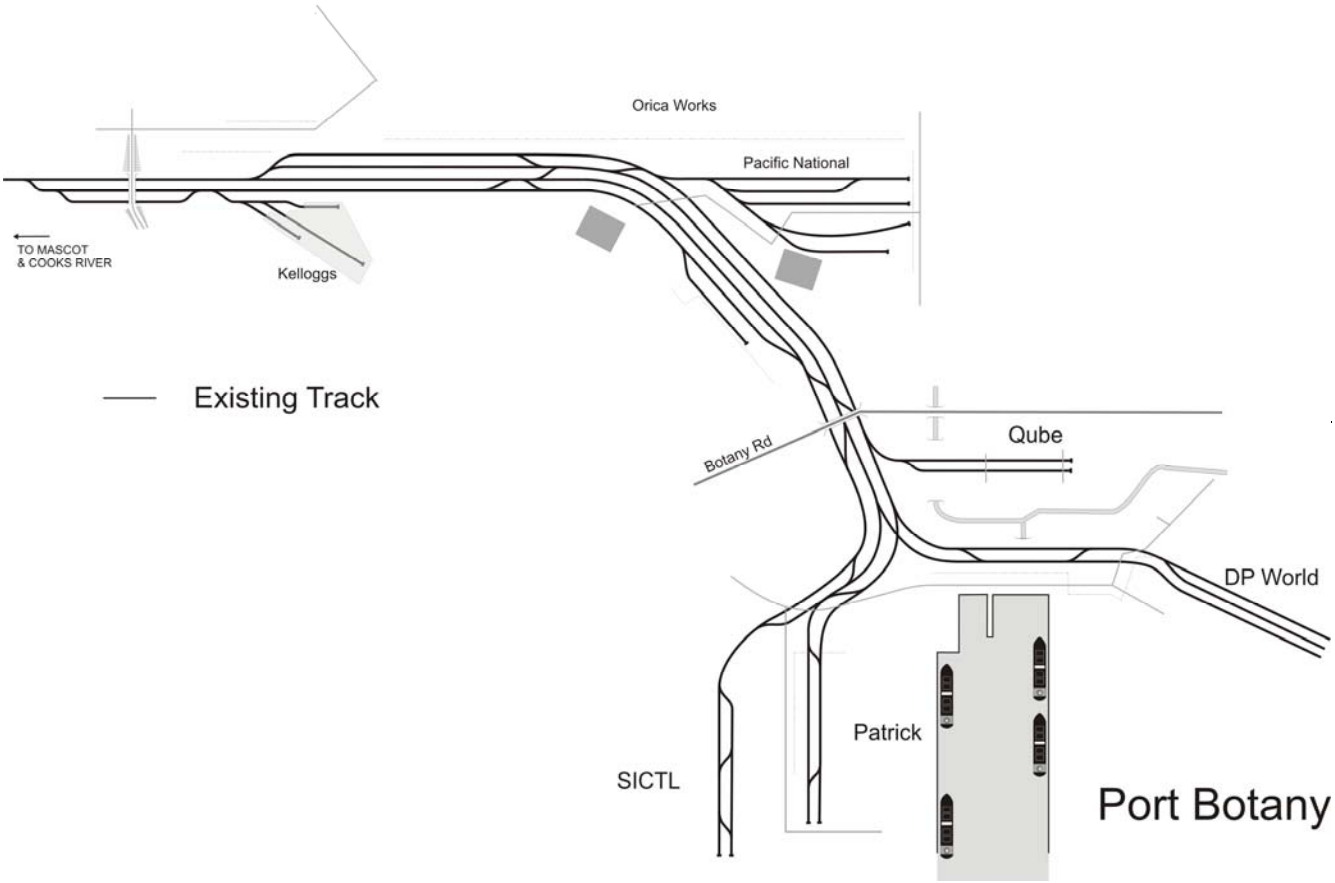
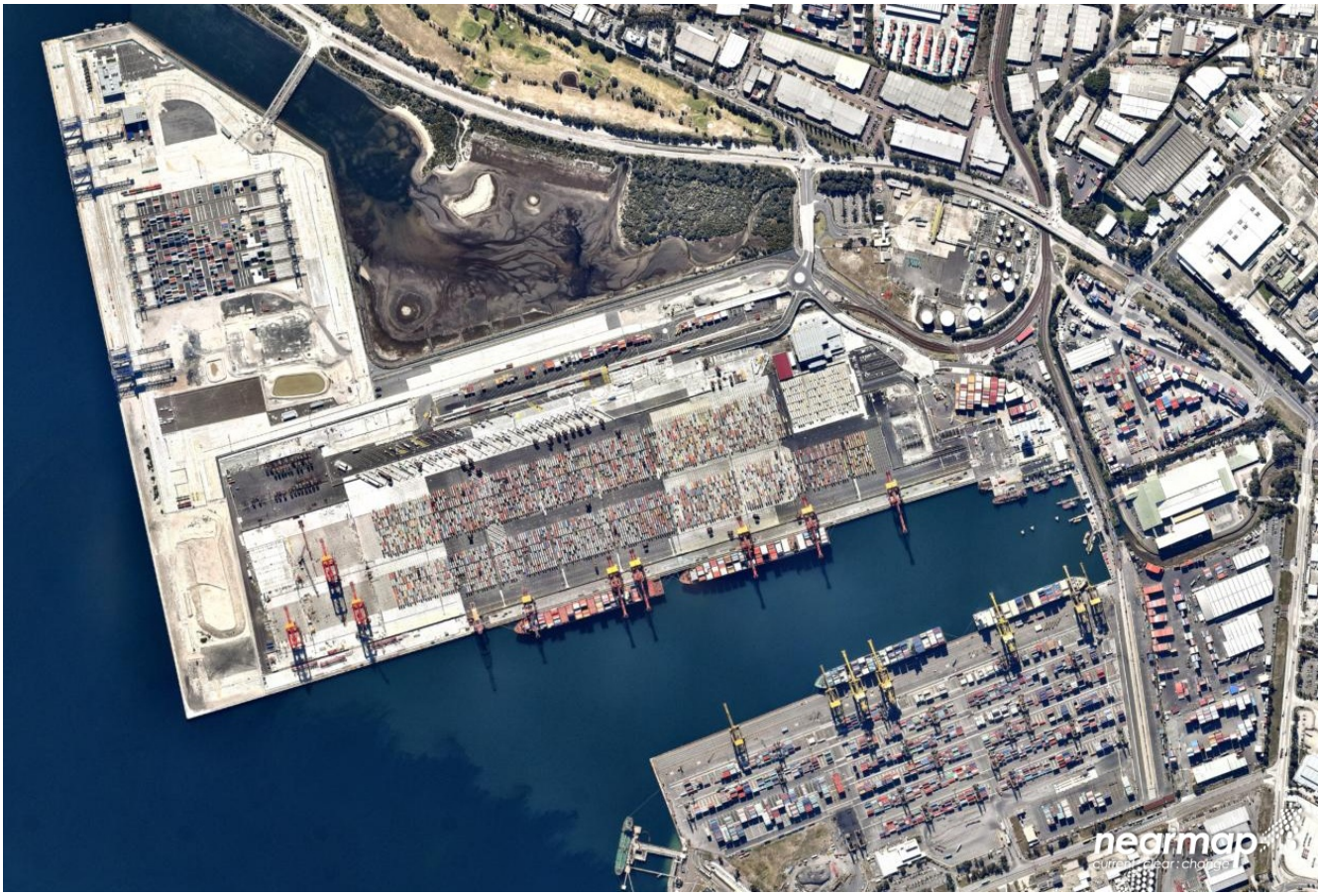


Figure 5-1: Schematic Botany Yard



Port Botany Capacity Assessment

ARTC has undertaken modelling of the operation of Port Botany yard to determine whether forecast volume can be accommodated with existing infrastructure.

Assumptions

Train volumes as set out in Table 5-2 were assumed for the capacity analysis along with the following key assumptions:

- All future new IMEX trains are assumed to terminate at one stevedore only;
- 75% Adjustment Factor has been applied to capacity calculation to allow for cancellations, maintenance and peaking;
- Regional Freight growth of 3% per year to represent a high growth scenario;
- Trains operate a maximum speeds of 10kmph in Botany Yard;
- Trains that terminate at multiple stevedores stand in the departure roads at Botany Yard for on average 175 minutes in addition to arrival and departure track occupancy;
- Trains only arrive and depart on signal (i.e. trains only arrive on arrival roads and only depart on departure roads); and
- TEU factor of 1.5.

