Rail options for the Sydney Greater Metropolitan area

Draft options paper

November 2011

Notice to Infrastructure Australia

This draft options paper for the greater metropolitan region of Sydney is provided to Infrastructure Australia to assist consideration of the North West rail submission only. The North West and South West rail projects are a fundamental part of the long term rail plan as they play a vital role in servicing Sydney's Growth Areas.

The options will be subject to Government and community consultation. The consultation process may generate additional options to be considered as part of the development of a Transport Masterplan for NSW.

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Executive summary

The CityRail passenger network is the backbone of the public transport system in greater metropolitan Sydney and it plays a central role in delivering high quality, high capacity public transport services to the community. As Sydney's population is forecast to increase by a further 1.7 million people between 2006 and 2036 to 6 million[1], Government and the community must make some important choices in respect to the long term development of the CityRail passenger network if the railway is to meet the future needs and expectations of the community.
This draft paper outlines some long term options for the development of the greater metropolitan region passenger network (the CityRail passenger network) that are being prepared for public consultation.

A rigorous evaluation process is currently being undertaken to identify long term requirements for rail passenger transport in the greater metropolitan region of NSW, both in terms of network capacity and customer needs. To date, seven options have been developed for public consultation on the future of the rail network and are described in this paper. The options outlined are passenger rail options and do not include options for freight rail. Public consultation may also generate other options.

Capacity

The rail network covers a geographically large area and has one of the most complex operating patterns of any train network in the world. Fifteen outer lines feed into eight inner lines which feed six CBD lines. Significant capacity constraints result from this convergence to six lines through the CBD.

If patronage grows at a relatively conservative rate of 1.7 per cent per annum, peak rail patronage will grow by over 50 per cent between now and 2036 and critical constraints will emerge across the network, especially through the CBD. The rail task could grow at a higher rate if there is also a shift to rail from other modes, such as bus and car, and providing access for Sydney's growth areas to heavy haul rail services will also add to the rail passenger task and further contribute to the capacity issues across the network.

There are three primary requirements that will need to be addressed as part of any long term rail network development strategy and which will be common to all options (albeit with potentially some differences in timing and sequence):

- Connecting to growth areas – the need to extend access to the network to new areas of population growth to facilitate access to employment centres and services;
- Network efficiency – improving the capacity of the existing network; and
- Augmenting CBD capacity – expanding capacity across the network by constructing a CBD extension and expand capacity across the harbour to allow increased capacity for services on some lines.

Meeting the needs of customers

At the most strategic level, Government and the community will need to make a choice as to whether to continue with a "standardised" approach to the provision of rail passenger services across the greater metropolitan region (i.e. using similar rollingstock and technology) or to adopt a more "customised" approach and tailor future rail passenger services to meet the needs of different market or customer segments (with different rollingstock and technology).

[1] NSW Department of Planning 2011, NSW Statistical Local Area Population Projections, 2006 – 2036

Market research, supported by international experience, has shown that different customer segments value different features of rail services. For instance, short-haul commuters favour frequency of service and fast journey times whereas longer-haul inter-city commuters put more weight towards trip comfort and seating. Choices will need to be made about how to best meet the needs of a diverse set of customers across a large and growing urban region.

Draft options

The seven options that have been developed reflect the two different approaches – standardised (suburban) services and more customised services. The standardised approach is about maintaining the existing suburban style services across the network for all trip purposes and increasing the capacity of the network by investing in new infrastructure. Customising services focuses on tailoring services to suit different customer markets based on trip length. For example customised services could involve the provision of metro style turn-up-and-go services for shorter trips using single deck carriages and developing additional capacity by making greater use of technology that will allow more trains to run on each line.

Each approach has difference advantages and disadvantages. Maintaining standardised services maximises seating on all train services and drives consistency and scale efficiency across the network. However these types of services are not well suited to short journeys, limiting growth on the network. Customised services better link the types of services to the needs of specific market segments but require costly reconfiguration of the network and rollingstock over time.

The seven options developed to date are summarised in Table ES1.

Table ES1. Passenger rail network development options

Option	Operations	Rollingstock	Infrastructure
1. Suburban Metropolitan Rail Expansion Plan (MREP)	Increased operational separation of services (sectorisation) to improve reliability and performance	Similar suburban double deck rollingstock	Single stage construction of a CBD extension and second harbour crossing to unlock capacity
2. Suburban – West Link	Express western services through to Wynyard	Similar suburban double deck rollingstock	Initial construction of CBD extension to enable fast western services; later construction of second harbour crossing to link to north and north western services
3. Suburban – Sector 5	Mix of fast, slow and skipped stop services to minimise travel times (at the expense of frequency)	Similar suburban double deck rollingstock	Construction of CBD extension and later construction of second harbour crossing
4. Customised 3 tier services	Three distinct services for short, medium and long distance trips	Single deck trains for short haul metro style services; double deck for longer haul suburban/inter-urban services	Construction of CBD extension
5. Modified 3 tier	As in 4 but NWRL serviced with suburban rather than Metro style services	Single deck trains for short haul metro style services; double deck for longer haul suburban/inter-urban services	Construction of CBD extension
6. Harbour link 3 tier	As in 5 but higher frequency services from the north	Single deck trains for short haul metro style services; double deck for longer haul suburban/inter-urban services	Construction of CBD extension and second harbour crossing
7. West link 3 tier	Converts some corridors to allow for high frequency services on inner lines	Single deck trains for short haul metro style services; double deck for longer haul suburban/inter-urban services	Construction of CBD extension and second harbour crossing

1 Overview of the Greater Metropolitan Network

The rail network in NSW has three inter-linked components:

- A metropolitan network, CityRail, which provides passenger services across Sydney's greater metropolitan areas including the Hunter, Central Coast, Blue Mountains, Southern Highlands and South Coast regions.
- A freight network used to transport goods between Sydney, ports, other major centres, interstate and rural and regional NSW—it incorporates some dedicated freight lines but largely shares the metropolitan network rail infrastructure with passenger trains.
- A long distance network, CountryLink, which provides access to Central station and selected other stations in Sydney for passengers travelling on interstate services from or to Melbourne and Brisbane and for passengers travelling intra-state in country NSW. Indian Pacific services that connect Sydney to the Northern Territory and Western Australia through South Australia also use the network.

The focus of the options outlined in this paper is the metropolitan and greater metropolitan CityRail passenger rail network.

1.1 The CityRail network

The network covers a large geographic area and is complex—fifteen outer lines feed into eight inner lines which feed six CBD lines. Significant capacity constraints result from this convergence. As shown in Figure 1.1, the hub of the network is central station where most lines start or end.

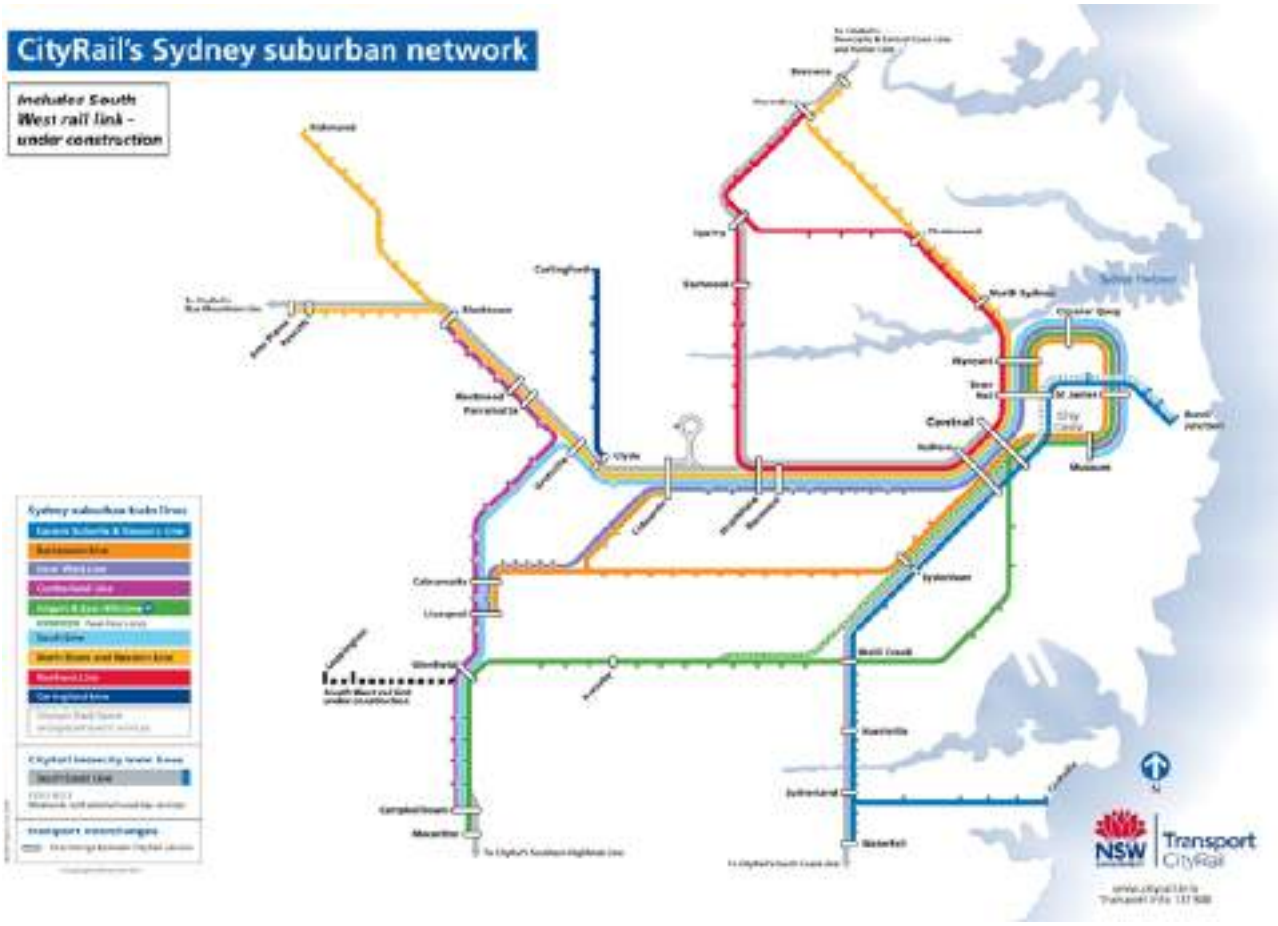
A focus over the last decade has been on investing in a program called Clearways that allows "sectorisation". The aim is to separate the network into five discrete sectors that are mainly operationally independent. This reduces the operational complexity of the network and means disruptions that occur in one sector will not necessarily affect other sectors. Projects completed to date have helped to increase the capacity in some sectors and the overall reliability of the network.

