

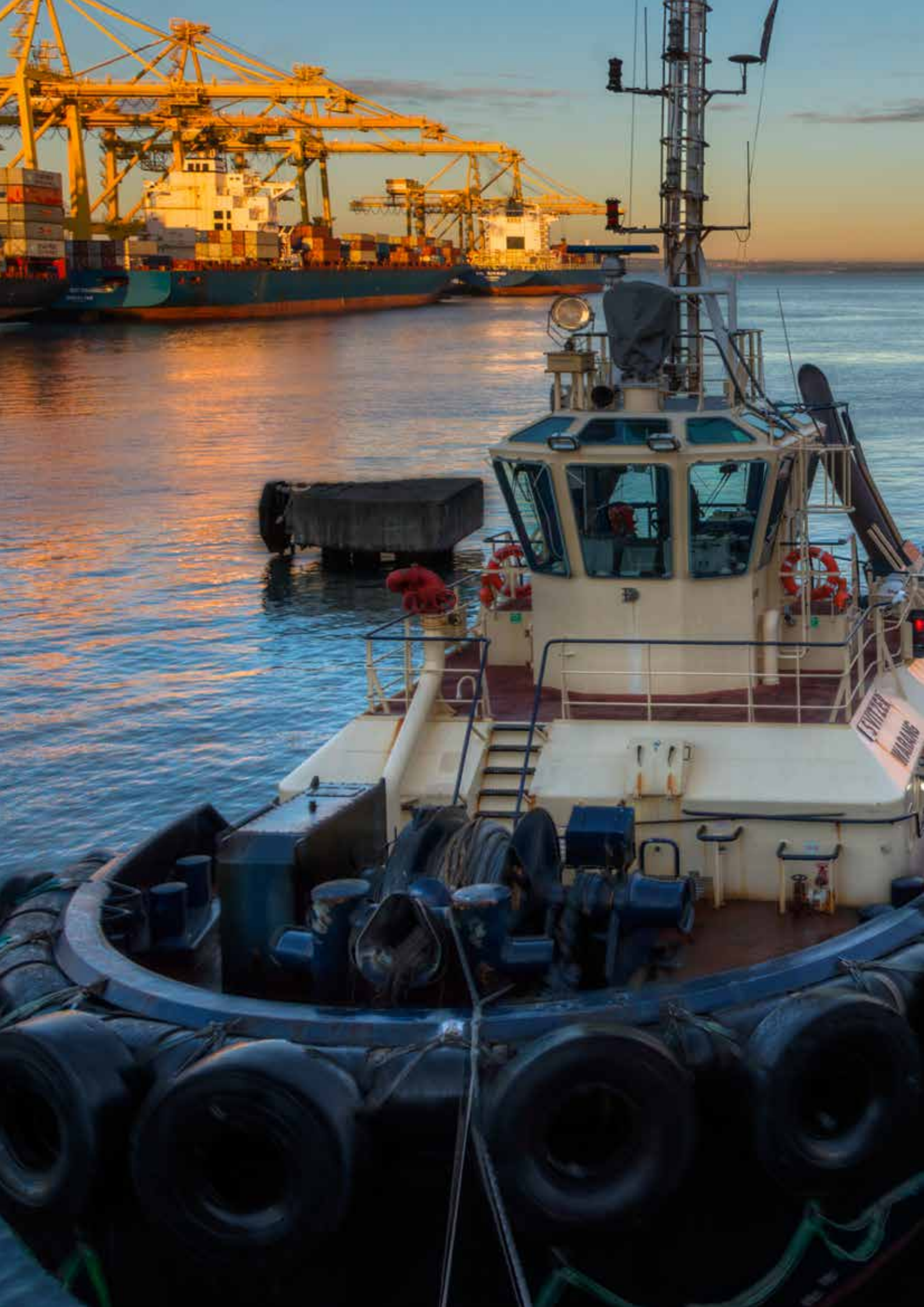
Navigating the Future

NSW PORTS' 30 YEAR MASTER PLAN



NSW Ports

OCTOBER 2015





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MESSAGE FROM THE CHAIRMAN

NSW Ports began operations in mid-2013 under a 99-year lease for Port Botany, Port Kembla, Cooks River Intermodal Terminal and the Enfield Intermodal Logistics Centre.

As custodian of these assets, we are committed to taking a long-term and sustainable approach to the way we operate, the actions we need to take or encourage from others, and the way we work with our stakeholders.

Navigating the Future: NSW Ports' 30 Year Master Plan is a way for us to do this. It looks at every aspect of our operations – the assets we manage, the stakeholders we deal with, the regions our freight travels to and from and the environmental and social outcomes we want to contribute to. It acknowledges that we have to get initiatives in place now that will have benefits well into the future.

This Master Plan focuses on sustainability, and not just our efforts to minimise our impact on the environment, but also on economic sustainability – the ability to reduce costs and improve productivity across the port supply chain – and on social sustainability, by managing the interface between the port supply chain and communities.

Getting the most out of existing port-related infrastructure, before investing in new infrastructure, is a fundamental principle of sustainable use and our social responsibility as the manager of key State infrastructure assets.

This Master Plan acknowledges that an efficient and sustainable port supply chain will contribute to the success of Sydney, NSW and Australia. It complements the objectives of government-led plans and strategies designed to build a sustainable future for Sydney and NSW.

I want to thank the many stakeholders that have contributed to the preparation of this Plan. I also want to thank the whole team at NSW Ports for their vision and determination in producing this Plan.

On behalf of NSW Ports, I commend this 30 Year Master Plan and support its objectives and actions.

A handwritten signature in dark ink, appearing to read 'Paul McClintock'.

Paul McClintock AO
Chairman

EXECUTIVE SUMMARY



Port Botany and Port Kembla are economic assets of national significance, critical to the future economic growth and development of NSW. They are NSW's key import and export gateways, collectively contributing around \$4 billion per year to the NSW economy and supporting over 26,000 jobs.

Port Botany is NSW's only container port and largest bulk liquid and gas port. Most of Port Botany's trade caters for Sydney's consumers and businesses, with 80 per cent of import containers delivered within a 40 kilometre radius of Port Botany.

Port Kembla is NSW's largest motor vehicle import hub, largest grain export terminal and second largest coal export port. Port Kembla is a key economic driver in the Illawarra region and services an extensive area of NSW, connected to trade locations by both road and rail.

Over the next 30 years:

- **Port Botany will remain Australia's premium port and NSW's primary container, bulk liquid and gas port servicing Australia's largest population centre.**
- **Port Kembla, as the NSW port of growth, will continue to be NSW's largest motor vehicle import hub and bulk grain export port while catering for a growing range of dry bulk, bulk liquid and general cargo. Port Kembla will also be home to NSW's second container port.**

Port Botany and Port Kembla combined will be required to cater for growing trade volumes over the next 30 years.

- Container volumes could more than triple from 2.3 million twenty-foot equivalent unit (TEU) to 8.4 million TEU.
- Bulk liquid volumes could more than double from 5.1 million kilolitres to 10.8 million kilolitres.
- Motor vehicles could more than double from 390,000 to 850,000 motor vehicles.
- Dry bulk products could grow from 20.3 million to 30 million tonnes.

On the waterside, forecast trade will be handled by larger vessels, with more product carried on each vessel and more vessel visits each year. Total vessel visits at Port Botany and Port Kembla combined could grow from 2,280 to 3,300.

To achieve a sustainable and efficient port supply chain for the people and businesses of NSW, operational improvements, proactive planning and investment in infrastructure will all be required.

Enfield and Cooks River intermodal terminals will be an essential part of the future port supply chain for NSW, becoming inland extensions to Port Botany where containers are rapidly moved by rail between the Port and the Terminals. Cooks River will operate as an extended port gate and the Enfield Intermodal Logistics Centre will provide a key logistics hub in the central-west of Sydney.

Maximising the use of existing port-related infrastructure before investing in new infrastructure is fundamental for a sustainable port supply chain and for responsible management of these key infrastructure assets. New infrastructure will still be required to cater for forecast trade growth; however, the enhanced use of existing infrastructure needs to be pursued first.

We have identified the following five objectives to sustainably cater for forecast trade growth. This Master Plan identifies the requirements to deliver on these objectives.



1 Provide efficient road connections to the ports and intermodal terminals

Efficient road connections to and from ports and intermodal terminals are vital to the efficient movement of freight and essential to be able to cater for the growing NSW freight task. While increased use of freight rail will assist in managing the growth in truck volumes, roads will continue to be the primary means of moving freight to and from ports and intermodal terminals. It is therefore essential that efficient road connections are available to ports and intermodal terminals.



2 Grow rail transport of containers

Increasing the movement of containers by rail to and from Port Botany will assist the Port to maximise its throughput capacity. In this way, forecast container growth can be accommodated in a cost-effective, efficient and sustainable manner.

We have set a target to move three million TEU per year by rail by 2045. Achieving this target requires action by all stakeholders involved in the container rail supply chain. The operation of intermodal terminals will be essential for achieving this target. The Enfield Intermodal Logistics Centre and Cooks River Intermodal Terminal will be part of this solution, with both being inland extensions to Port Botany.



3 Use land and infrastructure efficiently

Land and infrastructure within our ports and at our intermodal terminals is finite and in demand. Optimising the utilisation and productivity of existing land and infrastructure before investing in new land and infrastructure is at the core of our approach to sustainable asset management.



4 Grow port capacity

Even with improved productivity and greater land utilisation, new infrastructure will be required to cater for forecast trade growth. The timing for increased capacity will depend on actual trade volumes, productivity improvements and wider market developments.



5 Protect the ports and intermodal terminals from urban encroachment

Ports and intermodal terminals need to operate 24 hours a day, seven days a week, in order to meet the demand of businesses and consumers and to maximise productivity of significant asset investments. Activities at the ports and intermodal terminals will intensify to cater for growing trade volumes. These activities can impact on the amenity of sensitive land uses such as residential.

Ports and intermodal terminals require protection from urban encroachment and redevelopment to higher-value land uses such as residential, retail and commercial uses in order to operate efficiently.

This Master Plan outlines our priorities and the actions we believe are required for a sustainable and efficient port supply chain well beyond the 30 year horizon. We have recognised that we cannot achieve the objectives that will ensure the ports and intermodal terminals can efficiently and sustainably cater for NSW's future needs on our own. Many stakeholders will need to work in a coordinated and collaborative manner if we are to successfully deliver on this Plan.

INTRODUCTION



Navigating the Future: NSW Ports' 30 Year Master Plan presents our view on the actions required to create a sustainable port supply chain that will meet the needs of NSW over the next 30 years and beyond.

It is focused on the long-term sustainability of our port and intermodal assets: Port Botany, Port Kembla, Cooks River Intermodal Terminal and Enfield Intermodal Logistics Centre. The fundamental purpose of these assets is to meet the trade needs of NSW, for the benefit of the people and businesses of the State.

This Master Plan details expected trade growth over the next 30 years and outlines the actions that we believe are needed to address this growth.

It addresses the current and future state of each of our assets; how we can support the efficient and sustainable movement of goods within Sydney and to and from regional NSW; how we will work with stakeholders and nearby communities; and how we can manage environmental impacts.

This Master Plan is the result of a program of long-term planning that has actively called on the involvement and input of many stakeholders. These stakeholders have provided us with up to date information, global trends and future expectations, allowing us to be well-informed in our 30 year planning. We are pleased that so many stakeholders provided input to this Master Plan.

While this Master Plan will guide our decision making and actions, we cannot deliver it alone. Its actions require the coordination and cooperation of many stakeholders, and we will work constructively with all stakeholders in the interest of securing a sustainable and efficient port supply chain for NSW.

We are determined to ensure that our assets are ready for the future, and able to cater for the trade needs of NSW, for the benefit of the people and businesses of the State.



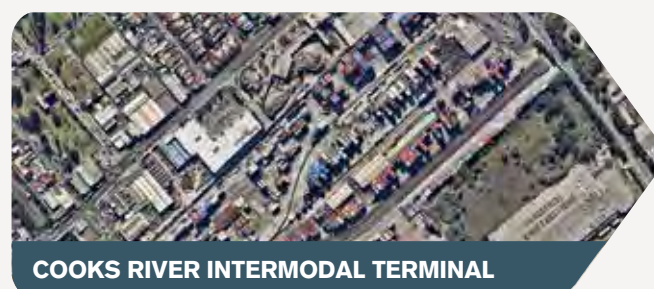
PORT BOTANY



ENFIELD INTERMODAL LOGISTICS CENTRE



PORT KEMBLA



COOKS RIVER INTERMODAL TERMINAL

Port Botany and Port Kembla are strategic economic assets for Australia, critical to the current and future economic prosperity of NSW. Collectively, operations at these ports contribute \$4 billion annually to NSW Gross State Product and support more than 26,000 jobs in NSW.

The Cooks River Intermodal Terminal and Enfield Intermodal Logistics Centre, connected to Port Botany by dedicated freight rail, form part of an expanding network of intermodal terminals in Sydney designed to grow the volume of containers transported by rail.

OUR PORTS AND INTERMODAL TERMINALS





Who We Are

NSW Ports is a consortium of leading institutional investors: IFM Investors, Australian Super, Tawreed Investments Limited and Q Super, Cbus, Hesta and Hostplus. Our shareholders represent over five million Australian superannuation fund members and are long-term investors with interests in a range of Australian infrastructure assets.

We are responsible for managing Port Botany and Port Kembla, the Cooks River Intermodal Terminal and Enfield Intermodal Logistics Centre. Much of the land we manage is leased to third-party port and logistics operators who are responsible for operations, maintenance and development within their leased areas.

We are responsible for some port operations such as operations at Port Botany's bulk liquid berths and rail operations within the Port Kembla port precinct.

Our roles and responsibilities, together with our regular interactions with port supply chain stakeholders, means that we understand port-related activities and the requirements to achieve a sustainable and efficient port supply chain.

Our Ports and Intermodal Terminals

As an island nation, Australia has no land connections with major trading partners. Sea freight is vital to the movement of goods in and out of the country, accounting for over 99 per cent¹ of our imports and exports.

Sea freight is the most efficient and sustainable method for transporting large volumes of goods over long distances. Our ports are the international gateways for this freight and are supported by landside freight facilities, intermodal terminals, infrastructure and services. They are well positioned to service the markets of Sydney, the Illawarra and regional NSW.

Port Botany and Port Kembla are NSW's primary import and export gateways. The Cooks River Intermodal Terminal and Enfield Intermodal Logistics Centre support the growing container trade demand through Port Botany.

NSW is Australia's largest economy and home to one-third of the nation's population. Port Botany and Port Kembla are critical to the economic growth and prosperity of NSW and Australia. The future of these ports, and the transport infrastructure supporting them will be a key driver for NSW's economic future.



NSW Ports' role is to manage Port Botany and Port Kembla and the Enfield and Cooks River intermodal terminals in a way that allows our customers to efficiently service the needs of the people and businesses of NSW while minimising environmental and social impacts.

¹ BITRE, *Australian Infrastructure Statistics Yearbook 2014*.

Our vision is to create an integrated, world-class port management company.

OUR OBJECTIVES

Develop both ports to their full potential

Ensure responsible and efficient operation of the organisation

Build strong relationships with all stakeholders

Focus on sustainable growth

OUR ACTIONS

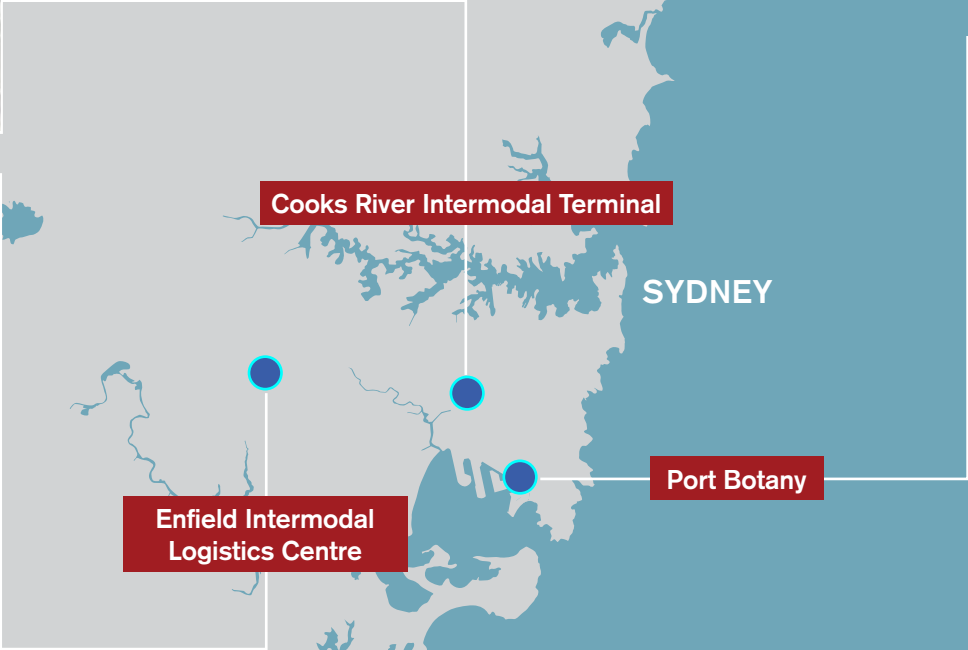
Promote safe, responsible and reliable operations
Capitalise on the strengths of each facility

Bring out the best from the organisation by having a highly engaged workforce
Support management and staff to deliver effective outcomes

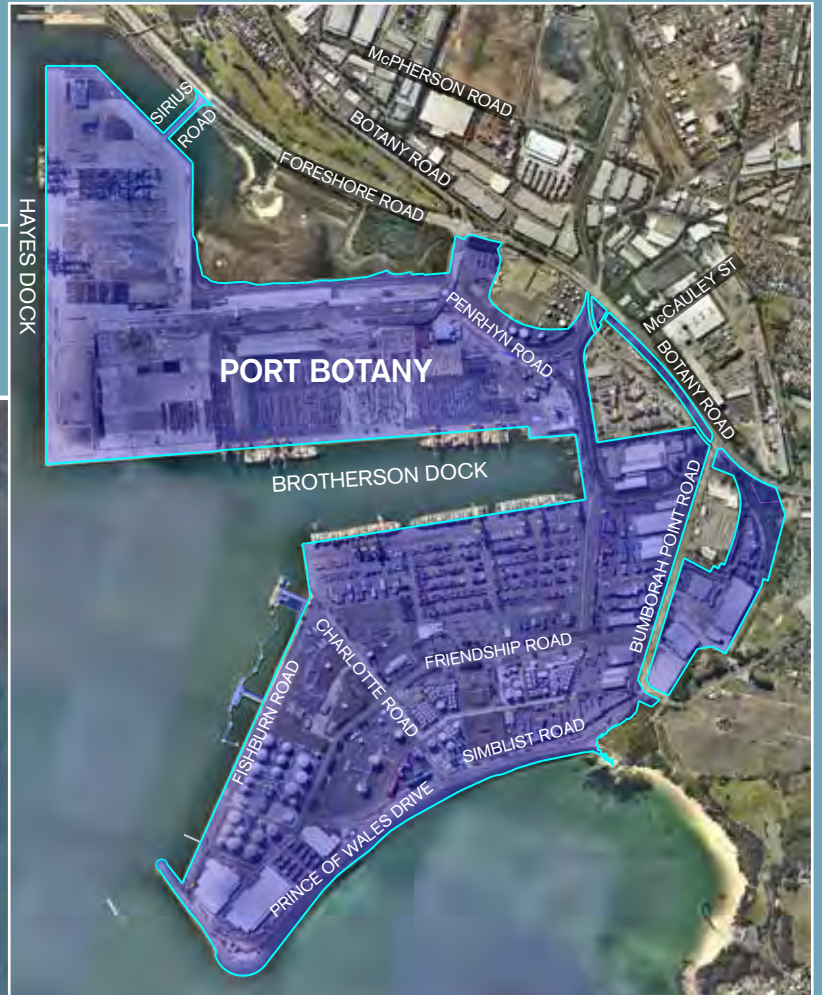
Maintain strong customer relationships
Work with other stakeholders including government, stevedores, transportation logistics companies and local communities to solve port issues

Manage and develop the ports in a safe, secure, efficient and environmentally-responsible manner
Be a good corporate citizen that employees and investors can be proud to be part of

OUR PORTS AND INTERMODAL TERMINALS



Port Botany



KEY

● NSW Ports' asset boundary

SCALE OF MAP INSERTS



Port Botany

Port Botany is Australia's premium port and vital to the economic wellbeing of Sydney and NSW.

Port Botany is home to NSW's only container port and is NSW's primary bulk liquid and gas port. It is Australia's second largest container port by volume, servicing a market supported by the largest population base in Australia. It has the largest dedicated common user bulk liquid facility in Australia, handling petroleum products, chemicals and liquefied petroleum gas (LPG) through the only LPG import and export facility in NSW.

The people of NSW rely on imported containers to supply the items they use every day, such as electronic goods, furniture, whitegoods and food. Australian products are loaded into containers and exported to overseas markets, filled with wine, farm produce, manufactured goods, wool, cotton and other goods. Container shipping connects NSW with the rest of the world and keeps the NSW economy functioning.

We rely on imported bulk liquid and gas products for many activities and businesses. LPG is used in plastics manufacturing, to heat barbeques and homes and in the autogas industry. The chemicals handled at Port Botany contribute to detergents, plastics, soap products and paint. Refined fuels are mainly used as transportation fuels in motor vehicles, aircraft and ships and in machinery. Bitumen is used for road pavement construction.

Port Botany handles 99 per cent of the State's container demand, 98 per cent of the State's consumption of LPG, 90 per cent of bulk chemical products, 30 per cent of refined petroleum fuels and 100 per cent of the State's bitumen products.

PORT BOTANY'S KEY STRENGTHS

- Located within Australia's largest population centre.
- Deep water shipping channel and berths that require minimal maintenance dredging.
- Able to service fully loaded 6,500 TEU container vessels without tidal restriction at all berths and larger container vessels at select berths right now.
- Short shipping channel that minimises vessel transit time and contributes to port efficiency.
- Connected to the Port Botany Freight Line, a dedicated rail freight line for freight distribution.
- Connected to underground pipelines to distribute bulk liquids, including aviation fuel to Sydney Airport and chemicals and gas to Botany Industrial Park.
- Home to container-related services such as empty container parks, transport operations, warehouse facilities and Australian Customs.
- Operates 24 hours per day, seven days a week (24/7).

Port Botany Operations



\$3.2bn

**annual contribution
to NSW GSP**



21,000 jobs



\$2.2m

**per vessel visit
contribution to NSW economy**

Port Kembla

Port Kembla is NSW's port of growth. Located south of Wollongong, Port Kembla is a key infrastructure asset for NSW and an economic driver in the Illawarra region.

Port Kembla accommodates a range of dry bulk, bulk liquid and general cargoes. It is home to NSW's largest motor vehicle import hub and grain export terminal, and is the second largest coal export port in NSW.

Port Kembla is a key gateway supporting NSW's motor vehicle, mining, agricultural, manufacturing and construction industries. The cars that individuals and businesses in NSW purchase are typically imported via Port Kembla. NSW's construction and manufacturing industries rely on bulk products and general cargo imported via Port Kembla, including cement clinker imports which are ground on-site to produce cement; iron-ore for steel making; and lubricant oils for cars and machinery.

Port Kembla is also an international gateway for agricultural and mining industries including grain exports to overseas markets and coal exports for overseas steel making.

Port Kembla is connected to Sydney and regional NSW via both road and rail infrastructure, with the majority of grain and coal transported to the Port by rail.

PORT KEMBLA'S KEY STRENGTHS

- Connections to regional NSW, including freight rail connections, to support agriculture and mining.
- Proximity and access to the growing population and employment lands of south-west Sydney and the Illawarra.
- Capacity to handle new trades and increased volumes of existing trades.
- Deep water shipping channel and berths that require minimal maintenance dredging.
- Capable of handling large cargo vessels.
- Short shipping channel that minimises vessel transit time and contributes to port efficiency.
- Excellent supply of well-connected nearby industrial land to support key trades and port-related activities.
- Operates 24 hours per day, seven days a week (24/7).

Port Kembla Operations



\$760m

**annual contribution
to NSW GSP**

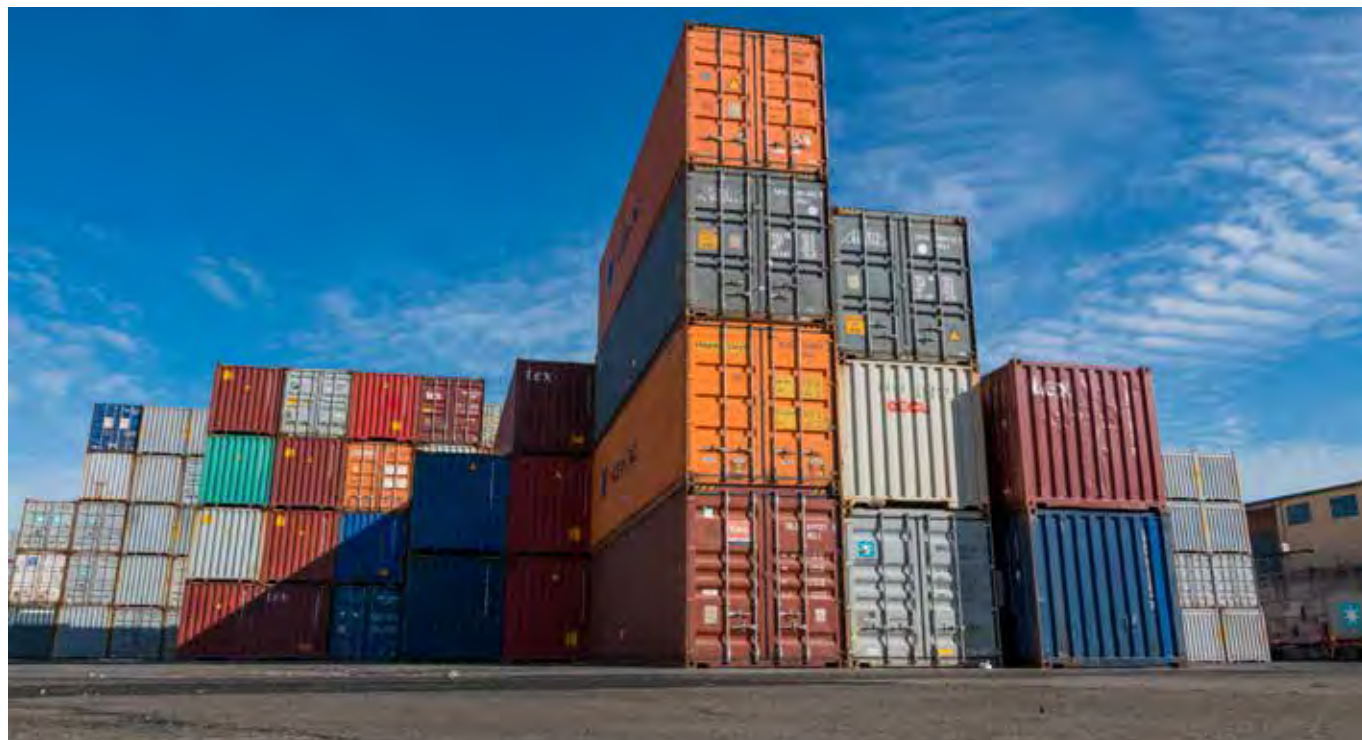


5,200 jobs



\$935K

**per vessel visit
contribution to NSW economy**



Enfield Intermodal Logistics Centre

The Enfield Intermodal Logistics Centre will be a key logistics hub in central-west Sydney.

Occupying 60 hectares, the site is close to industrial lands in central and western Sydney with a direct rail connection to Port Botany via the Port Botany Freight Line.

The Intermodal Logistics Centre includes an intermodal terminal, empty container storage areas and industrial lots for logistics, freight forwarding, pack-unpack, transport and warehousing uses. These industrial uses will benefit from their interface with the intermodal terminal.

The intermodal terminal will be able to accommodate 900 metre trains with port rail shuttles travelling 18 kilometres to and from Port Botany carrying full and empty containers. Cargo from regional trains will be transferred to shuttle trains destined for Port Botany, then regional trains will be loaded with empty containers to be repacked in the regions with products for export.

The intermodal terminal will be a bonded facility and will have a range of quarantine services. It will provide the full range of container services including full and empty container storage, repairs, washing and upgrades.

Overall, the Logistics Centre will reduce the reliance on road transport of containers to and from Port Botany.

ENFIELD INTERMODAL LOGISTICS CENTRE KEY STRENGTHS

- Located near industrial lands in central and western Sydney.
- Direct freight rail connection to Port Botany.
- Significant capacity to handle containers to meet growth in the area.
- Industrial lots and empty container storage areas within the site allow efficient transfer operations.
- Located on, and accessible from, key arterial road infrastructure including Hume Highway, Roberts Road, M5 and M4 motorways.
- Ability to operate 24 hours per day, seven days a week (24/7).

Cooks River Intermodal Terminal

The Cooks River Intermodal Terminal, ten kilometres by road and eight kilometres by rail from Port Botany, is directly connected to the Port by the Port Botany Freight Line. The Terminal is an inland extension to the Port and provides an important contribution to the container logistics freight task.