Botany Yard Track Capacity

The conclusion of ARTC's modelling is that there is currently sufficient existing track capacity at Botany yard to receive the volume of trains projected up to 2030. However, while this capacity exists in theory it does rely on good planning. Even at current volumes there are times when the yard becomes congested as a result of short term peaks and train numbers and shunting activities.

	Train Numbers Per Day (one Direction)							
Train Type	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
650m Train DP only	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
650m Train Patrick only	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
650m Train DP & Patrick	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
900m DP & Qube	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
900m Patrick & Qube	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5
900m DP & Patrick	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0
900m DP, Patrick & Qube	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.3
New 650m IMEX DP only	0.7	2.0	4.3	6.3	7.7	7.7	8.3	9.3
New 650m IMEX Patrick only	0.7	2.0	4.3	6.3	7.7	7.7	8.3	9.3
New 650m MEX SICTL only	0.7	2.0	4.3	6.3	7.7	7.7	8.3	9.3
Total	**15.3**	**19.4**	**26.5**	**32.6**	**36.7**	**36.8**	**38.9**	**42.1**
	Train Numbers Per Day (one Direction) cont							
Train Type	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
650m Train DP only	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
650m Train Patrick only	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
650m Train DP & Patrick	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
900m DP & Qube	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
900m Patrick & Qube	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6
900m DP & Patrick	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2
900m DP, Patrick & Qube	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
New 650m IMEX DP only	9.7	10.0	10.7	11.3	12.3	12.7	12.7	12.7
New 650m IMEX Patrick only	9.7	10.0	10.7	11.3	12.3	12.7	12.7	12.7
New 650m IMEX SICTL only	9.7	10.0	10.7	11.3	12.3	12.7	12.7	12.7
Total	**43.2**	**44.3**	**46.4**	**48.6**	**51.7**	**52.8**	**53.0**	**53.1**

Table 5-2: Future Train Services to Port Botany

Beyond 2030 the following infrastructure solutions will provide additional capacity benefit:

- Slot optimisation to reduce idle time for trains visiting multiple stevedores (up to 50% capacity increase);
- Bi-directional signalling to enable trains to stand on either arrival or departure roads (up to 14% capacity increase). Note that this signalling work is likely to be a by-product of duplication of the single track section of the Botany line;
- Arrival and departure speeds increased from 10 to 15kmph in Botany Yard (up to 12% capacity increase). Note this requires either installation of cross overs at stevedores or otherwise reducing the incidence of propelling; and
- New Holding Road at Botany Yard (up to 25% capacity increase), though this may require land acquisition.

There have also been opportunities identified to operate regional trains into IMEX terminals within Sydney and tranship containers onto cross-metro shuttles. While this involves double handling of containers it also offers flexibility and potential cost savings by optimising use of specific assets that may make it commercially attractive. Implementing an arrangement such as this would allow most or all trains to operate to a single stevedore providing another increment in yard capacity.

Taken together, these initiatives offer very significant increases in yard capacity and suggest that Botany yard will be adequate for growth beyond 2030 with relatively modest expenditure.

Potential Operational Changes

Propelling movements are common in rail operations, but it is preferable that they be minimised for both efficiency and safety reasons.

There are three apparent options for how propelling could be significantly reduced at Port Botany.

First, locomotives could perform a runaround move within the stevedores sidings. To achieve this though requires the train to arrive on one track and a second adjacent track to be clear. It also requires a crossover between the two tracks at the far end of the sidings. Both the Patrick and SICTL track configurations provide for this mode of operation, though the Patrick cross-over is currently booked out of use. DP World does not have a crossover at the end of its sidings.

For this approach to work, DP World would need to install a crossover and the Patrick crossover would need to be reinstated. The configuration of DP World, with three short sidings, also means that some propelling will be necessary for arriving trains even if a crossover is installed, but this would be over a relatively short and straight distance.

The extent to which this approach will reduce propelling depends on the length of the train and whether it is servicing more than one stevedore. Longer trains and those servicing more than one stevedore will still require a significant amount of propelling, particularly when making up a departing train.

The downside of this style of operation is that one track within the stevedores is always left empty, which potentially reduces the flexibility and productivity of the loading / unloading operations.

The second option would be to leave the locomotive locked-in while loading / unloading occurred. When the train was ready to depart, a shunt locomotive would be used to haul the train back to the yard area, releasing the train locomotive and allowing it to runaround the wagon consist. This mode of operations would require operators to have a locomotive, and most likely a second crew, available in the yard area to pull the train out. This could be achieved by having a permanent shunt locomotive or by splitting the locomotives where the train has arrived with multiple locomotives. Alternatively, a single, common use, shunt locomotive could be provided either by the operators acting collectively or through ARTC or other third party. The downside of this approach is that it adds to cost and complexity. It is unlikely to be an attractive solution.

A third broad approach would be to undertake the runaround moves generally between the stevedore interface and the Botany Rd overbridge. The current track configuration would allow for runarounds to occur in this area for (nominally) 650 m trains, though the wagon rake may need to be limited to 600 m or slightly less unless some infrastructure modifications were made. Some signalling works are also likely to be required.

The same approach could be adopted for trains longer than 650 metres, with a train length of approximately 1600 m able to be accommodated. However, this would require the runaround move to go all the way back to the mid-yard cross-overs, adding up to 2 km of light engine transit.

Runarounds in this area would also block the current level crossing for longer periods than at present and this may create some access issues that would need to be resolved.

ARTC will be working on understanding the cost and comparative benefits of these solutions to help inform discussion with industry on the preferred way forward.

Botany Rail Container Handling Capacity

ARTC has also undertaken a high level analysis of the capacity of the stevedores to accommodate forecast rail throughput with current operations to understand what constraints this may impose on growth and what the effect on rail operations might be as a result of initiatives by the stevedores to increase their capacity.

At a lifting rate of 36 containers per hour it is estimated that the current capacity of the stevedore rail handling facilities is 743,000 TEU's per year. Of this capacity approximately 59%, or 439,000, is allocated via the existing stevedore windows.

It is noted that of the allocated capacity of 439,101 TEU's approx. 325,000 TEU's are railed to or from Port Botany, which represents utilisation of 74%. This would suggest that the current window booking system significantly 'over contracts' volumes.

Assuming 2 hour windows for any unallocated stevedore terminal rail slots there is an additional 303,790 TEU's available. SICTL currently have 77% of this available capacity of which 44% is available on weekends.

Based on current container volume estimates Port Botany total rail handling capacity will be exhausted in 2018 assuming stevedores continue to utilise current practices and there is no change to the infrastructure. Given differences in volume and capacity, individual stevedores will start to run out of capacity prior to 2018.

Assuming the lifting rate was increased by 100% the total stevedore capacity would be around 1.3 million, a long way short of the 1.8 Million TEU's per annum predicted to be handled by rail. It is unclear that it is possible to double the lifting capacity without some infrastructure changes.

Alternatively, it would be possible to achieve some significant increases in capacity with operational changes. The major change would be for all trains to operate with a full train for the stevedore and to load in both directions. The limit of practical capacity with operational changes but current infrastructure and lift rates is likely to be around 1 m teu.

The capacity of the Botany line is approximately 1.3 m teu with current and planned train configurations. The stevedore capacity is significantly lower than this, which indicates that capacity enhancement will be required at the stevedores in advance of any track capacity enhancements. In the event that train configuration changes were implemented to increase stevedore capacity, this would also increase track capacity. With efficiently loaded trains the Botany line capacity would be in the order of 1.8 m teu.

It is understood that NSW Ports has been developing a Master Plan which has included concept designs for increased stevedore capacity. Initiatives in this area will be essential for rail to achieve the forecast throughput.