Rail services are provided from 307 stations. The frequency of service varies depending on the line, time of day, demand for services and capacity constraints in particular parts of the network. There are generally a minimum of four services each hour at suburban stations during peak periods and two in the off peak and much higher frequencies at major stations. Services can be less frequent at less used intercity stations but there is a minimum of two services in peak periods. There are also fewer services on the Carlingford line.

The CityRail fleet consists of 1,650 electric and diesel carriages.[2] All of the carriages used on suburban lines are electric, double-decker carriages. The oldest date from the 1970s. These are gradually being replaced by 626 new Waratah carriages. The new carriages will also add 11 new trains to the network to provide for growth in services.

[2] CityRail 2010, A Compendium of CityRail Travel Statistics, Seventh Edition (June 2010), p. 14.

Figure 1.1 City Rail network map



1.2 The transport task for rail

Sydney's 4.3 million residents make 16 million trips on all transport modes on an average weekday and 15 million trips on an average weekend day.[3] Public transport's share of the task is about 11 per cent on a weekday and four per cent on a weekend day. It accounts for 76 per cent of commute trips into the CBD during peak hours.

The share of rail is nearly one million trips per day, about the same as for buses. The number of rail trips grew at an average rate of about two per cent each year between 2001/02 to 2008/09.[4] About one third of passengers travel during the morning peak.[5]

Compared to buses, rail carries a relatively high proportion of Sydney commuters (16 per cent compared to 7 per cent) but relatively less passengers travelling for shorter trips such as for shopping, education and childcare, although this proportion is increasing.[6]

The average trip distance for rail passengers is around 19 kilometres compared to just over 6 kilometres for bus passengers and less than 10 kilometres for car drivers and passengers.

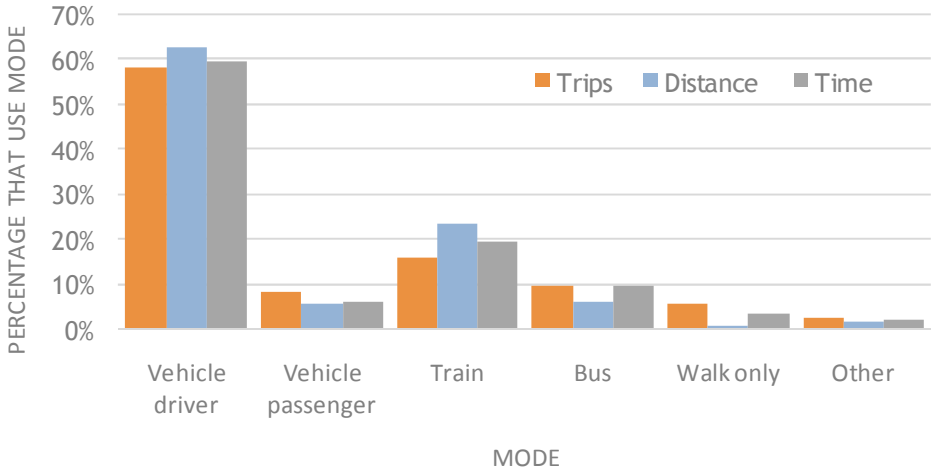
[3] Transport for NSW

[4] Bureau of Transport Statistics 2010 – rate of growth between 2001/02 to 2008/09.

[5] AECOM 2011, Long-term Rail Strategy Demand Analysis (draft 1 April 2011).

[6] Transport for NSW

Figure 1.2 Mode Share of Commute Trips by Sydney Residents (Average Weekday 2009/10)[7]



Rail is playing an increasing role in transporting people to smaller employment centres with a more than 25 per cent share of work trips to North Sydney, Chatswood, Bondi Junction and St Leonards and 24 per cent share to Parramatta.[8] Two-thirds of rail trips are made in the morning and afternoon week day peaks when roads are most congested.[9]

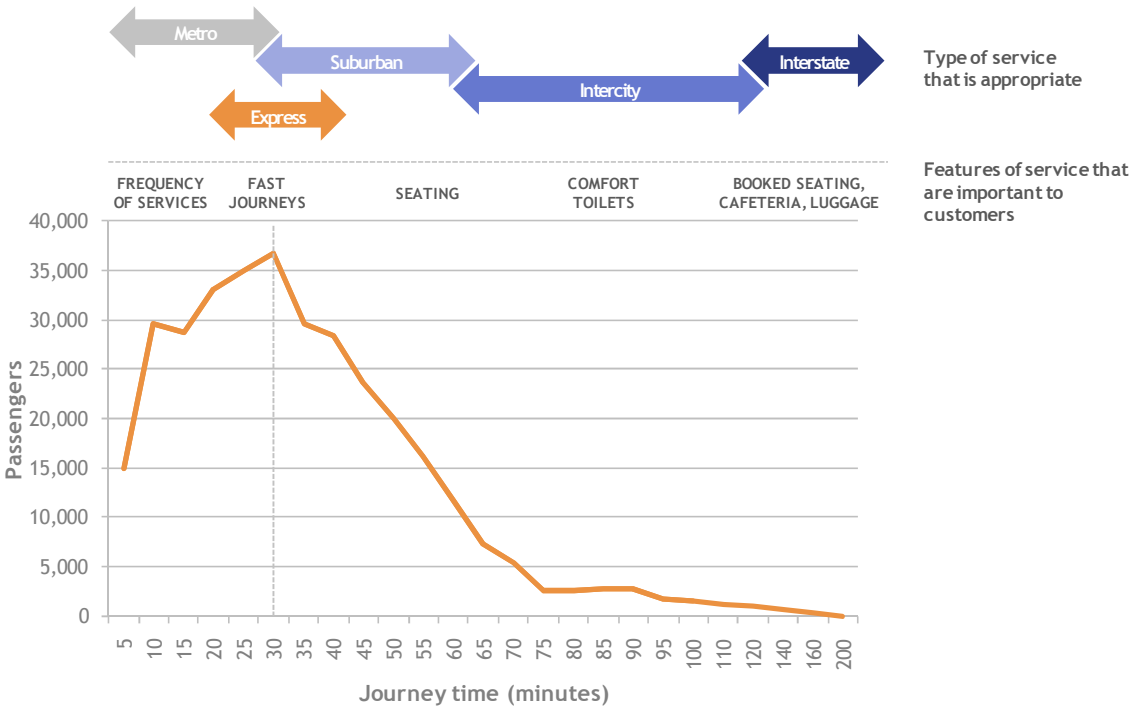
Despite increasing congestion on roads on weekends and traditional “off-peak” periods, rail has a much lower share of weekend and off-peak trips (only 4 per cent in the off-peak compared to 11 per cent in the peak). It has potential to be part of the solution for reducing road congestion on weekends and at other times. For example, by tailoring service patterns, particularly frequency, to provide for more of the types of trips and to the centres that people travel to in off-peak periods.

Currently, about 50 per cent of trips are less than 30 minutes, with a trip of 30 minutes being the most common (Figure 1.3).[10] There are a substantial number of trips of less than 10 minutes. For shorter trips, the frequency of service is very important while availability of seating is less significant. For customers making longer journeys, seating and the speed of a service become increasingly important. Few trips on the CityRail rail network are over 75 minutes.

At a conservative growth rate of 1.7 per cent, patronage would grow by over 50 per cent over the next 25 years.[11] Growth could be significantly higher, about 70 per cent, if the network is extended.[12] The share of different types of trips and at different periods, for example over weekends, could also change significantly, depending on the patterns of rail service and relative costs and constraints of other transport modes.

[7] CityRail 2010, A Compendium of CityRail Travel Statistics, Seventh Edition (June 2010).
[8] *Ibid.*
[9] *Ibid.*
[10] *Ibid.*
[11] AECOM 2011, Long-term Rail Strategy Demand Analysis (draft 1 April 2011).
[12] *Ibid.*

Figure 1.3 Length of time on rail[13]



1.3 Objectives

Sydney has a growing population and land-use patterns are changing. Our transport systems need to grow and adapt to meet demand and to improve connections across the city.
Planning for the future of rail is complex. A clear set of objectives is important for guiding plans for rail and ensuring the existing network adapts to a growing population in ways that meets the future needs and expectations of customers and the community. Proposed objectives are set out below grouped under the themes of customer experience, city shaping and sustainability.

Customer experience
In considering options for meeting public transport need into the longer term a range of network efficiencies are being examined with a particular focus on improving the customer experience and meeting customer expectations.

1. Simplify timetables
Customers expect that the rail system will be convenient to use and that services will arrive at predictable intervals. Simplifying timetables and providing services at regular times throughout the day makes rail services easier to use.

2. Improve reliability
Customers want to know that they will be able to get to their destination on time. They expect services to arrive as scheduled.

[13] CityRail 2010, A Compendium of CityRail Travel Statistics, Seventh Edition (June 2010), p. 65.

3. Meet customers' diverse needs

Customer needs vary with the length and purpose of a trip. Those who make short trips are concentrated in inner-city areas, live in highly urbanised environments and may expect to be able to move quickly to and around the city without needing to look up a timetable. The quality of the travel experience for those who make longer journeys, for example commuting from outer suburbs to the CBD, may depend on having a seat for their journey. Those who travel on outer-suburban and inter-city services may need access to additional facilities such as toilets and more comfortable seats with greater leg room. Storage for baggage might be needed for customers travelling to the airport.

4. Provide real time information

Timetabling information is increasingly accessible to customers through a range of channels. Technology now allows the delivery of more real time information to customers which can relieve frustration about delays and increase certainty about when the next service might arrive as well as aid communication of alternative transport options when problems do occur.

5. Deliver fair fares

The fares for train trips should be fair, reflect the benefits to the community of more people using rail and encourage, not discourage, customers to use the rail system.

6. Reduce crowding

Crowding in trains at peak times is consistently the most common reason for dissatisfaction of rail customers in customer surveys. Table 1.1 shows the reported frequency of customers being unable to board trains. Reducing crowding can improve the travel experience and mean more people use rail confident that they will be able to board the first train that arrives.

Table 1.1 Frequency of being unable to board train because of crowding in the previous six months[14]

Frequency	**Travel to or from work by train?**		
	Yes	No	All train users
At least once a week	14%	4%	8%
At least once a month	17%	6%	11%
Less often than once a month	20%	14%	17%
Not at all	49%	76%	64%
Don't know	0%	1%	0%
Total	**100%**	**100%**	**100%**

7. Decrease journey time

Customers are more likely to choose rail if the journey time compares well to other transport modes. Decreasing journey times can provide more flexibility for customers to manage their time.

8. Increase the convenience of changing services including integrated ticketing

Many customers need to change services to get to their final destination or to shorten their overall trip time by switching to express services. Changing services to other trains or other modes of transport is often perceived as disruptive but can be made easier by integrated ticketing, clear signage, coordinated timetabling and higher frequency services.

[14] CityRail 2011, Customer survey.