The Cooks River Intermodal Terminal has operated since 1947 under an open access regime available to all rail and road operators. It utilises rail to transfer containers to and from Port Botany and regional NSW and provides the largest empty container storage facility in NSW.

The Intermodal Terminal offers container storage as well as facilities for the repair, washing and upgrading of empty containers and other ancillary container-related services. Trucking operators use it to deliver empty containers and collect full containers, optimising truck fleets and minimising the number of trucks travelling to Port Botany.

COOKS RIVER INTERMODAL TERMINAL KEY STRENGTHS

- Located close to Port Botany.
- Direct freight rail connection to Port Botany.
- Accessible from key arterial road infrastructure including the Princes Highway, M5 Motorway and Eastern Distributor.
- Operates 24 hours per day, seven days a week (24/7).
- Capacity to handle additional container volumes to service the needs of the Port.
- Located opposite the proposed WestConnex St Peters Interchange to provide a future direct connection to the M4 Motorway and a more direct connection to the M5 Motorway.



THE ROLE OF STAKEHOLDERS



The scale and importance of ports to the economy of NSW and the nation involves many diverse stakeholders.

We recognise that many stakeholders need to be involved for our ports and intermodal terminals to efficiently and sustainably cater for NSW's future needs.

Australian Government

The Australian Government provides the national governance frameworks within which ports and freight logistics operate. It is responsible for international trade policies and agreements, shipping legislation, heavy vehicle regulation, trade data collection and analysis, customs and quarantine, nationally-significant environment protection matters, sea dumping, biosecurity and port security. It also invests in infrastructure such as roads and rail and identifies Australia's infrastructure needs.

The Australian Government has been particularly focused on improving efficiencies in the freight logistics chain and identifying the need for efficient use of Australia's existing infrastructure. The *National Ports Strategy* (2011) aims to facilitate trade growth and improve the efficiency of port-related freight movements across infrastructure networks. It recognises that a coordinated and collaborative approach must be taken to the future development and planning of Australia's major ports and freight infrastructure. This process commenced with the release of the *National Land Freight Strategy: A place for freight* (2012), developed in partnership between all levels of government and industry to drive efficient and sustainable freight logistics networks.

Infrastructure Australia and the Productivity Commission continue to provide advice on policy reforms and areas for improvement for all levels of government including industry relating to the freight logistics chain. Recommendations are focused on economic, social and environmental sustainability.

These organisations ensure timely delivery of required infrastructure projects to generate the greatest productivity benefits to the Australian economy. They recognise that making better use of existing infrastructure before constructing new infrastructure, and maximising existing and new infrastructure through land preservation and policy reforms will facilitate optimal use, promoting these issues as requiring greater consideration by all infrastructure users and providers.

The Australian Government-owned Australian Rail Track Corporation (ARTC) manages operations, maintenance and new infrastructure development on freight rail lines including the Port Botany Freight Line. The ARTC is responsible for achieving operational performance targets on the freight rail line and providing capacity to cater for future freight rail growth.

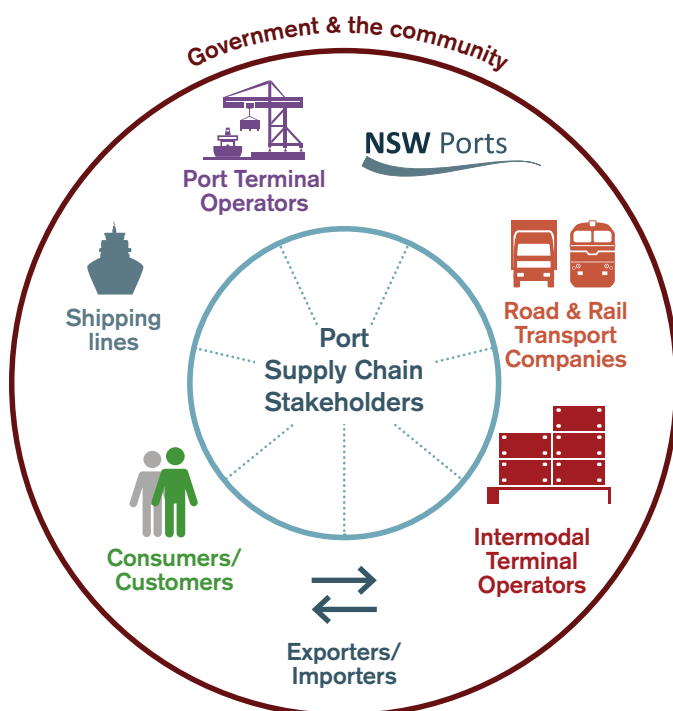
The Australian Government is also responsible for aviation safety at Sydney Airport. With two nationally significant assets side-by-side, all stakeholders must ensure the efficient co-habitation of Port Botany and Sydney Airport and that both assets can develop to their full potential.

NSW Government

The NSW Government provides the State frameworks within which ports and freight logistics operate. It is responsible for port and transport policy and legislation, port performance standards, heavy vehicle regulation, safe navigation of vessels, emergency response, land use planning, development approvals and environmental legislation and policy. It also funds the delivery and maintenance of road and rail infrastructure.

The NSW Government has the ability to influence efficiencies in the port and freight logistics network through both policy settings and infrastructure provision including:

- delivering road and rail infrastructure to address inefficiencies in the transport system and reduce the costs of freight transport
- driving road and rail reforms, such as mandatory performance standards and measures to grow container volumes on rail
- preserving industrial lands for port and intermodal uses and protecting the ability of these assets to grow and operate efficiently



- identifying, reserving and protecting land for future port, intermodal, road and rail infrastructure
- ensuring efficient development assessment and approvals processes and appropriate approval and licence conditions
- approving the use of high productivity vehicles.

The NSW Government recognises the economic significance of both Port Botany and Port Kembla and the importance of creating efficiencies in the State's logistic chain. The *NSW Long Term Transport Master Plan* (2012), *NSW Freight and Port Strategy* (2013), *A Plan for Growing Sydney* (2014) and the *Draft Illawarra Regional Growth and Infrastructure Plan* (2014) recognise the economic importance of the Ports including recommended actions to improve the logistics chain. The *NSW Freight and Port Strategy* outlines a number of actions to improve transport network capacity including the policy and planning requirements to achieve a sustainable transport network.

Actions identified within these strategic policies:

- foster the delivery of an intermodal terminal network within metropolitan and regional areas
- embed freight requirements within planning schemes
- ensure planning decisions consider freight logistics needs and network implications such as truck route and truck access times
- facilitate increased rail capacity and use between Port Botany and intermodal terminals such as the Enfield Intermodal Logistics Centre
- implement measures to shift port-related truck movements into the off-peak period.

The Port Authority of NSW manages emergency response and navigation safety within the ports of NSW. Each port's Harbour Master is accountable for establishing port operational procedures relating to vessel berthing and depth requirements and performance standards to achieve safe, effective, reliable and cost efficient shipping. The Port Authority of NSW provides pilots who board vessels to direct their navigation within the ports. The timely availability of pilots to cater for forecast vessel types and vessel volumes is essential for efficient waterside operations.

Local Government

Local councils provide infrastructure and services to benefit their local community and industry including local roads, land use planning and development assessment processes. Councils support and improve efficiencies in the port and freight logistics chain by:

- zoning land to preserve industrial land supply and prevent encroachment of incompatible uses on port and industrial lands
- approving developments that are compatible with, and do not restrict, port and freight operations
- requiring developments within the zone of influence of port operations to implement mitigation measures that reduce port amenity impacts
- ensuring development approval conditions do not restrict hours of operation on port, intermodal and industrial sites
- maintaining truck access routes and supporting requests for higher productivity vehicle access on these routes
- providing new and upgraded road infrastructure and road maintenance in a timely manner.

Port Terminal Operators

Port terminal operators handle trade and transfer it between waterside and landside. As volumes grow and vessel sizes increase, terminal operators will need to invest in equipment, operating methods, technology and new infrastructure in order to provide efficient services and to maximise utilisation of the land on which they operate. This includes investment in rail operations and rail infrastructure to grow the mode share of containers moved by rail.

Intermodal Terminal Operators

Intermodal terminal operators facilitate the movement of freight to and from Port Botany by rail. Investment in rail infrastructure, terminal equipment and road exchange facilities will be required to not only maximise the volume of containers that can be handled through each facility but also to handle containers efficiently.

Logistics Industry

Road and rail transport companies and shipping lines are essential to the port logistics supply chain and can influence the performance and efficiency of the freight supply chain.

To meet the growing freight task, transport companies will need to drive improvements in road transport efficiency by:

- increasing the number of TEU carried by each truck
- using more high productivity trucks
- increasing two-way truck loading
- spreading traffic through the 24/7 period
- investing in engines with greater efficiencies and reduced emissions.

Rail operators will need to drive improvements in rail productivity and growth in rail usage by:

- increasing the utilisation of each train
- increasing train two-way loading
- improving on-time running
- investing in new rolling stock with improved environmental standards.

With the number of empty containers forecast to grow, shipping lines will play an important role in reforming the way in which empty containers are managed. This will include reducing dwell times; de-hiring containers at intermodal terminals; planning in advance for the return of empty containers to vessels; maximising the return of empty containers by rail to port; and making sure facilities at stevedore terminals can accept empty container arrivals by rail.

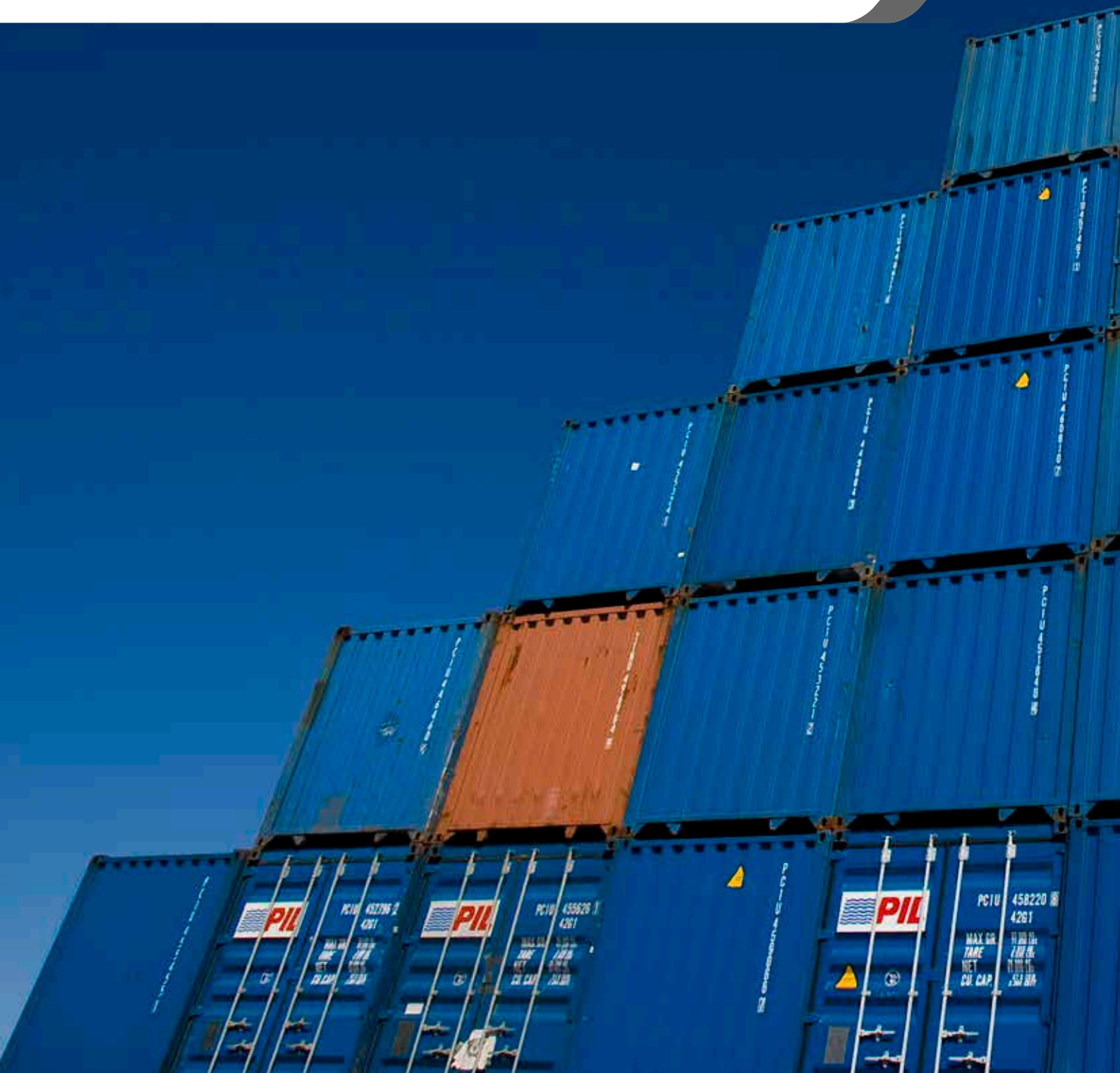
To meet overall growth, the logistics industry must operate on a 24/7 basis.

Community

Our ports and intermodal terminals operate in urban environments. Adjacent communities can be impacted by operations at these facilities. We consult regularly and provide leadership, working with the community to manage impacts from our port and intermodal terminal operations and developments in a way that balances efficient operations in the context of the surrounding environment in which they operate.

Community awareness of, and input to, the long-term development and operation of ports and intermodal terminals identifies issues of importance to the community and informs our asset management. We communicate with the community through regular meetings and our website to share information regarding port and port-related activities.

A SNAPSHOT: THE NEXT 30 YEARS



To achieve a sustainable and efficient port supply chain for the people and businesses of NSW, operational improvements, proactive planning and investment in infrastructure will be required.

Doing nothing is not an option. The port supply chain will not meet the long-term needs of NSW without action. Government policy will also need to ensure infrastructure delivery is not just focused on constructing new infrastructure, but also focuses on protecting the long-term efficient use of existing and future infrastructure.

What We Know

Port Botany and Port Kembla contribute around \$4 billion per year to the NSW economy and support over 26,000 jobs.

Port Botany is Australia's premium port and vital to the economic wellbeing of Sydney and NSW. Port Botany is the State's only container port and the largest bulk liquid and gas port.

Port Kembla is NSW's port of growth and a key economic driver in the Illawarra region. Port Kembla is NSW's largest motor vehicle import hub; largest grain export terminal; and second largest coal export port.

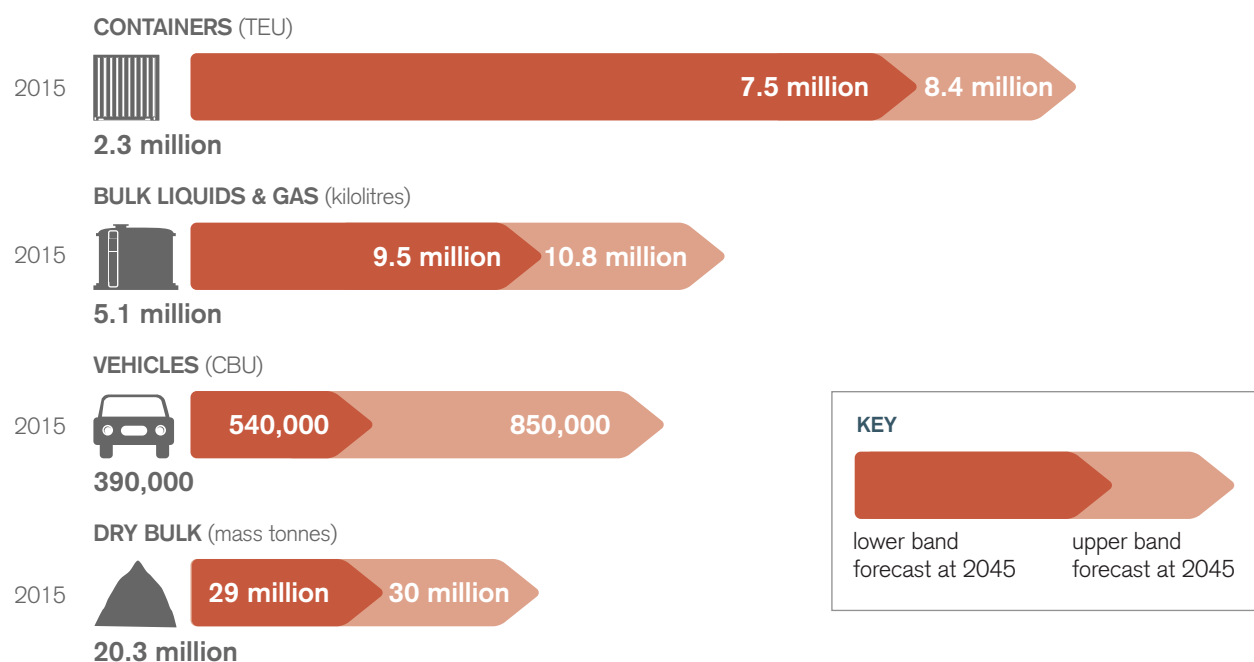
Currently, 2,280 vessels call at Port Botany and Port Kembla combined, carrying:

- 2.3 million twenty-foot equivalent units (TEU) of containers
- 5.1 million kilolitres of bulk liquids
- 390,000 motor vehicles
- 20.3 million tonnes of dry bulk products.

Most of Port Botany's trade caters for Sydney's consumers and businesses, with 80 per cent of import containers delivered within a 40 kilometres radius from Port Botany. Most containers are distributed by road, with 14 per cent transported by rail. Port Botany currently handles 99 per cent of the State's container demand, 98 per cent of the State's consumption of LPG, 90 per cent of bulk chemical products, 30 per cent of refined petroleum fuels and 100 per cent of the State's bitumen products.

Port Kembla services an extensive area of NSW, connected to trade locations by both road and rail. Sixty per cent of coal, 90 per cent of grain and 100 per cent of copper concentrates are transported to Port Kembla by rail.

30 year trade forecast (combined trade through Port Botany and Port Kembla)



What we are planning for

- **Port Botany will remain Australia's premium port** and NSW's primary container, bulk liquid and gas port servicing Australia's largest population centre.
- **Port Kembla, as the NSW port of growth**, will continue to be NSW's largest motor vehicle import hub and bulk grain export port while catering for a growing range of dry bulk, bulk liquid and general cargo. It will be home to NSW's second container port.
- **Enfield and Cooks River Intermodal Terminals will be inland extensions to Port Botany**, with Cooks River operating as an extended port gate and the Enfield Intermodal Logistics Centre a key logistics hub in the central-west of Sydney.

Over the next 30 years we expect to see an increase in annual trade volumes through Port Botany and Port Kembla.

- Containers could more than triple from 2.3 million to 8.4 million TEU
- Bulk liquids through both ports combined could more than double from 5.1 million to 10.8 million kilolitres
- Motor vehicles could more than double from 390,000 to 850,000 motor vehicles
- Dry bulk products could grow from 20.3 million to 30 million tonnes.

On the waterside, forecast trade will be handled by larger vessels, with more product carried on each vessel and more vessel visits each year. Total vessel visits at Port Botany and Port Kembla combined could grow from 2,280 to 3,300.

At Port Botany:

- Container vessels are forecast to increase from 6,500 TEU to 10,000 TEU carrying capacity. Larger container vessels could call in the next 30 years; however, the timing of their deployment will depend on a range of factors.
- Bulk liquid and gas vessels are expected to carry greater product volume per vessel within the existing size range of vessels calling at the port. The next size in tanker vessels, Long Range 2, could call within the next 30 years.

The majority of imported containers will remain destined for metropolitan Sydney, with 80 per cent delivered within a 40 kilometre radius from Port Botany. There will be a greater proportion of containers destined for west and south-west Sydney over this time period.

More containers will be transported by rail, supported by a network of existing and new metropolitan intermodal terminals. We have set a target to transport three million TEU by rail by 2045, with the Cooks River Intermodal Terminal and Enfield Intermodal Logistics Centre supporting this task.

At Port Kembla:

- Bulk liquid vessels are expected to carry greater product volume per vessel within the existing size range of vessels calling at the Port. The next size in tanker vessels, Long Range 1, could call within the next 30 years.
- Motor vehicle vessels are forecast to increase from 6,800 completely built-up units (CBU) to 8,000 CBU carrying capacity within the next 10 years and then remain stable.
- Dry bulk vessels are expected to carry greater product volume per vessel within the existing size range of vessels – Handysize to Capesize vessels – currently calling at the Port.

Within the supply chain, trade will continue to be moved to and from the ports by road, rail and pipeline.

Growth in truck numbers will be managed by improved truck productivity and greater use of rail.

What needs to be done

Five objectives can sustainably cater for forecast trade growth:



1

Provide efficient road connections to the ports and intermodal terminals



2

Grow rail transport of containers



3

Use land and infrastructure efficiently



4

Grow port capacity



5

Protect the ports and intermodal terminals from urban encroachment

These objectives can only be achieved with the involvement of stakeholders, including government and the community.

Our role is to act as a key advocate so that we can manage and develop our assets in a safe, efficient and environmentally responsible manner to secure a port supply chain that will meet NSW's growing needs.

We are committed to promoting the trade benefits of our ports both domestically and internationally and will support government actions in respect of international trade relations and initiatives that foster improved international trade exchange.



1

Provide efficient road connections to the ports and intermodal terminals

Our ports and intermodal terminals will not achieve optimum capacity if road connections to and from these facilities are limited. In this context, congestion on Sydney's road network is the key issue.

Even with significant growth in containers moved by rail, trucks will remain the primary means of moving containers to and from Port Botany over the next 30 years. Managing the growth in truck numbers will be important to limit congestion at Port Botany and to limit impacts on the local community. Port truck traffic is, and will remain, a small component of the overall traffic volumes on Sydney's roads.

NSW Government agencies are tasked with managing the key arterials of the metropolitan road network – these are the connections that are vital to the efficient movement of freight.

OUR ACTIONS:

- **Operations:** Advocate for improved container truck productivity including:
 - increased number of TEU transported per truck
 - increased two-way loading of trucks
 - expanded use of higher productivity vehicles.
- **Operations:** Support actions to spread truck movements at the ports and intermodal terminals across the 24 hour and seven day week (24/7) to reduce traffic congestion.
- **Planning:** Work with partners to capture comprehensive port truck traffic data as inputs into Sydney-wide traffic models for planning road upgrades.
- **Infrastructure:** Work with partners to secure timely delivery of road and intersection upgrades around the ports and intermodal terminals to meet growing freight demands.
- **Infrastructure:** Advocate for efficient port connections to and from the M5 and M4 Motorways, in conjunction with the WestConnex project, to secure Port Botany's capability to handle future trade demand efficiently.

OTHER REQUIRED ACTIONS:

- **Operations:** NSW Government to maintain and regularly update the mandatory standards for container truck access and servicing at Port Botany to reflect increased trade volumes and productivity improvements.
- **Operations:** All levels of government to support and promote the use of high productivity vehicles in and around ports and intermodal terminals and to key off-site locations.
- **Infrastructure:** In conjunction with the WestConnex project:
 - improve the Foreshore Road/General Holmes Drive intersection for both left and right turning trucks
 - upgrade the connection from Foreshore Road along General Holmes Drive to the M5 Motorway
 - deliver an efficient connection from Foreshore Road to the proposed M4 Motorway connection at St Peters
 - deliver dedicated road freight corridor connections to secure long-term freight capacity.
- **Infrastructure:** Upgrade the capacity of intersections around Port Botany at Foreshore Road/Botany Road/ Penrhyn Road and Botany Road/Bumborah Point Road.
- **Infrastructure:** Facilitate increased mass limits on roads in and around the Port Botany precinct by strengthening the Bumborah Point Road bridge, Botany Road bridge and several culverts.
- **Infrastructure:** Widen Foreshore Road and Bumborah Point Road, together with other traffic upgrade works on Bumborah Point Road.
- **Infrastructure:** Upgrade Centenary Drive, Hume Highway and Roberts Road to enable efficient access to and from the Enfield Intermodal Logistics Centre.
- **Infrastructure:** Deliver road enhancements to support efficient connections to Port Kembla such as the "Gateway to the South" M1 Motorway (formerly F6 Freeway) extension and Mount Ousley road widening.



2

Grow rail transport of containers

Maximising the transport of containers by rail between Port Botany and Sydney metropolitan intermodal terminals will be essential for cost-effective, efficient and sustainable container distribution throughout Sydney. Growth in use of rail will benefit the road networks surrounding the Ports by reducing the numbers of trucks. Significant growth in containers moved by rail will reduce the growth of trucks around the Port and will enable Port Botany to achieve its optimum capacity.

Port Botany will not achieve an annual container throughput of over seven million TEU without rail becoming a more significant component of the port logistics chain.

We have set a target of three million TEU per year to be transported by rail by 2045 – around 40 per cent of forecast container volumes. Achieving this target requires action by all stakeholders involved in the container rail supply chain including NSW Ports, all levels of government, rail operators, shipping lines, stevedores and intermodal operators.

OUR ACTIONS:

- **Operations:** Encourage the NSW Government to implement mandatory rail performance standards to address handling rates at terminals, on-time running of trains, window availability, standardised train lengths and minimum train utilisation.
- **Operations:** Commence operations at Enfield Intermodal Terminal to provide additional rail based capacity for the container supply chain.
- **Operations:** Support growth in rail based operations at Cooks River Intermodal Terminal.
- **Operations:** Advocate for, and facilitate, empty container return to Port Botany by rail through:
 - empty container storage and de-hire at intermodal terminals
 - back-loading trains with empty containers for return to the Port
 - empty container storage areas within or adjoining stevedore terminals.
- **Planning/Infrastructure:** Advocate for investment in rail including:
 - protection of future rail corridors
 - building new intermodal terminals with dedicated freight rail connections
 - constructing new/expanded rail capacity.
- **Infrastructure:** Support opportunities for investment via the NSW Government rail sidings investment program for works that promote cost-effective transport connections from regional NSW to Port Botany and Port Kembla.

OTHER REQUIRED ACTIONS:

- **Infrastructure:** Duplicate the Port Botany Freight Rail Line between Port Botany and Mascot to increase reliability for rail operations and create long-term capacity to achieve the rail target.
- **Infrastructure:** Port stevedores to invest in additional rail infrastructure, including rail sidings and equipment, and stage this in line with demand.
- **Infrastructure:** Develop Moorebank Intermodal Terminal and commence operations.
- **Planning:** NSW Government to reserve and protect land and dedicated freight rail corridors for future intermodal terminals at Eastern Creek and Badgers Creek.
- **Infrastructure:** Deliver new intermodal terminals with dedicated freight rail connections.
- **Infrastructure:** Construct a shunting line at Cooks River to avoid blocking the mainline.
- **Infrastructure:** Maldon-Dombarton rail line to be operational to expand rail service capability to Port Kembla and to connect to a future container terminal in the Outer Harbour of Port Kembla.



3 Use land and infrastructure efficiently

Land and infrastructure within our ports and intermodal terminals is finite and in demand. To manage our land and infrastructure sustainably we will optimise the use and productivity of existing land and infrastructure before investing in new land and infrastructure.

Enhanced use of existing infrastructure and undertaking maintenance to extend the functionality and life of existing infrastructure, before investing in new infrastructure, is at the core of our approach to sustainable asset management.

OUR ACTIONS:

- **Operations/Infrastructure:** Require investment by port tenants and operators to maximise utilisation of existing infrastructure and allocated land footprint to cater for forecast trade volumes.
- **Operations:** Prioritise the allocation of land at the ports for uses that require a direct connection to berths for importing and exporting trade.
- **Operations:** Advocate for changes to empty container handling in the supply chain to maximise the return of empty containers to Port Botany by rail and to match empty container returns to the Port by truck with full container collection.
- **Planning:** Work with stevedores, Sydney Airport, Commonwealth aviation authorities and the Port Authority of NSW to address interface issues relating to future larger vessels and quay cranes.
- **Operations/Infrastructure:** Grow capacity at Enfield Intermodal Logistics Centre and Cooks River Intermodal Terminal to cater for growth in container volumes moved by rail.
- **Infrastructure:** Progressively develop the industrial lands within the Enfield Intermodal Logistics Centre to support the intermodal terminal.

OTHER REQUIRED ACTIONS:

- **Operations/Infrastructure:** Port Botany container terminal operators to invest in additional equipment, improved terminal layout configurations, technological improvements and increased rail use to improve terminal performance, cater for larger vessels and maximise container throughput capacity.
- **Operations/Infrastructure:** Port Botany bulk liquid and gas operators to optimise capacity by investing in additional transfer infrastructure, improved product transfer rates to storage tanks and optimised vessel scheduling.
- **Operations/Infrastructure:** Port Kembla tenants and operators to invest in material handling equipment and transfer and storage infrastructure to optimise product transfer rates and terminal capacity, and optimise vessel scheduling.
- **Operations:** Shipping lines and transport operators to adjust their approach to empty containers by:
 - reducing empty container dwell times
 - de-hiring of empty containers at intermodal terminals
 - maximising the return of empty containers to the Port by rail
 - matching empty returns to the Port by truck with the collection of a full container.
- **Operations:** The Port Authority of NSW to support optimised waterside performance through: pilot resource levels suitable for efficient servicing of forecast vessel volumes and the range of vessel types; and port operational procedures relating to vessel access and water depths that are safe, effective and cost-efficient.
- **Infrastructure:** Upgrade Moss Vale-Unanderra Rail Line to allow longer, heavier and faster trains to access Port Kembla.