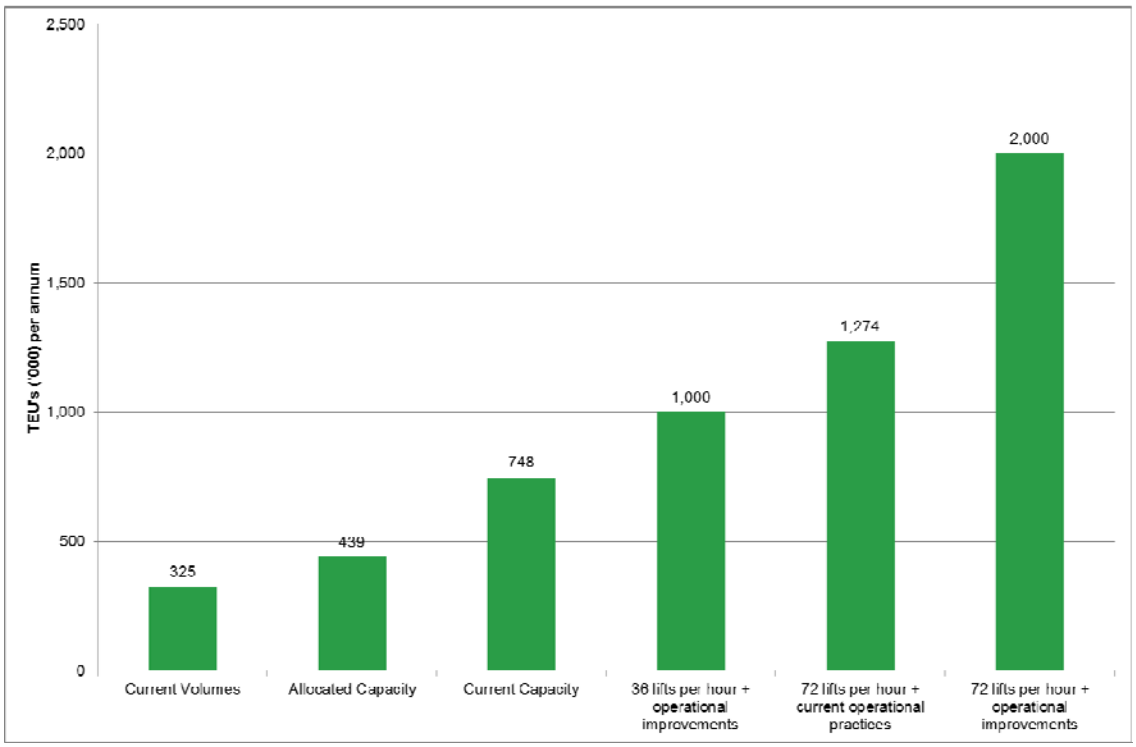


Figure 5-2: Future Stevedore Container Handling Capacity

6

Providing capacity on the MFN & SSFL

Context

With existing infrastructure and currently projected growth the capacity on the SSFL will be consumed by 2020. This is primarily due to growth in interstate and shuttle services to Port Botany. In 2025 some capacity is recovered on account of the commencement of operations of the Inland Rail which diverts freight volumes from Sydney.

Assumptions

Note that the following assumptions have been made in estimating the available paths:

- 650m long Port Botany IMEX shuttle services to and from Moorebank (with the connection point being described in this analysis as Moorebank Junction) will commence operation in 2017 and will have an ultimate capacity of 1.05 million containers (twenty foot equivalents or TEU's) per year in IMEX freight by 2028;
- Enfield IMEX Terminal will have a capacity of 300,000 TEU in 2016. IMEX trains from Enfield are assumed to be 650m long;
- Chullora terminal will have an initial capacity of 75,000 TEU per annum, growing to a target capacity of 135,000 TEU per annum,
- Pacific National Superfreighters will continue to

Scenario		1	2	3	4	5	6	7	8
Coal diverted to SSFL (2025)		×	×	×	✓	✓	✓	×	✓
Inland Rail (2025)		✓	×	✓	✓	✓	×	×	×
1,300m IMEX Trains		✓	✓	×	✓	×	✓	×	×
Cost ($M) - Undiscounted		**$20.5**	**$87.5**	**$175.0**	**$135.5**	**$316.4**	**$178.5**	**$238.0**	**$336.4**
Cost ($M) - Discounted @7%		**$10.4**	**$44.5**	**$103.0**	**$68.9**	**$178.1**	**$90.7**	**$138.6**	**$187.0**
Warwick Farm Loop									
1,350m	$ 67.0		2025	2022	2025				
1,850m	$ 110.0					2022	2025	2022	2022
Ingleburn / Minto Loop (south)									
1,350m (50.13 to 51.48km)	$ 48.0				2025	2025	2025		2025
Botany Line Double Track									
From Botany end (900m)	$ 20.5	2025	2025	2021	2025	2021	2025	2021	2021
Completion of Full Duplication (1,940m)	$ 87.5			2023		2023		2023	2023
Leightonfield Loop Extension									
350m (West)	$ 20.0							2027	2027
Casula Loop									
1,350m loop	$ 50.4					2026			2026

Notes: All cost estimates are unescalated $2015. Botany duplication includes $20 m for signalling works in the yard to align the arrival and departure roads to the mainline track direction.

Table 6-1: Infrastructure Requirements by Scenario

terminate at Chullora rather than relocate to a new interstate intermodal terminal at Moorebank;

- The Toll / DP World joint venture at Villawood commences in 2017 with 2 trains per day (90,000 teu) increasing to 4 trains in 2017. The existing steel shunt to Villawood is assumed to cease in 2017.
- Existing IMEX shuttles to Minto and Yennora achieve a 33% increase in average teu per path in 2017.
- In 2017 the following increase in existing daily IMEX services will occur:
  - West Regional (excl Manildra) from 2 to 3;
  - Illawarra (Manildra to Enfield) from 0.5 to 1; and
  - Newcastle and North West Service from 4 to 5.
- A new refuse train between Botany and Crisps Creek will commence in 2017 with 1 service per day.
- Stage 3 of the Port Botany Rail Link (PBRL) engineering work improving the track geometry and train operating speeds has been delivered;
- Inland Rail commences operations in 2025, and interstate services between Melbourne and Brisbane will no longer traverse the Sydney network; and
- No services currently using the Illawarra line are assumed to switch to the SSFL in advance of extension of the Sydney metro to Hurstville, which is discussed further in Chapter 6 and is not expected in the timeframe of this Strategy.

Alternative Scenarios

There are three potential changes to the operational assumptions in the base case that have significant implications for the capacity outcomes:

- Length of Moorebank IMEX Shuttle Trains (1,300m or 650m);
- Diversion of Melbourne – Brisbane intermodal trains from the coastal route to Inland Rail; and
- Diversion of coal trains from the Illawarra line to the SSFL to accommodate a more intensive 'metro' style passenger operation on the Illawarra line.

Taking each of the possible combinations of these three issues gives eight possible train volume scenarios. These have been tested in the capacity model to determine the infrastructure requirements for each scenario. A summary of the required infrastructure projects for each scenario is provided in Table 6-1. The required infrastructure covers the ARTC network and does not consider additional terminal investments that may be required to accommodate trains longer than 650m.

Scenarios 1 and 3 are low cost options and both assume Inland Rail is operational in 2025 and coal remains on the Illawarra Line.

Scenarios 2 and 7 assume that the Inland Rail is delayed until at least 2030 and coal remains on the Illawarra Line.

Scenarios 4 and 5 assume that the Illawarra Coal volume is transferred to the Main South when the Inland Rail is operational in 2025. Importantly this option provides sufficient infrastructure in the event that the Inland Rail project is delayed beyond 2025 and represents the most cost effective way to transfer coal from the Illawarra to the Main South Line. This option

creates more capacity for future passenger services on the Illawarra.

Finally for scenarios 6 and 8 it is assumed that Illawarra Coal volume is transferred to the Main South in 2025 regardless of when the Inland Route is operational. This is not an efficient approach to manage the additional infrastructure on the SSFL. Indeed, should Inland Rail become operational after coal trains commenced on the Main South much of the infrastructure would become superfluous.

Figure 6-1 shows growth in rail TEU and the associated timing of capital projects under Scenario 3, considered to be the 'most likely' scenario.

For capacity purposes projects are first triggered on the single track between Botany and Mascot in 2021. The partial and eventual full duplication of the track is a complex project potentially impacting a wide range of stakeholders as the track is located adjacent to residential and industrial precincts and any duplication will require construction next to a heavily utilised operational railway track. As such the Botany to Mascot partial and full duplication projects represent high risk construction activities.

In order to mitigate these risks there would be benefit in planning, and ultimately construction, commencing as soon as funds are available. Should the projects be delivered prior to 2021 it is recognised that track duplication provides additional redundancy, resilience, reliability and robustness of the rail network.

Cross metro shuttle train length

A consolidation of the eight scenarios comparing costs between 650 m and 1300 m shuttle trains has been provided in Figure 6-2. The incremental cost increase as shorter trains and less efficient infrastructure solutions are adopted is evident.