9. Improve safety and security

Rail customers want to feel safe and secure using the network, particularly at non-peak times. Increased staff presence and visible CCTV cameras can improve the safety and security of customers. High operational safety standards for trains must always be the highest priority and underpin customers' confidence in using the train network.

10. Provide clean, modern facilities and rolling stock

Modern facilities and rolling stock increase passenger comfort and improve the attractiveness of rail relative to other transport modes. Customers of rail expect that the stations and carriages will be clean and tidy, with regular rubbish pickups and checks.

City shaping

Any expansion of rail networks provides an opportunity to integrate land use planning and influence the way the greater metropolitan region of Sydney is planned and developed. Issues under consideration in this context include increasing accessibility for a much greater number of people and exploring options for urban renewal.

11. Increase accessibility

Rail connects people to key employment and activity centres. Extending the network and increasing its capacity will provide greater access for more people to economic opportunities in major employment centres and contribute to productivity growth. It can also influence where employers locate their businesses and bring jobs closer to where people live, although most employers tend to favour established centres. By providing links to employment and services, accessibility has an important social inclusion element and can reduce inequality and social isolation.

12. Increase potential for urban renewal

Some transport corridors can be considered 'transformative' in that they can facilitate urban renewal, accommodate significant population growth and reduce social isolation if they are better networked as part of the transport system. Rail can play a pivotal role in consolidating these corridors and connecting transport modes to create a networked city.

Sustainability

Long term planning for rail is essential to ensuring the sustainability of the network to meet future demand, manage risk and take account of related policies that will impact on how the region functions.

13. Minimise delivery risk

Rail network enhancements should be delivered as planned—on time and within budget. Risks to delivery should be identified and managed.

14. Minimise operability risk

The long term strategy should account for and accommodate risks of change to the operation of a complex network. The network should be easy to operate on a daily basis.

15. Accommodate future evolution of the network

Any options implemented to improve the rail network and increase capacity should retain flexibility to accommodate future options both within and beyond a 25 year timeframe.

16. Enable the freight strategy

Part of the rail network is shared by passenger and freight services. Volumes of freight moved by rail are expected to grow significantly. The strategy for the passenger network needs to also facilitate the implementation of the freight strategy that is being developed.

17. Achieve environmental goals

By providing customer focused services and infrastructure, rail can drive efficient and sustainable transport choices that maximise benefits across the transport sector and that lower overall transport energy use.

18. Maintain fiscal responsibility

As demand for rail grows, it will be essential that targeted and responsible investment decisions are made that account for constraints on the availability of finance.

1.3.1 Challenges

There are considerable challenges in meeting the various objectives for the long term future of rail, again grouped by the themes of customer experience, city shaping and sustainability.

Customer experience

1. Manage change

Change is disruptive even if it is also has benefits. Most long term options for a sustainable train network will change the customer experience, some more than others. This may mean there is resistance to change or that the transition to new services is difficult. For example, simpler timetables may be better for most customers but may require some customers who don't interchange today, to do so in the future. This may mean their total trip time is less but is broken into more parts. Changes may also involve replacing rollingstock with new stock of different configuration that allows easy access and quicker trips but means there are fewer seats for passengers. It is important that this is effectively managed to avoid inertia in making change that brings overall benefits.

2. Relieve crowding

Overcrowding of trains reduces passenger comfort and can delay trains once crowding reaches threshold levels. At these levels, it takes longer for passengers to get on and off. This in turn reduces the number of trains that can be provided each hour because of the longer time a train needs to spend at each stop, which itself exacerbates crowding and delays. It is this link between train boarding and crowding that ultimately sets the capacity of the CityRail network.

Congestion on platforms in the CBD is also increasing in peak periods. Physical constraints at key stations, particularly Town Hall and Wynyard, limit options for managing crowding in these locations. Many interchanges occur at these stations with flows of people joining or leaving the rail network as well as changing services or using station facilities as pedestrian links.

3. Provide services that meet peak and off-peak needs

Most of the past planning and configuration of the CityRail network has focused on meeting demand in peak periods. Off peak customers have different requirements. Capacity is less important than high frequency of services for these customers. Similarly the safety and security aspects of the configuration of rollingstock and station facilities that are important to customers can be different when fewer people are around compared to peak periods. For example, in peak periods a 900 seat train may be attractive but in the off peak a train with less seating but greater visibility throughout the train may be more desirable.

City shaping

4. Cater for population growth

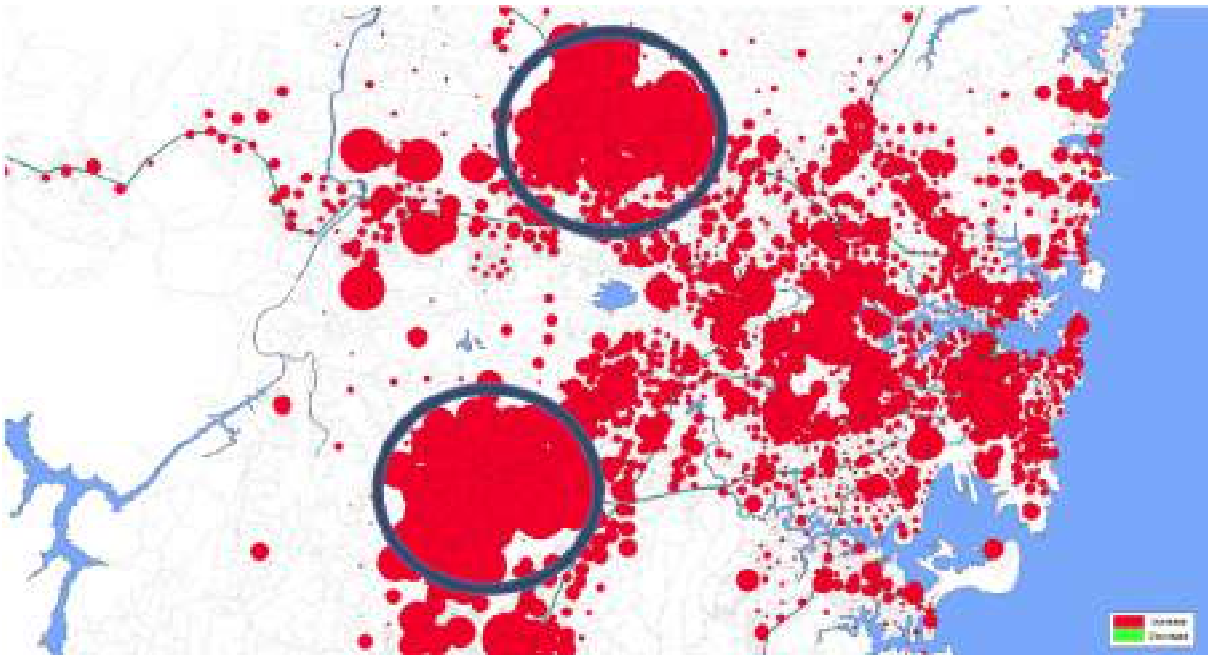
Sydney's population is expected to grow by 1.7 million to 6 million people by 2036, an additional 56,650 residents each year. This will increase the demand for rail services.

Figure 1.4 shows the forecast spatial distribution of Sydney's proposed population growth to 2036. Most of the population growth will occur within the city's existing footprint with strong growth along most corridors in the inner Sydney and around most rail lines. There will also be large population growth in the South West and North West of Sydney. By 2036, more than half of Sydney's population will live in the West which will increase the demand for transport services to and from this region. Accompanying this population growth will be significant employment growth, from 2.2 million jobs currently to 2.9 million by 2036. These new jobs will not only be located in the CBD, with the strongest growth in employment occurring in Macquarie, Olympic Park, Norwest and the airport.

It is important the in catering for population growth the growth in movement of people across NSW is addressed. The corridor from the North West through the global economic arc will experience strong growth with a high proportion of people residing in the North West working in the CBD and the global economic arc.

In the South West there will be strong growth of movement to the CBD, however the most significant growth will be of residents of the South West going to centres of growth in the West such as Parramatta.

Figure 1.4 Spatial distribution of Sydney's population growth to 2036



5. Address capacity constraints

Growth in use of the network to cater for population growth is limited by capacity constraints across the network. Capacity is constrained by:

- dwell times – this is the length of time a train stops at a station and is related to the type of rollingstock and extent of crowding, which can affect how long it takes customers to get on and off a train
- the signalling system – the current system requires long safety overlaps which reduces the maximum number of trains that can be operated per hour on each line
- the need for recovery time to provide reliability – existing timetables build in additional time that means trains can continue to run on time if there are short delays.

Current standards mean that only twenty 900 seat trains can operate per hour per line. This is about 18,000 seats per hour per track. This is high by world standards. However, each track can only carry about 24,000 people per hour (including seated and standing passengers), which is low by world standards. In contrast, the metropolitan network in Hong Kong provides 12,000 seats per hour per line and 60,000 passengers per hour per track. Many systems in Europe carry more than 40,000 people per hour.

The most significant constraints are in the CBD itself and the capacity for crossing the harbour. CBD constraints are expected to be critical by 2021 when the network is unlikely to be able to accommodate forecast demand operating at current CityRail capacities. After addressing CBD constraints, cross harbour capacity constraints are also expected to become critical in the 2020s.

6. Integrate transport and land use planning

The implications of population growth for the transport task will depend on where people choose to live, where employment growth occurs and where other activities are concentrated. A transport network can both respond to these land use patterns as well as influence them. Integrated and coordinated planning of the transport network is complex but necessary for Sydney's long-term sustainability. It needs to support planned land use and be able to evolve and adapt as change occurs.

7. Preserve and reserve corridors

Flexibility and adaptability for the rail and wider transport network is constrained by availability of suitable reserved land on which new rail lines and roads can be built. Some corridors are already reserved. There are also new transport corridors being identified for which no land is currently reserved. It is important that the future CBD rail corridors are confirmed and preserved as a priority.

Sustainability

8. Implement complex technical change

The CityRail network operates across a large, geographically diverse urban area. The operating environment is complex and investment in infrastructure and rollingstock needs to be carefully analysed to ensure fit and operability with the existing network. For example, providing new services on new lines can reduce the number of services on existing lines to the CBD. Any new technologies that improve service standards need to be sufficiently adaptable so that they work, without causing unnecessary disruption, when applied across a network with infrastructure assets of varying ages.

9. Identify funding

Rail infrastructure projects typically involve large investments.
Fares paid by passengers amount to less than 25 per cent of the operating costs of the network. The major portion of operating costs is funded from NSW Government revenue and additional investment in the network needs to be funded from Government revenue or other sources.
Benefits from rail, including reduced traffic congestion and lower greenhouse gas emissions, may justify some level of public subsidy. However, the funding available for major investments is constrained and allocating funds can involve trade-offs with the provision of other infrastructure and public services. Funds, whether from the public or private sector, need to be identified. Pricing strategies across all transport modes including private vehicles need to be designed to facilitate sustainable transport solutions.