4

Grow port capacity

Even with improved productivity and land use, additional port capacity will be needed over the next 30 years to efficiently service the growing trade volumes. The timing and delivery of increased capacity will depend on actual trade volumes, productivity improvements and wider industry changes.

We will invest in infrastructure which provides additional port capacity to cater for trade growth. Investment in infrastructure and operational upgrades will also be required by government and private sector stakeholders to cater for trade growth. Actions identified in the other objectives, specifically road and rail related actions, will be required to grow port capacity. Government policy that focuses on protecting the long-term efficient use of existing and future infrastructure is fundamental to facilitating port growth and capacity.

OUR ACTIONS:

- **Infrastructure:** Deepen isolated locations in the Port Botany Shipping Channel and Brotherson Dock to cater for unrestricted access by 10,000 TEU container vessels and Long Range 2 tanker vessels.
- **Infrastructure:** Facilitate early reclamation works in the Port Kembla Outer Harbour to support opportunities to use surplus clean material, such as from excavation projects. This will allow the Outer Harbour to be readily developed to meet demand.
- **Infrastructure:** Enable the development of additional container capacity, when required, at Port Botany through additional land area/berth length and/or at the Outer Harbour Development in Port Kembla.
- **Infrastructure:** Progressively develop the Hayes Dock Services Area to provide additional accommodation for small service boats such as lines boats and tugs.



5

Protect the ports and intermodal terminals from urban encroachment

Ports and intermodal terminals require protection from urban encroachment and redevelopment to higher-value land uses such as residential, retail and commercial uses in order to operate efficiently.

Industrial lands close to the Ports provide space for uses that do not require direct connectivity to berths but which benefit from proximity to the port. These lands are an extension to the Port precinct, supporting port-related uses and facilitating efficient movement of goods. Similarly, industrial lands around intermodal terminals facilitate container-related businesses close to rail hubs, reducing transport distances for containers. These lands need to be protected.

The consequence of reduced industrial land supply around the Ports and intermodal terminals is an increase in interface issues with surrounding residential areas. Port and intermodal-related activities can generate traffic, noise, light and aesthetic impacts on nearby areas. These impacts can increase as trade volumes grow. For these reasons, we need a buffer between port and intermodal related activities and any sensitive uses such as housing.

The planning system can no longer rely on design mitigation as the solution to addressing landuse conflict matters and allow industrial and sensitive uses to be developed side by side. Physical land separation and protection of industrial and employment lands from sensitive uses is required as a fundamental principal of good landuse planning policy.

OUR ACTIONS:

- **Planning:** Advocate for the establishment of Protection Zones that prohibit incompatible uses around the Ports and adjoining industrial lands.
- **Planning:** Promote the preservation of industrial lands around the Ports and intermodal terminals for port-related uses.
- **Planning:** Advocate for the establishment of buffer zones around port-related infrastructure (roads, rail and pipelines) and the retention of large parcels of industrial lands near the Ports.

OTHER REQUIRED ACTIONS:

- **Planning:** Planning authorities to facilitate efficient port and intermodal operations through strategic planning policies, development controls and development assessment processes that support:
 - 24/7 operations of ports, intermodal terminals, port-related infrastructure and port-related uses
 - preservation of industrial lands around the ports and intermodal terminals for port-related uses
 - controls on sensitive use developments in proximity to ports, intermodal terminals, port-related infrastructure and port-related uses
 - creation of Protection Zones that prohibit incompatible uses
 - retention of large parcels of industrial lands in proximity to the Ports.
- **Planning:** Planning authorities to consult with NSW Ports during the preparation of planning and development proposals with a potential to have an impact on, or be impacted by, port and intermodal activities.



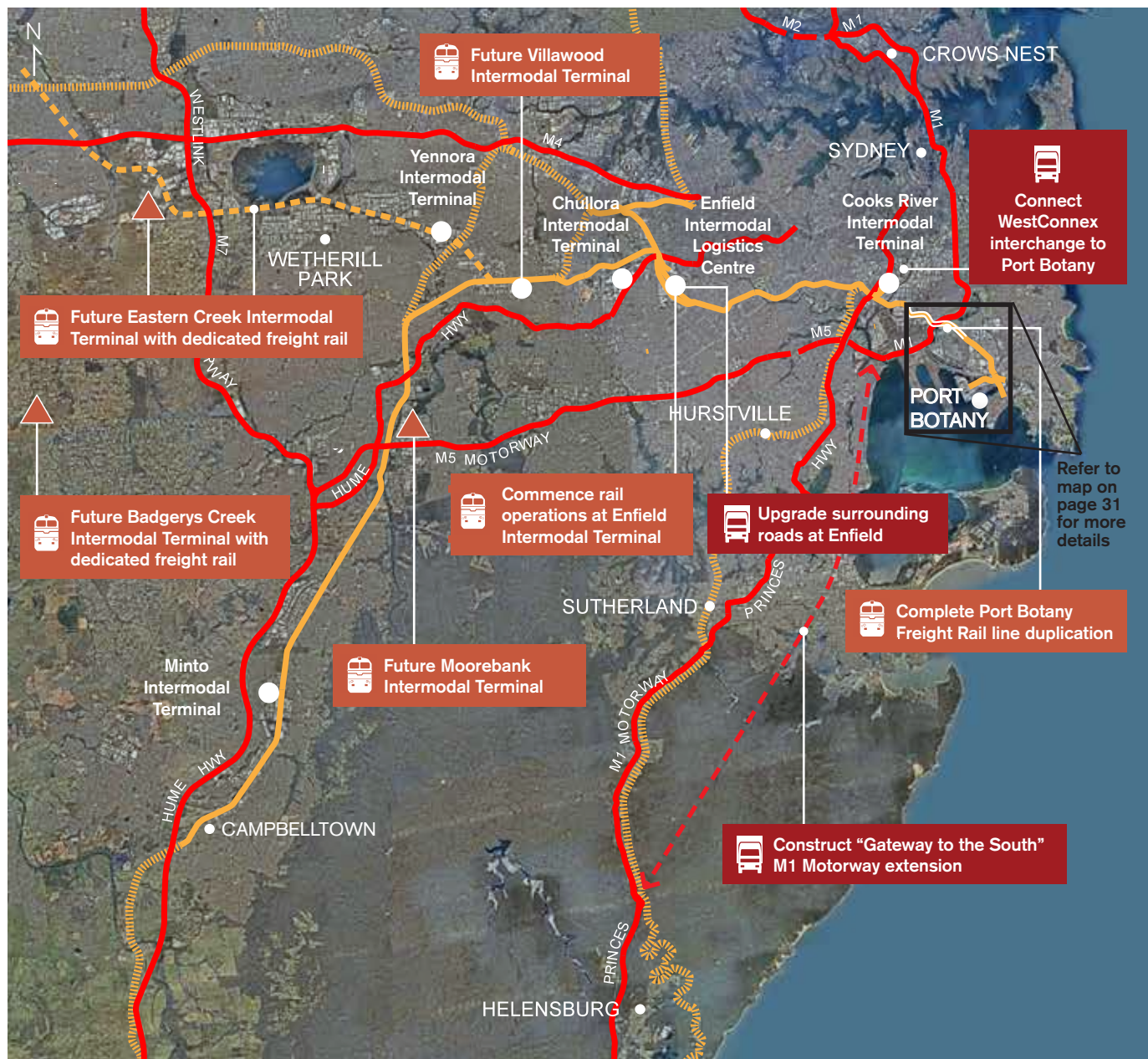
Key infrastructure actions: Port Botany

KEY

● Port Botany

— Main port access roads

— Rail lines – Dedicated freight



Key infrastructure actions: Sydney metropolitan area

KEY	— Rail lines – Dedicated freight	- - - Rail lines – Shared freight and passenger	- - - Potential rail freight link
	— Major roads	- - - Potential major road	



Key infrastructure actions: Enfield Intermodal Logistics Centre



Key infrastructure actions: Cooks River Intermodal Terminal

KEY — Rail lines – Dedicated freight

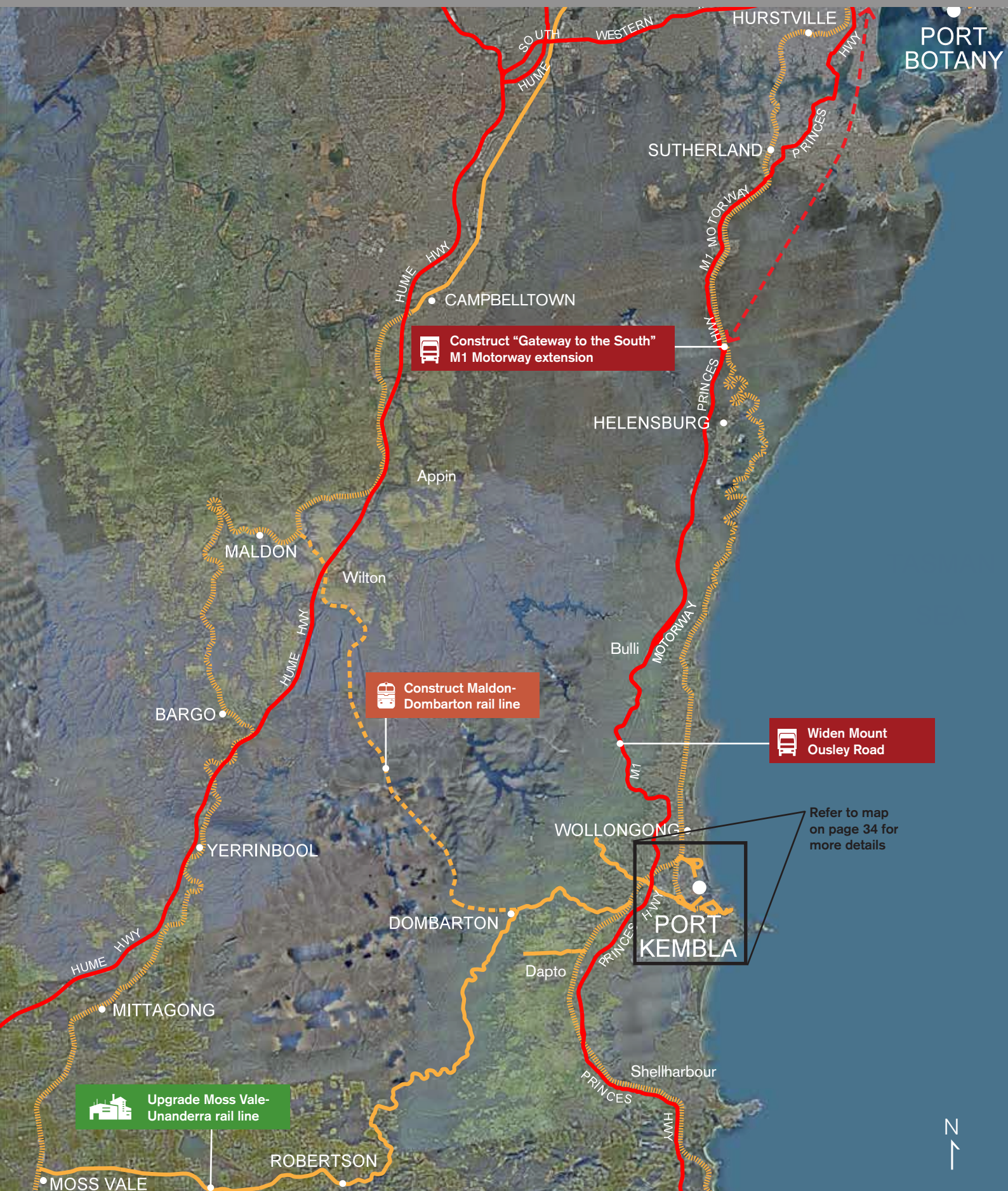
— Main access roads

- - Potential major road



Key infrastructure actions: Port Kembla

KEY	 Port Kembla	 Major roads
	 Rail lines – Dedicated freight	 Rail lines – Shared freight and passenger

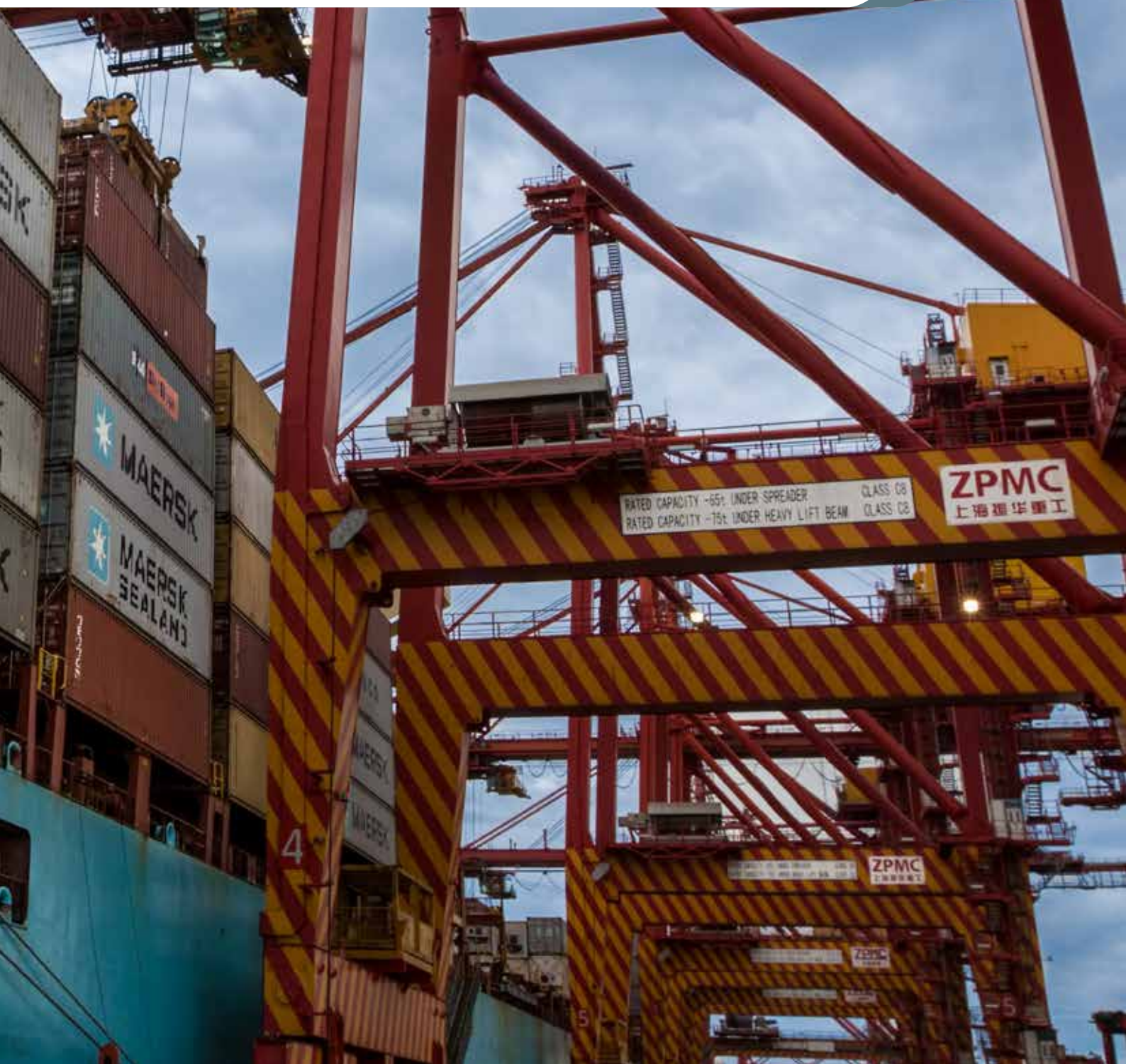


Key actions: Illawarra and Southern Sydney regions

KEY

- | | | |
|--|---|---|
| — Rail lines – Dedicated freight | - - - Rail lines – Shared freight and passenger | - - - Potential rail freight link |
| — Major roads | - - - Potential major road | |

PORT BOTANY: THE NEXT 30 YEARS



Port Botany will remain Australia's premium port and NSW's primary container, bulk liquids and gas port servicing Australia's largest population centre.

Port Botany is central to the future economic growth and prosperity of Sydney and NSW. Facilitating the efficient and sustainable handling of growing trade volumes through the Port will maximise economic benefit for the State and minimise environmental impacts on the local and wider community. Without this, inefficiencies in the port supply chain will result in additional costs borne by consumers and businesses.

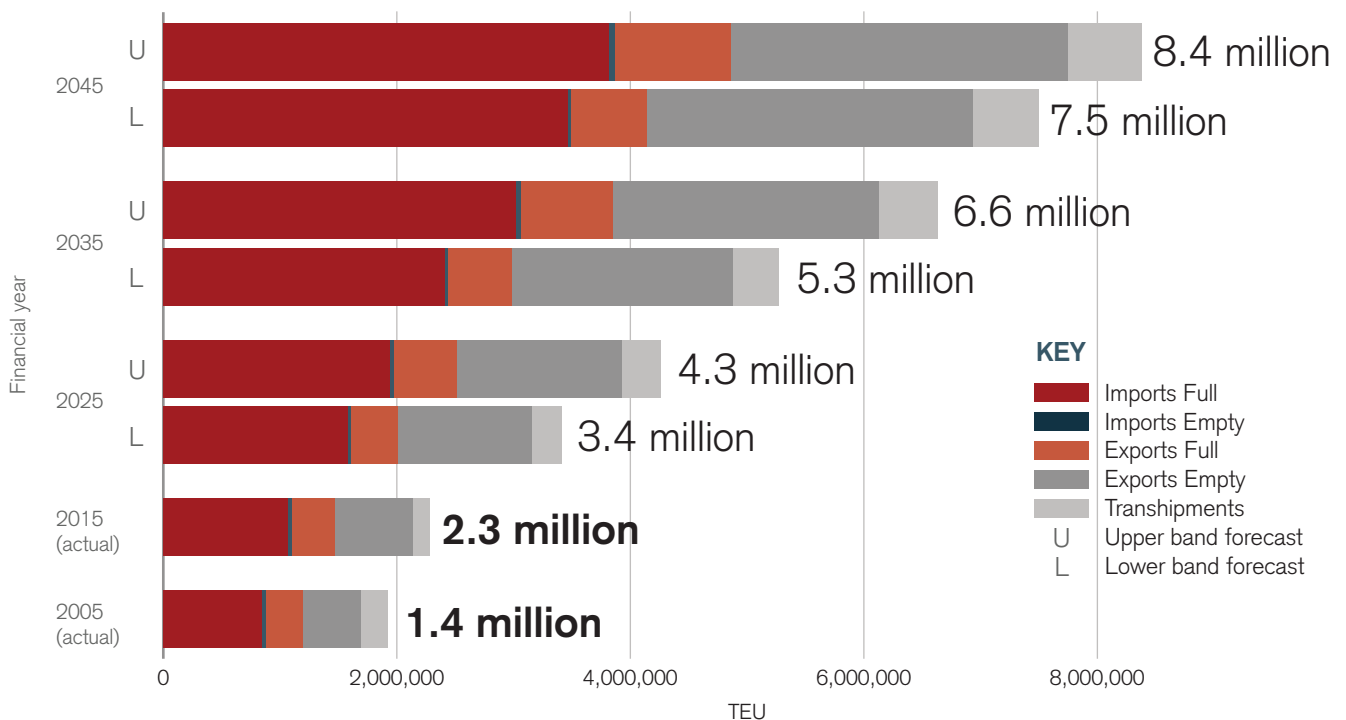
Trade Demand

Containers

The primary form of trade through Port Botany is containers. Port Botany is expected to become Australia's largest container port by volume in the next 30 years. Containers are forecast to grow from 2.3 million TEU now to between 7.5 million and 8.4 million TEU per year by 2045.

The key drivers of container growth through Port Botany are domestic demand, population growth, the strength of the NSW economy, the value of the Australian dollar, levels of domestic manufacturing, government trade policies and the location of key distribution centres.

Container forecasts



What's in the box? Items we import and export in containers.

Import categories



Export categories



Note: Based on 2014 financial year data.

Growth of full import containers over the next 30 years will be stronger than full export containers, resulting in an increase in empty container exports from 62 per cent of exports now to more than 74 per cent by 2045.

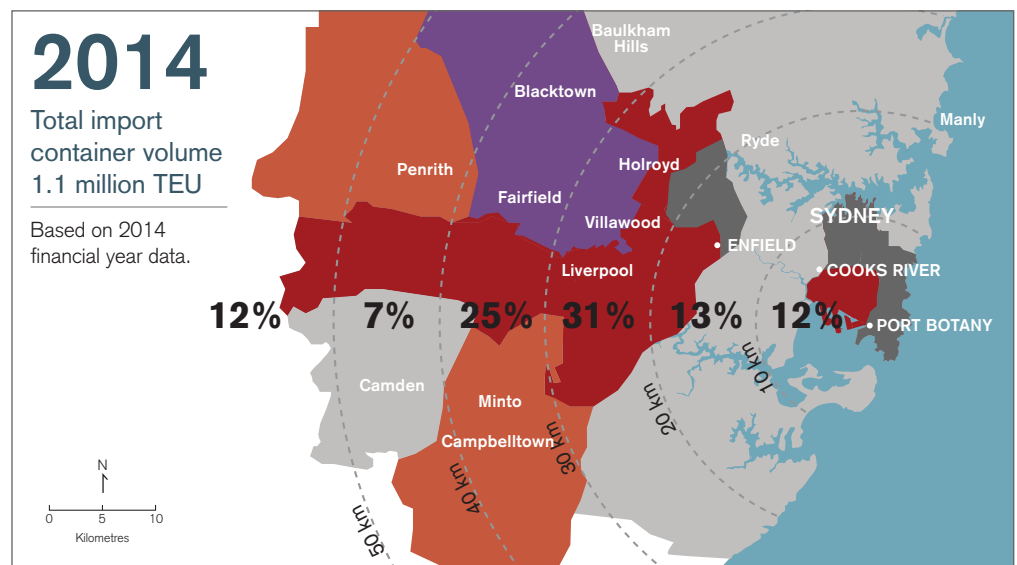
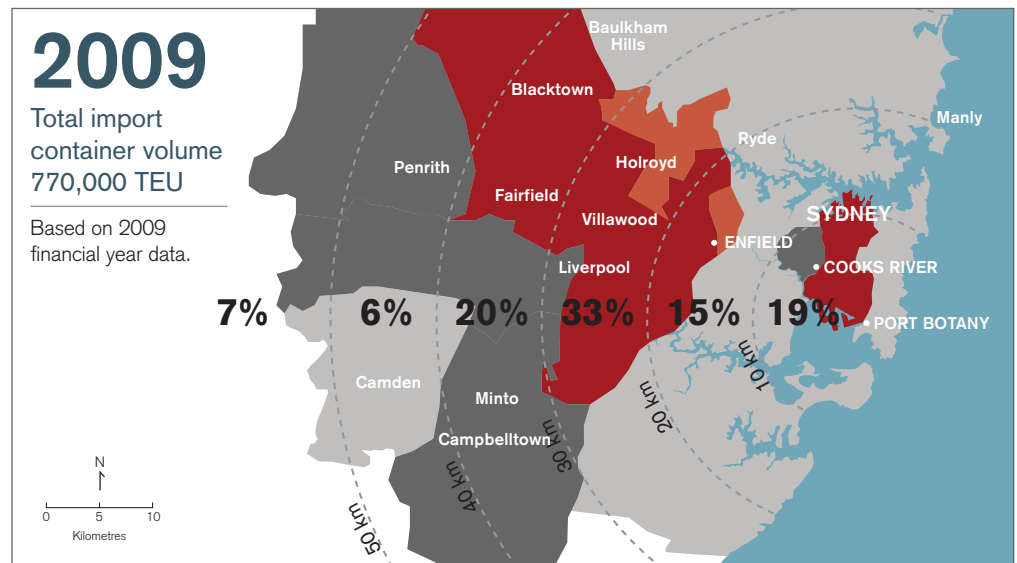
Container trade from Asia dominates container imports and exports through Port Botany. This is expected to remain for the next 30 years, with direct European services expected to be replaced with transshipments via Asia.

Over 80 per cent of import containers through Port Botany are delivered within a 40 kilometres radius of the Port, remaining within metropolitan Sydney. The goods associated with those 80 per cent of import containers are either destined for the Sydney market or are unpacked at Sydney-based distribution centres, repackaged, and distributed to regional NSW or interstate.

While we expect this trend to continue, there will be an upward shift in the proportion of containers destined for Sydney's western and south-western suburbs, especially to the local government areas of Blacktown, Fairfield, Holroyd and Liverpool, due to the availability of large parcels of land and the lower cost of land for the development and operation of distribution centres in these local government areas.

Distribution of import containers

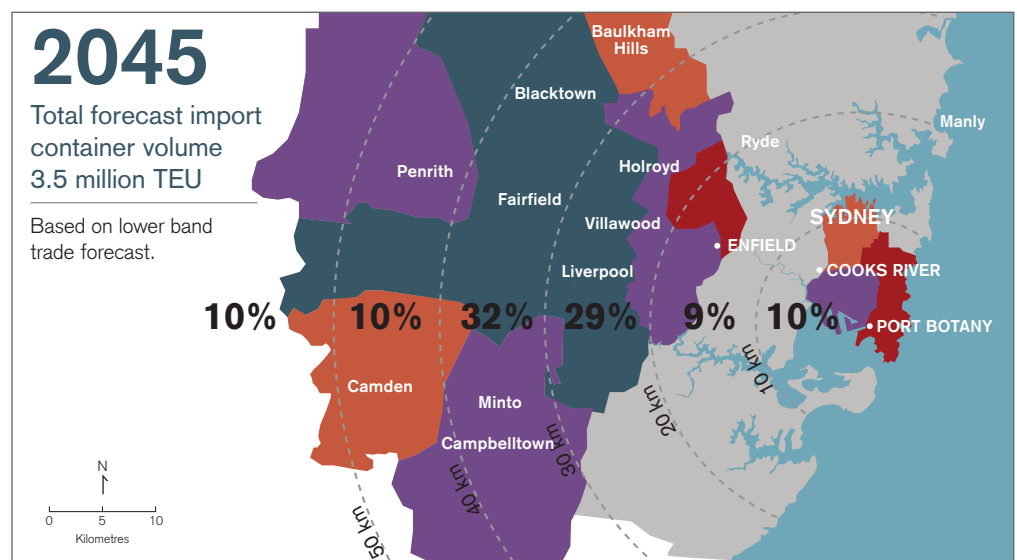
Over 80 per cent of import containers through Port Botany are delivered within a 40 kilometre radius of the Port and this will remain over the next 30 years.



KEY

- Greater than 170,000 TEU
- 80,000 to 170,000 TEU
- 45,000 to 80,000 TEU
- 30,000 to 45,000 TEU
- 20,000 to 30,000 TEU
- 0 to 20,000 TEU
- % percentage of imported containers within 10 kilometre radius bands.

Note: Distribution mapped by local government area.



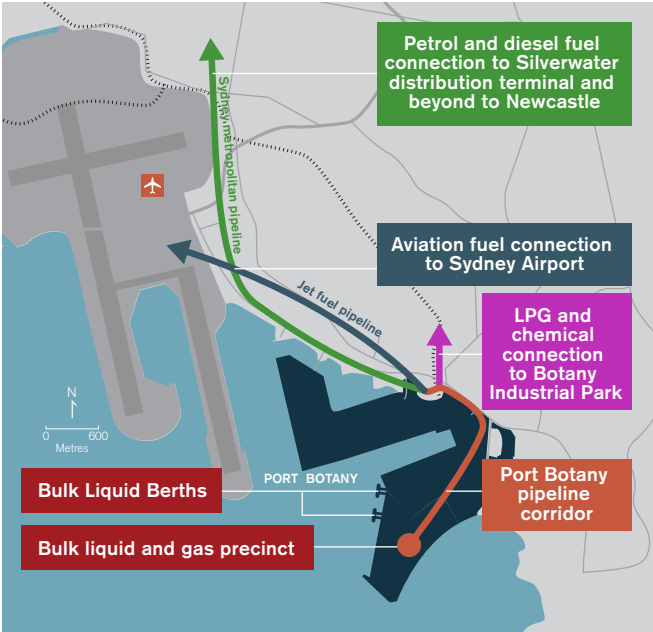
Bulk Liquid and Gas

The Port Botany bulk liquid precinct handles 4.7 million kilolitres of bulk liquids and gas each year and is forecast to handle 7.3 to 8.3 million kilolitres a year by 2045, primarily driven by growth in refined petroleum imports.