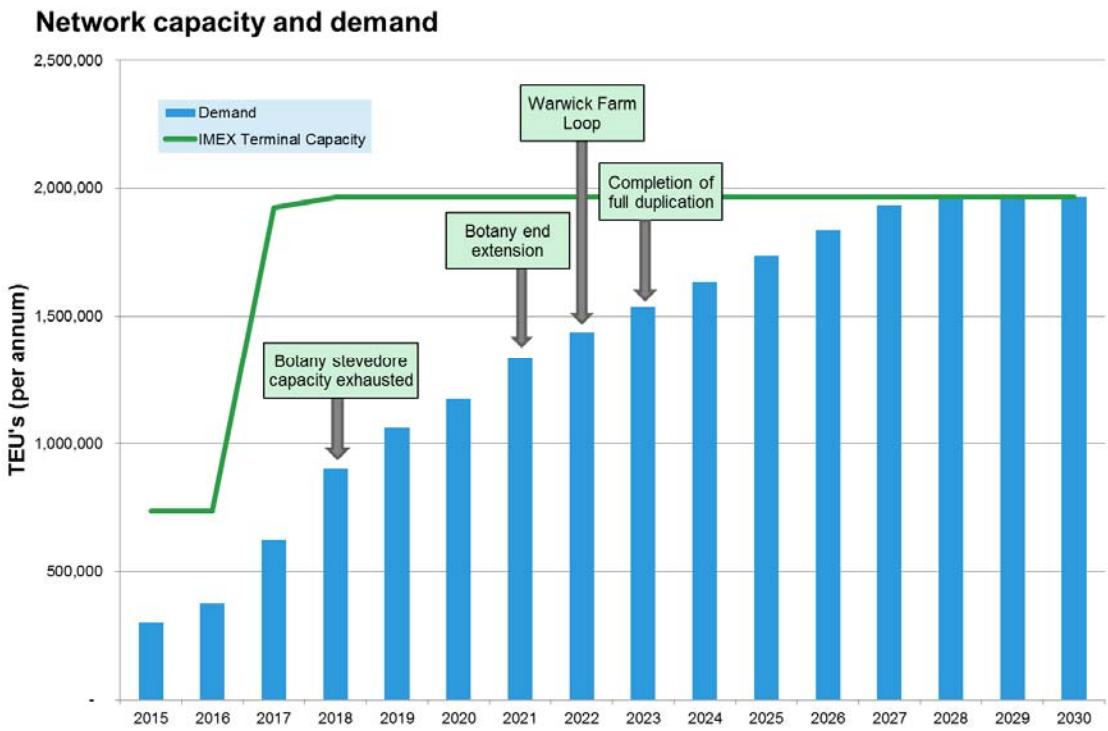


Figure 6-1: Capacity Projects

	Spare Paths (round trips) per day										
Section	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
SSFL Diverge - Moorebank Junction	11.2	11.2	10.1	9.6	9.2	8.8	8.6	8.2	9.1	9.9	10.7
Moorebank Junction - Leightonfield	12.7	12.7	9.8	7.4	4.3	5.2	3.2	9.7	9.9	9.8	9.8
Leightonfield - Sefton Park Junction	16.7	16.6	14.6	11.1	8.3	10.6	8.7	5.9	6.0	5.7	5.5
Sefton Park Jct - Chullora West Jct	140.4	140.3	136.2	131.7	128.4	128.4	126.3	123.1	122.9	121.8	120.7
Chullora West Jct - Chullora South Jct	144.3	142.3	138.3	133.3	130.3	129.3	127.3	124.3	123.3	121.3	119.3
Chullora South Jct - Marrickville Jct	114.7	112.7	106.1	100.1	95.0	93.0	88.9	85.9	84.8	83.7	81.7
Marrickville Jct - Cooks River	133.3	131.3	125.3	119.3	114.3	112.3	108.3	105.3	104.3	103.3	101.3
Cooks River - Botany	22.4	20.4	14.5	8.6	3.6	1.6	3.1	0.2	106.3	105.3	103.3

Table 6-2 Spare Capacity on MFN and SSFL

The modelling identified that for all of the options there are significant infrastructure cost savings from operating 1,300m IMEX trains as compared to 650 m IMEX trains. This analysis does not factor in investment that may be required in other parts of the supply chain to enable the operation of trains longer than 650m though and operator feedback has not been positive on 1,300 m IMEX trains due to concerns around the potential impact on train cycle times. However it should be noted that ARTC's analysis of the capacity of Botany yard has been done on the basis that 650 m trains occupy an entire arrival or departure track. As these tracks can already accommodate a 1,300 m train there is no apparent requirement for additional investment in Botany yard to operate 1,300 m shuttles.

While 1,300 m trains prima facie represent the lowest cost solution to accommodate IMEX shuttle volume growth, any future decision to invest to support the operation of longer trains would need to consider the full supply chain cost.

Leightonfield loop

There have been suggestions that ARTC should consider lengthening Leightonfield loop. The purpose of this extension would be to better manage trains trying to access the Pacific National terminal at Chullora as well as generally providing an additional crossing option. The loop currently has a standing length of 1370 m. There are options to increase this to either 1500 m or 1800 m.

However, it is important to note that once Inland Rail is commissioned the only trains likely to operate through Leightonfield at lengths above the current loop length are Sydney—Melbourne / Adelaide / Perth trains to and from the PN Chullora terminal. In the event that PN ultimately choose to relocate to Moorebank it is unlikely that any trains would operate through Leightonfield at longer than the existing loop length., other than a small number of Sydney—Brisbane / Newcastle intermodal and steel services

In these circumstances it is difficult to justify investment in lengthening Leightonfield loop.

Chullora and Cooks River Shunting

Chullora and Cooks River accommodate important facilities for the rail network. In both cases there is a need for rail operators to shunt onto the mainline. Conflicts inevitably arise between mainline trains and these shunting operations.

Historically these conflicts have been able to be managed but as volumes grow the level of disruption may begin to impact on efficient operations at both locations.

In both locations it may be possible to mitigate the effects by construction of shunting necks within the rail corridor. ARTC will continue to monitor and assess these locations.

Spare Capacity

Table 6-2 shows spare capacity in paths assuming the demand and projects described in this Strategy under Option 3.

Each path, if used by a 650 cross-metro shuttle, achieving an average 80% loading, is estimated to move approximately 45,000 teu per year.

In interpreting this table it is important to note that different train configurations have different capacity impacts and that this analysis shows spare capacity with the average forecast train size in each year.

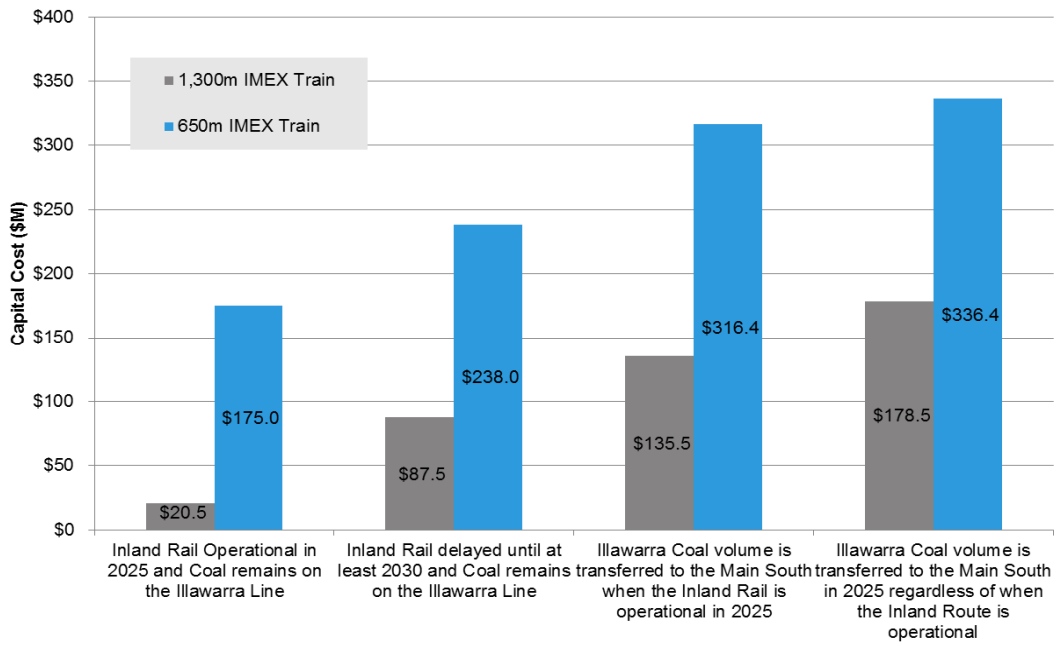


Figure 6-2: Infrastructure Cost Comparison

7

Issues on the Shared Passenger / Freight Network

Northern Sydney Freight Corridor

The Northern Sydney Freight Corridor (NSFC) program is a joint Australian and NSW Government initiative to improve capacity and reliability for passenger and freight trains between Sydney and Newcastle.