10. Manage long lead times

The size and complexity of investment decisions means there can be long lead times before a decision is made and between a decision and completion of a project. Decision makers need to rely on forecasts and modelling and make assumptions to inform their thinking. This increases the risks associated with decisions. This is reduced by robust technical and economic analysis of options, but often means that decisions for long term change are considered for prolonged periods. Once a decision is made, users of the network may not realise the benefits for several years while construction takes place.

2 Rail and an integrated planning framework

The Government is committed to transport planning that supports land use planning. Understanding projected growth in employment centres, how growth in population will be accommodated and where key services and activities will be located all shape plans for the transport network.

A number of inter-linking plans and strategies are being developed for NSW's transport network to form a transport planning framework.

NSW 2021- A Plan to Make NSW Number One is a 10 year plan to rebuild the economy, return quality services, renovate infrastructure, strengthen the local environment and communities and restore accountability to Government. It will guide all policy and budget decisions. *NSW 2021* has a series of 32 goals relating to the economy, services, infrastructure, environment and governance. Options for the rail network should support achieving the following 6 goals in the plan:

- Reduce travel times
- Grow patronage on public transport by making it a more attractive choice
- Improve customer experience with transport services
- Invest in critical infrastructure
- Build liveable centres.

Transport for NSW is also developing an overarching *Transport Masterplan* that links land use and transport planning—other plans for specific areas or modes of transport may be developed consistent with the overarching plan.

The Masterplan will be developed in 2012 and is predicated on a transport network in which all modes are readily accessible and work together to provide a network that is properly integrated with the way cities, towns and suburbs operate.

The options for rail in the Greater Metropolitan Area will inform development of the Masterplan.

2.1 Network of transport corridors

While Sydney does have a set of strong strategic centres, the vast majority of trips made across the Sydney region are not to these centres and are not made by public transport. The transport network needs to support the growth of centres, while also recognising the need to cater for cross-regional trips.

Analysis has identified a network of 46 transport corridors (Figure 2.1) across Sydney. These are a combination of existing major transport routes as well as transport links that are expected to be of greater importance in the future. Planning to consolidate growth along these existing and emerging corridors provides a basis for the ongoing evolution of a transport network.

The majority of Sydney's established public transport corridors, including rail corridors, form radial connections to 'Global Sydney' – made up of the harbour cities of Sydney and North Sydney as well as adjoining mixed use areas such as Pyrmont, Redfern, Camperdown, Surry Hills and East Sydney. Public transport services that also improve connections across Sydney can support improved access to employment and services for a greater proportion of people closer to where they live.

The Global Economic Corridor has emerged over the last 15 to 20 years and extends from the airport through to Macquarie Park. This corridor contains around 40 per cent of Sydney's jobs and is a

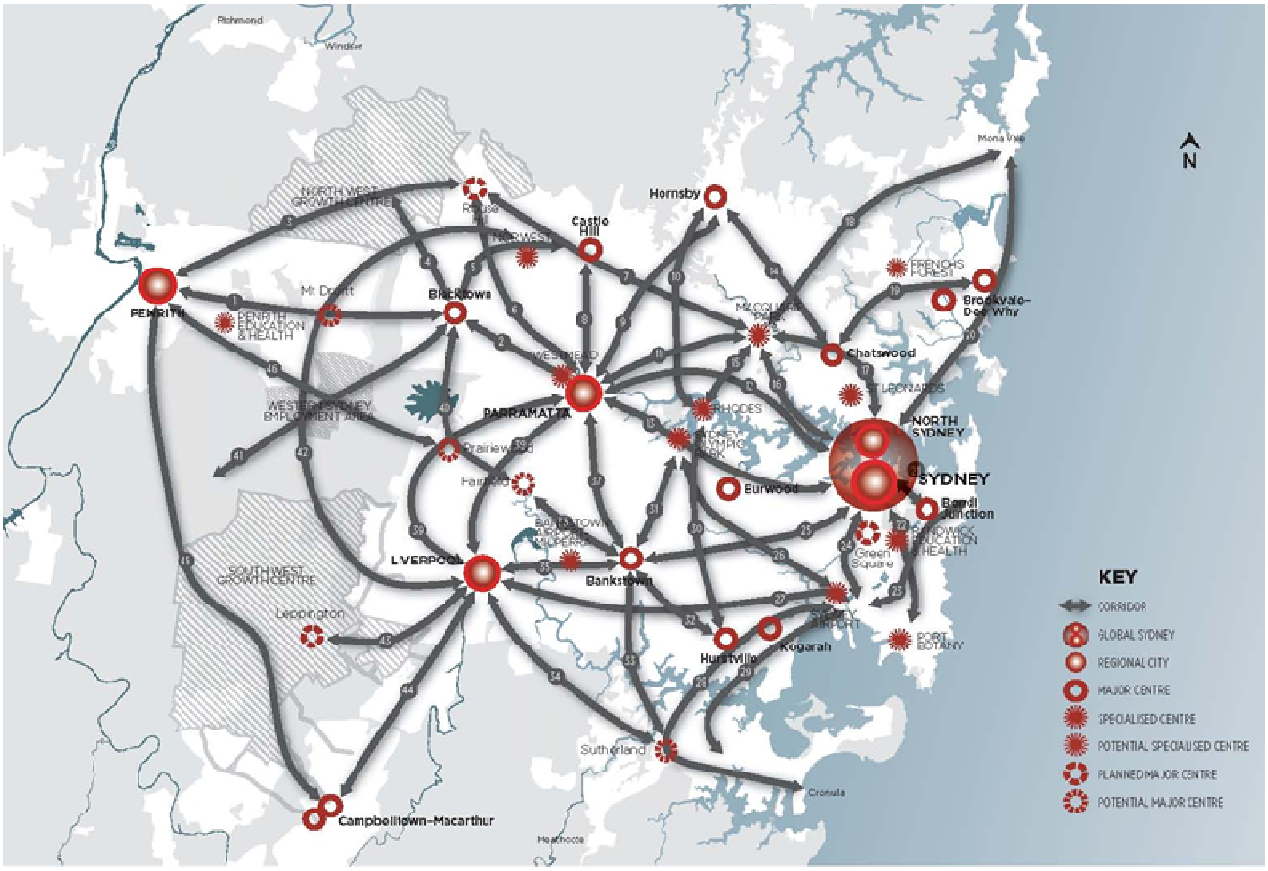
powerhouse of the Australian economy. The success of other centres relies on continuing strength of activity in Global Sydney and this economic corridor.

A network of corridors can help to accommodate forecast population growth sustainably. The majority of new homes are expected to be located within existing suburbs although there will also be significant growth on the periphery of existing development in the North West and South West of Sydney.

Various strategies can help to shape Sydney as a networked city over the short medium and long terms with increasing cross-city connections.

In the short term, growth can be encouraged in locations with high transit usage but relatively low density. These are mostly along existing rail corridors, have demonstrated ability to attract transit users and generally have good access to existing regional centres.

Figure 2.1 Sydney's 46 Transport Corridors



In the medium term, growth in Sydney's South West and North West will be supported by extensions to the rail network, specifically the South West and North West Rail links, and through growth in the use of existing rail links. This strategy is aligned with forecasts of high population growth in these areas and is critical to ensuring equitable access and reduced car dependency in and from these areas.

An ongoing strategy is to identify corridors that provide city shaping opportunities. These offer the opportunity to unlock urban renewal potential in established areas and further increase the proportion of people living within close proximity to their centres of work.

2.2 The role of rail in the Greater Metropolitan Area

The rail network is the backbone of Metropolitan Sydney's public transport system. It forms core public transport corridors that connect key centres and along which there tends to be a higher density of homes and businesses.

Rail is a mass transit system – it can move large numbers of people relatively quickly over long or short distances along dedicated corridors.

It is viable where sufficiently high densities of people use the network to make investment sustainable over the long term. This can occur in densely populated areas and where people can readily access a train station by first catching a bus, using park and ride facilities or other transport modes. Buses perform an important 'feeder' function with 16 per cent of trips on buses connecting customers to rail.

Other transport modes are better suited to servicing dispersed, low density populations. For example, buses are able to achieve greater penetration at relatively low cost in local areas and are suitable for most local trips – connecting students to local schools and shoppers to urban centres, although rail also performs these functions in some areas.

Further, rail corridors are fixed and rail networks do not have the same flexibility to respond to short-term population changes and demands as some other public transport modes. Establishing bus routes, building patronage and a public transport culture can be an effective precursor to establishing a new rail corridor in growth areas.

People travelling to work use rail more than other public transport modes. The network facilitates short journeys to work from inner-ring suburbs, longer commutes from outer-suburban areas as well as inter-city commutes between Sydney, Newcastle, the Central Coast, Blue Mountains, Southern Highlands and Wollongong.

2.3 Rail and access to the CBD and Parramatta

The CBD is Sydney's largest employment centre and the number of jobs in the CBD is forecast to grow to 355,000 by 2036 from 274,000 in 2006. Travel to the CBD in the morning peak could grow by 32 per cent for rail to 142,900 trips.

The CBD has a high usage of public transport services with about 76 per cent of people using public transport. Almost half of all work trips to the CBD are by rail.[15] Apart from rail, frequent bus services carry passengers from the Northern Beaches, the North West, Eastern and South Eastern Suburbs, the South and South West. Ferry services and light rail carry a small proportion of commuters. Less than 20 per cent arrive by car and long term planning indicates this could reduce to 14 percent. Walking accounts for about 6 per cent.

Most trips to the CBD originate from inner-ring suburbs. More than 70 per cent are from suburbs within 10 kilometres of the CBD (see Figure 2.2).