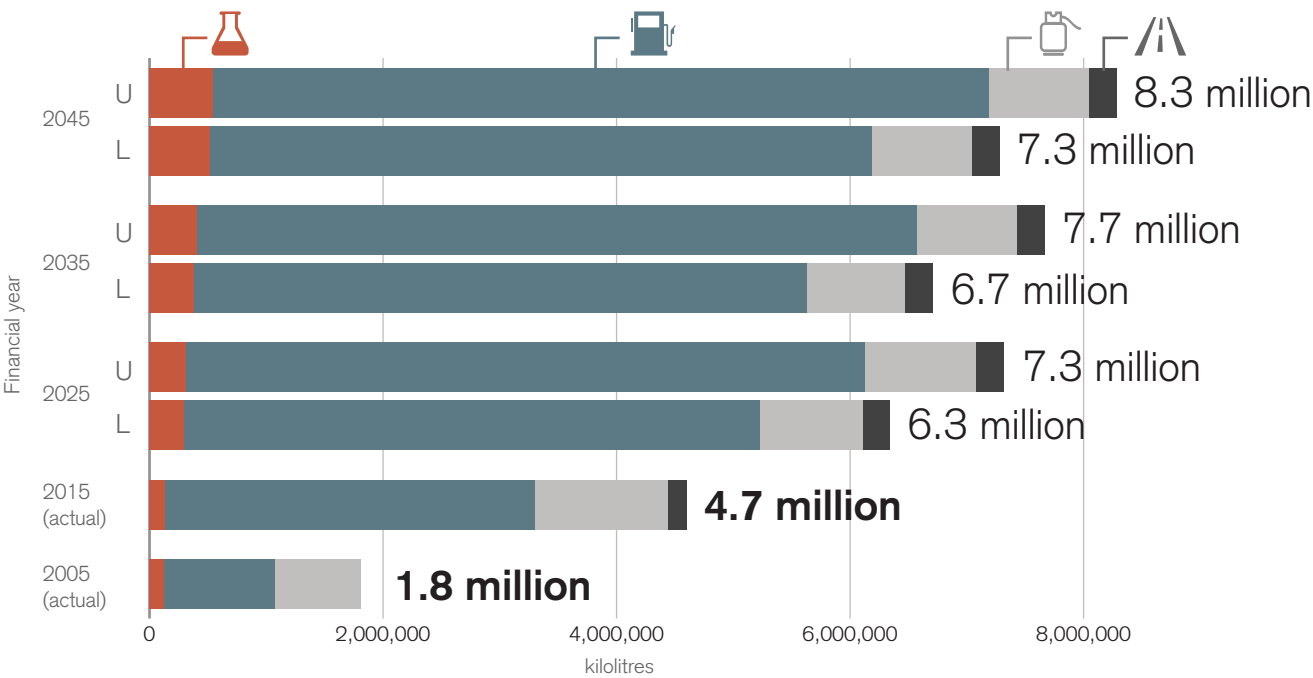
Bulk liquids handled at the Port include: refined petroleum, ethanol and biodiesel, which are used to fuel vehicles, machinery, ships and aircraft; bitumen, used for pavements and road surfaces; and chemicals, used in manufacturing to produce detergents, plastics, soap products, paint and other products. Bulk gas handled at the Port includes propane (LPG) which is used as feedstock for plastics manufacturing and fuel for homes, barbecues and the autogas industry, as well as butane, which is used in aerosols.

Bulk liquids and gases are shipped to Port Botany from international and national locations then pumped directly from the ships at berth to storage tanks or the 130,000 cubic metre LPG underground storage cavern within the Port Botany precinct. Products are distributed from the storage tanks and the cavern to customers either by pipeline connections, road tanker trucks or smaller vessels.

Port Botany pipeline routes
(diagrammatical representation)



Bulk liquid and gas forecasts



KEY Chemicals Liquid Fuels Gas Bitumen U Upper band forecast L Lower band forecast

Future Vessels

As trade volumes through Port Botany continue to grow, the number of vessels arriving at the Port, the volume of product carried on each vessel and the size of vessels will increase.

Container vessel sizes are increasing due to the steady increase in the international container freight task and the consolidation of freight by shipping lines to achieve economies of scale. As vessels on key east-west shipping routes between Asia, Europe and North America are replaced by new and larger vessels, existing vessels are redeployed to the smaller north-south routes and regional markets like Australia.

We expect to see larger container vessels visiting Port Botany in the future and will ensure shipping channels and berthing areas have the capacity to manage these larger vessels. As these vessels typically visit the ports of Melbourne and Brisbane on the same voyage, the size and the timing of their deployment to Australia may depend on available infrastructure and water depths at those ports.

The largest container vessel currently calling at Port Botany has a capacity of 6,500 TEU – we expect this to increase to 8,000 TEU by 2025 with vessels of 10,000 TEU capacity or larger thereafter. The timing for the arrival of larger vessels could be earlier than indicated where there is further consolidation of shipping line consortia, reduction of calling frequency, increase of transshipment or use of partial loading of vessels.

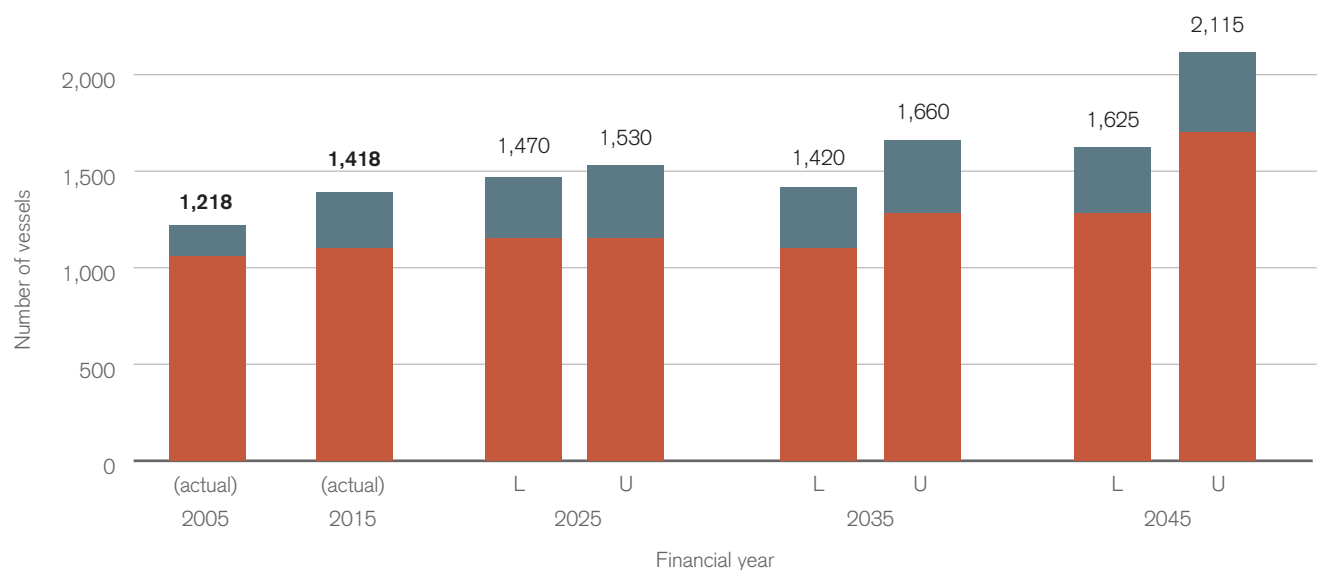
As the exact timing for the arrival of larger vessels is difficult to predict, we will continue to liaise with the shipping industry to plan and prepare accordingly to cater for the vessels calling at Port Botany.

The number of container vessels forecast to call at Port Botany is expected to rise from about 1,100 per year to between 1,300 and 1,700 per year in 2045, depending on the shift to larger vessels.

Bulk liquid and gas vessels calling at Port Botany range from small tankers to Long Range 1 tankers and Large Gas Carriers. Trade growth will largely be catered for within this range of vessels, with increasing volumes of product carried per vessel. It is possible that Long Range 2 tankers will arrive within the next 30 years.

The number of bulk liquid and gas vessels forecast to call at Port Botany is expected to rise from about 315 vessels a year to between 345 and 415 vessels a year in 2045.

Forecast vessel numbers



KEY

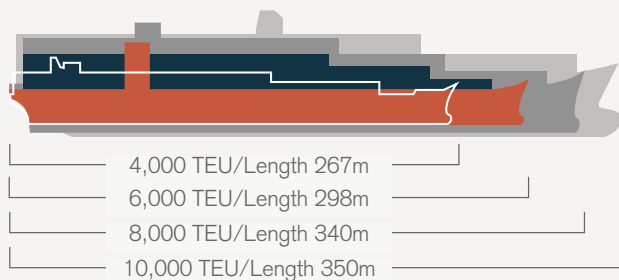
Container vessels

Bulk liquid and gas vessels

U Upper band forecast

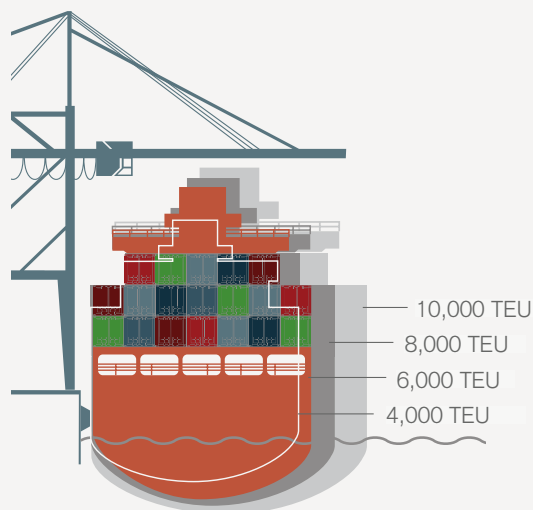
L Lower band forecast

Changing container vessel size



Vessel Capacity (TEU)	4,000	6,000	8,000	10,000
Dead Weight Tonnage (DWT)	50,000	70,000	110,000	125,000
Length overall (LOA)	267m	298m	340m	350m
Beam	32m	41.8m	43.2m	45.6m
Draft – fully loaded	12.5m	14.0m	14.5m	15.0m

Note: Typical dimension indicated. Dimensions will vary.



Bulk liquid and gas vessel sizes

CHEMICAL AND BITUMEN CARRIERS

Small Tanker



LOA 180m

Medium Range Tanker



LOA 172-190m

GAS CARRIERS

Small Gas Carriers



LOA 100m

Large Gas Carriers



LOA 225m

Note: LOA = length overall of a vessel.

LIQUID FUEL CARRIERS

Medium Range Tanker



LOA 172-190m

Long Range 1 Tanker



LOA 228m

Long Range 2 Tanker



LOA 245m

Vessel Type	DWT	LOA (m)	Beam (m)	Draft (m)
Small Gas Carrier	20,000	100	18	6.5
Large Gas Carrier	70,000	225	36	12.5
Small Tanker	22,000	180	17.5	10
Medium Range Tanker (MR)	45,000	172-190	32	12.2
Long Range 1 Tanker (LR1)	75,000	228	32	13
Long Range 2 Tanker (LR2)	110,000	245	42	15.5

Note: Typical dimension indicated. Dimensions will vary.

Bulk liquid and gas trade growth will largely be catered for within the current range of vessels, with increasing volumes of product carried per vessel.

KEY

- Current size range
- Future increase in size range

Infrastructure Capability

Providing for forecast trade volumes will require, in priority order:

1. Improved efficiency of port operations
2. Optimised use of existing infrastructure
3. Provision of new infrastructure.

Maximising the use of existing port-related infrastructure, before investing in new infrastructure, is essential for a sustainable port supply chain. New infrastructure will still be required to cater for forecast trade growth; however, the enhanced use of existing infrastructure needs to be pursued first.

Shipping Channel and Berths

Unlike most ports, Port Botany's deep shipping channel and berths do not require regular sediment removal. The Port Botany shipping channel has not required maintenance dredging since it was originally constructed in the 1970s. Only a small number of seabed levelling campaigns have been undertaken at Brotherson Dock since 1980, mainly to level high spots caused by ship propeller action.

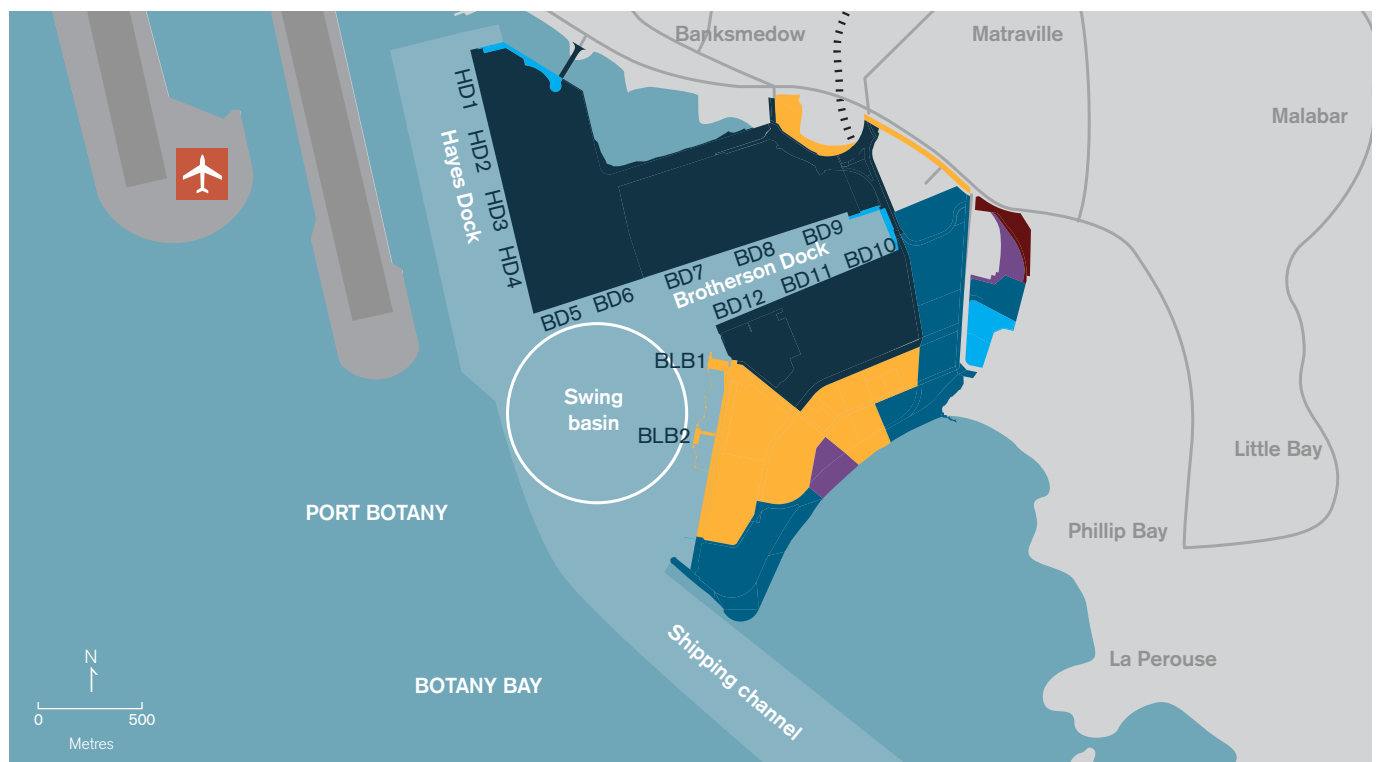
Port Botany is capable now of receiving fully-loaded container vessels of 6,500 TEU capacity, Large Gas Carriers and Long Range 1 tankers without tidal or infrastructure restrictions. It can accommodate fully loaded 8,000 TEU and Long Range 2 tankers at select berths 95 per cent of the time in a year using tidal windows for shipping channel movements.

With targeted dredging within Brotherson Dock and at isolated locations in the shipping channel, Port Botany could accommodate 10,000 TEU vessels or larger and Long Range 2 tankers without tidal restrictions. Dredging would not be required in Hayes Dock or the swing basin for these vessels.

The implementation of a dynamic under-keel clearance system would enable further operational shipping improvements at Port Botany. This could delay the need for dredging or reduce the volume of dredging required.

Our aim is for channel and berth depths at Port Botany to be capable of receiving larger vessels. Required dredging works will be undertaken in line with demand from container vessel growth.

Port Botany shipping access and current land utilisation



KEY

Shipping channel	Container facilities	Empty container parks
Bulk liquid and gas facilities	Container logistics and warehousing	Vacant land
Port services and other infrastructure	BD# Brotherson Dock berth number	HD# Hayes Dock berth number

Container Facilities

Port Botany's three container terminals have 3.6 kilometres of quayline and 147 hectares of land. Each is accessed via a different intersection off Foreshore Road and Botany Road.

Container terminal capacity is sensitive to factors such as terminal operating practices, vessel scheduling, vessel size, container dwell times and truck arrival patterns.

We have assessed the container handling capacity of Port Botany's combined container terminals to be at least 7.2 million TEU per year.

Our assessment accounts for realistic planning buffers; variations in terminal operational behaviour; seasonality and other peak demands; and inherent real-life fluctuations and randomness in vessel, truck and train schedules and fleet mixes.

Achieving Port Botany's container handling capacity requires investment by container terminal operators in additional equipment, improved terminal layout configurations, improved gate operations, increased rail usage, expanded on-site container storage facilities and technological improvements to reach the following performance levels:

- berth productivity – 2,000 TEU/m/annum
- crane productivity – 200,000 TEU/crane/annum
- yard productivity – 49,000 TEU/ha/annum
- average dwell time – 3 days
- 24/7 operations.

Access to additional land and/or berth length for stevedoring operations will be required to accommodate the 30 year container trade volume forecasts. Options exist to facilitate additional container handling capability at Port Botany and we will progress development of a container terminal at Port Kembla, giving NSW capacity to meet container growth requirements well beyond 2045.

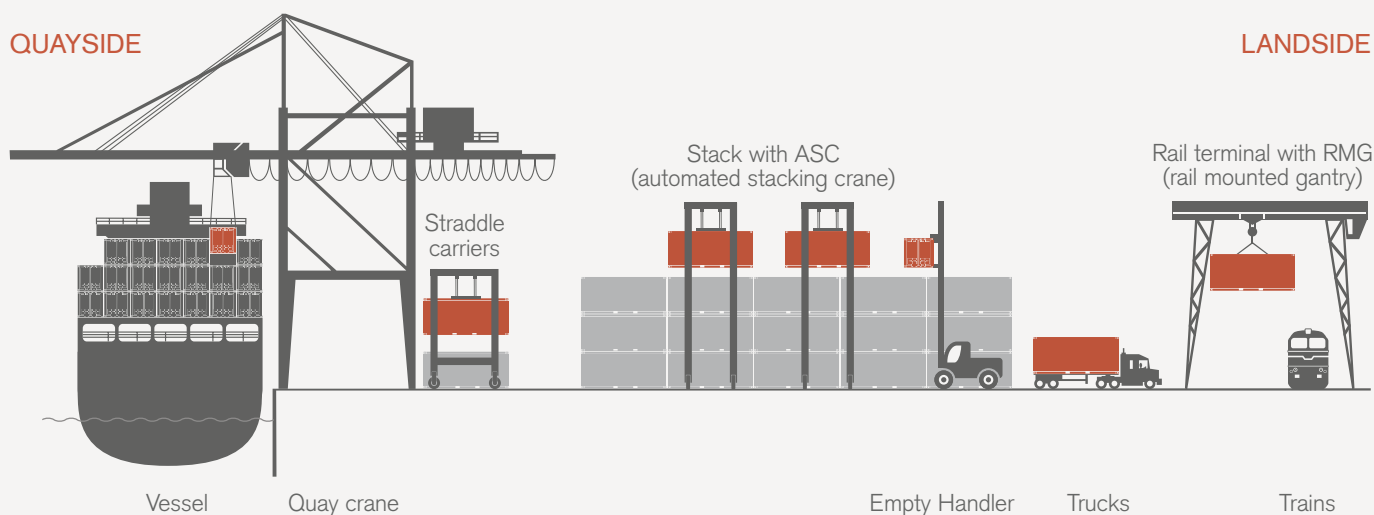
The nature and timing for additional capacity will align with actual container growth. Current growth forecasts indicate additional capacity is not required within the next 20 years.

Port Botany's container terminal wharf structures are in good condition. The Hayes Dock wharf structures were completed in 2011 with a 100-year design life and the Brotherson Dock wharf structures were completed in 1979 with at least a 50-year design life. Both are capable of accommodating the expected larger container vessels, including berth deepening and heavier quay cranes required for such vessels.

Works will be required on the Brotherson Dock wharves in the short to medium term to protect the concrete structures from corrosion and preserve their integrity beyond 2045.

A review of operating procedures for the berthing and mooring of vessels at Brotherson Dock will ensure loads do not exceed the capability of the fenders and bollards, particularly during storm conditions. Upgrading fenders and installing additional bollards on the Brotherson Dock container wharves by the respective terminal operators will provide further capacity and operational flexibility to receive the larger vessels.

Indicative cross section – Container terminal



Bulk Liquid and Gas Facilities

Port Botany's bulk liquid and gas facilities are serviced via two dedicated common user berths, linked to storage terminals and 4.8 kilometres of pipeline corridors. Bulk Liquid Berth 1 (BLB1) was completed in 1979 with a 50-year design life, and was recently refurbished to extend its life. Consistent with structures of this type, refurbishment works will be required every 10 years or so to preserve its longevity. The second bulk liquid berth (BLB2) was completed in 2013, with a 50-year design life.

The capacity of bulk liquid and gas facilities is sensitive to factors such as product type, product volume, pumping rates, pipeline capacity and product turnover within tanks.

Based on the forecast bulk liquid and gas product mix, at least 8.3 million kilolitres per year can be transferred across the two Port Botany bulk liquids berths. While the two berths will be capable of handling the forecast trade to 2045, terminal operators will need to install additional transfer infrastructure and improve rates of product transfer to storage tanks by removing bottlenecks in transfer systems.

Productivity improvements over the next 30 years should at least achieve the following product transfer rates per vessel (average pumping rate):

- refined fuel – 1,600 kilolitres per hour
- chemicals – 300 kilolitres per hour
- gas – 980 kilolitres per hour
- bitumen – 400 kilolitres per hour.

Port Botany has space for a third bulk liquids berth, which would only be built once vessel scheduling and product transfer rates are optimised by the bulk liquid and gas operators to maximise utilisation of existing infrastructure.

Land allocated to bulk liquid and gas storage facilities is expected to be sufficient to cater for forecast trade volumes.

Indicative cross section – Bulk liquid berth transfer to storage facility

QUAYSIDE

LANDSIDE



Land Use and Utilisation

Land at Port Botany is allocated for container terminal operations; bulk liquid and gas storage facilities; and support and ancillary services such as tugs, lines boats, bunkering (vessel refuelling), pilot and emergency response operations, customs and quarantine.

Land within the Port Botany precinct is in demand and scarce. It is typically leased for 10 to 30 year periods, depending on the level of capital investment required, resulting in limited turnover of land. Our focus is to improve the productivity and use of underutilised, vacant or underperforming parcels of land.

We will continue to prioritise the allocation of land for uses that require direct connection to berths to facilitate import and export trade. If additional land is required for direct importing and exporting activities, existing uses that do not need direct berth access may become displaced. Where proximity to the Port is a requirement or advantage, these uses would ideally relocate to the area immediately adjoining the Port precinct, contingent on suitable land for these uses being available in the area around the Port.

Over the next 30 years, we expect that existing container logistics land will be re-allocated to container terminal handling operations. Sufficient land has been allocated to bulk liquid and gas storage facilities.

We will also investigate opportunities to enhance the Port's public areas with uses such as a café on Prince of Wales Drive.

Port Services

Existing pilot, tug, lines boats and bunkering facilities in Port Botany are largely adequate to service forecast growth. Repositioning of existing facilities may be required to accommodate other port activities.

The Hayes Dock Services Area will be developed as a common-user facility accommodating lines boats and tugs as well as temporary occupation by work barges, vessel servicing barges and lay-up of small vessels as required.

Border protection and biosecurity services are located within the Port. Additional services may be required to manage forecast growth.

Container Logistics and Warehousing

Container logistics businesses provide facilities for receiving, storing and distributing containers; packing and unpacking containerised goods; storing inventory; and quarantine processes.

These businesses are located within the Port Botany precinct, in adjoining industrial lands and elsewhere throughout Sydney, particularly in freight logistic precincts.

Container logistics facilities located close to the Port provide hubs to stage containers overnight for morning goods delivery across Sydney. The supply chain benefits from these facilities being close to the Port.

With the decline of suitably-sized industrial lands around Port Botany, and the high price of the remaining industrial land, many container logistics businesses have relocated to western Sydney where larger, cheaper parcels of land are available.

Availability of land within the Port for container logistics businesses will decline over the next 30 years as we prioritise port activities requiring direct wharf access. Retention of suitable industrial lands in the areas around the Port for these uses is required to cater for forecast growth.

Empty Container Parks

Over the next 30 years, empty container exports will grow from about 670,000 TEU to up to 2.9 million TEU as the volume of full import containers grows at a faster rate than full export containers.

Empty container parks provide storage for empty containers before they are transported back to the port for repositioning overseas or to regional NSW for packing with exported goods. The growing empty container task requires reforms to the empty container supply chain, including:

- shipping lines repositioning empty containers overseas at a faster rate to reduce their dwell time in empty container parks
- de-hiring empty containers at intermodal terminals, with empty containers then transported to regional areas for re-packing or returned by rail to the stevedores at the Port for overseas repositioning
- prioritising full collections for trucks arriving at the Port with an empty container, to increase the two-way loading of trucks.

Both the Cooks River and Enfield intermodal terminals have the ability to operate empty container storage areas to provide for the transfer of empty containers to the Port by rail.

Over the next 30 years, we will facilitate opportunities to locate empty container parks within or adjacent to stevedore terminals. This is a sustainable outcome that will facilitate return of empty containers by rail and internal gate transfer, to minimise truck movements on internal and surrounding port roads.

Road and Rail Connectivity

Improving the landside connectivity of Port Botany to metropolitan Sydney and regional NSW will be essential for efficiently moving the growing NSW freight task.

Inefficient road and rail connections to and from Port Botany would adversely impact on the competitiveness of the State's importers and exporters and could limit the Port's growth before the ultimate capacity is achieved. Congestion on Sydney's road network and the relatively low rate of containers moved by rail must be addressed if we are to meet our objectives for a more sustainable and efficient port supply chain.

Maximising the capacity of Port Botany requires a combined investment in, and optimisation of, road and rail networks. Investment in just one mode will not suffice.

The Sydney road network is already subject to congestion at peak times. Road investment is needed to improve efficiency of key port access routes and connections.

The Sydney metropolitan rail system is currently underutilised for freight transportation. Investment in, and optimisation of, rail will provide a high-volume freight dedicated link from Port Botany to Sydney's intermodal terminals and distribution centres. This will reduce the volume of port trucks on the roads around the Port.

With a focus on improved rail and road networks, capacity of Port Botany can be optimised. Without improvements to the road and rail connections to Port Botany, the Port will not achieve an annual container throughput of over seven million TEU.

Even with a focus on growing container movements by rail, trucks will continue to be the primary means of moving containers to and from Port Botany over the next 30 years. We will advocate for investment in road infrastructure that provides efficient access to the Port to meet forecast growth in the face of growing background traffic.

Road

Truck volumes at Port Botany are forecast to increase from 3,900 to between 6,300 and 6,900 trucks per day in 2045.

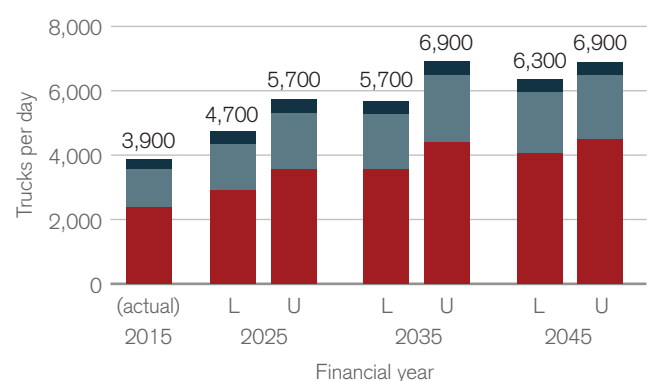
Growth in trucks will be managed through a gradual increase in rail mode share to 40 per cent and greater use of higher productivity vehicles with increased two-way loading to grow truck capacity utilisation to 80 per cent so that the number of TEU carried per truck to and from the Port grows and trucks do not travel empty. Without these improvements, truck volumes would be higher, growing to between 8,800 and 9,900 trucks per day.

We will also manage impacts on peak congestion if we can achieve more uniform truck distribution over 24/7 operations.

Since the introduction in 2011 of mandatory performance standards for trucks at Port Botany, truck turnarounds at the stevedore terminals have reduced to an average of 30 minutes, helping to limit truck queuing and congestion. We will advocate for these mandatory road-based performance standards to be retained, reviewed and updated to reflect trade volumes, changes in truck capacity and terminal productivity improvements, and to facilitate two-way loading of trucks.