The NSFC program comprises four projects:

- North Strathfield Rail Underpass (complete);
- Epping to Thornleigh Third Track (under construction);
- Gosford Passing Loops (complete); and
- Hexham Passing Loop (complete).

The NSFC program will relieve constraints on the number and flexibility of freight paths through northern Sydney and cater for forecast growth in freight services in northern Sydney.

In addition, the works will improve reliability of passenger services and have other consequential benefits for passengers arising from complimentary works being undertaken by the NSW Government.

TfNSW has designed the NSFC to cater for the forecast growth in interstate container freight traffic between now and 2028.

A Memorandum of Understanding (MOU) in relation to the Northern Sydney Freight Corridor (NSFC) was signed between the Commonwealth and the NSW Government in December 2011. Figure 7-1 and Figure 7-2 detail the existing freight capacity as stated in the MOU for northbound and southbound trains as determined at Hornsby.

Table 7-1 is a summary of the spare intermodal capacity that will exist after the completion of the NSFC program. This is for the 'Core Period' (0400-22:00 at Hornsby), which was considered to be the 'marketable' timespan for intermodal trains through northern Sydney in the NSFC studies. Sydney Trains has applied a practical utilisation of 70% to determine the number of feasible train movements.

At current forecast growth rates the northern Sydney capacity will be adequate at least until Inland Rail becomes operational.

Western Line and Illawarra

The NSW Government has made a decision to construct the North West Rail Link as a metro style train operation. It is proposing that this will subsequently be extended across the harbour to connect to the Bankstown line, which will be converted to metro operation. This is not expected to have significant consequences for freight operations. However, the NSW Government is also considering a longer term plan to convert the Illawarra line to metro operations to Hurstville. This is likely to have significant consequences for rail freight operations due to the consequential need to transfer some suburban trains to the other pair of tracks. This is likely to consume all of the freight paths currently available, other than between midnight and 5 am.

Description	Northbound	Southbound
Current interstate intermodal Paths	4	3
Potential additional intermodal paths pre NSFC Stage 1	1	2
Total pre NSFC Stage 1	**5**	**5**
Additional paths created by NSFC Stage 1	13	9
Total post NSFC Stage 1	**18**	**14**
Practical train movements (@ 70% utilisation)	13	10
Spare capacity (Train movements less current paths)	**9**	**7**

Table 7-1: Summary of Intermodal Paths (Daily)

The logical consequence of this will be that most of the freight services that currently use the Illawarra line will need to divert to the SSFL.

It is understood that at this stage no decision has been made on this project and its timing is likely to be well into the future. However, it is important that its potential consequences for long term capacity be considered for this Strategy. This has been taken into account in the modelling by testing the scenario where all coal trains are diverted from the Illawarra to the SSFL / Main South. For this analysis it has been assumed that there will be sufficient capacity for the other relatively small number of non-coal freight services to operate via the Illawarra between midnight and 5 am.

One unknown is whether, in the event that coal services are diverted off the Illawarra, they will access

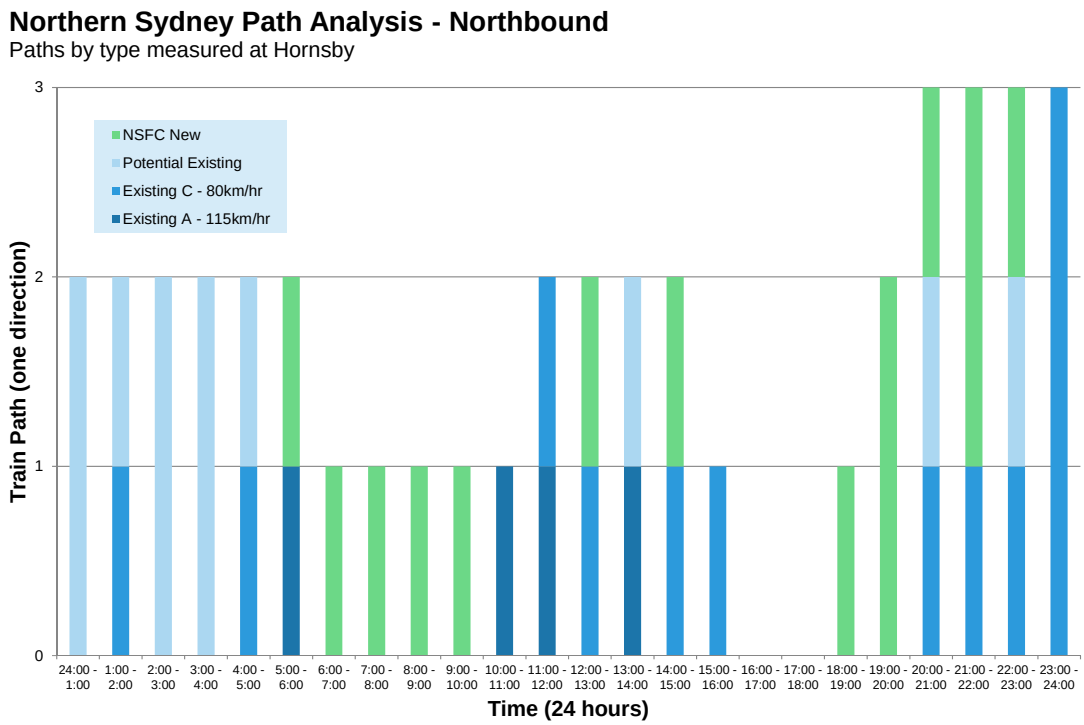


Figure 7-1: NSFC Existing and Future Freight Capacity - Northbound

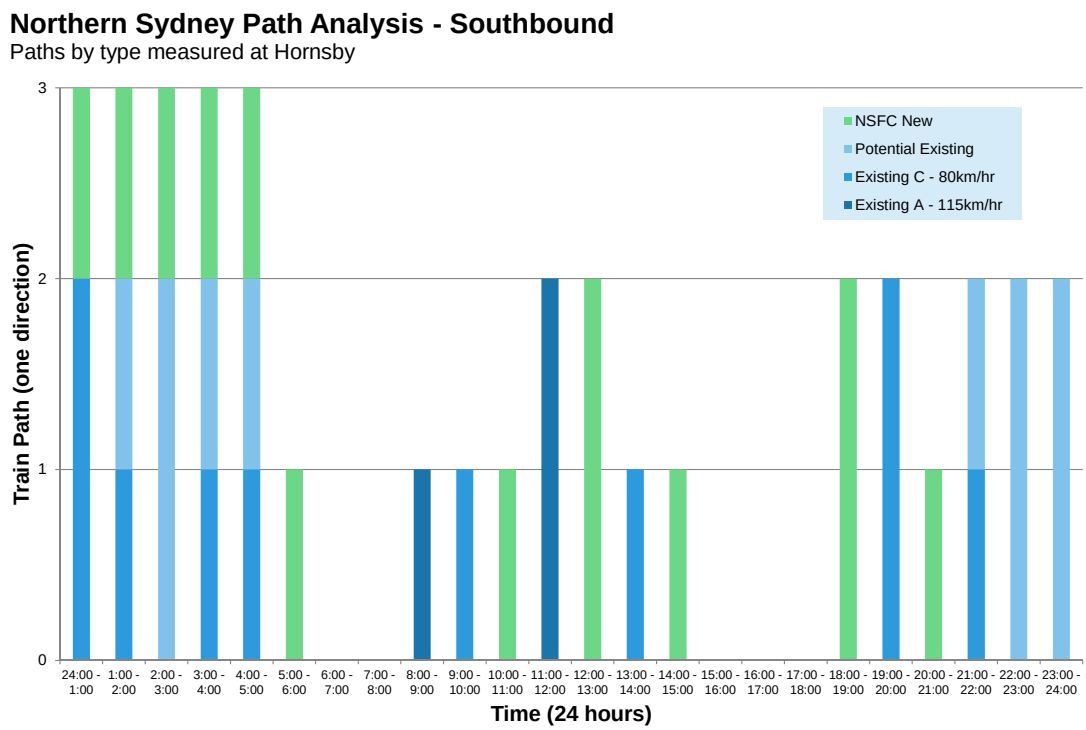


Figure 7-2: NSFC Existing and Future Freight Capacity - Southbound

the SSFL at Cabramatta and use the Old South via Fairfield to reach the western line, or whether they will operate via the SSFL and MFN, connecting to the western line at Lidcombe. In designing the proposed loop at Warwick Farm, provision is being made to assess the feasibility and cost of a connection to the Sydney Trains network to allow the first of these two operating options.