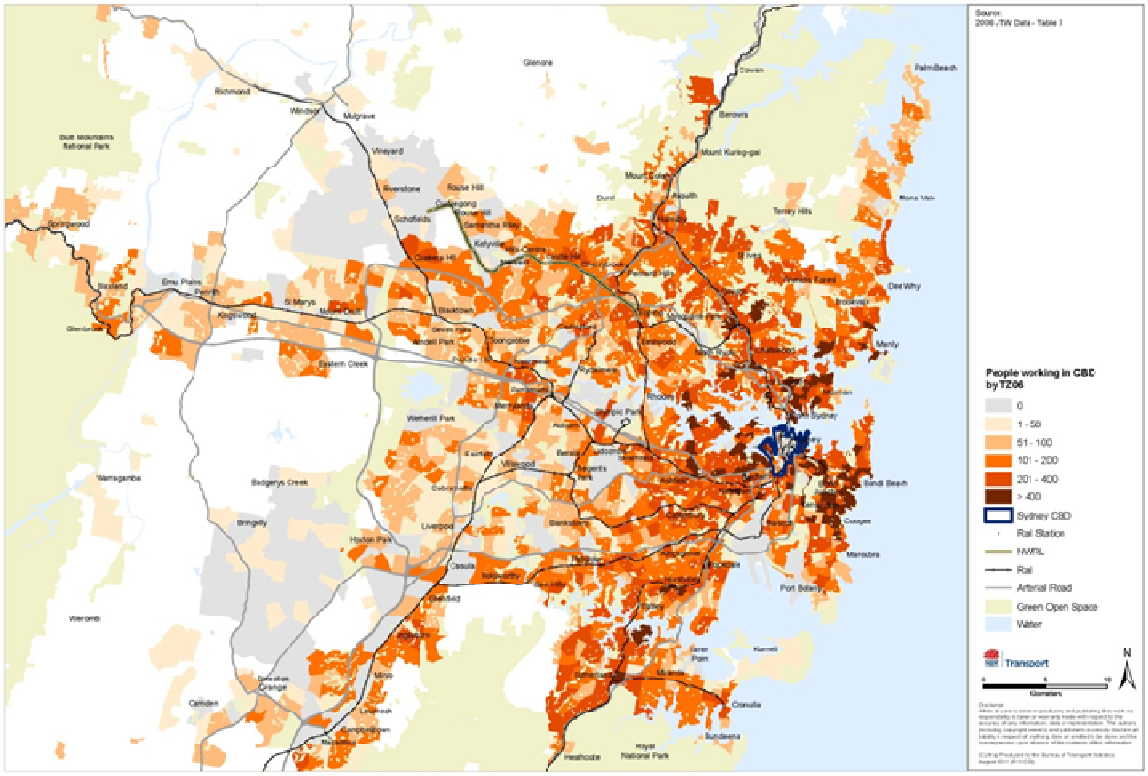
The existing CBD road network is operating close to capacity in a number of key corridors in peak periods and increased numbers of buses by 2015 will worsen congestion. Some bus passengers already experience significant delays in peak periods as buses queue up to drop off and pick up passengers.

In the long term, increasing capacity on the rail network in the CBD is essential because of the constraints on above ground space and because heavy rail provides greater capacity to move more people more quickly than any other transport mode. For rail to at least maintain its current share of commuter trips, nearly 40 additional train loads of people at current train capacity could be needed,

[15] CityRail 2010, A Compendium of CityRail Travel Statistics, Seventh Edition (June 2010), p. 25.

mostly in peak periods. This is without rail increasing mode share as bus capacity limits are reached or providing for other types of trips.

Figure 2.2 Number of people who work in the CBD in 2006



2.3.1 Barangaroo and Wynyard

Over the next 15 years, significant growth is expected in trips originating or arriving at Wynyard. An important driver is the Barangaroo development, which will be made up of a combination of office and retail buildings, a headland park and pedestrian access. Barangaroo is situated directly to the west of the CBD and runs from Walsh Bay in the North to the King Street development in the South. The first building at Barangaroo is scheduled to be completed in late 2013.

Currently, Wynyard is one of Australia's busiest transport precincts and a gateway to some of the higher concentrations of office space in Australia. Wynyard is the third busiest station on the CityRail network, handling 41,000 rail customers in the three and a half hour peak morning period. In addition to this, over 35,000 passengers arrive at Wynyard on 800 bus services during this period. Wynyard already displays some of Sydney's most visible and intractable public transport and traffic challenges.

There will be 2,500 residents at Barangaroo and the precinct is expected to attract a further 33,000 visitors per day.[16] It is forecast that there will be 14,000 workers at Barangaroo by late 2015, 21,000 workers by late 2020 and 23,000 by late 2023.[17] Of the 23,000 workers who will travel to Barangaroo daily, the target is for 63 per cent or 14,500 commuters to travel by rail in the morning peak hour.[18]

Plans will be developed to identify measures to accommodate the growing trips to Wynyard. Upgrades to Wynyard station, as well as the optimisation of timetables, will help cater for the additional commuter and pedestrian traffic through and around Wynyard. A pedestrian link from Wynyard to

[16] The Audit Office of New South Wales 2011, *Performance Audit: Government expenditure and transport planning in relation to implementing Barangaroo,* p. 5.

[17] *Ibid.*

[18] *Ibid.*

Barangaroo (the Wynyard Walk) will be constructed to meet demand for access. Three new ferry wharves at Barangaroo South are planned. Investigation of light rail options for the medium term is also underway. There will also be a range of operational changes to buses in the area to manage congestion including the relocation of some bus stops, installing and adjusting some traffic signals and deploying bus marshals.

Ultimately, there will need to be additional rail capacity in the CBD and across Sydney Harbour to meet the forecast demand for additional trips to Wynyard.

2.3.2 Rail access to Parramatta CBD

The City of Parramatta is Sydney's second CBD and provides employment, higher education and business services for Western Sydney. It has an employment base of 43,000 jobs which is targeted to grow 60 per cent to 70,000 jobs by 2036.[19]

Parramatta is serviced by trains from both directions on the Western Line, including the Blue Mountains as well as the Cumberland Line. About 100 of the Greater Metropolitan Sydney rail stations provide a direct service to Parramatta and it can be reached from almost every other station with just one interchange.

The Parramatta Interchange brings rail and bus services together with approximately 45 bus routes serving the city centre, including T-way and Metrobus services. Over 250 services operate during the morning peak and key routes offer peak hour frequencies of between 10 and 15 minutes.

On weekdays in the peak, 14 rail services depart from or arrive at Parramatta. During the morning peak 11,400 passengers leave and 6,100 enter Parramatta station. There are more than 29,000 daily entries and exits, making it the fourth busiest railway station in the CityRail network and the busiest outside of the Sydney CBD.

There were around 153,000 trips to Parramatta city centre on an average weekday in 2008 with 11 per cent of these rail trips (figure 2.3). Together, bus and rail account for 15 per cent of total trips. However, for commutes in the peak, (figure 2.4) the share for rail is 32 per cent and the total for bus and rail is more than 39 per cent.

[19] NSW Government 2010, *Metropolitian Plan for Sydney 2036,* p. 33.

Parramatta Trips by Mode

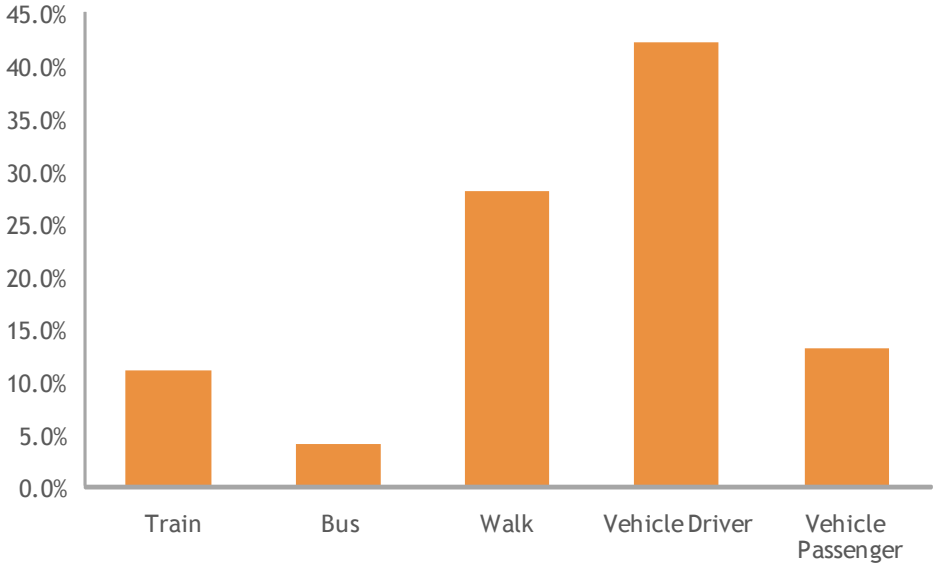
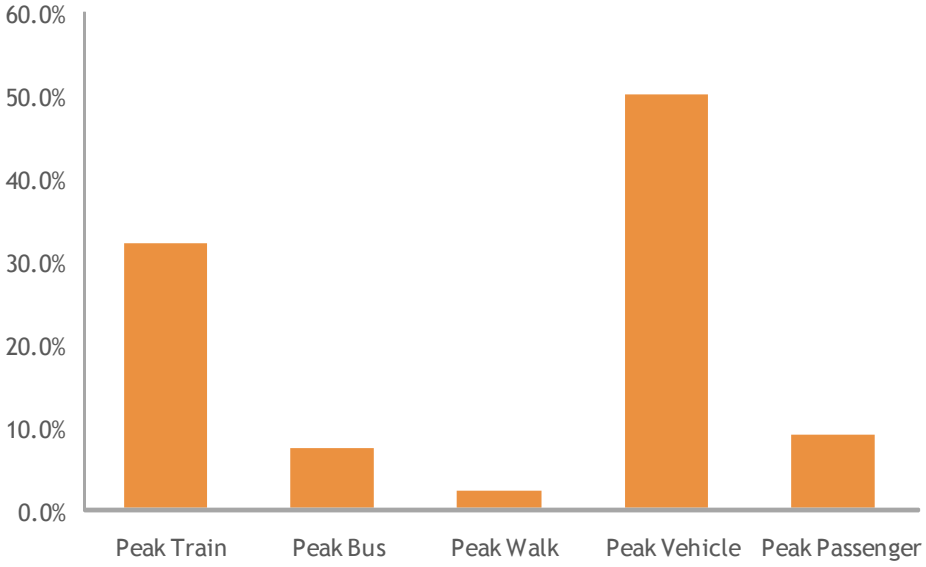


Figure 2.3 Peak Parramatta Commuter Trips



The NSW 2021 target is to increase the share of commuter trips made by public transport to and from Parramatta CBD during peak periods to 50 per cent by 2016.[20] To achieve this, a focus on high frequency public transport services on all key corridors leading to Parramatta is required. This issue will be examined as part of the NSW Transport Masterplan.

[20] NSW Government 2011, NSW 2021: A Plan to Make NSW Number 1, p. 20.