With the exception of Bumborah Point Road, we manage all roads within the Port precinct. These will be able to accommodate forecast traffic volumes with minor work to address pinch points and facilitate traffic flows as volumes increase.

Forecast daily truck numbers at Port Botany



KEY	Bulk liquid
	Empty container park and logistics operation
	Container facilities
L	Lower band forecast
U	Upper band forecast

Container truck types at Port Botany

Rigid 20' or equivalent (1 TEU)



1%

Length 12.5m

Semi-trailer or equivalent (2 TEU)



70%

Length 19m

B-double or equivalent (3 TEU)



13%

Length 26m

Super B-double or equivalent (4 TEU)



16%

Length 30m

Note: % = Proportion of truck types currently accessing Port Botany container facilities.

The roads and intersections immediately surrounding the Port, including Bumborah Point Road, are managed by the NSW Government. Within the next 10 years, critical intersections immediately adjoining the Port at Foreshore Road/Botany Road/Penrhyn Road and Botany Road/Bumborah Point Road will require upgrades to accommodate forecast traffic growth. Road widening works for Foreshore Road and Bumborah Point Road, together with other traffic upgrade works on Bumborah Point Road, will also be required within 10 to 20 years.

Any new high traffic-generating non-port developments, such as higher density housing and retail developments, could adversely impact road service levels around the Port. We will encourage planning authorities to consider these developments carefully and only in the context of suitable road upgrades to accommodate such developments.

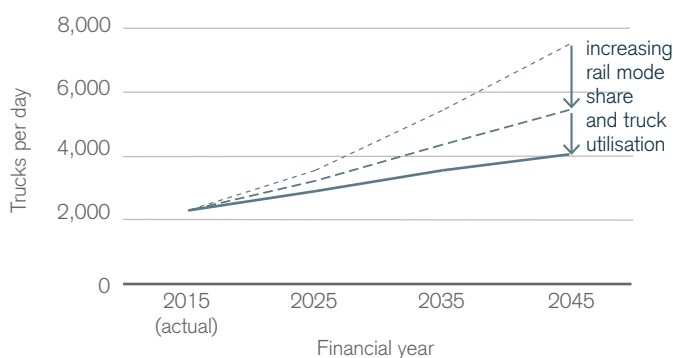
We need to cater for higher productivity vehicles in and around Port Botany and to key off-site locations to reduce the growth in truck numbers and transport costs. We will work with authorities to promote the benefit of higher productivity vehicles in the supply chain and on the road network.

We will continue to work with the relevant authorities to increase mass limits to 109 tonnes on roads in and around the Port precinct including the strengthening of the Bumborah Point Road bridge over Bunnerong Canal, Botany Road bridge and several culverts. These high mass limits currently only apply to a section of the southern port precinct (Simblist Road, Friendship Road and sections of Bumborah Point Road).

We will work with the relevant authorities to capture comprehensive port truck volume data as inputs into Sydney-wide traffic models to identify when and where road improvements are needed.

Container truck numbers to stevedore terminals can be reduced by increasing rail mode share and increasing truck utilisation.

Effect of rail and truck utilisation on container truck volumes



KEY

- No change to current rail mode share or truck utilisation
- Gradual increase in rail mode share to 40%
- Gradual increase in rail mode share to 40% with improved truck utilisation

Despite the perception that port traffic contributes to traffic volumes and congestion, the proportion of port trucks to total traffic volume quickly reduces as trucks travel away from the Port. On the M5 East Motorway, port trucks account for two per cent of traffic in peak hours and this is forecast to increase to up to four per cent in 2045.

The intersection of General Holmes Drive and Foreshore Road constrains the movement of port traffic in peak periods. Specifically, high traffic volume and associated congestion on the M5 East heading west causes congestion and delays on Foreshore Road. More than 90 per cent of all traffic destined for the Port passes through this intersection.

Improvements to the General Holmes Drive/Foreshore Road intersection, additional capacity on General Holmes Drive and the M5 East, and an efficient connection to the M4 Motorway are the highest road priorities for Port Botany's efficiency.

The WestConnex project will benefit the port supply chain and will facilitate improved connections between the Port, the M4 Motorway and western Sydney. However, in terms of the effect of the project on the critical port connection between Foreshore Road and General Holmes Drive/M5 East, the project is likely only to reduce the rate of growth of vehicles on General Holmes Drive and the M5 East, which are already congested roads at peak times. Reducing the growth rate would simply reduce the rate at which the problem worsens rather than provide a solution.

We believe the scope of the WestConnex project should be expanded to meet the needs of the port freight supply chain for the Sydney metropolitan area. We will therefore advocate for the intersection between Foreshore Road and General Holmes Drive (both left and right turns in and out of the Port) to be improved to achieve suitable truck linkages from Port Botany to the M5 East and the new WestConnex. Ideally a freight dedicated corridor would provide a link to the main road corridors.

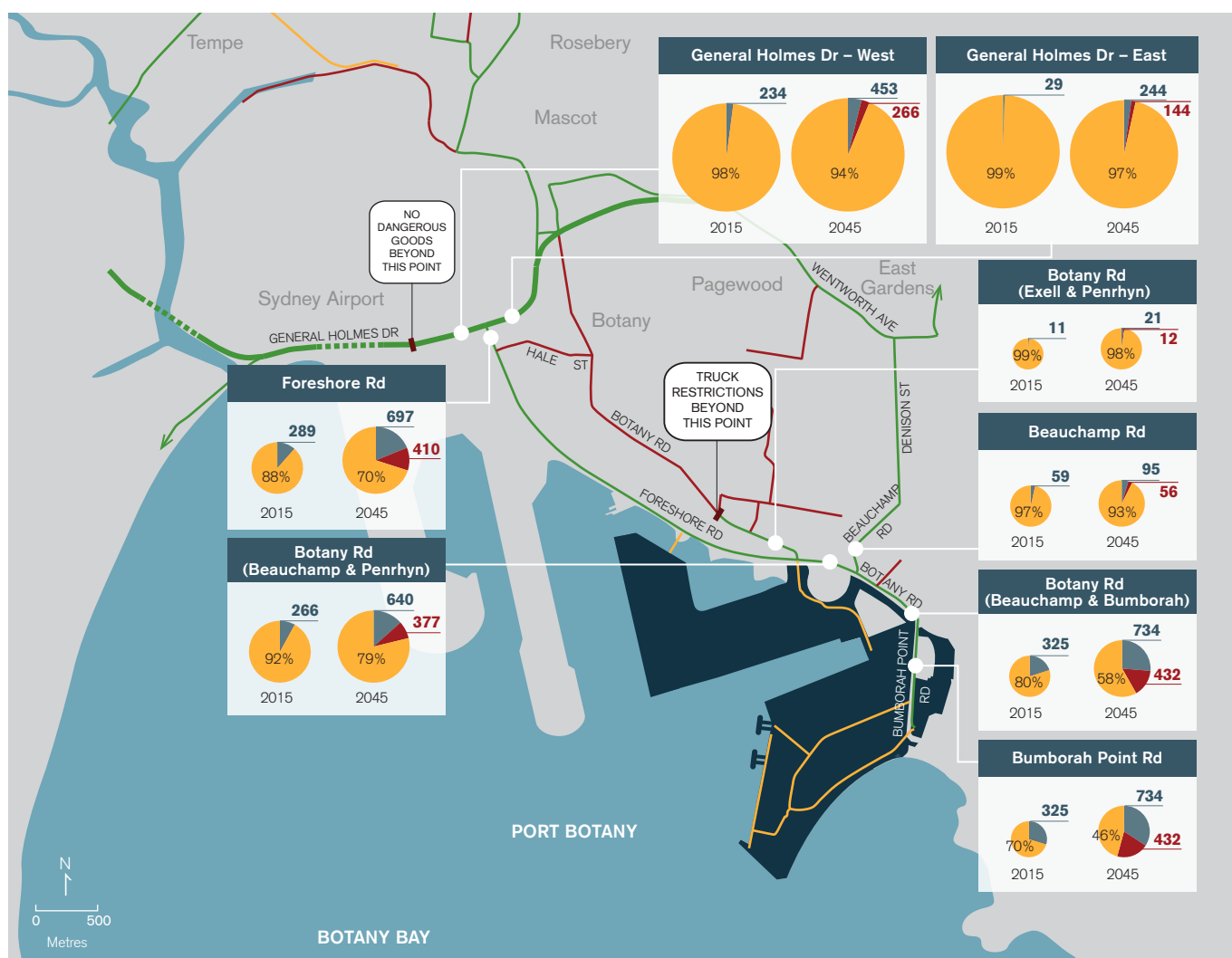
In addition to Foreshore Road and General Holmes Drive, Beauchamp Road and Denison Street provide an important access route to the Port with around 10 per cent of port-related trucks using Beauchamp Road/Denison Street to travel to and/or from Port Botany. This truck access route is becoming increasingly important for bulk liquids trucks travelling to and from the north and needs to be maintained for port-related traffic.



The cost of urban transport congestion in Australia's capital cities has been forecast to increase from about \$14 billion to \$53 billion a year by 2031 unless there is significant infrastructure investment and better planning.²

² Infrastructure Australia (2015) Australian Infrastructure Audit.

Proportion of port trucks to total traffic on surrounding road network – Morning peak hour



KEY

- Port Botany precinct
- NSW Government managed road
- Local government managed road
- NSW Ports managed road

PIE CHARTS (size indicative of traffic volumes)

- # Port trucks (lower band forecast numbers)
- # Additional port trucks (upper band forecast numbers)
- % Background vehicles under upper band (%)

Note: Assumes delivery of WestConnex.

Rail

Movement of freight by rail rather than road allows large volumes to be carried, in one movement, by each train on freight-dedicated transport corridors. To benefit from the high productivity capable of being achieved by rail movements, the freight rail system needs to be improved to ensure it has capacity to handle larger volumes and be a reliable and cost effective mode of transport.

Increasing the movement of containers by rail to and from Port Botany is essential for the Port to accommodate forecast container growth efficiently and sustainably.

About 290,000 TEU per year are currently transported by rail to and from the three stevedoring terminals at Port Botany. Additional rail volumes are handled at the adjoining intermodal terminal on Botany Road.

Our goal is for three million TEU per year to be transported by rail by 2045 – around 40 per cent of forecast container volumes. This can be achieved by:

- improving rail operations, including train scheduling, on-time running, window availability, dedicated trains for each stevedore with standardised length and train back-loading
- improving rail lift rates at stevedore terminals
- building additional rail sidings and procuring additional container handling equipment, such as rail mounted gantry cranes, at stevedore terminals
- creating additional infrastructure on the freight rail line, including duplication and passing loops
- creating additional intermodal terminal capacity in metropolitan Sydney.



Every one million TEU moved by rail reduces the number of trucks on the roads around Port Botany by more than 900 trucks each day.

To grow the volume of containers moved by freight rail we need to begin by resolving operational issues and make rail more reliable and cost-effective.

The introduction of mandatory performance standards for rail service providers and stevedores will address current operational issues provided they cover minimum lift rates at stevedore terminals, on-time running of trains, window availability, standardisation of train lengths, dedicated trains and minimum train utilisation.

The existing rail infrastructure at Port Botany has capability to handle one million TEU based on realistic productivity levels. Allocation of additional equipment and labour to rail operations, together with the required improvement in rail operation performance, will allow this capacity to be realised.

Growing capacity at the Port can be achieved through staged investment in additional rail sidings and the use of rail mounted gantry cranes. Rail mounted gantry cranes span over a number of sidings while maintaining lift rates and train turnaround times, thereby increasing the overall capacity of the rail facilities. Sufficient port land is available to develop the stevedores' rail terminals to cater for three million TEU on rail.

While each stevedore currently has its own dedicated rail sidings which connect to the Port Botany Freight Line, stevedores may choose to share rail facilities in the future to maximise efficiencies.

Moving three million TEU per year by rail will require up to 56 port shuttle trains over a 24 hour period arriving and departing the Port via the Port Botany Freight Line. Currently about 16 trains per day use this line.

We understand from work conducted by ARTC that the Port Botany Freight Line will have capacity to cater for the forecast port shuttle volumes once the line has been duplicated between Port Botany and Mascot and operational improvements on the line have been implemented.

Duplicating the line between Port Botany and Mascot is an important element of securing increased capacity and reliability of the freight rail network. Duplication work needs to be progressed as a priority to ensure there is redundancy for the existing single line but also to minimise the impact to rail operations during the works. As the duplication works are complex and will occur in an operational and narrow rail corridor, undertaking the works before rail volumes significantly grow, is essential.

Capacity improvements on rail beyond the Enfield Intermodal Logistics Centre, for example passing loops near Warwick Farm on the Southern Sydney Freight Line, will also be required to cater for the growth of the Moorebank Intermodal Terminal and future intermodal terminals in western Sydney.

Port Surrounds

Operations at Port Botany occur within an increasingly constrained environment. Urban encroachment on the Port, port-related lands, road and rail connections, and industrial lands could impact operational efficiency of the freight logistics network and compromise the Port's capacity.

Industrial Land Supply

Industrial lands close to the Port provide space for uses that do not require direct connectivity to berths and which benefit from proximity to the Port. These lands are an extension to the Port precinct. Over the next 30 years, the volume of containers having a destination within 10 kilometres of the port is forecast to triple.

Container-related activities require large paved areas for container stacking and other transport operations, and warehousing for container pack and unpack activities. Land larger than two hectares is more attractive for container related uses.

Of the 390 hectares of industrial land surrounding Port Botany, 219 hectares is made up of lot sizes exceeding two hectares. Few vacant sites are found within this area where container handling is permitted.

Urban encroachment and pressure from higher-value land uses such as residential, retail and commercial uses impact the supply of industrial lands close to the Port. A recent NSW Government report³ found that between 2006 and 2014, 223 hectares of industrial land in Sydney was rezoned for business uses. In 2015, a further 124 hectares of industrial land was rezoned in the Southern Sydney Employment Lands precinct for residential and business uses.

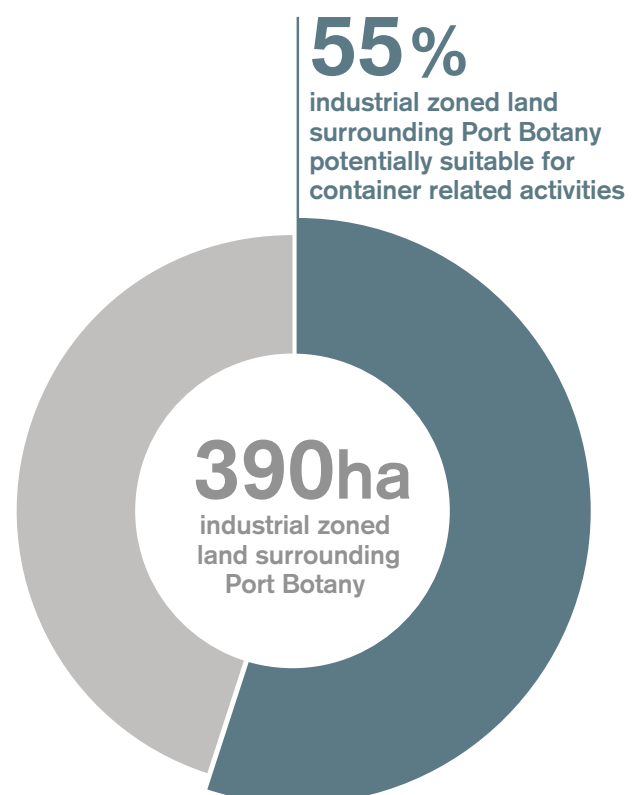
The NSW Government recognised the importance of Port Botany and the adjoining industrial lands through the implementation of *State Environmental Planning Policy (Three Ports) 2013* (the Ports SEPP).

The Ports SEPP has helped to retain the area of industrial zoned land adjoining the Port but has been less effective in preserving this land for port-related uses. Prohibitions on container handling operations have been imposed on some sites within the Ports SEPP area and incompatible developments have been approved on land immediately adjoining the Ports SEPP boundary. Not having a buffer (or transition) zone around the Ports SEPP boundary compromises the use of industrial land within the SEPP area.

In addition to rezoning pressures, the subdivision of existing large industrial lots into lots smaller than two hectares reduces the availability of suitable land for container-related uses.

We will advocate for the following solutions to address industrial land supply issues:







- **prohibit rezoning and prevent expanded permitted uses on industrial lands around the Port, including bulky goods retail**
- **prevent further subdivision of large parcels of industrial land around the Port**
- **encourage consent authorities to seek our input to the assessment of development and subdivision proposals on lands within or adjoining the industrial lands around the Port**
- **establish a buffer (or transition) zone around the remaining industrial lands to ensure compatibility of adjoining uses.**



³ NSW Planning & Environment – Employment Lands Development Program (2014 Update Report).

Remaining industrial lands surrounding Port Botany



KEY	 Port Botany	 Industrial lands	 Residential areas
	 Main port access roads	 Rail lines – Dedicated freight	 Ports SEPP industrial land boundary

Urban Encroachment

Port activities can generate traffic, noise, light and aesthetic impacts on nearby areas. These impacts can increase as trade volumes grow, due to greater intensity of activities and 24/7 operations. For these reasons, we need a buffer between port activities and any sensitive uses such as housing.

The consequence of reduced industrial land supply around the Port has led to an increase in interface issues between the Port and surrounding residential areas. Noise-related complaints have been received from residents up to two kilometres from the Port.

We aim to operate in harmony with the surrounding environment; however, this is not practical if residential development exists 200 metres from port operations as is the current case.

We will advocate for a number of solutions that can manage community impacts while also delivering an efficient and sustainable port:

- **establish a Port Botany Protection Zone which prohibits incompatible uses**
- **ensure all planning and development proposals within the Port Botany Protection Zone are referred to NSW Ports for comment during the planning policy phase and development assessment process**
- **prohibit incompatible development along key access roads around the Port so that these roads can continue to be primary port truck routes**
- **identify the extent of the area affected by port-related activities and industrial operations and map these in environmental planning instruments (just as airport noise contours and flood prone lands are mapped)**
- **within the affected area, impose development controls that require appropriate mitigation measures like the noise mitigation measures that Botany Bay City Council imposes to address noise impacts from Sydney Airport operations**
- **include notifications on Section 149 certificates that properties are within a port and industrial impact zone, as has been adopted by Leichhardt Municipal Council for impacts arising from the Glebe Island and White Bay port area.**

We will also prioritise the protection of the Port Botany Freight Line. Increasing use of this line and 24/7 operations should not be constrained by incompatible developments along the line.

Airport Interface

Port Botany is located close to Sydney Airport. Port operations and developments must consider the regulatory environment related to airport operations. All current quay cranes at Port Botany have appropriate approvals in place to intrude into Sydney Airport's protected airspace known as the Obstacle Limitation Surface (OLS).

For the Port to accommodate forecast container trade growth and for port operations to remain cost effective and competitive, there will be a need to install more, and in some cases higher, quay cranes. Future vessels, depending on their physical height, their loading utilisation and the tidal levels, may also intrude into the OLS when operating in the Port's navigational areas.

We therefore foresee further intrusions into the OLS but no penetration of the critical protection surfaces associated with the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS).

We will work with Sydney Airport, stevedores, Commonwealth aviation authorities and the Port Authority of NSW to address interface issues relating to larger vessels and quay cranes. Appropriate aeronautical assessments will be undertaken and approvals sought to ensure that the port and airport can jointly grow to their full potential supporting the Sydney and NSW economy.

Trucks travelling around Sydney Airport on Qantas Drive and trains on the Port Botany Freight Line currently penetrate the OLS. With growth in both truck and train volumes required, we will work with government and airport stakeholders in relation to interface issues.



INTERMODAL TERMINALS: THE NEXT 30 YEARS

Enfield and Cooks River intermodal terminals will be inland extensions to Port Botany, with Cooks River Intermodal Terminal operating as an extended port gate and the Enfield Intermodal Logistics Centre a key logistics hub in the central-west of Sydney.

Intermodal terminals are critical to the logistics chain and essential if we are to increase the volume of containers moved by rail.

The strategy for growing intermodal terminals with dedicated freight rail connections is well recognised throughout industry and by the NSW and Australian Governments as necessary to efficiently service the container transport needs of a growing Sydney.

Moving up to three million TEU by rail requires a network of metropolitan intermodal terminals connected to Port Botany by a dedicated freight rail network. It also requires the mandatory performance standards to address current rail operational issues.

Intermodal terminals facilitate landside transport-logistics efficiencies. They offer a sustainable and practical transport solution to meet the challenge of Sydney's growing freight volumes. They allow containers to be loaded onto rail at Port Botany for transportation to intermodal terminals throughout Sydney, getting containers closer to their end destination and reducing the distance travelled by trucks. They also allow export and empty containers to be returned to the Port by rail from an intermodal terminal, further reducing the distance travelled by trucks.

Where warehouse/distribution centres adjoin an intermodal terminal, containers can be transferred between the warehouse and the intermodal terminal without travelling on the external road network.

Transport operators that use intermodal terminals reduce the distance travelled by their trucks, making better use of their truck fleet.

Sydney metropolitan intermodal terminals



KEY	Rail lines – Dedicated freight	Rail lines – Shared freight and passenger	Potential rail freight link
	NSW Ports intermodal terminals	Existing intermodal terminals	Future intermodal terminals

Port Botany is serviced by trains from the Cooks River, Minto and Yennora intermodal terminals and, from 2015, intermodal terminals at Chullora and Enfield.

Collectively, these intermodal terminals do not have sufficient capacity to meet the forecast freight task. Future intermodal terminals at Moorebank, Eastern Creek and Badgerys Creek, all with dedicated freight rail access, will be critical to meeting future rail demand.

We will advocate for the identification and protection of sites and rail access routes for future intermodal terminals at Eastern Creek and Badgerys Creek. This includes the preservation of adjoining industrial land supply for container-related businesses that will not only provide a buffer to other uses, but also reduce truck movements between intermodal terminals and their end destination.

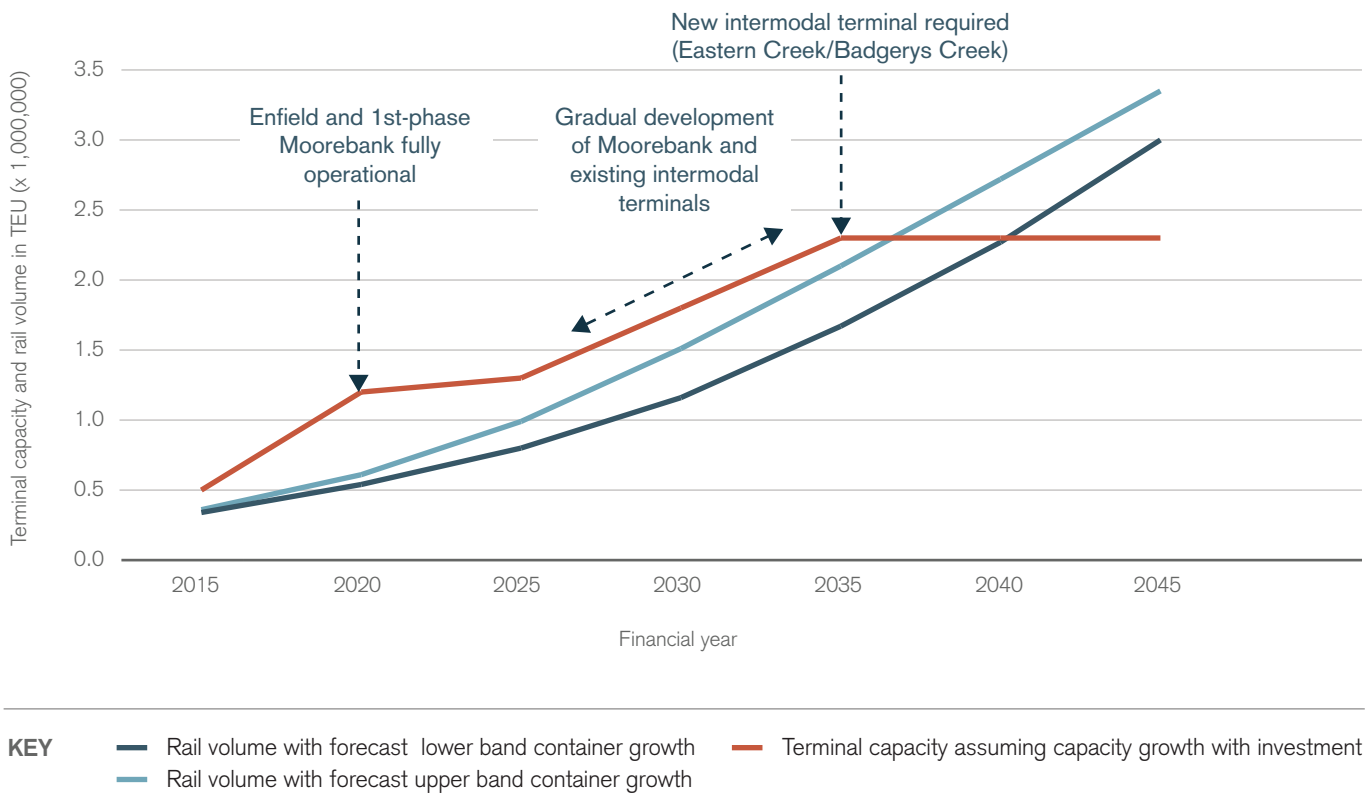
We will only see the potential value of intermodal terminal sites and adjoining industrial lands if they can be protected from urban encroachment, incompatible adjoining developments and from subdivision into unsuitable smaller land parcel sizes.

Enfield Intermodal Logistics Centre

The Enfield Intermodal Logistics Centre will bring new intermodal terminal capacity to Sydney when it commences operation. This capacity will only drive growth in rail transport of containers with further uptake by the logistics industry in using rail and improvements in rail operations including servicing of rail at stevedores.

The transportation of containers by rail to the Enfield Intermodal Logistics Centre is cost competitive against road transportation within a catchment extending from Enfield, west to Penrith, north to Baulkham Hills and south to Campbelltown. Currently 430,000 TEU have been estimated as being contestable for rail transport via Enfield and this is forecast to grow to 1.7 million TEU by 2045.

Intermodal terminal capacity and rail volumes based on assumed growth of rail mode share to 40% in 2045



Infrastructure Capability

Approved to handle 300,000 TEU per annum by rail to and from Port Botany, the Enfield intermodal terminal could achieve a higher throughput, subject to planning approval. The rail sidings have capacity to handle in excess of 300,000 TEU, while the intermodal terminal area has ample capacity for storage with minor access reconfiguration. At this volume, ten port shuttle trains per day would be serviced at Enfield.

The Enfield Intermodal Logistics Centre will include empty container storage areas. Empty containers will be returned to Port Botany by rail for export or loaded onto regional trains to be filled with export products.

With two 900 metre sidings, Enfield Intermodal Logistics Centre will accept regional trains. Export cargo will be transferred to dedicated port shuttles and empty containers returned to the regions for filling. This improves utilisation of rolling stock as regional trains can return directly from Enfield and avoid travelling to the Port for unloading at the stevedore terminals.

Once it reaches 300,000 TEU a year, the Enfield intermodal terminal will remove more than 370 container trucks every day from the roads around Port Botany.

Industrial land within the Enfield Intermodal Logistics Centre will support logistics, freight forwarding, pack/unpack, transport and warehousing uses to complement the intermodal terminal. Containers will be transferred to these adjoining sites without travelling on the external road network.

Road Connections

The Enfield Intermodal Logistics Centre is well positioned to key arterial road infrastructure via Wentworth Avenue to Roberts Road onto the M4 and M5 Motorways and the Hume Highway.

The road network providing access to the Enfield Intermodal Logistics Centre is managed by both the NSW Government and local government. Some roads and intersections are already inadequate, particularly during peak periods. Key access routes via Centenary Drive, Hume Highway and Roberts Road are already subject to low travel speed and delays and require upgrading to enable efficient access to and from the Enfield Intermodal Logistics Centre.

Currently capable of receiving B-doubles, the Intermodal Logistics Centre will need access for higher productivity vehicles to improve efficiency of the road freight task. This will reduce the number of trucks visiting the site.

Truck traffic to and from the Enfield Intermodal Logistics Centre is forecast to be about 580 trucks a day at 300,000 TEU per year throughput. This volume will not materially impact the level of service of the main access routes, as the level of service is driven predominantly by background traffic.