Passenger growth on the western line is a major issue for the Sydney Trains network and a number of potential capacity enhancements are under consideration. One of these options would involve terminating all stops passenger services at Parramatta. There are also plans to implement high capacity / communications based signalling, which as a transitionary measure would only be applied to some tracks.

These initiatives may have some significant implications for freight services. Specifically, the changes may preclude the option of freight trains accessing the Old South via the Harris Park triangle. This is not a current operation, but as discussed above would be an option in the event that coal trains are shifted to the SSFL and Main South.

Implementation of high capacity signalling might also have implications for freight services as the technology required to be installed on the locomotive is comparatively expensive and it may be prohibitively expensive to provide current levels of access for freight services.

8

Network Expansion

Context

Both Government and the rail freight industry could arguably have performed better in recent decades in terms of long-term land use and transport planning that will support the efficient movement of freight by rail. The ideal environment for rail to be competitive is for an urban environment where:

- Land-use planning identifies suitable locations for the agglomeration of major freight generating industries and makes provision for rail freight infrastructure in the land-use plan.
- Industry that generates significant volumes of freight is encouraged by the planning process to locate in those areas.
- Activities that do not generate significant volumes of freight are discouraged from locating in those areas.

It should also be noted that this approach also minimises road freight within the city as business to business freight movements can be consolidated within a freight precinct, minimising truck trips through residential areas.

Inevitably there will be a degree of dispersion of industry as industrial activity generally tends to gravitate toward lower value land on the outskirts of the city, with traditional industrial areas redeveloped into residential or commercial. However, as per Figure 8-3, Sydney has developed with an industrial geography that is almost an extreme opposite of the preferred structure, with 15 distinct major freight activity precincts spread across much of the urban area of Sydney and interspersed with residential development.

Future industrial development in Sydney is expected to be concentrated in the 'employment lands' area extending approximately south west from Eastern Creek toward the planned second airport at Badgerys Creek, as highlighted by Figure 8-1. Given the natural environmental constraints on Sydney's growth, this area has a strong possibility of ultimately becoming the long term dominant industrial area.

From a rail industry perspective it would be highly desirable for planning mechanisms to reinforce this outcome. There also then needs to be appropriate intermodal facilities and connecting rail lines developed to efficiently service this dominant industrial precinct.

Terminals

Moorebank Intermodal terminal was first conceived in the early 2000's and is scheduled to be operational in 2017. This highlights the long timeframes for the development of significant freight infrastructure and the need to begin planning for additional terminals to be located in the western employment areas.

There has previously been some work done by NSW on a nominal terminal site identified at Eastern Creek. However, at this stage it is understood that no land has been acquired or reserved.

The Eastern Creek terminal was conceived as purely an import / export terminal, but if the region is going to be the long term centre of industrial development in Sydney it may be desirable to contemplate an interstate terminal in this region as well. The Eastern Creek site does not appear to be suitable for an interstate scale terminal

The Eastern Creek region has already experienced significant development. Recognising the very long lead times to develop a terminal and the direction of industrial development, a site further southwest, closer to Badgerys Creek, is likely to be appropriate for an interstate terminal. It would be desirable to also co-locate an IMEX terminal with the interstate terminal which could potentially see both the Eastern Creek and a Badgerys Creek terminal developed.

Figure 8-2 from the Sydney Metropolitan Plan illustrates current and future potential terminals in relation to the Sydney industrial lands.

Future Rail Network in Western Sydney

If an intermodal terminal is to be built in western Sydney, potentially around the employment lands, it will be desirable to connect it to the dedicated freight network.

The concept of a Western Sydney Freight Line to and through the Eastern Creek area was first assessed in 2000. The basic concept was to connect the employment lands to the dedicated rail freight network via an alignment that was optimised for movements to Port Botany, but also effective for north and south bound freight. The concept alignment was a greenfield option running roughly westward from Leightonfield, through Yennora and passing to the south of Prospect Reservoir before turning approximately north and connecting to the Western Line at Rooty Hill, thereby also providing a dedicated freight bypass of much of the Western line.

During 2005, the NSW Government undertook a detailed study to identify a preferred alignment for a Western Sydney Freight Line. This considered a number of greenfield options and a dedicated freight track in the existing Western Line corridor. It concluded that the most effective solution remained the option identified in 2000, though NSW also flagged a potential interim solution with a line connecting an Eastern Creek Terminal to the Western Line and shared passenger / freight operations on the Western Line until demand warranted a dedicated freight connection to the rest of the freight network.

At this stage it is understood that there is no corridor defined and no land reserved or acquired for a line. Development in the area since 2000 is gradually making it harder and more expensive to ultimately develop a corridor.

A second challenge is that in the long term it is likely to become increasingly difficult to accommodate growth on the Southern Sydney Freight Line. Options for further capacity enhancement on the SFFL are limited between

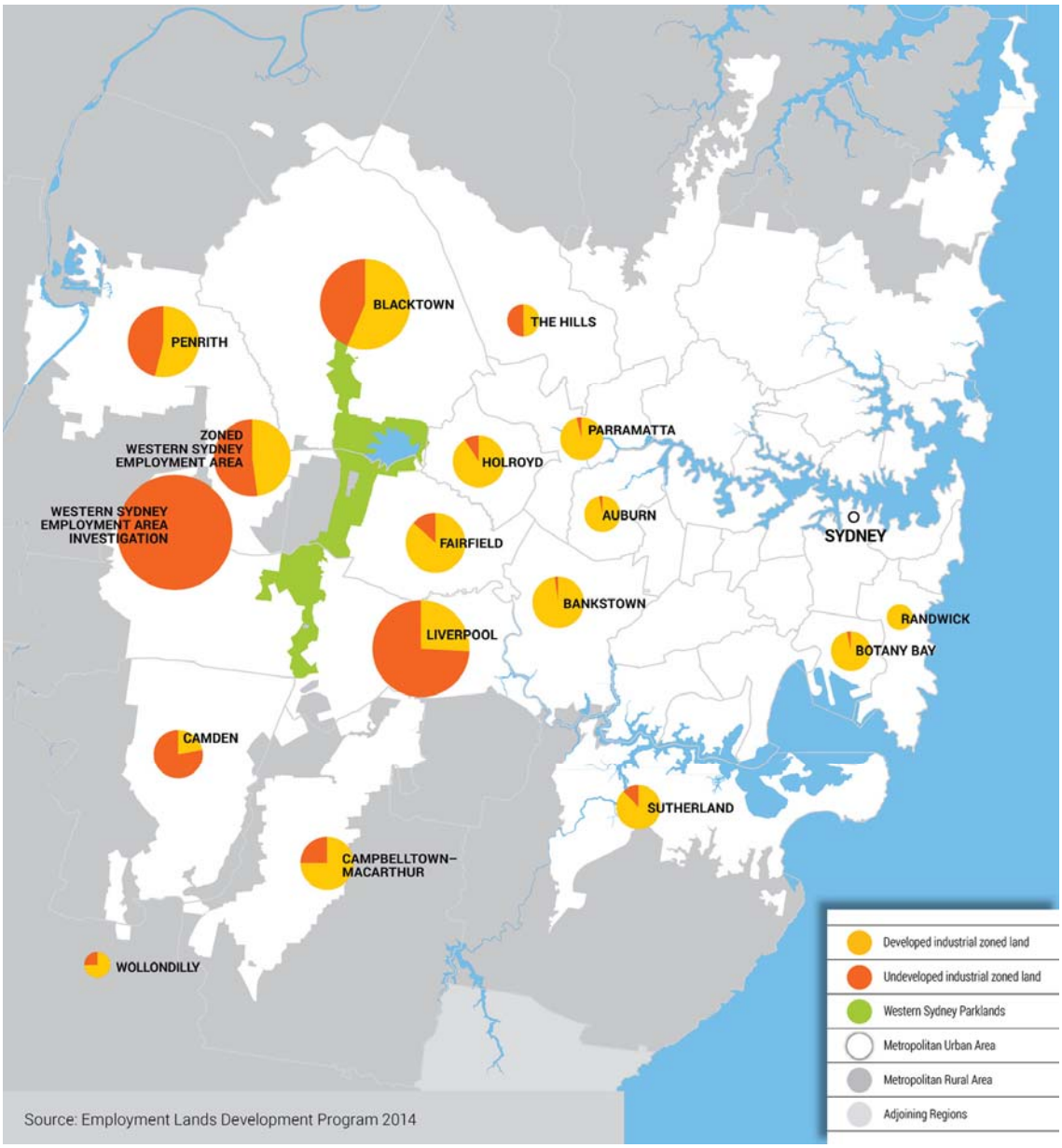


Figure 8-1: Plan for Growing Sydney (December 2014) - Current and future industrial land (figure 18)

Cabramatta and Liverpool. As Sydney grows there is also the possibility that there will be a need for additional passenger tracks, particularly south of Glenfield.