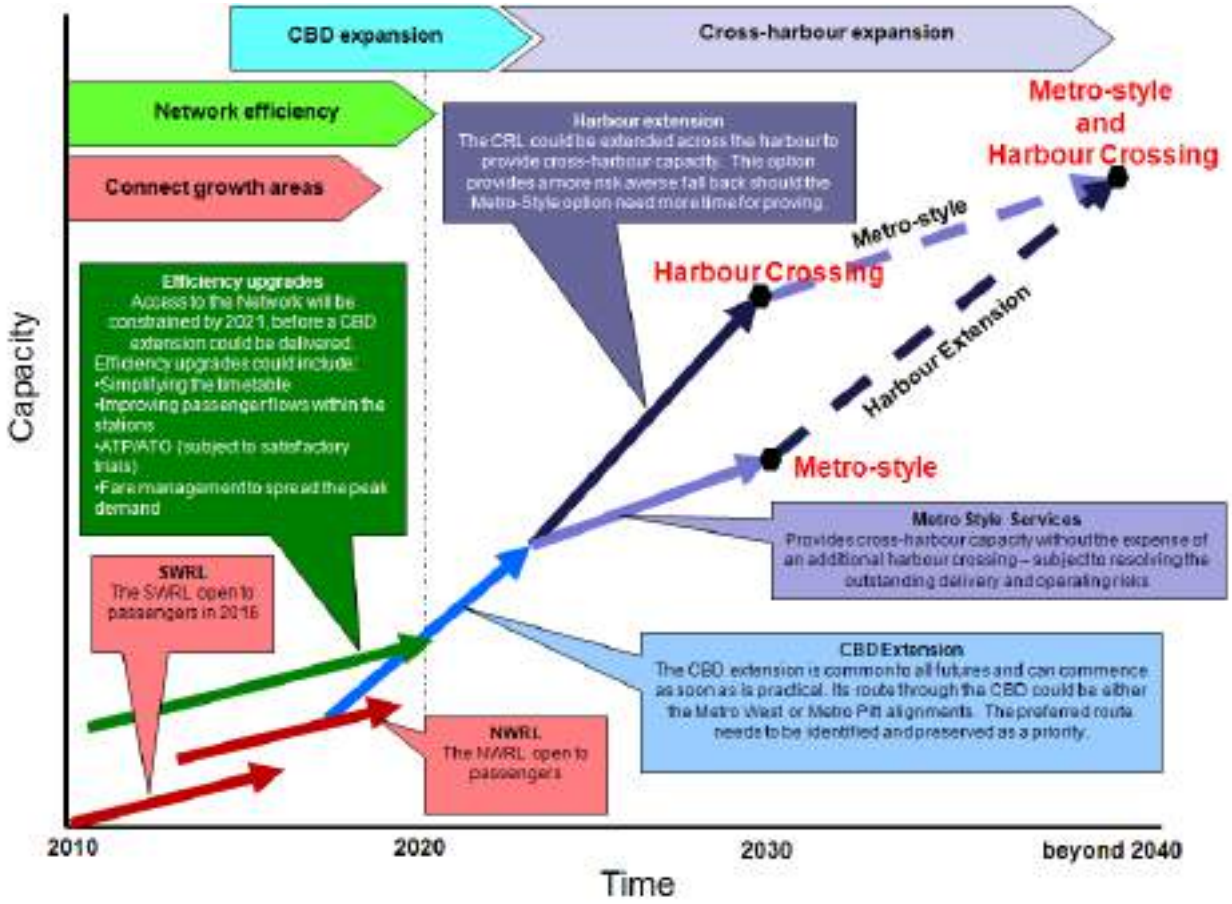
3 Common elements of the rail options

There are three primary requirements that will need to be addressed as part of any long term rail network development strategy and which will be common to all options (albeit with potentially some differences in timing and sequence):

- Connecting to growth areas – the need to extend access to the network to new areas of population growth to facilitate access to employment centres and services;
- Network efficiency – improving the capacity of the existing network; and
- Augmenting CBD capacity – expanding capacity across the network by constructing a CBD extension and expand capacity across the harbour to allow increased capacity for services on some lines.

An example of how these requirements could potentially be sequenced is illustrated in Figure 3.1 which highlights the initial plan for connecting to growth areas, combined with a network efficiency program which would be common to all currently identified options. The key area of choice in this example is what solution is identified for first addressing cross harbour capacity. The exact sequencing and project solutions to address these primary requirements will be developed as part of the Transport Masterplan.

Figure 3.1 Illustrative sequence of events to deliver long term rail strategy



3.1 Connecting to growth areas

Extensions of the network are already underway and will grow the network to meet demand in the south west and north west through delivery of the South West Rail Link and North West Rail Link projects. These extensions are part of a logical sequence that ultimately progresses to considering additional capacity through the CBD and across the harbour that will allow for increased capacity on these and other lines as demand across the network grows.

3.1.2 South West Rail Link (SWRL)

The SWRL currently in phase 2 of its construction and is shown in Figure 3.2. It includes:

- A new 11 kilometre rail line from Glenfield to Leppington
- New passenger stations at Leppington and Edmondson Park, including park and ride facilities and interchange facilities
- An upgrade to the Glenfield Station, including interchange facilities and a 700 space multi-storey commuter car park
- An extension of the park and ride facilities at Seddon Park.
- A new train stabling yard at Rossmore, and
- The construction of flyovers to the North and South of Glenfield Station.[21]

The SWRL will provide links in the South West to major employment centres including Liverpool, Parramatta and the Sydney CBD.
The SWRL builds on the Clearways program. The Revesby to Kingsgrove quadruplication and Revesby turnback all support additional trains and the SWRL runs in the one part of the CBD where there is train capacity through Central, Museum and St James stations.
In the next 30 years the population of the South West is expected to grow by 300,000 people.[22] The provision of efficient, reliable and convenient rail services through the SWRL will be essential to accommodating this growth. The Link will allow additional services to operate on the East Hills and Main South Line and once complete, will provide passengers with at least four trains per hour throughout the day and up to twelve trains per hour in peak periods.
Construction of the SWRL commenced in August 2009 at Glenfield. The commuter car park at Seddon Park was opened in 2009 and the Glenfield multi-story commuter car park was opened in 2010.[23] In May 2011 staged construction of the rail line between Glenfield and Leppington commenced. Construction of the Glenfield Transport Interchange is expected to be complete in 2013-14 and the SWRL will be open for use by passengers in 2016.[24]

[21] Transport Construction Authority 2011, SWRL: Project Profile. Avaliable at http://www.tca.nsw.gov.au/Our-Projects/Current-Projects/South-West-Rail-Link/Project-Profile/Project-profile/default.aspx

[22] Transport Infrastructure Development Corporation 2011, South West Rail Link: Overview, p. 2.

[23] *Ibid.*

[24] *Ibid.*

Figure 3.2 South West Rail Link

3.1.3 North West Rail Link (NWRL)

The NWRL will provide a new rail service to the 360,000 residents in Sydney's North West and provide convenient access to destinations across the Sydney metropolitan area. The 23 km Link will include at least 6 new stations and provide services from Epping to Rouse Hill that will complement the existing network.[25] It will incorporate the longest underground rail tunnel ever constructed in Sydney - the first 15 kilometres from Epping to Kellyville will be an underground tunnel.[26]

Figure 3.3 shows the NWRL route and the stations planned for Cherrybrook, Castle Hill, Hills Centre, Norwest, Kellyville and Rouse Hill.

All stations will have bus, pedestrian and cycling access facilities to ensure ease of access. In addition to this, a total of 3,000 park and ride spaces will be provided at the Cherrybrook, Hills Centre and Kellyville stations.[27]

The Link will connect the growing North West to major employment centres in Norwest Business Park, Macquarie Park, St Leonards, Chatswood, North Sydney and the CBD. The NWRL will also improve the accessibility of retail and entertainment areas in Rouse Hill and Castle Hill, as well as access to Macquarie University.

Increasing the rail mode share in the area will have the additional benefit of reducing bus congestion on the northern approach and into the Sydney CBD. The construction of the NWRL will help relieve bus congestion in the Wynyard precinct and through York Street. It is a key project for meeting the

[25] Transport for NSW 2011, North West Rail Link: Project Overview 2011, p. 6.

[26] Transport for NSW 2011, North West Rail Link: Project Overview 2011, p. 6.

[27] *Ibid.*

overall target of increased rail mode share in the CBD and will reduce pressure on surface streets in the CBD.
The NWRL will be developed to build on the principles of a more simplified timetable with consistent stopping patterns. The NWRL can be integrated with the existing North Shore Line with a combined package of network efficiencies and a simplified NWRL timetable.

The Government will fast track the planning and construction of the NWRL and has established an integrated project team to:

- Determine the planning approvals needed to proceed with the project
- Put together full costings of the rail line
- Begin planning on the most effective way to integrate trains on the NWRL with the rest of the rail network, and
- Open discussions with communities and stakeholders along the route.

Figure 3.3 North West Rail Link

3.2 The need for CBD Expansion

3.2.1 CBD Expansion

While incremental capacity increases could be achieved through network efficiency measures, a CBD expansion will be required given the expected growth in demand across the network. A CBD extension is therefore a critical component of all of the future rail development options. The CBD extension would be the first new line in the CBD since construction of the Eastern Suburbs line in 1979. It is a rail

link that could run from Eveleigh towards the northern end of the CBD near Wynyard or Circular Quay. There are several routes this line could take and the details of this, and where stations would be located, could be determined in later analysis. Identification and protection of a corridor for the CBD extension is a high priority.

3.2.2 Cross-Harbour connections

Cross-harbour capacity constraints could be addressed in the future by:

- Introducing high frequency metro style services with up to 28 trains per hour across the harbour bridge – this would allow 50 per cent more passengers per hour without the need for additional major infrastructure
- Extending the CBD Extension under the harbour to join up with a quadrupled Chatswood to St Leonards line – this requires significant investment in new infrastructure.

If metro-style services were introduced, they would require substantial changes to the operation of Sydney's rail network. Analysis shows there are risks to reliability of operating 28 trains per hour on the existing tracks between Redfern and St Leonards. However, 26 trains per hour could reliably operate with only a small loss of benefit. Further analysis is required to determine the optimal number of trains that could reliably operate under this scenario.

Unlike the metro-style services, the second harbour crossing could be based on existing CityRail technology and operating systems. This means it could have lower implementation risk, though this would come at a higher capital cost.

The second harbour crossing and metro-style services are not mutually exclusive and a decision on these options is not necessary prior to about 2020. This allows time for detailed studies and development and testing of the improved control systems that would need to operate reliably to support metro style services.

Beyond 2036 a second harbour crossing could be added to metro-style services or metro-style services could be added to a second harbour crossing depending on which is already implemented. This would add additional capacity and allow for significant growth in trips to the CBD.

4 Draft Options for the Greater Metropolitan rail network

No single option will meet all customers' preferences for rail services across different parts of Sydney. There are also risks to delivery of each option, but a planned sequence of investments and making changes to the way the system operates means rail could better meet customer needs and strengthen its role as the backbone of our public transport network.

Without action and investment, capacity within the CBD is likely to be severely constrained from 2021. Any option could be complemented by implementing an efficiency program as the first step to addressing emerging capacity constraints. Its aim could be to make the most of existing assets with minimal additional investment to enhance capacity. A range of initiatives could be considered but would require additional studies to determine how best to implement them. These include:

- Simplifying timetables
- Reducing the length of time trains need to stop at stations
- Introducing new train protection and control technology
- Enhancing platform capacity
- Improving communications and signage
- Spreading demand to non-peak periods, and
- Continuing the Clearways project.