Surrounding Areas

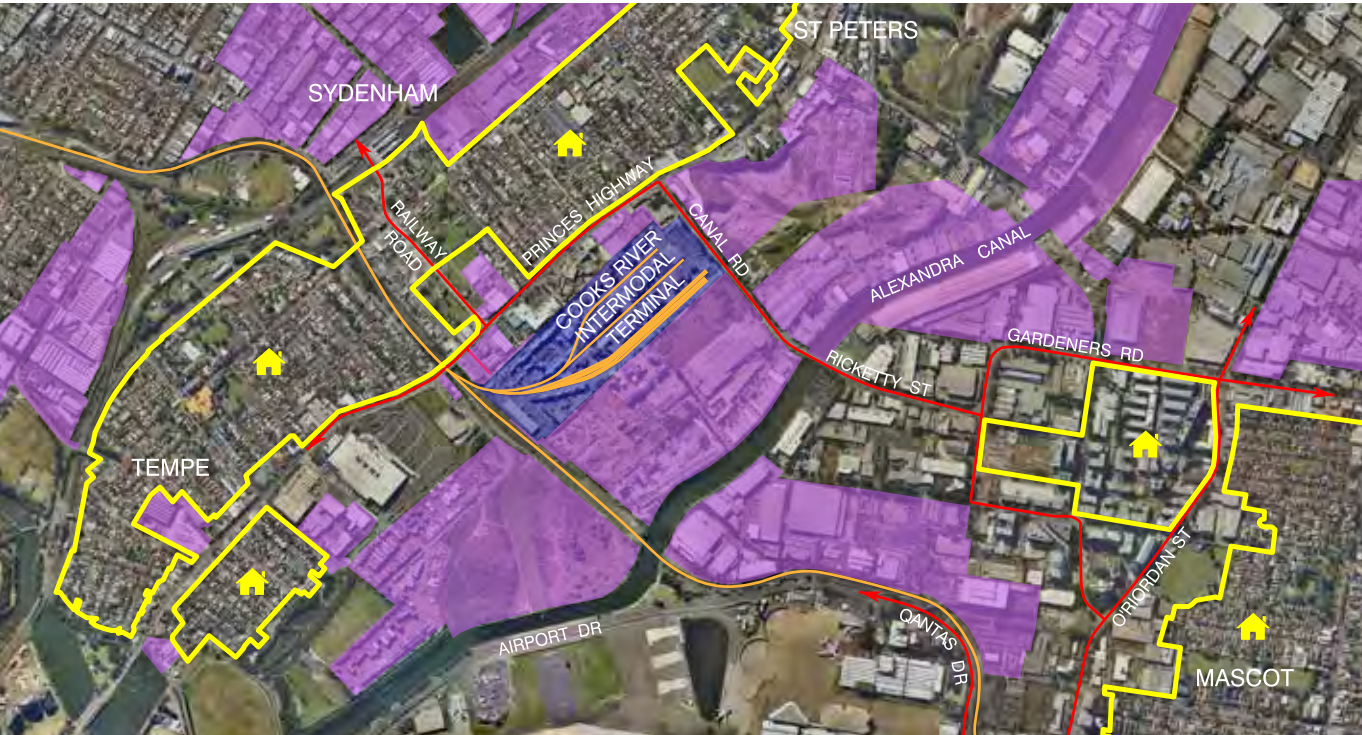
Industrial lands surrounding the Enfield Intermodal Logistics Centre are being rezoned for alternate uses such as commercial and residential. Preserving the industrial land supply will facilitate nearby container-related businesses and protect the Intermodal Logistics Centre from the impacts of urban encroachment.



Enfield Intermodal Logistics Centre is predicted to reduce truck vehicle kilometres travelled by 6.5 million kilometres a year – reducing diesel fuel consumption by 2.2 million litres per year and equating to a nett annual reduction in CO₂ emissions of 993 tonnes per year within the Sydney air shed.⁴

⁴ SKM (2005) Environmental Assessment: Intermodal Logistics Centre at Enfield.

Remaining industrial lands surrounding Enfield Intermodal Logistics Centre and Cooks River Intermodal Terminal



KEY

Industrial lands

Main access roads

Rail lines – Dedicated freight

Residential areas

Cooks River Intermodal Terminal

Cooks River Intermodal Terminal is just 10 kilometres from Port Botany by road and eight kilometres by dedicated freight rail, enabling it to grow as an 'alternate port gate' with containers transported by road and rail from the Port to the Intermodal Terminal. This will supplement Port Botany's land capacity and reduce the volume of trucks accessing the Port.

The Cooks River Intermodal Terminal is a staging point for containers for small to medium size trucking companies, an empty container depot with repair and washing services and an intermodal rail facility for regional and port shuttle trains. The viability of using Cooks River Intermodal Terminal for staging via rail will increase over the next 30 years and prospects may be enhanced by the WestConnex proposal with the St Peters Interchange opposite the Intermodal Terminal.

Opportunities exist to diversify the range of container-related activities on the site as a result of its proximity to Port Botany, direct access to freight rail, the ready availability of empty containers and on-site container maintenance and repair facilities. For example, a grain containerisation facility has been approved for the site – the first on-port grain containerisation facility in NSW. Cooks River could be essentially an on-port facility whereby bulk grain would arrive to site by rail, be packed into containers on site, and then complete its journey to the Port by rail as containerised units for export.

These are important sustainability opportunities that will grow the volume of full export containers via Port Botany, reduce truck movements, and provide cost effective opportunities to exporters so that more NSW produce is exported from NSW ports.

Infrastructure Capability

The Cooks River Intermodal Terminal has eight sidings with a total length of 4.5 kilometres. It currently handles 330,000 TEU per year, which could increase to about 500,000 TEU subject to some site reconfiguration, increased use of port shuttle trains and optimisation of the average container storage time on site.

Further capacity increases would be possible with the introduction of rail mounted gantry crane operations over existing rail sidings and reduced container storage time on site.

Container storage capacity is limited by available land area which is further constrained by stacking height limitations associated with the site's proximity to Sydney Airport.

Better rail access to and from the Intermodal Terminal through a new rail shunting line or passing loop on the Port Botany Freight Line will optimise the rail capacity of the site as well as the main line. Currently, about six trains visit the site each day – this may grow to 13 trains with a throughput of 500,000 TEU per year.

Road Connections

The Cooks River Intermodal Terminal is well connected to arterial road infrastructure. Access to and from the site is via Talbot Street and Canal Road, which connects to the Princes Highway, O'Riordan Street and Joyce Drive, providing connections to the M5 Motorway and Port Botany.

Truck traffic will gradually increase from 550 to 750 trucks per day at a throughput of 500,000 TEU per year.

The road network providing access to the Cooks River Intermodal Terminal is managed by the NSW Government and local government. Some road upgrades will be required on Princes Highway and Talbot Street to improve access to the Intermodal Terminal and enable the receipt of B-double trucks.

The surrounding road network generally operates at reasonable levels of service and we expect the road network and intersections to adequately accommodate forecast traffic, subject to the proposed WestConnex development.

We will work to ensure that the proposed WestConnex interchange at St Peters, opposite the Cooks River Intermodal Terminal site, does not adversely impact on container throughput capacity nor reduce the land footprint given current land capacity constraints.

Surrounding Areas

The area surrounding the Cooks River Intermodal Terminal contains industrial lands and is protected by arterial road networks such as the Princes Highway. The St Peters Interchange, as part of the WestConnex project, will provide a further buffer. Existing industrial lands immediately adjoining the site to the south and east must be retained to prevent rezoning to incompatible uses.

PORT KEMBLA: THE NEXT 30 YEARS



Port Kembla, as the NSW port of growth, will continue to be NSW's largest motor vehicle import hub and bulk grain export port, while catering for a growing range of dry bulk, bulk liquid and general cargo. It will be home to NSW's second container port after Port Botany.

Over the next 30 years, Port Kembla's role in supporting NSW's mining, agriculture, manufacturing and construction industries will grow and strengthen. Port Kembla will continue to connect NSW with overseas markets for agriculture and mining exports and be a gateway for the imports required for the State's motor vehicle, manufacturing and construction industries.

Port Kembla will continue to be NSW's largest motor vehicle import hub and bulk grain export port over the next 30 years and will handle an increasingly diverse range of dry and liquid bulk products over this time period. It will become NSW's second container port.

Port Kembla's connectivity to regional NSW and proximity to major growth areas in Sydney's south-west makes it central to the future economic prosperity of NSW, Sydney and the Illawarra. Its ability to be flexible and expand to cater for new trades will benefit the NSW economy.

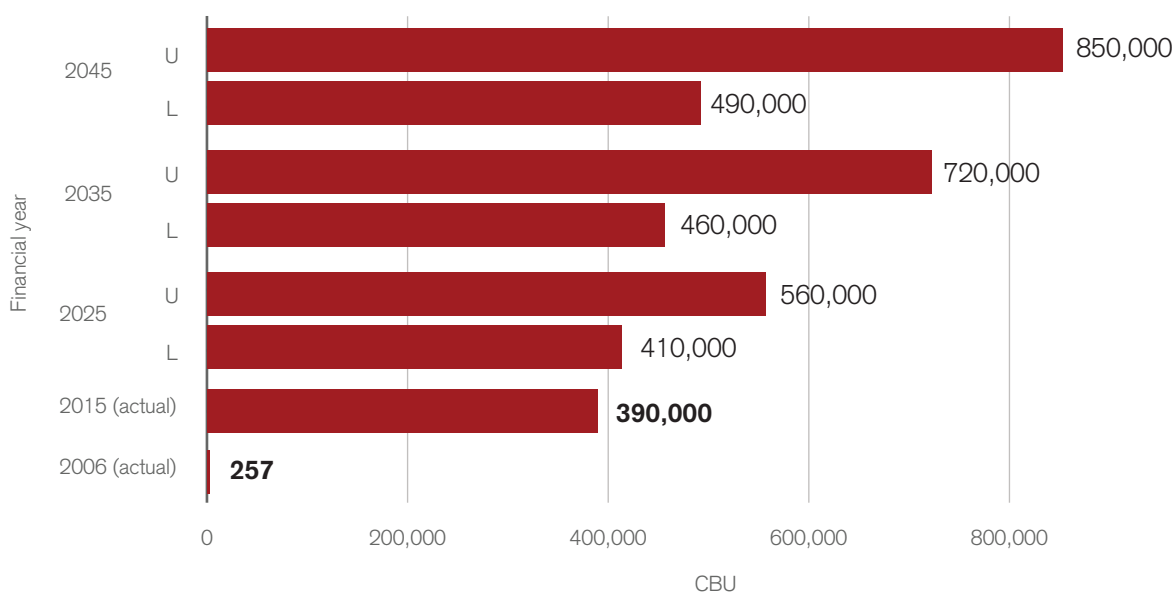
Trade Demand

Motor Vehicles

Port Kembla is home to NSW's largest motor vehicle import facility, handling 390,000 vehicles and machinery each year. Volumes are forecast to grow to between 540,000 and 850,000 vehicles per year by 2045.

Vehicle growth will be influenced by the NSW economy, population growth, transshipment of vehicles destined for other Australian states and changes in vehicle technology such as electric cars. Motor vehicles are imported from Japan, China, Korea, Thailand, USA and Europe. Increased imports are forecast from the USA, Europe and China as well as India and Malaysia.

Motor vehicle forecast



KEY

U Upper band forecast

L Lower band forecast

Dry Bulk

Port Kembla is the only significant bulk port in southern NSW. It accommodates NSW's largest grain handling facility and is the second largest coal export port in NSW. The Port's main dry bulk trades are grain, coal, coke, cement clinker, and steel making raw materials such as iron ore. Other dry bulk products include fertiliser, copper concentrate, soda ash and gypsum.

Overall, dry bulk trades are forecast to grow from the current 20.3 million tonnes up to 30 million tonnes per year by 2045.

Grain exported via Port Kembla comes from regional NSW, extending between Coonamble in the north to the Riverina in the south. The quantity of grain handled through the Port each year depends on weather patterns, but the trade is forecast to at least remain equivalent with the long-term historic yearly average of 1.3 million tonnes.

Coal exports will be subject to fluctuating global demands. Coal trade at Port Kembla is forecast to gradually grow from about 13 million tonnes per year to a potential of 20 million tonnes per year, with the opening of new coal mines well connected to Port Kembla.

Coal exported via Port Kembla comes from the southern coalfields in the Illawarra and the western coalfields west of Lithgow. This coal is a mix of mostly high quality metallurgical coal used in steel making and thermal coal

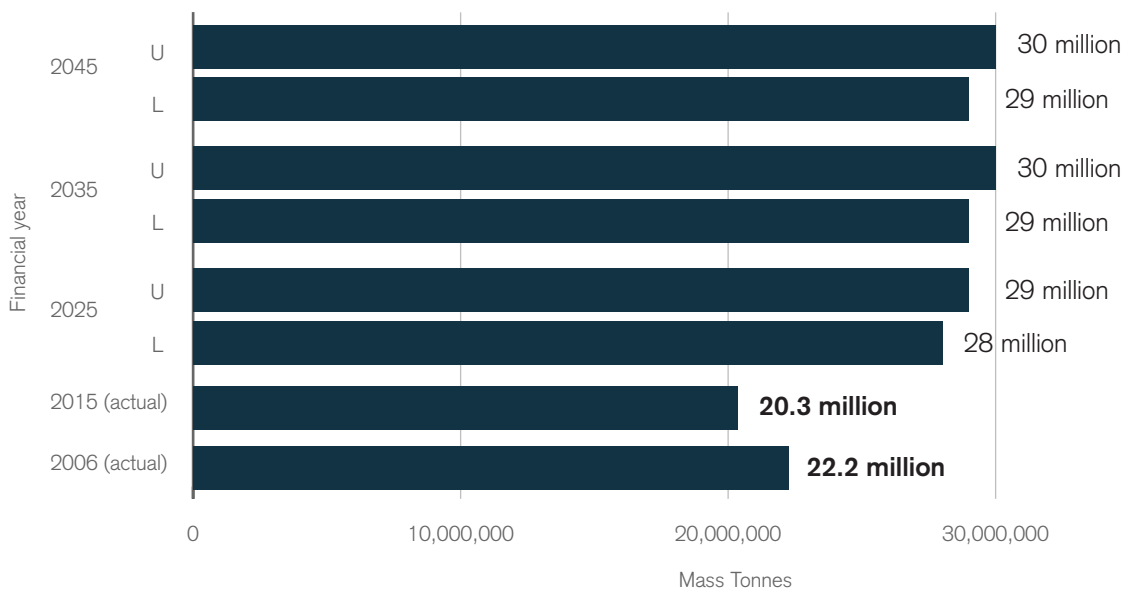
used in energy production. The metallurgical coal exported via Port Kembla is destined for steel making facilities in Japan, China, India, other parts of Asia and Europe. Demand for high quality metallurgical coal is forecast to continue.

Steel making raw materials, such as iron ore, are imported through Port Kembla for use by Bluescope in the adjoining steel making plant. Finished steel products leave the Bluescope site either by ship for export, or train and truck for domestic consumption. Changes to steel making operations at Port Kembla could replace imports of steel making raw materials with steel coil imports for coated steel production. Surplus berth and land capacity at Bluescope's facility could be utilised for alternate port uses such as alternate dry bulk trades or containers.

Port Kembla's cement production facility provides a significant portion of the cement required for the NSW construction industry. Cement clinker is imported by ship, ground on site, then mixed with gypsum and limestone to make cement. Cement product leaves Port Kembla to its final destination by truck. The trade is forecast to grow broadly in line with Australian population growth.

Port Kembla has the potential to handle additional dry bulk trades such as those currently serviced at Glebe Island (gypsum, sugar, cement and salt) as well as potential future mineral, sand and aggregate trades.

Dry bulk forecast



Bulk Liquid

The volume of bulk liquid handled through Port Kembla will continue to increase and diversify with the development of new bulk liquid storage facilities. The Port currently handles 433,000 kilolitres per year of bulk liquids and is forecast to handle up to 2.6 million kilolitres per year by 2045.

The Port handles a range of bulk liquid products including: diesel and lube oils for vehicles, machinery and equipment; marine fuel oil for refuelling ships; and sulphuric acid, used at the Bluescope steel works.

Growth in the bulk liquid trade will be driven by further diversification in the petroleum fuel industry, increased competition with other bulk liquid import facilities and a gradual increase in volume aligned with population growth.

General Cargo

Port Kembla handles a range of general cargo such as steel exports, containers, mining equipment, construction materials and special project cargo like power generation transformers, wind turbines and yachts. Port Kembla currently handles about 1.5 million mass tonnes of general cargo and this is forecast to remain the average annual volume over the next 30 years.

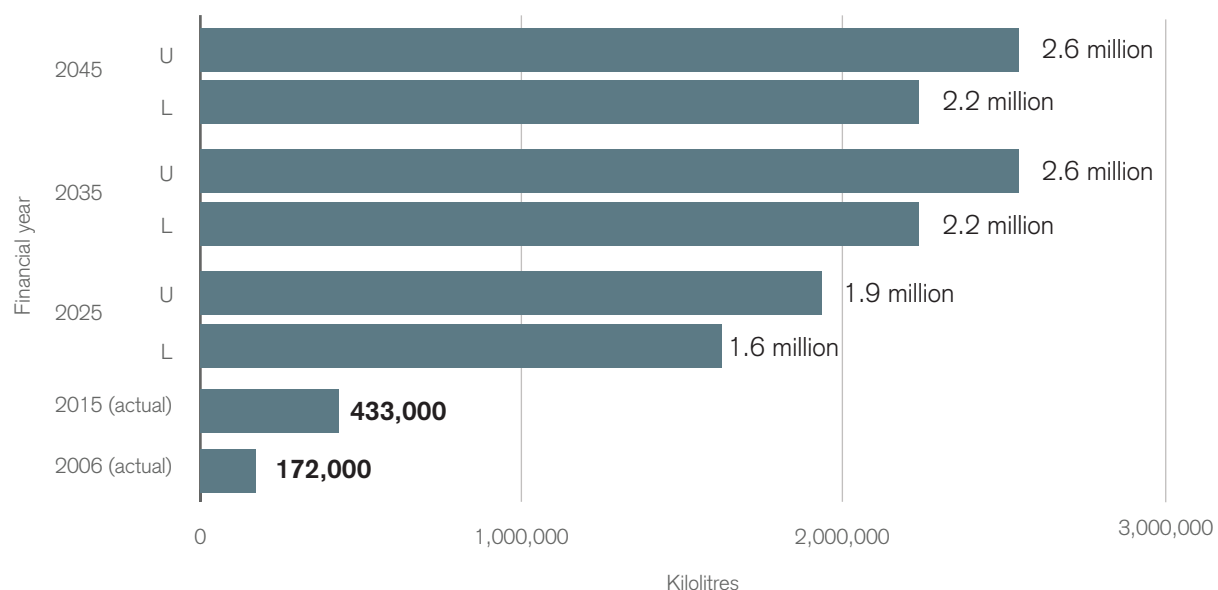
Containers

When completed, Port Kembla's Outer Harbour Development will cater for NSW's future container trade volumes. Planned for operation once Port Botany nears capacity, the Outer Harbour Development may be completed sooner if an operator wishes to develop a container terminal at Port Kembla prior to this time.

Other Port Uses

Other infrequent port-related uses could be accommodated at Port Kembla subject to availability of berths and landside facilities at the time of the visit, for example cruise vessel visits, the first of which is scheduled to occur in late 2016.

Bulk liquid forecast



KEY

U Upper band forecast

L Lower band forecast

Future Vessels

A range of vessels call at Port Kembla, from Handysize vessels for small dry bulk shipments to Post-panamax and Capesize vessels for coal exports and iron ore imports, and car carriers for motor vehicle imports.

The size of vessel used depends on a range of factors including the type and volume of cargo to be handled, vessel availability, vessel charter rates, and any restrictions within the ports being visited. Cost efficiencies are typically achieved by maximising shipment volumes and fully utilising the available vessel's capacity.

Over the next 30 years, we expect increased trade volumes to be largely catered for by increased shipment volumes within the range of current vessel categories, with some increase in vessel sizes for certain trades.

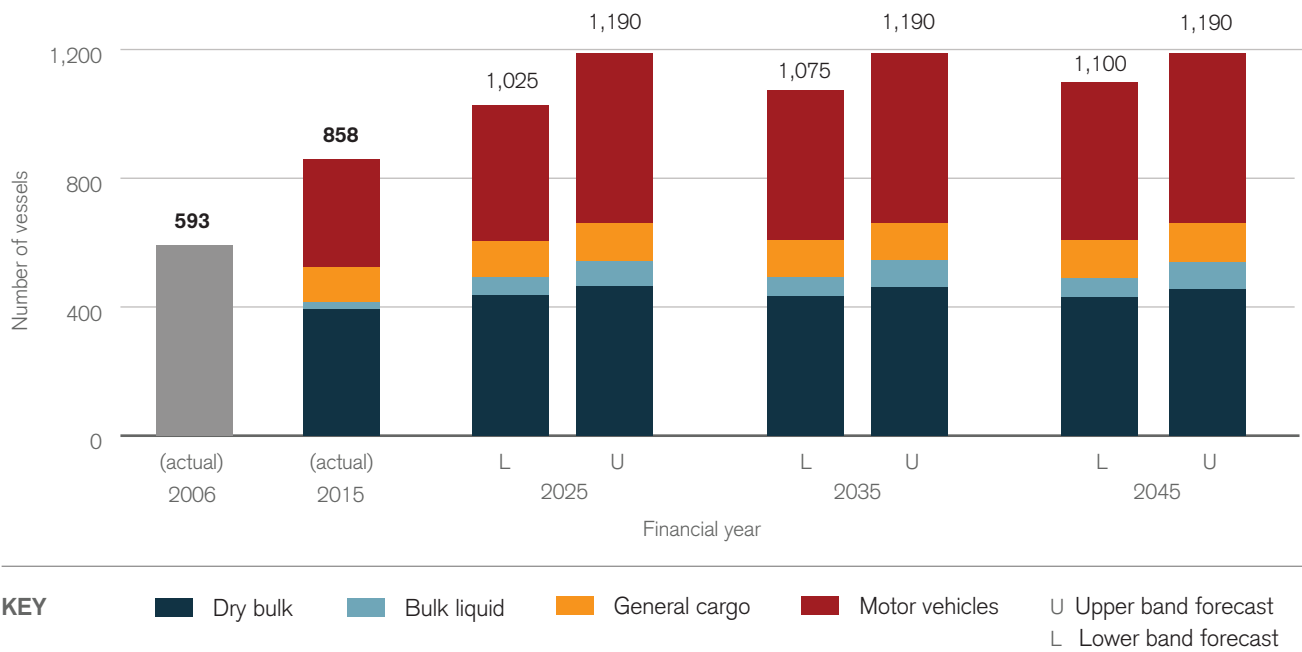
As a result, the number of vessels forecast to call at Port Kembla is expected to remain at approximately 1,000 vessels per year over the next 30 years. This could increase marginally to 1,190 vessels per year with the higher trade growth forecasts.

In the past, large Capesize vessels have visited Port Kembla. Future vessels are not expected to be larger than those that have previously arrived at the Port.

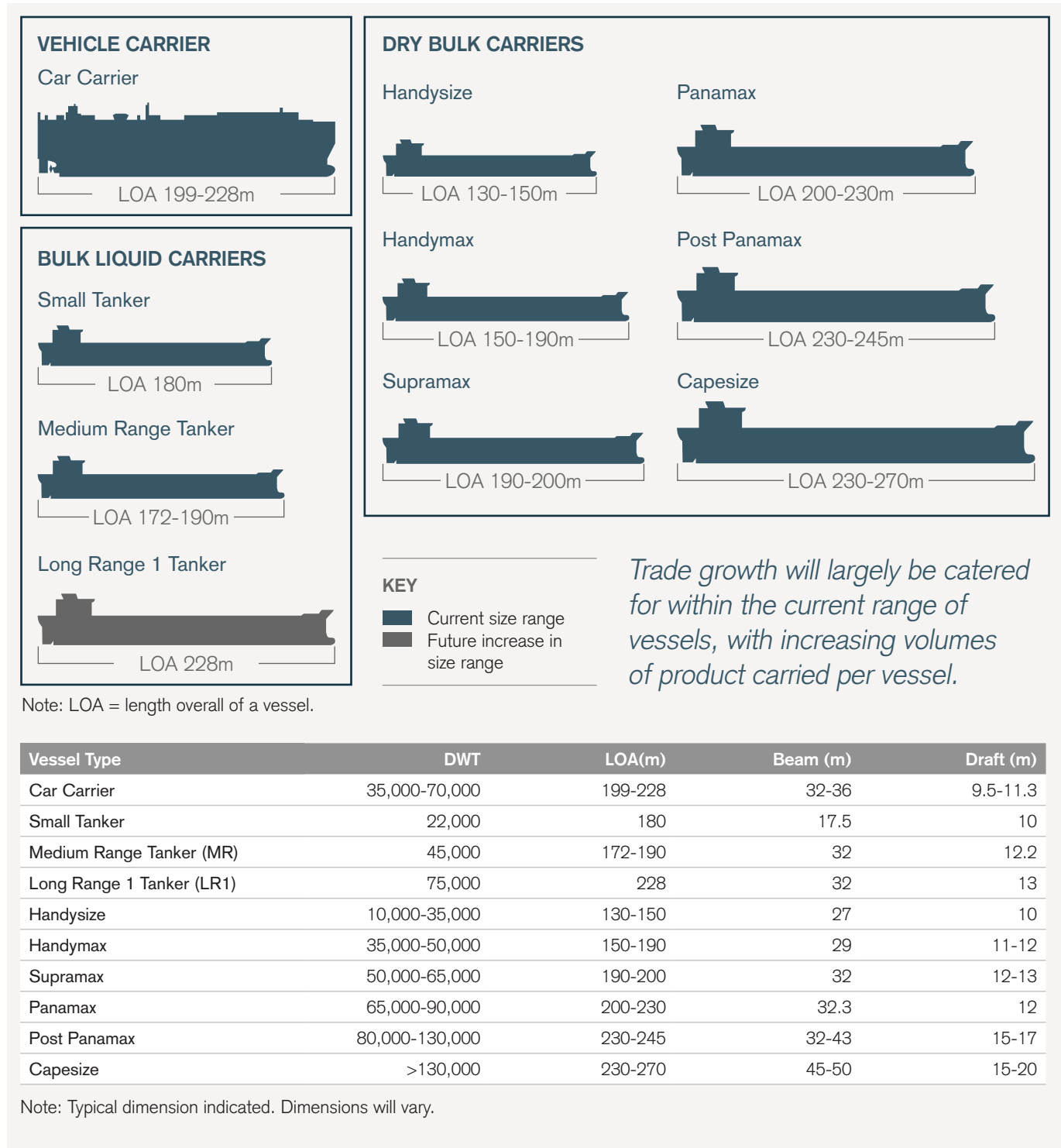
We expect the following changes in vessel size:

- Motor vehicle vessels will increase from a current carrying capacity of 4,500 to 6,800 CBUs to up to 8,000 CBUs within the next 10 years, and then remain stable, as demand for imported motor vehicles increases.
- Larger medium range vessels will be deployed in the liquid bulk trade with a likely introduction of Long Range 1 vessels within the next 30 years.
- Larger dry bulk vessels are expected to be used to cater for growth in dry bulk trade volumes. Where there are depth limitations, part-loading of vessels and/or use of tides will be required.

Forecast vessel numbers



Range of vessel sizes



Infrastructure Capability

Port Kembla can support forecast trade demands through optimised use of existing infrastructure and ensuring timely maintenance and upgrades to extend infrastructure life and functionality.

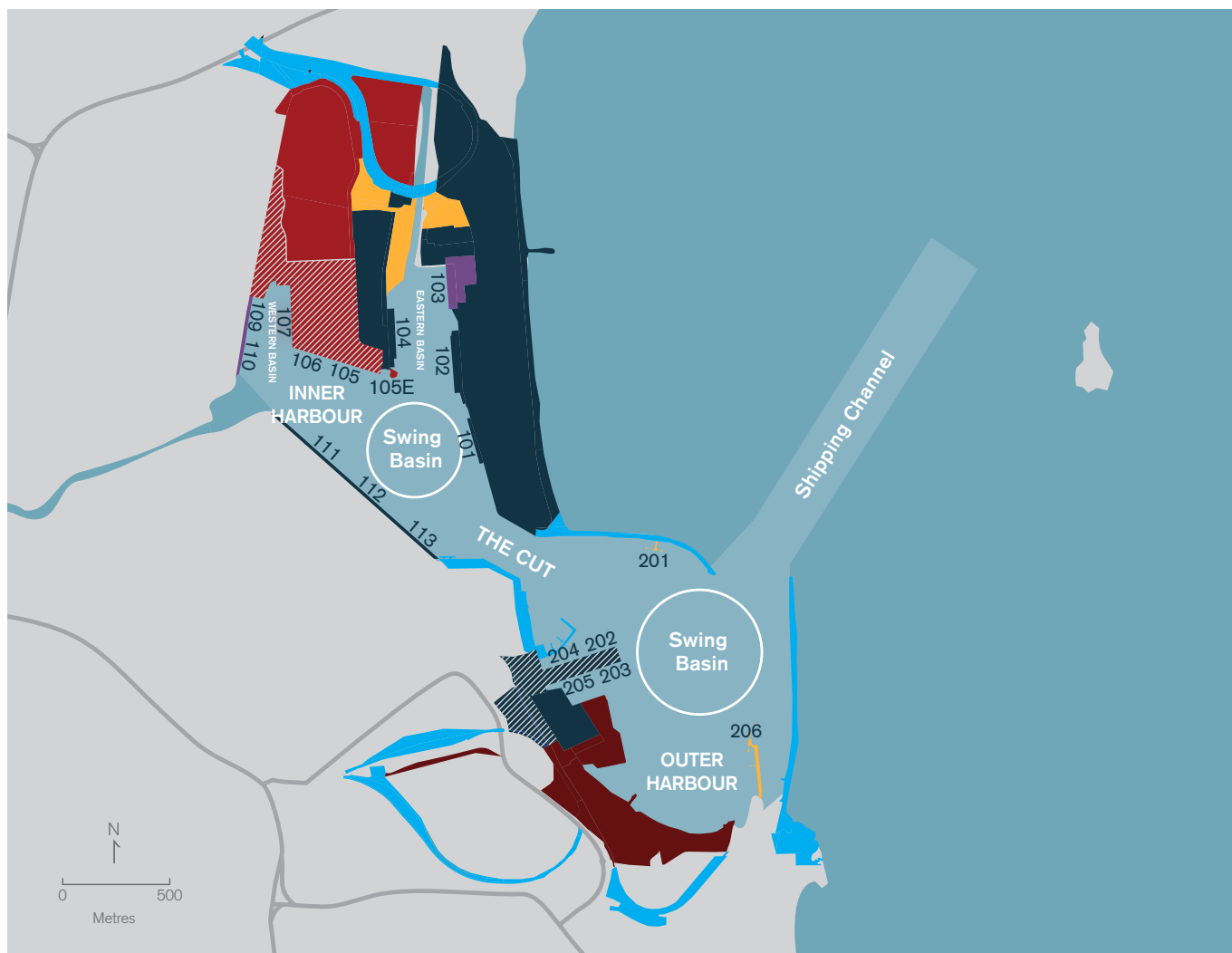
The multi-functional character of facilities at the Port is a strong feature of the Port's flexibility to grow and adapt to fluctuation and diversification of trades. This will remain an important feature of the Port into the future.