NSW planning documents have floated the concept of an M9 corridor or Outer Sydney Orbital that would run north-south in far western Sydney. This concept has included both a road and rail line. In the very long term, a western Sydney terminal, connected to the north and south by the M9 corridor and to Port Botany by a western Sydney freight line / MFN may be a desirable solution for Sydney's rail freight needs.

The NSW Ports and Freight Strategy highlighted both the Western Sydney Freight Line and the Western Sydney Orbital as part of the long term conceptual development of a freight network in western Sydney as per Figure 8-3.

Maldon to Dombarton

During the 1980s, the NSW Government partially constructed a freight rail line between Maldon in the Southern Highlands and Dombarton near Port Kembla. The work included 35kms of earthworks such as major cuttings and embankments and the installation of ballast. A bridge and tunnel portals were also partially built. Construction on the line started in 1983 but was halted due to an economic downturn and the forecast growth in coal traffic not eventuating.

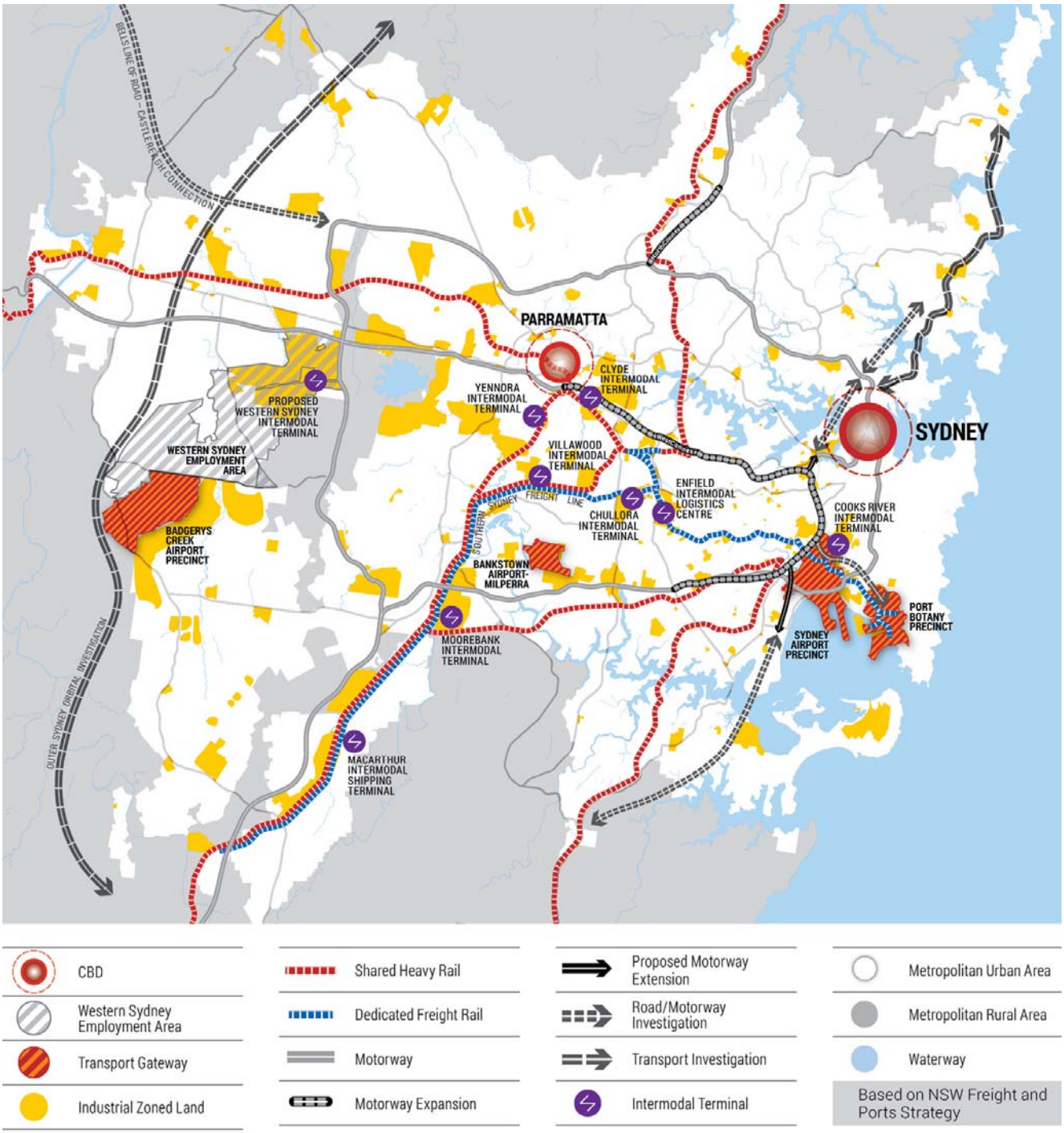


Figure 8-2: Plan for Growing Sydney (December 2014) - Freight transport network and industrial zones land (figure 14)

During 2010–2011, a feasibility study was done to inform decision-making on the Maldon - Dombarton Rail Link proposal. The study concluded that there was no apparent trigger for the project that would make it economically justified.

More recent investigations completed by Transport for NSW and the NSW Bureau of Freight Statistics indicate existing rail infrastructure is sufficient to manage short and medium term rail capacity at Port Kembla up to 2030. The most likely trigger for the project would be the conversion of two Illawarra line tracks to metro style operation to Hurstville, as disussed elsewhere in this Strategy.

Notwithstanding this, in response to approaches from the private sector, the NSW Government has been undertaking an expressions of interest process for third parties willing to construct the line at no cost to Government.

Future work to complete the Maldon - Dombarton Rail Link would involve building:

- a four km tunnel – one of the longest freight rail tunnels in Australia
- a 250m bridge over the Cordeaux River
- a 190m bridge over the Nepean River
- a crossing underneath the Hume Highway
- three road overbridges
- new track for the entire rail line, and
- installing signalling systems, power supplies, fencing and other ancillary infrastructure.

If completed, the freight rail line would connect Port Kembla to the Main South Line at Picton. Completing the Maldon - Dombarton Railway is estimated to cost in the order of $840M in current dollars.