Seven draft options for the CityRail network have been developed through a rigorous process. They fall within two broad approaches – standardised (suburban) services and customising services.

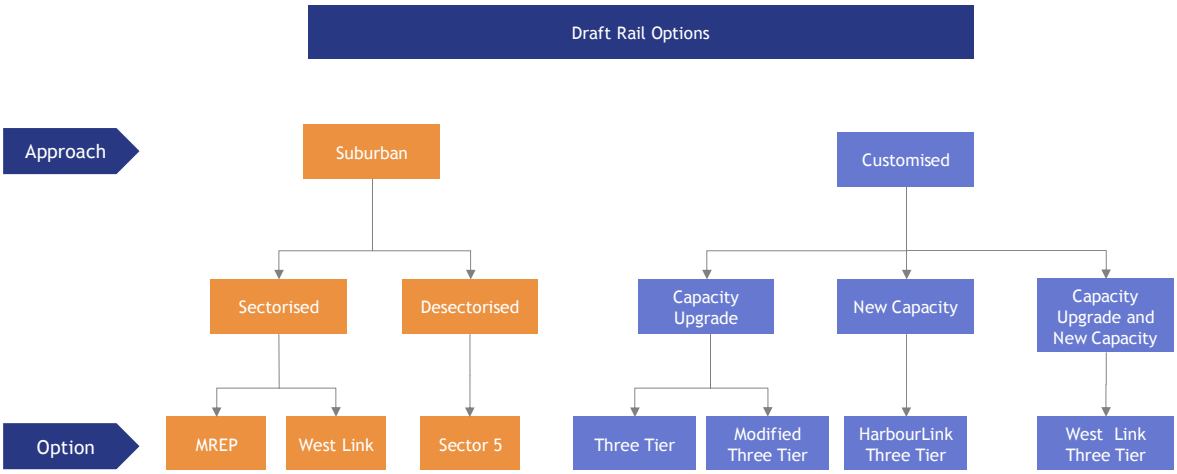
The standardised approach is about maintaining the existing suburban style services across the network for all trip purposes. It could involve increasing the capacity of the network by investing in new infrastructure that mostly caters for the suburban or medium distance market and could deliver similar services to those provided today.

Customising services seeks to recognise that different types of services are needed to meet different customer needs. It is about tailoring services to better meet the needs and preferences of three customer markets based on trip length: long distance trips, medium distance 'suburban' trips and short distance inner-city trips.

The seven options have been carefully structured to represent the differences in the approaches and the range of options for delivering those approaches. These options are still in draft form and variations to these options, as well as other alternative options, could be explored as part of more detailed planning and in response to extensive public consultation that will be undertaken as part of developing a Transport Masterplan for NSW.

The approaches and options are described in more detail below and are summarised in Figure 4.1.

Figure 4.1 Draft rail options



An extensive evaluation process is underway comprising demand forecasting, operational analysis, infrastructure scoping and costing, economic appraisal and environmental assessment. This evaluation will also be informed by on-going public and stakeholder consultation as part of the Transport Masterplanning process. Alternative options may also be developed as part of this process and more detailed analysis of the advantages and disadvantages of options will be reported.

4.1 Base case

The base case reflects the government's existing commitments and investments which include building the South West Rail Link by 2016, the North West Rail Link by 2019 and the implementation of a 'Clearways timetable' that allows additional peak services for the South and Bankstown lines and provides operational and journey time benefits for Macarthur and Campbelltown services. All options include these initiatives. The base case is shown in Figure 4.2.

Figure 4.2 Base Case City Rail Network 2036

4.2 Options for standardised (suburban) approach

The suburban approach is about building new infrastructure to expand the capacity of the existing network. This new infrastructure could operate at similar capacity standards as existing infrastructure does today. A similar mix of express and all stop services could be provided that cater to the medium distance or suburban market. Double deck trains of eight carriages with two sets of doors per carriage could be used for all services.

Three draft suburban options have been developed.

4.2.1 Option 1- Suburban MREP

The Metropolitan Rail Expansion Plan (known as MREP) involves construction of a CBD Extension and second harbour crossing in one stage to unlock additional capacity. This enables a direct rail connection between the North West and South West corridors connecting people to jobs and allows for simplified operation through increased sectorisation.

Figure 4.3 Option 1 Suburban – MREP 2036

4.2.2 Option 2 Suburban – West Link

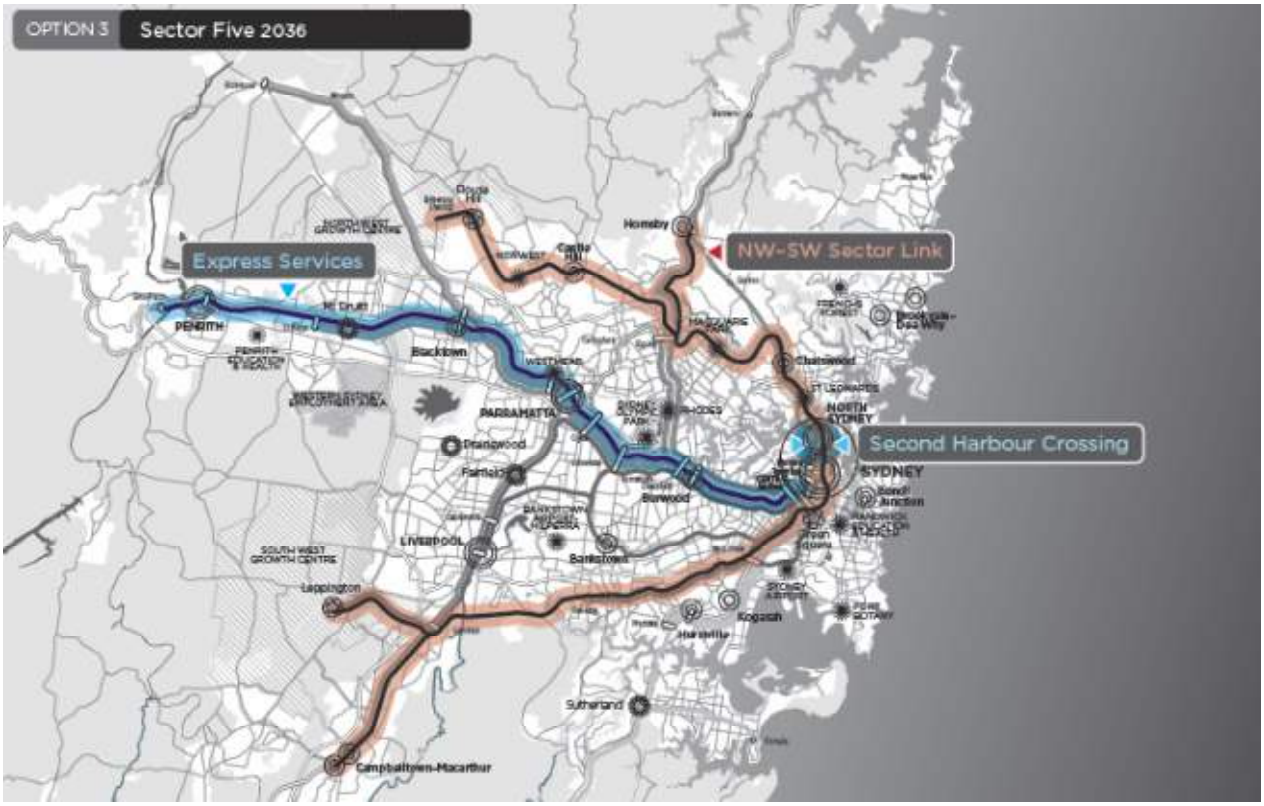
Unlike MREP, this option could involve construction of a CBD Extension and second harbour crossing in two stages. The first stage could enable Express Western services through to Wynyard using the CBD Extension. The second stage could involve extending this line across the harbour to link these services with the North West Rail Link and the Epping to Chatswood Rail Link. This option is aligned with connecting Penrith, Parramatta and the northwest region to jobs.

Figure 4.4 Option 2 Suburban - West Link 2036

4.2.3 Option 3 Suburban - Sector 5

This option is similar to MREP but could also see the introduction of a mix of fast, slow and skipped stop services to prioritise faster train trips over train service frequency and reliability. It involves staging construction so that a second harbour crossing is built subsequent to the construction of a CBD Extension. It is aligned with connecting the Hills District and South West Growth Centre to jobs.

Figure 4.5 Option 3 Suburban - Sector 5 2036



4.2.4 The advantages of the suburban options

The suburban options could maximise seating on all train services. They could maintain the existing 18,000 seats per hour per line which is high by world standards. These options could maintain and improve capacity for good suburban to CBD commuter services in peak periods. They could also provide the ability to mix freight, express and suburban services, which is an effective use of low and medium density lines.

4.2.5 The disadvantages of the suburban options

The suburban options are not well suited to shorter journeys which make up about 50 per cent of current trips. Low service frequency is likely to divert passengers to private cars or more frequent bus services. For example, only four trains per hour could be provided at key inner city stations such as Erskineville and St Peters just two stops from the CBD with fewer services in the off-peak. This restricts the potential for growth on these lines.
Further, these options are not suited to services that go through the CBD with many passengers getting on and off at congested platforms.

Heavy, double deck trains could continue to run during off-peak and on weekends with light loading. Low off-peak and weekend frequencies could also limit the attractiveness of services outside peak periods.

An upper limit of both seated and standing passengers of 24,000 per hour per line could be retained which is low by world standards and will be challenging to sustain with patronage growth forecasts approaching 50 per cent by 2036.

These options, like the customised options, also have some operational and implementation risks that would need to be managed prior to implementation.

4.3 Options for customising services

Customising services involves tailoring services to meet different needs such as:

- Higher frequency services with standard stopping patterns for shorter trips that allow passengers to turn- up- and- go, a service concept often referred to as Metro
- Suburban services for middle distances that are reliable and provide frequent access to work and home
- Intercity and Outer Suburban express services that provide express services between major centres, areas outside the Sydney basin and the CBD.

The approach recognises that there is latent capacity on some inner lines. In order to use this capacity, metro style services could be offered for shorter trips in the inner ring. These could be targeted at the 50 per cent of rail trips under 30 minutes.

Customising services could involve greater use of Automatic Train Protection and Automatic Train Operation to increase capacity on each line. Automatic Train Protection potentially allows the safe reduction of operating distances between trains which can increase capacity by operating more trains per hour on each line. This form of operation can be linked in a package with higher frequency services with standard stopping patterns and with rollingstock with higher door capacity, to enable increases in train frequency.