Shipping Channels, Berths and Wharf Structures

Port Kembla has 16 operational berths: 12 in the Inner Harbour and four in the Outer Harbour. The wharf structures were constructed and upgraded in stages over the last 80 years. Most structures are in a good condition, with some of the older structures requiring significant maintenance or upgrade to keep them in service or extend their functionality.

We are currently deepening Berth 103 in the Inner Harbour and expanding the adjoining wharf structure. This will provide access to Post-panamax vessels on this multi-user facility. We are also undertaking upgrades to the wharf

Port Kembla shipping access and current land utilisation



KEY	■ Shipping channel	■ Dry bulk facilities	■ General cargo facilities
	■ Bulk liquid facilities	■ Motor vehicle facilities	■ General cargo use
	■ Port services and other infrastructure	■ Vacant land	# Berth number

structure at Berth 206, located in the Outer Harbour, supporting the bulk liquid trade on this multi-user facility.

Port Kembla's Outer Harbour Development is planned to provide new wharves and berthing facilities to cater for port activities and a future Outer Harbour Development container facility.

Responsibility for maintenance and upgrading of infrastructure is shared between NSW Ports and the operators of the facilities. Older wharves will be either refurbished or, where investment in these structures is no longer commercially feasible, gradually decommissioned and removed. Current operations on aged infrastructure could be relocated to other existing or new infrastructure.

Port Kembla's Inner and Outer Harbours require minimal sediment removal compared to other ports. Regular levelling of sea-bed sediment in the Port redistributes sediment that has accumulated in areas, in order to restore and optimise depths.

Bulk maintenance dredging works may be required in the next 10 to 20 years to remove accumulated sediment. This will depend on catchment inputs and movement of sediment within the Harbours.

Deepening of the Inner and Outer Harbours is likely to require the removal of substantial quantities of rock and sediments that may be contaminated. This investment would only be justified by significant trade demand or cost-efficiencies associated with a deepening campaign in conjunction with dredging for the Outer Harbour Development container terminal. Deepening of berths adjacent to existing wharf structures may not be possible without costly strengthening or replacement of the wharf structures.

Motor Vehicle Facilities

The Port Kembla Inner Harbour has four berths available for the importation of vehicles. The car carrier vessels have built-in ramps allowing for the efficient discharge of vehicles. The berths and adjacent terminal areas are operated as an open-access and multi-purpose facility. Four Pre-Delivery Inspection (PDI) service providers are located directly adjacent to the terminal to support the motor vehicle trade. PDI service providers offer a range of motor vehicle pre-delivery services including installation of vehicle accessories, detailing/showroom preparation, vehicle registration and transportation to off-site storage facilities or direct to motor vehicle dealers. The combined facilities occupy 55 hectares within the Inner Harbour.

The motor vehicle terminal's capacity is sensitive to how long vehicles remain in the terminal, the allocation of terminal area for storage of other trades like general cargo and dry bulk, and the allocation of terminal area to PDI facilities.

Port Kembla's motor vehicle terminal is expected to have sufficient capacity to handle forecast vehicle volumes beyond 2045.

General Cargo Facilities

Several berths and terminals in the Inner and Outer Harbour are capable of handling general cargo using mobile quay cranes or the ship's own cranes, making the infrastructure and operations versatile to meet the typically wide-ranging and fluctuating demand. There is ample availability of open-air and some covered storage at the Port to accommodate forecast general cargo volumes.

Dry Bulk Facilities

Dry bulk facilities at Port Kembla are located within both the Inner and Outer Harbour. The main dry bulk facilities comprise grain, cement clinker, coal and iron ore.

By late 2015 there will be two grain export facilities operating from the Inner Harbour in Port Kembla from separate berths and storage facilities. The grain berths are shared with other users and trades. The rail and road receival facilities, elevators, conveyor systems, ship loaders and silo storage facilities all have capacity to be able to cater for the forecast grain trade, including the range of grain products and seasonal peaks. There will continue to be sufficient berth availability at these berths for the forecast grain volumes.

Coal and coke is exported from two Inner Harbour facilities, with the large majority being handled at Berth 102, which is a high-productivity and dedicated coal export berth.

Capacity of the coal export facilities is sensitive to: the productivity of material handling equipment (such as ship loaders, stockyard reclaimers, conveyor systems and road and rail receival bins and feeders); stockyard size and material management; and arrival patterns of vessels, truck and trains. Investment in upgrades of the material handling equipment will ensure the coal terminal has the capacity to handle forecast volume well into the future.

Iron ore is handled through dedicated facilities in the Inner Harbour that have handled larger volumes historically than those forecasted, so no capacity constraints are foreseen.

Berths 202 and 203 have dedicated loading/unloading equipment for copper concentrate and cement clinker. Fertiliser, soda ash, gypsum, cement clinker, copper concentrate and scrap metal are handled at multiple berths in the Inner and Outer Harbour. Material handling equipment can be adjusted to meet demand volumes or product changes.

There is availability of open-air and covered storage at terminals for dry bulk trades. Capacity of the cement clinker import facility is sufficient to accommodate forecast trade demands, with expansion of the facility possible should high growth trade forecasts be realised.

Overall, Port Kembla's dry bulk facilities are capable of handling forecast dry bulk volumes over the next 30 years.

Bulk Liquid Facilities

Currently, four berths at Port Kembla are used for bulk liquid transfers, two of which are open access berths dedicated to liquid bulk trades only. The berth structures of the dedicated liquid bulk berths are, at least partially, aged.

The Inner Harbour bulk liquid facility commenced operations in 2015 and is serviced via a shared multi-purpose berth. There are development plans for further bulk liquid facilities in the Inner Harbour. Land allocated to bulk liquid storage facilities is expected to be sufficient to cater for forecast trade volumes.

Typically bulk liquids are transferred from the berth by pipeline to storage tanks. The capacity of bulk liquid facilities is sensitive to factors such as product type, consignment volume, pumping rates, pipeline capacity and product turnover within tanks.

The current and proposed bulk liquid facilities will be capable of handling the forecast trade to 2045. However, with the increased pressures on shared berth facilities additional transfer infrastructure may be needed to improve product transfer rates.

Opportunities to consolidate trades handled at the bulk liquid berths will be pursued over the next 30 years. This may be at existing berths and facilities or as part of the new Outer Harbour Development.

Outer Harbour Development

The Outer Harbour Development provides for additional trade capacity capability at Port Kembla. We have planning approval to develop a container and multi-purpose facility at Port Kembla's Outer Harbour, which envisages new wharves, berths and terminal facilities for NSW's second container terminal.

The Development Approval proposed three stages for the development. We have largely completed Stage 1A of the development, which provided seven hectares of additional port land on which a cement grinding and storage facility was constructed. We have also progressed with the design of the new wharf structure which will adjoin this reclaimed land to the east.

The Outer Harbour container terminal will be required before Port Botany reaches capacity. We will facilitate early reclamation works in the Outer Harbour if opportunities arise to use surplus clean material, such as from excavation projects. A container terminal facility capable of handling at least three million TEU with both road and rail access is required for a viable facility.

Location of Outer Harbour Development



KEY

- Port Kembla boundary
- Outer Harbour Development

The Maldon-Dombarton Rail Line will facilitate the efficient and sustainable movement of container trade to and from the Port to the growing region of western Sydney. This rail line will help to attract additional trade opportunities to the Outer Harbour area and the Port and will assist with managing the growth of truck movements.

Land Use and Utilisation

Port leases are long term in nature due to the level of capital investment required to establish operations at the Port, resulting in infrequent turnover of land. Land within the Inner Harbour and parts of the Outer Harbour are currently leased. Within the Outer Harbour, vacant NSW Ports land will be incorporated into the Outer Harbour Development for future container and bulk product handling.

We are pursuing opportunities to maximise utilisation of existing land and infrastructure. New facilities are being co-located within existing tenanted areas. We will work with tenants to ensure that land and berth utilisation meets industry productivity benchmarks in order to accommodate trade growth. We will encourage open access, multi-user and multi-purpose facilities to ensure flexibility and the ability to respond to the needs of new port customers and new trade opportunities.

Planning for future land use will respond to changing trade patterns as well as changes in terminal operating practices and technology.

Port Services

The current number of service vessels providing shipping support services including tugs, lines boats and pilot boats is considered adequate to accommodate the forecast ship numbers.

There is capacity to accommodate two additional service vessels in the tug harbour, following some development works. Relocation of pilot vessels, lines boats and other port-related services vessels to the tug harbour could align with development of the Outer Harbour.

Road and Rail Connectivity

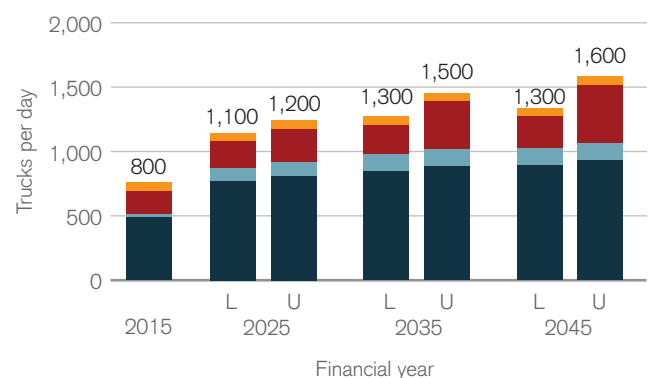
The productivity and competitiveness of export producers and importers is influenced by the timely and efficient delivery of their products to and from the Port. Road and rail infrastructure is the key mechanism for moving these products to and from Port Kembla. Additional transport costs impact the overall cost of products exported via Port Kembla, making Australian products less competitive in the global trade market.

Road

Port Kembla is well connected to the export regions of NSW and is supported by high productivity vehicle routes connecting to the Port. This benefits exporters by maximising the volume of product carried on each truck, which also benefits road users by reducing the number of trucks required to transport product volumes and providing better environmental outcomes.

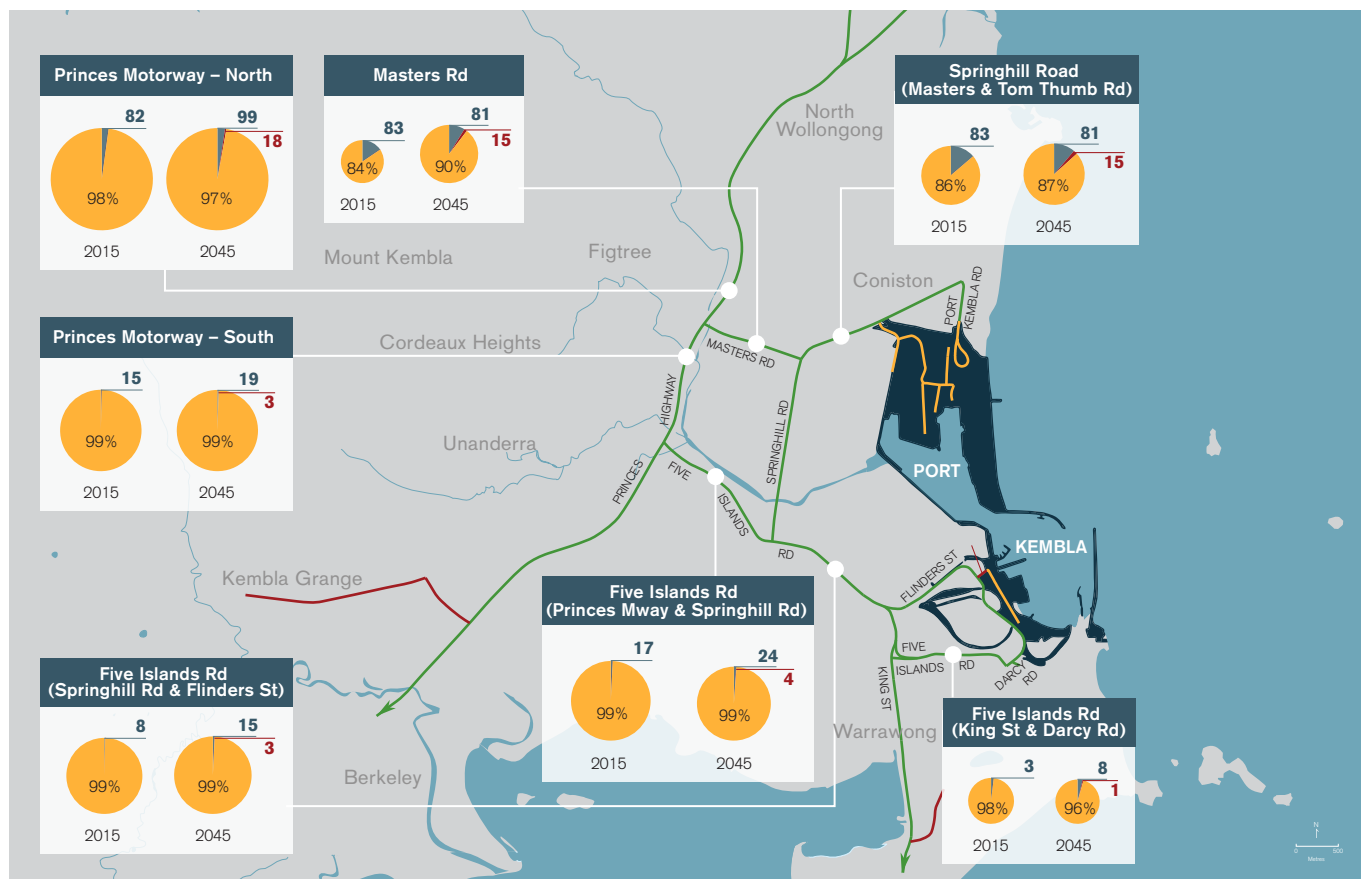
The Port currently receives an average 800 trucks per day. Subject to future trade volumes, port trucks are forecast to grow to between 1,300 and 1,600 trucks per day by 2045 largely driven by the growth of motor vehicle, coal, cement and bulk liquid trades.

Daily port trucks at Port Kembla



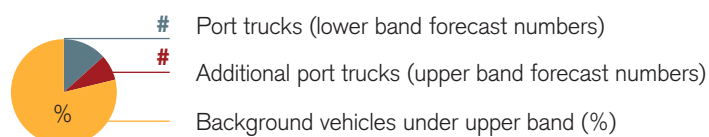
KEY	 Dry bulk	 Bulk liquid
	 Motor vehicles	 General cargo
	L Lower band forecast	U Upper band forecast

Proportion of port trucks to total traffic on surrounding road network – Morning peak hour



- KEY**
- Port Kembla precinct
 - NSW Government managed road
 - Local government managed road
 - NSW Ports managed road

PIE CHARTS (size indicative of traffic volumes)



The existing internal port road network, which we manage, can accommodate forecast traffic volumes with only minor work to address pinch points and facilitate traffic flows as volumes increase.

Masters Road, Springhill Road, Five Islands Road, Mount Ousley Road, Picton Road and the Princes Highway are the main access roads used to transport products to and from the Port. The proportion of port traffic on these roads will grow but will remain low compared to background traffic volumes.

The access roads and intersections surrounding the Port are managed by the NSW Government. These roads and intersections will be able to accommodate forecast port-related vehicle movements without impacting on performance levels. Future road projects that would improve the connectivity of Port Kembla to the Sydney region include the “Gateway to the South” M1 Motorway (formerly F6 freeway) extension and road widening works on Mount Ousley.

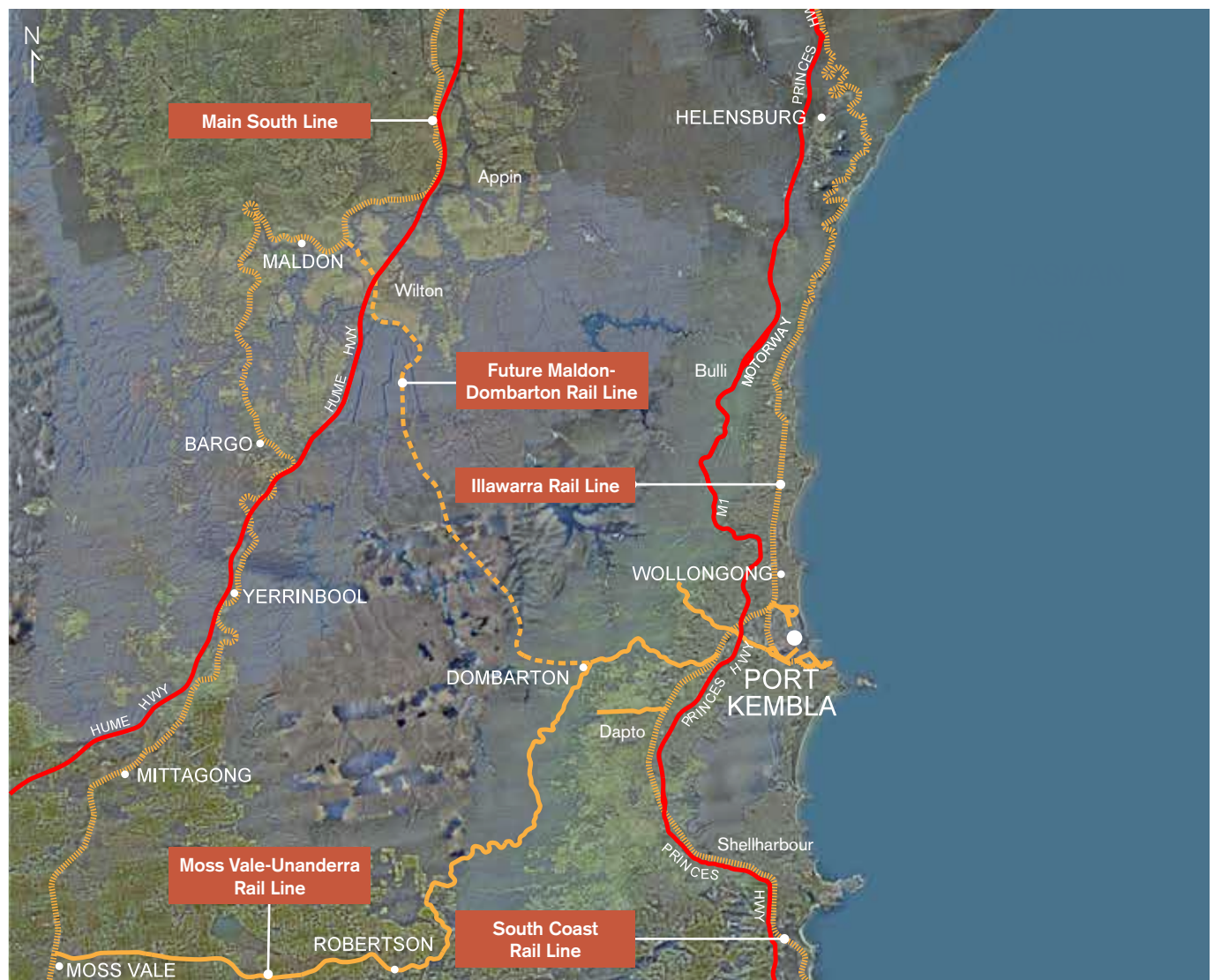
Rail

Port Kembla's coal, grain, copper concentrate and steel are the main products handled by rail. Currently, about 12 trains arrive and depart from the Port each day. This is forecast to grow to about 17 trains a day based on the forecast trade growth of existing commodities.

We manage the rail network within the Inner Harbour and the Outer Harbour consisting of rail lines, sidings and loops. The Illawarra Line and the Moss Vale-Unanderra Line, managed by the NSW Government and ARTC respectively, provide rail connections to Port Kembla from markets in regional NSW.

The Illawarra Line is a shared passenger and freight rail line. Freight is not permitted to use the line during the peak commuter periods when priority is given to passenger trains. Due to the line's set up for passenger trains, longer train paths for freight trains are more difficult to secure. Growth in the passenger network, and implementation of the State's rapid trains project for southern Sydney, will further impact the availability of train paths on the Illawarra Line for freight trains and limit its ability to cater for the forecast growth in freight trains.

Port Kembla rail network



KEY

- Rail lines – Dedicated freight
- - - Rail lines – Shared freight and passenger
- - - Potential rail freight link
- Major roads

Bulk product transport by rail results in lower transport costs for many bulk products and is more environmentally sustainable than transport by road, where a rail alternative exists. Rail solutions need to be found to accommodate further freight rail demands, such as upgrades to the Moss Vale-Unanderra Line and construction of the Maldon-Dombarton Line.

The Moss Vale-Unanderra Line is a dedicated rail freight line with capacity to accommodate additional trade movements. The Moss Vale-Unanderra Line connects to the Main South Line which connects to the Sydney metropolitan freight network. Exporters compare the time and cost effectiveness and viability of using the Moss Vale-Unanderra Line with road and other rail transport options. Upgrades of the Moss Vale-Unanderra Line to allow longer, heavier and faster trains will improve the line for freight use.

The Maldon-Dombarton Line could unlock the potential of Port Kembla and maximise rail transport of bulk products. It would free up capacity for commuter needs on the Illawarra Line while providing a more direct rail connection to the Sydney metropolitan freight network.

The rail infrastructure requirements for an Outer Harbour container terminal would involve reconfiguration and upgrades of the internal port rail network. The Maldon-Dombarton Line will be important for the efficient movement of containers between the Port and the growth areas of western Sydney.



Port Surrounds

Port activities can generate traffic, noise, dust and aesthetic impacts on nearby areas. These impacts can increase as trade volumes grow and activities are intensified. To ensure a sustainable outcome, we need a buffer between Port activities and any sensitive uses such as housing.

Port Kembla is generally surrounded by industrial lands although pockets of residential uses are located near the Port - the closest house is 110 metres away.

Interface issues between the Port and surrounding residential areas already exist with communities concerned about dust and rail noise impacts. Preserving the industrial buffer zone around Port Kembla will assist in minimising amenity impacts on the surrounding community while ensuring port activities can operate efficiently.

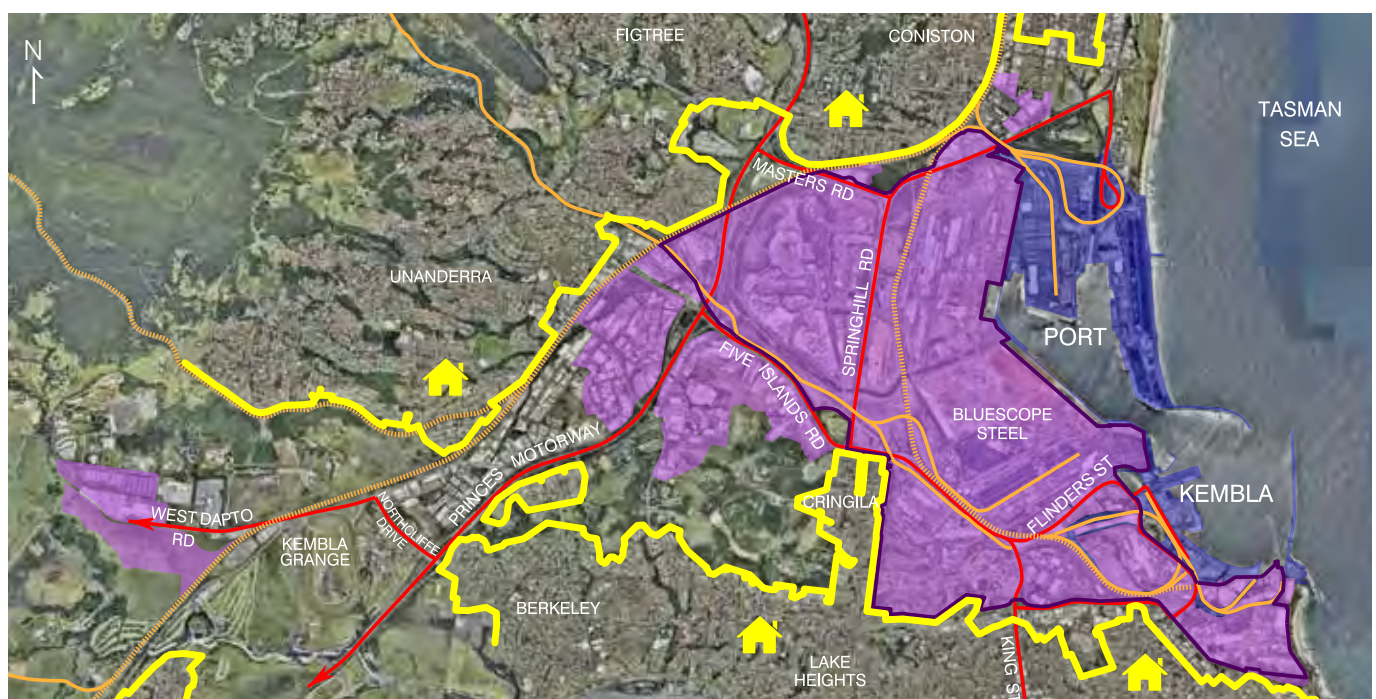
Industrial lands adjoining the Port are surrounded by residential, businesses uses and green open spaces. These industrial lands, including those located in Kembla Grange, will continue to support port and freight related activities as trade volumes through Port Kembla grow. We will advocate to maintain open space and business buffers between port and industrial lands and residential areas.

Port Kembla can avoid urban encroachment issues through a strategic planning approach that can also protect the long-term employment opportunities for the Illawarra region.

We will advocate for the following solutions to manage port-related impacts to secure an efficient and sustainable Port Kembla into the future:

- establish a Port Kembla Protection Zone which prohibits incompatible uses
- ensure all planning and development proposals within the Port Kembla Protection Zone are referred to NSW Ports for comment during the planning policy phase and development assessment process
- identify and protect port-related roads and rail lines in order to allow the Port to grow
- identify the extent of the area affected by the Port, related activities and industrial operations and map these in environmental planning instruments (just as flood prone lands are mapped)
- within the affected area, impose development controls that require appropriate mitigation measures
- include notifications on Section 149 certificates that properties are within a port and industrial impact zone.

Remaining industrial lands surrounding Port Kembla



KEY	● Port Kembla	● Industrial lands	— Ports SEPP industrial land boundary	Residential Area
	— Main access roads	— Rail lines – Dedicated freight	— Rail lines – Shared freight and passenger	

CONNECTING REGIONAL NSW



Goods produced in regional NSW for export are moved in bulk form to Port Kembla and in containers to Port Botany. Bulk export products include coal, grain and copper concentrates. Containerised export products include paper, grain, cotton, meat, chemicals, wine, rice and minerals.

Not all exported produce from regional NSW moves through a NSW port. The export port selected depends on availability of required handling facilities and, importantly, the efficiency of transport connections. More efficient transport reduces costs and makes exports more competitive. Efficient and reliable transport connections between regional NSW and Port Botany and Port Kembla are required in order to support the export of products from regional NSW through these ports.

Given the distances from product origin to the nearest ports, rail has the potential to provide cost competitive outcomes compared to road, where rail infrastructure and services are available.

Regional Container Exports – Port Botany

Regional container exports through Port Botany originate from the North West, Central West, Riverina, Hunter and Southern Inland NSW regions.

Containerised exports from regional NSW via Port Botany include: grain, meat and timber from the Central West; paper products, grain, wine and meat from the Riverina; and wheat, canola, fava beans, chickpeas, cereals, assorted grains and cotton from the North West.

We expect modest growth in regional container volume exports over the next 30 years. However, with improved transport connections to Port Botany, more regional containers would be exported via Port Botany over this time horizon.