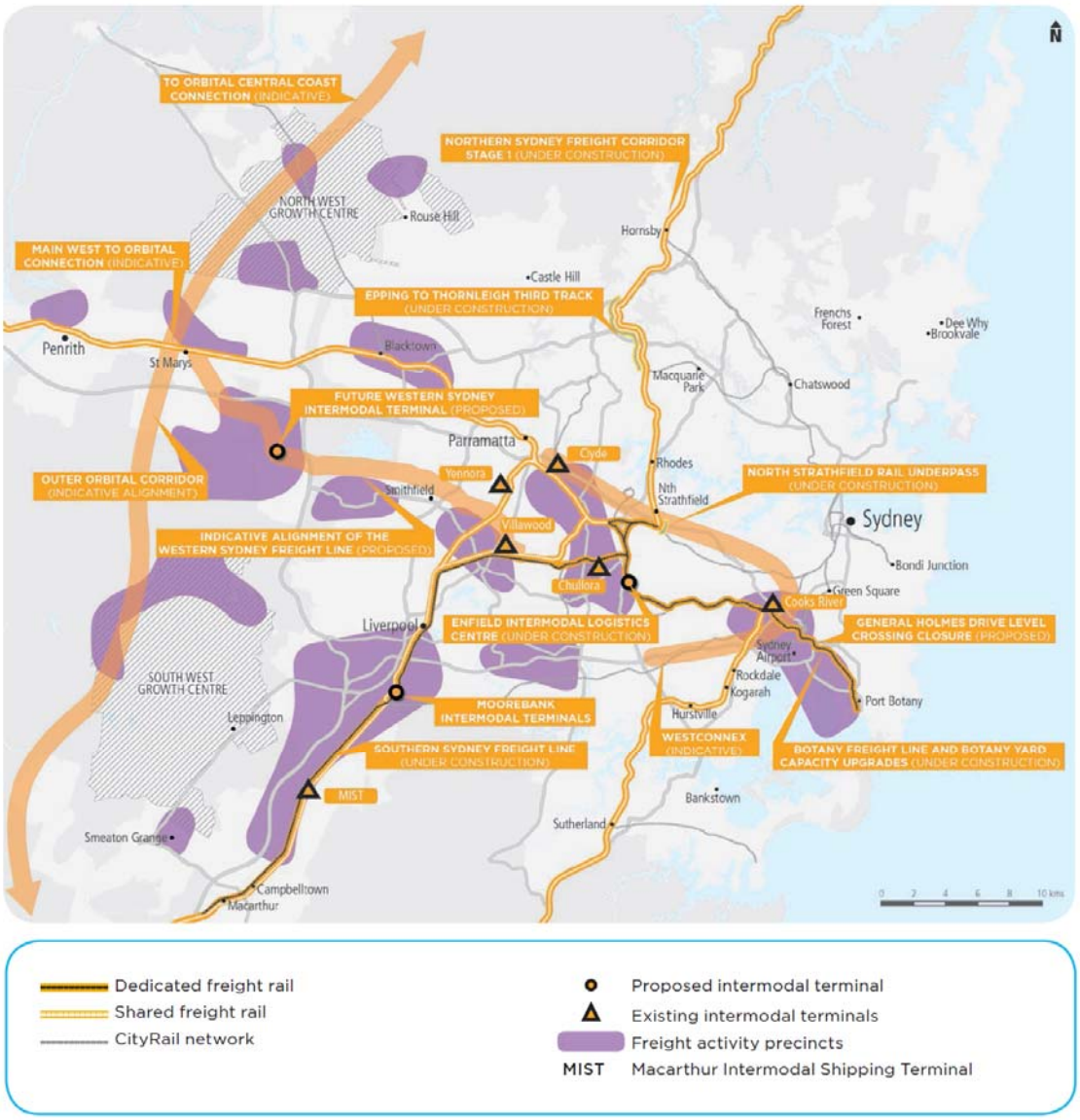


Figure 8-3: NSW Freight and Ports Strategy (November 2013) - proposed freight transport developments (figure 28)

9

Key conclusions and recommendations

The key outcome of the analysis in this document is that Scenario 3 (Inland Rail in 2025, no diversion of Illawarra trains, 650 m IMEX shuttles) is the most likely forward volume scenario and requires capacity investment of $175.0m. The projects and cost estimates are only considered in the context of the rail corridor and not the total supply chain.

On this basis it is considered that engineering analysis and environmental approvals should proceed on a new simultaneous entry loop of either 1,350m or 1,850m located at Warwick Farm and full duplication of the double track from Mascot to Botany Yard.

Further analysis of the feasibility of 1,300 m port shuttle trains in the medium term should be pursued, which would reduce the required investment on mainline track to $20.5 m, though it may necessitate additional investment in terminals.

Further discussions with NSW Ports and the Port Botany stevedores regarding train handling capacity and future infrastructure required to receive the projected volume of containers arriving at Port Botany by rail are required. Based on current container volume estimates Port Botany rail handling capacity will be exhausted in 2018 assuming stevedores continue to utilise current container handling practises with the existing infrastructure.

ARTC is supportive of increased coordination at Port Botany and looks forward to the establishment of a clear and industry supported charter for the Rail CMCC. ARTC will be carefully following this initiative to assess whether it is achieving its aims and actively contributing to the growth of rail volumes.

Design and land acquisition for both the proposed Eastern Creek IMEX terminal and a second terminal within the 'employment lands' area for both IMEX and interstate containers, together with connecting rail lines, needs to proceed as a matter of priority. ARTC is willing to progress this work on behalf of NSW if desired, subject to suitable funding arrangements. Ideally the NSW Government should also take steps through the land use planning process to promote the employment lands as the long-term centre for major freight generating activities.

Table 9-1 summarises the infrastructure projects, cost estimates and development timeframes for projects identified in this Strategy while figure 9-1 shows them geographically.

Infrastructure	Cost $[1]	Completion by
Network Capacity Enhancements		
Warwick Farm Loop	$67.0M	2022
Botany Line Double Track		
From Botany end (900m)	$20.5M	2021
Completion of Full Duplication (1,940m)	$87.5M	2023
New Rail Corridors		
Western Sydney Freight Line	Unknown	2025
Western Sydney Orbital (M9 corridor)	Unknown	Beyond 2030
Terminals		
Western Sydney	~$500M	2025

Table 9-1: Infrastructure Projects

1. Dollar estimates are based on current known scope, survey and geotechnical knowledge, legislation and tax regimes. Project dollars are order of magnitude estimates only and do not represent concluded project dollars.

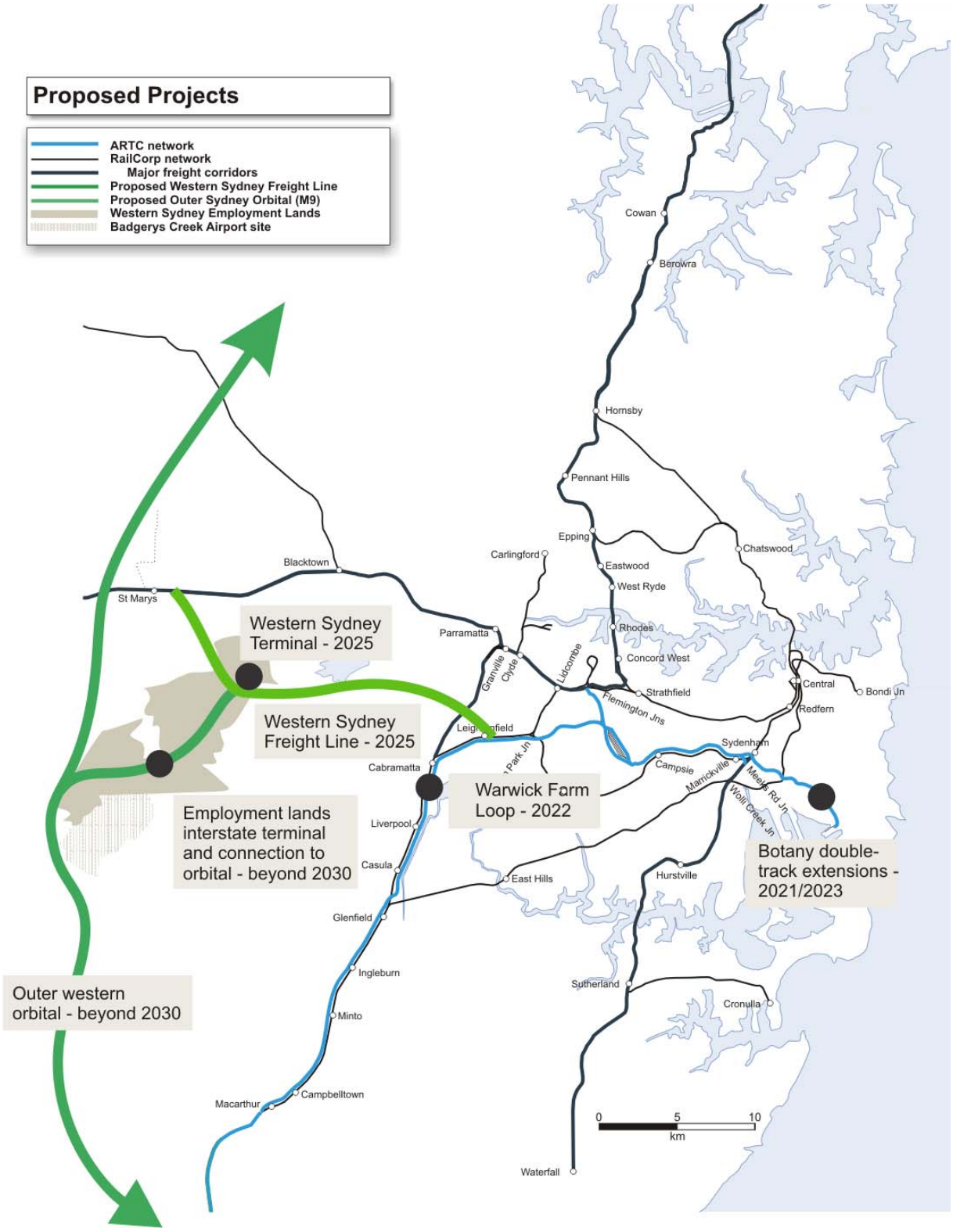


Figure 9-1: Overview of projects