Many operational issues affect the efficiency, reliability and viability of regional rail. These in turn affect the logistics costs of exports and hence the selection of export port. Specific issues to be addressed include:

- availability of rail services to the port
- availability of rail windows at the port to service regional trains
- on-time running of regional trains
- ability to service and accommodate long trains
- regional trains calling at multiple stevedore terminals at Port Botany
- underutilisation of available slots on regional trains

- loading of trains with empty containers for return to the regional areas
- competing uses of rail, from passenger and other freight demands, resulting in limited path availability.

These issues can be addressed through a combination of infrastructure investment and operational performance standards, as recommended for metropolitan rail.

Addressing these issues is important to provide effective container export connections to Port Botany. At present, some produce sourced from southern NSW is exported via the Port of Melbourne and some produce sourced from northern NSW is exported via the Port of Brisbane. Effective rail connections, improved intermodal infrastructure and regular rail services to Port Botany will make Port Botany a competitive alternative for product currently being exported via these interstate ports.

Port Botany has the additional advantage of being able to supply empty containers, which can be back-loaded onto trains and returned to the regions for filling.

We will advocate for investment in regional rail infrastructure in support of access to Port Botany, including as part of the NSW Government's rail sidings investment program. The NSW Government has committed three more years of investment under this program.

Regional Container Exports – Port Kembla

The future container terminal at Port Kembla makes it logistically advantageous to export regional container exports from the southern regions of NSW through Port Kembla.

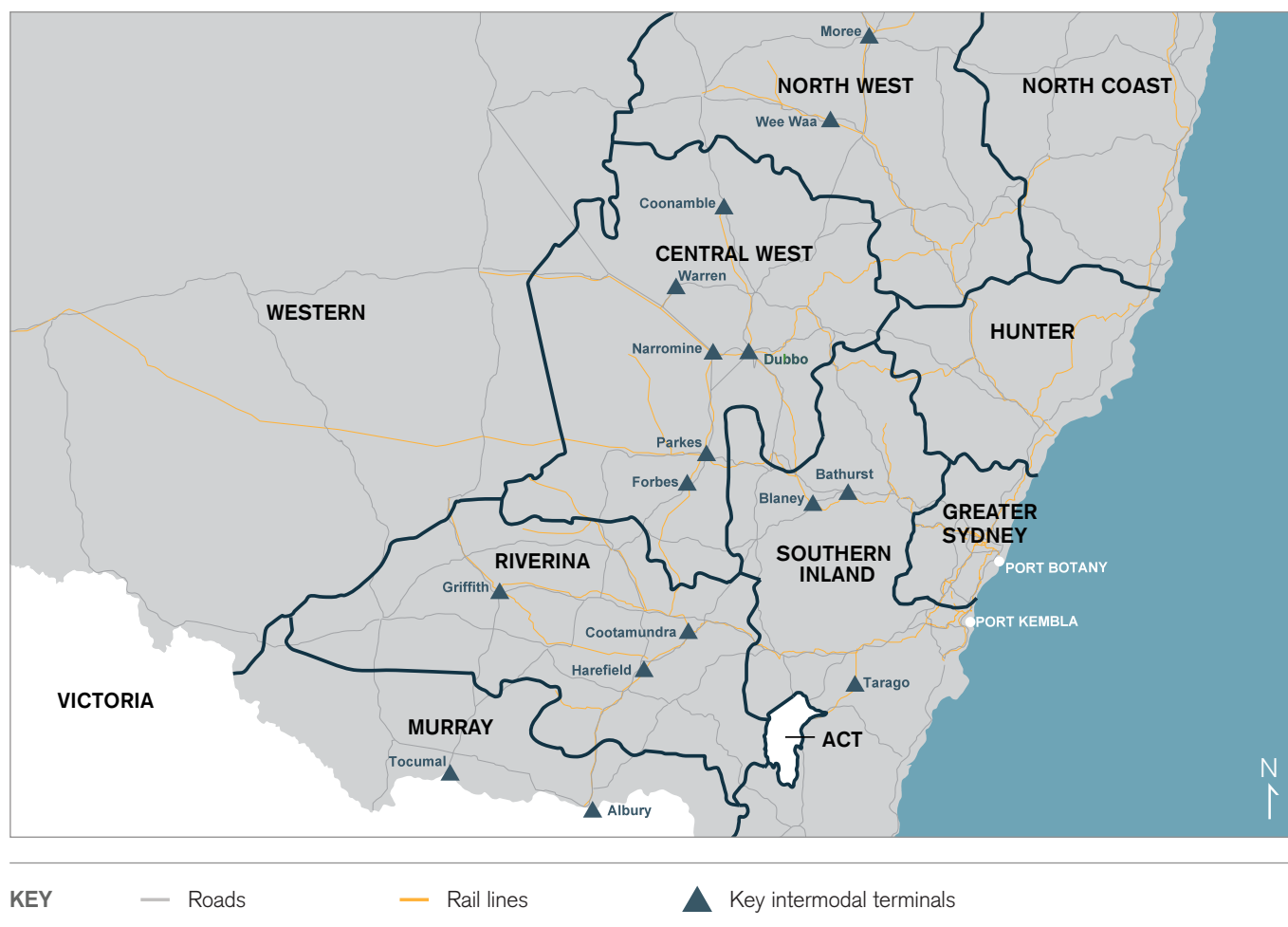
Trade from southern regions of NSW could utilise the Moss Vale-Unanderra Line to access Port Kembla – a shorter distance than to Port Botany. The future Maldon-Dombarton Line could attract export container trade from the central region of NSW to Port Kembla.

Regional Bulk Exports – Port Kembla

Bulk exports via Port Kembla originate from as far north as Coonamble, south to the Riverina area and west to Cobar. The majority of these products are transported to Port Kembla by rail.

Rail is a more cost-effective means of transporting bulk from their source to Port Kembla, where rail options are available. Products using rail to Port Kembla use the Blue Mountains, Moss Vale-Unanderra and Illawarra Lines.

Regional NSW container export markets and intermodal terminals



Key issues affecting bulk rail connections to Port Kembla include:

- curfews during peak commuter periods on shared freight-passenger lines, particularly the Illawarra Line, that affect the availability of paths for freight trains and is expected to be exacerbated as passenger rail volumes grow
- load and length limitations on sections of rail, including limits to train lengths on the Moss Vale-Unanderra and Illawarra Lines
- speed and load limitations due to lower standard of infrastructure, particularly on country branch lines.
- on-time running of regional trains.

Construction of the Maldon-Dombarton Line would benefit bulk rail access to Port Kembla by providing an alternate rail connection that avoids the congested Illawarra Line. This would free capacity on the Illawarra Line for commuter needs and would divert bulk trains from the Sydney metropolitan freight lines.

The Maldon-Dombarton Line has the potential to attract additional rail-based volumes through Port Kembla, maximising the transport by rail to and from the Port.

Inland Rail

The Australian Government Inland Rail project has been proposed to provide an efficient freight rail connection between Melbourne to Brisbane via an inland rail route.

This project could result in the transfer of some interstate freight trains away from the Sydney freight rail network, creating additional capacity on the Sydney freight rail network for metropolitan container trains, delaying the need for rail infrastructure capacity expansion works as rail volumes grow.

The Inland Rail project is not expected to improve connections from the regions to Port Botany or Port Kembla.

ENVIRONMENT AND COMMUNITY



As port and intermodal terminal operations grow and develop, we must manage impacts on the environment and community if we are to grow sustainably. This includes protecting water from pollution, maintaining the amenity of local communities and addressing broader issues such as resource consumption and climate change.

Sustainable growth means achieving the economic potential of the assets we manage through efficiency, innovation and appropriate development; preserving and enhancing environmental and social values; and fostering a network of constructive relationships with stakeholders. It also means protecting the health, safety and welfare of employees, contractors, visitors and any other person at our workplaces.

Leadership Commitment

The NSW Ports Board has adopted an Environment Policy that includes a commitment to address “sustainable principles to improve our economic, environmental, social and cultural performance.”

Our first Sustainability Plan has been released in conjunction with this Master Plan, providing a strategic framework to guide our actions in the short and long term as we continually improve the sustainability of our business.

We provide leadership in our role as landlord to encourage and support tenants and facility users to continually improve their environmental and sustainability performance.

Sustainability Focus Areas

Five focus areas for sustainability have been identified, with goals for each area set out in our Sustainability Plan:



Transport and Logistics



Development and Land Use Planning



Local Environmental Outcomes



Resource Conservation and Efficiency



Stakeholder Consultation and Relations

Transport and Logistics

Shipping is the most efficient mode for transporting goods. Shipping produces fewer CO₂ emissions for each tonne transported by water than air, road or rail transport.

It is more environmentally efficient to receive vessels with a larger freight carrying capacity than receiving multiple smaller ships. We will work to cater for larger vessels as the global trend of increasing carrying capacity continues.

Air emissions from the shipping industry are regulated under international conventions. The shipping industry has significantly reduced its environmental impact through more fuel-efficient vessel design and engines and by using higher quality fuel which reduces sulphur and nitrogen oxide emissions.

New international regulations are coming into effect. Since 2011, all new vessels must achieve a 20 per cent reduction in nitrogen oxide emissions as compared to the previous emission limits. The maximum sulphur content of fuel used by shipping is intended to reduce from 3.5 per cent to 0.5 per cent from 1 January 2020.

Shoreside power supply in select ports addresses specific air quality issues from ships at berth. These ports allow vessels to plug in to mains power instead of using their engines at berth. There is no international standard for power connections to vessels. Converting vessels to accept shoreside power is expensive and shoreside power infrastructure is also costly and operationally inefficient. Shoreside power usage is only feasible where the same vessel is a frequent visitor to the port, which is not the norm for vessels calling at Port Botany and Port Kembla.

The use of shoreside power can result in higher CO₂ emissions than the emissions from vessel engines operating at berth if the energy source being used to generate the mains power is a high CO₂ emissions source such as the coal fired power plants used in Australia.

Liquefied Natural Gas (LNG) is in the early stages of being used to power ships operating in Northern European and United States waters. An LNG-powered roll-on, roll-off vessel is currently being built to operate on the Melbourne-Devonport route in Australia. Combustion of LNG results in significantly lower emissions of sulphur, nitrogen oxides and particulate matter than heavy fuel oil or distillate fuels. In the medium term, LNG is likely to suit vessels that operate regularly in areas where the fuel is readily available and low-emissions performance is a priority. In the longer term, LNG may provide a stepping-stone for the international shipping fleet towards a more sustainable energy source.



We aim to support commercial shipping as the most efficient mode of transport by providing and maintaining port infrastructure to meet demand.

Rail freight is more energy efficient than road freight, generates fewer emissions per tonne of product transported and removes trucks from road networks. Growth in rail freight to and from the Ports will benefit the road networks around the Ports.

Growth in rail volumes can only be achieved through planning, operational and infrastructure improvements throughout NSW. We contribute to this task in many ways including our role as land manager of the intermodal terminals at Cooks River and Enfield and portside rail facilities at Port Botany and Port Kembla, as well as managing freight rail infrastructure at Port Kembla.

The environmental performance of rail operations is likely to improve as rolling stock operators work with the NSW Environment Protection Authority (EPA) to reduce noise and air emissions as outlined in the *2015 Diesel and Marine Emissions Management Strategy*⁵.

We aim to be actively involved in delivering and promoting increased use of rail transport as an efficient means of moving cargo to and from the ports.

Road haulage is an important mode of transport in the supply chains of many goods. Emission standards for on-road diesel heavy duty vehicles have improved in recent years, with benchmarks for nitrogen oxide and particulate matter emissions from vehicles manufactured since 2011 reducing by 75 per cent and 94 per cent respectively compared to the standards which applied in 1995.

We will collaborate with stakeholders to improve the efficiency of road transport in and around the ports and intermodal facilities.

Development and Land Use Planning

Planning appropriately for future infrastructure and its interface with the community is critical. It is a challenge for port and intermodal operations to operate and cater for growth in an urbanised environment. Urban encroachment has the potential to impact on the efficiency of the logistics chain and can result in amenity impacts for the local community.

To plan for compatible land use, we must identify existing and future freight-related infrastructure and corridors early and protect these for the long term through appropriate planning controls.

Residential areas and other sensitive uses should be separated from ports and intermodal terminals by appropriate buffer zones to minimise land use conflicts. Situations where residences are within a few hundred metres of operations at the Ports must be avoided.

⁵ EPA (2015) *Diesel and Marine Emissions Management Strategy*.

Strategic plans, environmental planning instruments and development control plans should be used to secure current and future freight lands and corridors and to manage land use conflict.

We will identify and promote the development of infrastructure for expected long-term increases in trade volumes and will work with state and local governments to promote the compatible development of ports, intermodal facilities and surrounding communities.

Efficient and sustainable design and operating practices are critical for the future growth and development of the port and intermodal terminal facilities.

We will continue to promote sustainable design and operations at the ports and intermodal terminals by implementing development codes and guidelines that incorporate sustainability objectives and outcomes in new developments.

Climate change may cause more frequent severe weather events that disrupt port operations and supply chains. Changing temperature, humidity, sea levels and ocean acidity regimes may also affect the durability and maintenance requirements of port and freight infrastructure.

The potential impacts of climate change on Port Botany and Port Kembla were assessed in research conducted by the National Climate Change Adaptation Research Facility in 2012-13.⁶ The research focused on understanding future climate scenarios and implications, assessing the functional resilience of port environments and modelling the structural resilience of core port infrastructure. A climate change adaptation guideline for ports was developed as a key outcome of the project.

We will continue to assess potential risks and develop adaptation measures for future weather events and longer-term climate change. All new development at Port Botany is subject to a climate change risk assessment.

We aim to assess the likely impacts of climate change on our assets and adapt as necessary to ensure their long-term resilience.

Local Environmental Outcomes

The impacts of port and intermodal assets on the local environment and neighbouring communities differ for each asset, depending on the proximity of residents, level of existing disturbances and adjoining industrial land uses.

We have developed overarching environmental management plans (EMPs) for each of our assets to provide a consistent framework for the environmental management of activities across the sites. Port and intermodal operators develop activity specific EMPs and are directly responsible for their own environmental performance. All future EMPs will be consistent with the Overarching EMPs.

We aim to maintain local environmental values and the amenity of communities as port and intermodal operations grow.

Specific actions to be undertaken to address key environmental impacts are:

- develop a noise strategy for Port Botany to identify port-related noise sources and actions to address these sources, including long-term noise monitoring
- monitor traffic movements at Port Botany and Port Kembla to quantify traffic volumes and track the performance of roads and intersections in the vicinity of the Port as trade increases
- assess hazards and risks associated with trade growth to guide the safe development of ports for the benefit of workers and neighbouring communities
- assess options for dredged spoil disposal to protect water quality and minimise waste
- fund, manage and monitor the conservation of remnant vegetation communities and enhance habitats of ecologically significant flora and fauna on or adjacent to assets, such as Green and Golden Bell Frog habitat and Cumberland Plain Woodland
- manage local and state significant heritage items for the benefit of future generations.

⁶ National Climate Change Adaptation Research Facility (2013)
Enhancing the Resilience of Seaports to a Changing Climate.

Resource Conservation and Efficiency

We pursue opportunities to improve the utilisation of land and infrastructure. Optimal use of land and infrastructure such as berths, roads and rail is emphasised as part of new developments together with adapting existing operations and facilities in response to changing market trends, to increase trade efficiencies and throughput of existing infrastructure.

We undertake office resource recycling and energy management activities within our office buildings and we will continue to undertake and support projects within the port and intermodal terminals that reuse and recycle materials as part of development projects.

We aim to minimise resource consumption and waste through the better use of land, infrastructure, renewable energy and recycled materials.

Stakeholder Consultation and Relations

Stakeholders are key to the pursuit of sustainability. We communicate regularly and openly with port and intermodal terminal operators and users, government agencies and the community.

Community consultation and liaison groups discuss port and intermodal terminal operations and developments, receive information regarding environmental improvement initiatives and discuss relevant aspects of construction and operational activities.

Community awareness and support is important to long-term operations and we will continue to communicate with the community through these forums to share information regarding port activities.

Further cooperation with tenants on strategic environmental and sustainability initiatives will be initiated through new Environmental and Sustainability Working Groups at Port Botany and Port Kembla.

State and local governments are crucial for implementing planning protocols and environmental regulations that allow for growth while maintaining environmental standards and residential amenity. We will continue to work together to pursue positive sustainability outcomes.

Over the long term, we will work constructively and consistently with all stakeholders to:

- explain the value of our ports and intermodal terminals and increase stakeholder awareness of the importance and sustainability of shipping, ports and logistics
- foster whole-of-port action towards sustainability among staff, contractors, tenants, community and government
- receive feedback on operational impacts and input to development and planning processes.

We aim to proactively and openly engage with stakeholders to ensure a coordinated and transparent approach to sustainability.





IMPLEMENTING THE MASTER PLAN



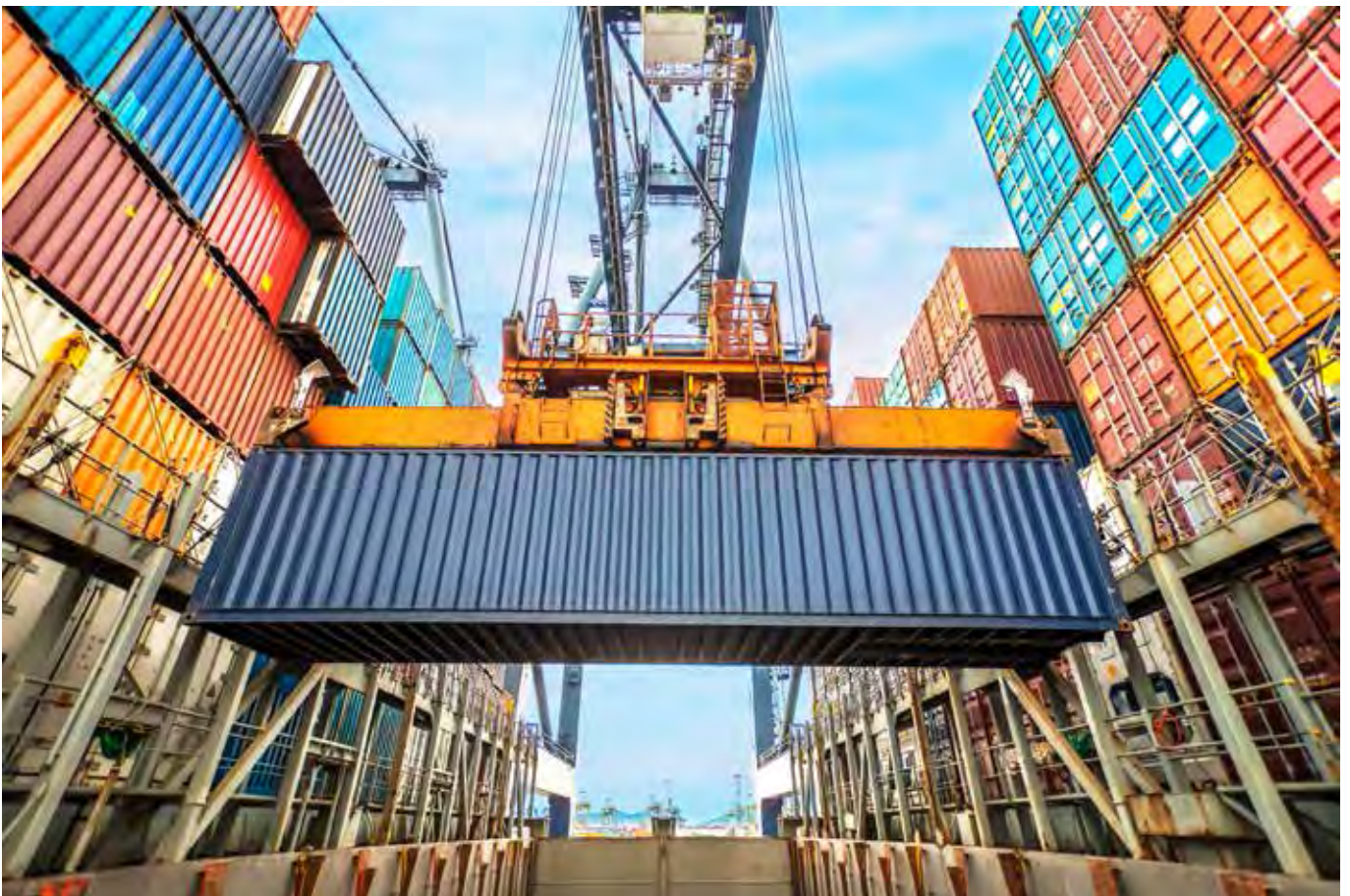
This Master Plan sets out a vision for the next 30 years and the actions that are needed to meet this vision.

The trade and movement of goods into and out of our ports is essential to the community's wellbeing and the strength of the economy. This Master Plan acknowledges that we will respond sensibly, strategically and sustainably to meet NSW's growing trade needs, recognising that the global movement of goods is subject to fluctuations, new trends and new ways of doing things.

For stakeholders, this Plan articulates our priorities and the actions we believe should be undertaken to ensure a sustainable and efficient port supply chain well beyond the 30 year horizon. It is designed to be a blueprint for our stakeholders, setting a clear and consistent direction that will guide decision making and inform discussion.

Our long-term planning will not come to a standstill with the release of this Master Plan. Changes and evolution are inevitable as new information and trends come to light. We are committed to working with government, industry and stakeholders as we implement this Plan to ensure that our direction remains current and that we are all collectively working towards the delivery of a sustainable and efficient port supply chain for NSW.

It is for this reason that we see the Master Plan as a living document and the start of a collaborative process. Its assumptions and directions will constantly evolve as we respond to new challenges and trends.



GLOSSARY OF TERMS

Term	Explanation
Automated stacking crane (ASC)	An unmanned portal-shaped crane on rails used in container terminals to stack containers and move containers between straddle carriers, container stacks and trucks.
Back-loading / two-way loading	A truck or train carrying freight on both the arrival and departure journey.
Beam	The width of a vessel at the widest point.
Berth	The area alongside a wharf where vessels reside to receive or discharge cargo. Also, to bring a vessel alongside a wharf.
Bollard	A device on a wharf around which mooring lines are fastened.
Bulk liquids	Liquid cargo that is transported in large volumes.
Bunker fuel	Fuel oil for a vessel.
Capacity	The available space for, or ability to handle, freight.
Cargo / Freight	Any item, goods or produce being transported and includes containers (whether empty or otherwise), gases, liquids, minerals, plant and equipment, raw materials and vehicles.
CBU	Completely Built-up Unit, a measure of motor vehicle volume.
Container quay crane	A crane located on a wharf for the purpose of loading and unloading container vessels.
Container terminal	A specialised facility where container vessels berth to unload and load containers.
De-hire	De-hire is the term given when a container has been emptied of its contents and returned to an Empty Container Park or other holding depot for re-use.
Dock	A part of the navigable waterway next to or between wharf structures.
Draft	The depth of a vessel in the water taken from the level of the waterline to the lowest point of the hull of the vessel.
Dry bulk	Loose dry cargo that is transported in large volume.
DWT	Dead Weight Tonnage; measure of how much weight a ship is carrying or can safely carry.
Fender	A device used in shipping to absorb the kinetic energy of berthing vessels. Generally fixed to the face of wharves but also suspended on the sides of vessels such as tugs.
General cargo	Also known as break bulk cargo, is non-containerized cargo handled individually or in boxes, bales, pallets, barrels or other units
GSP	Gross State Product. It is a measurement of the economic output of a state and is the sum of all value added by industries within the state.
High productivity vehicle	Vehicles approved to carry loads above standard mass limits under Higher Mass Limits or Performance Base Standards.
Intermodal Terminal (IMT)	A facility used to transfer freight from one transport mode to another, for example from road to rail.
Lines boat	Small boat used to handle mooring lines from vessels.
LOA	Length Overall. Linear measurement of a vessel from bow to stern.
Marine lading arm	Articulated steel pipes located on a wharf that connect a bulk liquid vessel to the landside pipelines and storage tanks for loading and discharging of bulk liquid cargo.
Mooring	To tie-up and secure a vessel to a wharf.
Pilot	A licensed navigational guide with thorough knowledge of a particular section of a waterway whose occupation is to guide ships into and out of a harbour.
Quay	A wharf.
Rail terminal	A part of a stevedoring terminal where containers are loaded and unloaded on trains.
Rail siding	A section of rail track used to place trains during loading and discharging of cargo or to shunt trains.
Rail mounted gantry (RMG) crane	A portal-shaped crane on rails utilised in container terminals or intermodal terminals to move containers between trains, trucks and container stacks.
Reachstacker	A vehicle used for handling containers in container terminals and intermodal terminals.

Shunting line	A section of rail track used for pushing or pulling trains from the main line to a siding.
Stevedore	A company involved in loading and discharging cargo on and from ships.
Straddle carrier	A vehicle used in container terminals to move and stack containers.
Swing basin	Also referred to as a turning basin; a wider body of water located in a port to allow ships to turn and reverse in their direction of travel.
TEU	Twenty-foot equivalent unit. A unit of measurement equal to the space occupied by a standard twenty foot container. One 40 foot container is equal to two TEU.
Transhipment	Cargo transferred from one ship to another ship. This normally involves cargo being unloaded from one ship at a wharf and then loaded onto another ship destined for another port.
Tug boat	A special purpose boat used for manoeuvring ships into and out of port and to and from berths.
Under-keel clearance	Is the vertical distance between the lowest part of the ship's hull and the seabed.
Vessel	A ship.
Wharf	A structure at which vessels tie up to load and discharge cargo.

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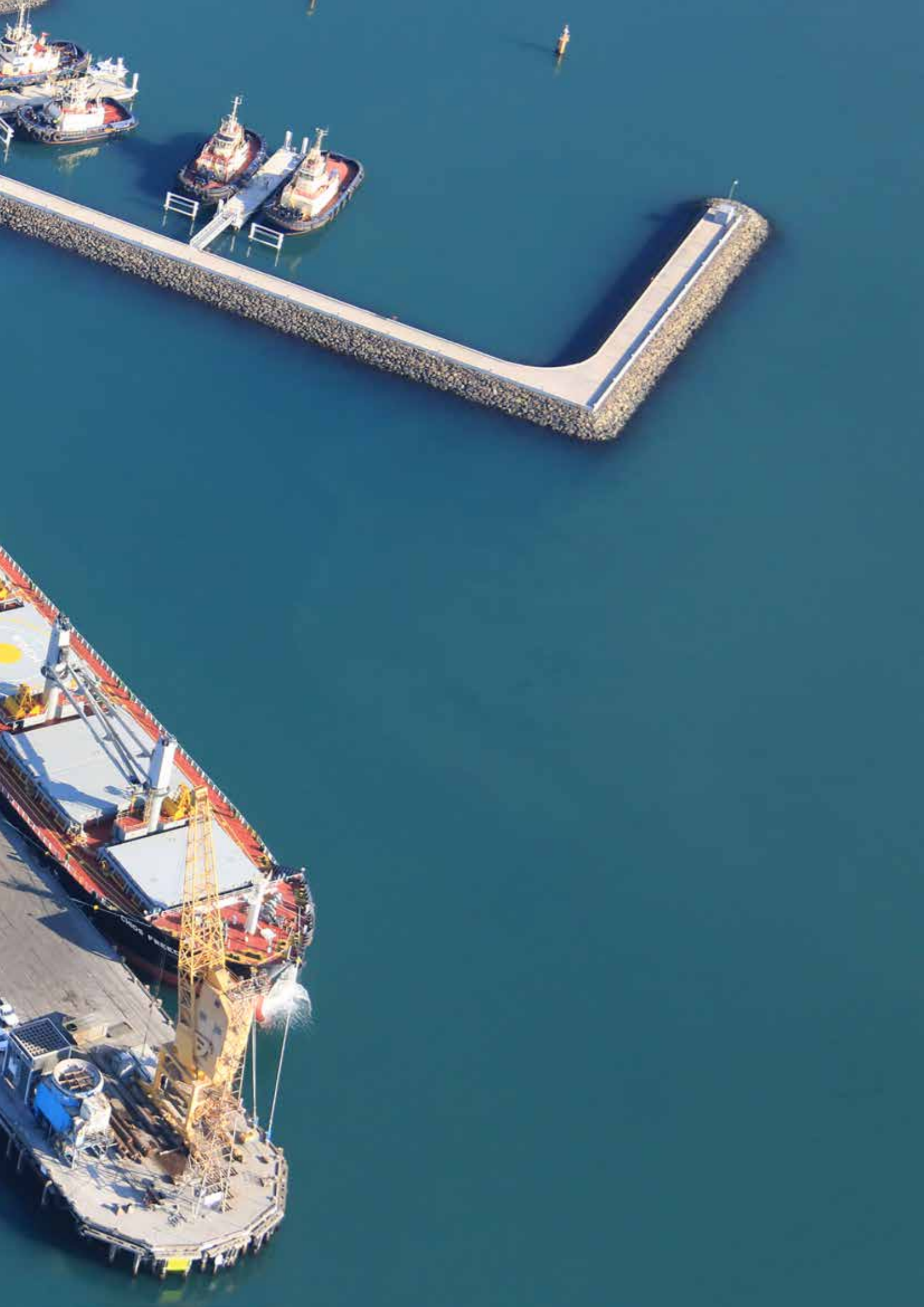
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