An Automatic Train Operation systems typically overlays an Automatic Train Protection system and optimises train speed, including the setting in motion and stopping of trains between stations. When combined with faster loading and unloading of trains, it potentially allows the reduction of operational margins built into timetables and increases capacity to operate more trains per hour on each line.

The customised approach could also involve different configurations for rolling stock for each type of service. For short trips, more frequent services could be provided and the overall capacity of each line increased by using single deck trains with at least three sets of doors per carriage and more standing room but fewer seats. This configuration of rollingstock and modified station design could reduce the time needed for passengers to board and disembark from trains and allow more trains each hour on each line. For medium and long distance trips double deck carriages could continue to be used. Seats could be available for the majority of passengers on most services. Longer, 10 carriage trains could be used for the longest trips to increase capacity of services.

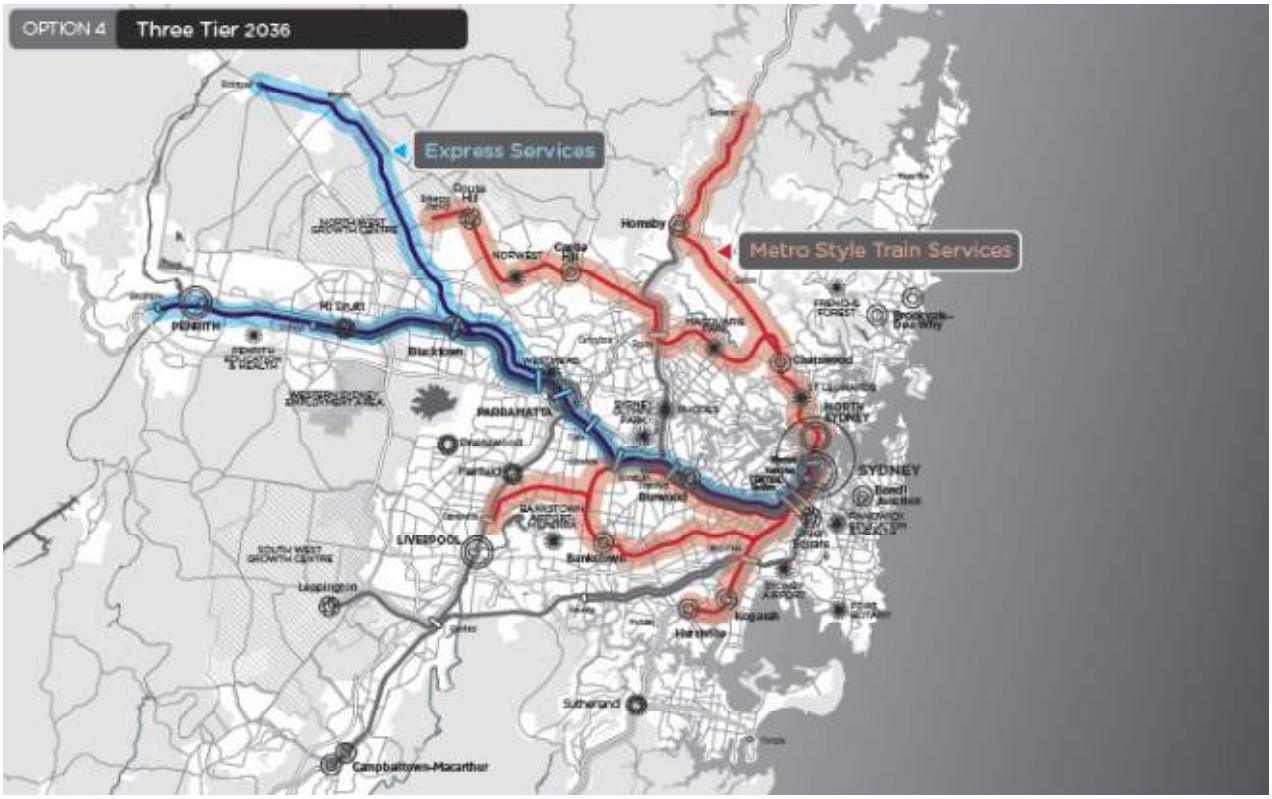
While the emphasis of the customised approach is to make the most of existing assets, it does involve the construction of a CBD Extension for all the draft options developed. This could help to simplify the complex movement of trains from Homebush to the CBD and enhance network wide capacity. Further, if other new lines were to be constructed, they could be designed to maximise the number of

passengers that could be transported per hour on the line achieving significantly higher capacities than the existing 24,000 passengers per hour.
The four options for customising services that are being evaluated are outlined in the following sections.

4.3.1 Option 4 Customising services - Three Tier

Under this option, three distinct services for short, medium and long distance trips could be introduced. Metro style turn-up-and-go services could be provided using single deck trains on selected lines. Construction of the CBD Extension could also enable 10 carriage Express Western services to the heart of the CBD. This option supports urban renewal along existing rail lines as well as meeting needs for Parramatta CBD and the North West Growth Centre.

Figure 4.6 Option 4 Customising services - Three Tier 2036



4.3.2 5 Customising services - Modified Three Tier

This option is similar to the Three Tier option but the NWRL could be serviced with suburban rather than metro style services so more seating is provided for longer trips. This reduces the complexity of the metro style operations compared to the Three Tier option.

Figure 4.7 Option 5 Customising services - Modified Three Tier 2036

4.3.3 Customising services - HarbourLink Three Tier

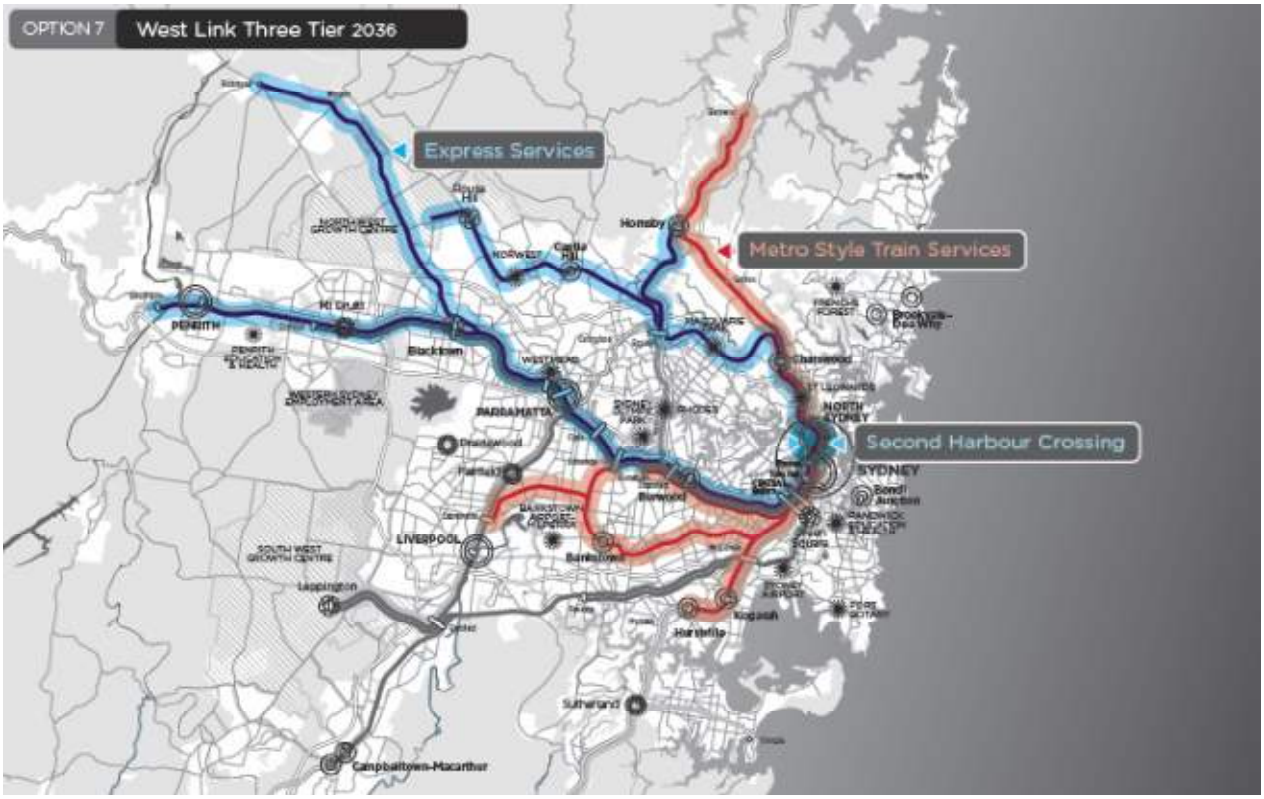
In addition to introduction of differentiated services, this option could also involve construction of a second harbour crossing. Relative to the suburban options, the second harbour crossing could operate higher frequency services and enable the potential integration of bus transport from the Northern Beaches using Bus Rapid Transport to Chatswood and North Sydney rail stations. Western suburban services could be provided to the heart of the CBD through to the North Shore.

Figure 4.8 Option 6 Customising services - HarbourLink Three Tier 2036

4.3.4 Customising services - West Link Three Tier

This option provides for differentiated services by converting some corridors to allow for high frequency services on some inner lines. It could involve construction of the CBD Extension and a second harbour crossing but compared to the HarbourLink Three Tier, the second crossing could support suburban services and maximise seating for longer trips. It could help facilitate urban renewal as well as connecting Penrith, Parramatta, the North West Growth Centre and Hills District to jobs.

Figure 4.9 Option 7 Customising services - West Link Three Tier 2036



4.3.5 The advantages of the options for customising services

The customised options tailor services and train types to suit customer preferences. Seats, express services and a reliable timetable could be provided for longer distances. Higher frequency services could be provided for shorter distances so that customers can turn-up-and-go without needing to check a timetable. Different rollingstock and new technologies for these services could allow easier and quicker boarding and disembarking from the train. Platform congestion could also be relieved as frequent services with standard stopping patterns mean passengers are not waiting long for their train. These options could also increase sectorisation of the network which simplifies network operation and separates the different services.

4.3.6 The disadvantages of the options for customising services

Less seats for shorter journeys could be provided by the customised options with more passengers required to stand although more comfortably than in existing double deck trains. In addition these options may require more interchanging by passengers between their origin and destination. There are also some operational and implementation risks to be managed before these draft options, which rely on heavier use of automated technologies, could be implemented.

4.4 Developing and evaluating the draft options

The seven options have been developed through an exhaustive five phase process that commenced with a review of options by RailCorp in 2009.

In Phase 1 of the process RailCorp identified 8 options and through an evaluation process narrowed these down to the Metropolitan Rail Expansion Program representing the suburban approach and the Three Tier Option representing the approach of customising services. These were further analysed in Phase 2, along with an option that included the then proposed CBD Metro. The analysis compared the options to a Base Case based on demand forecasts, customer implications and estimated costs.

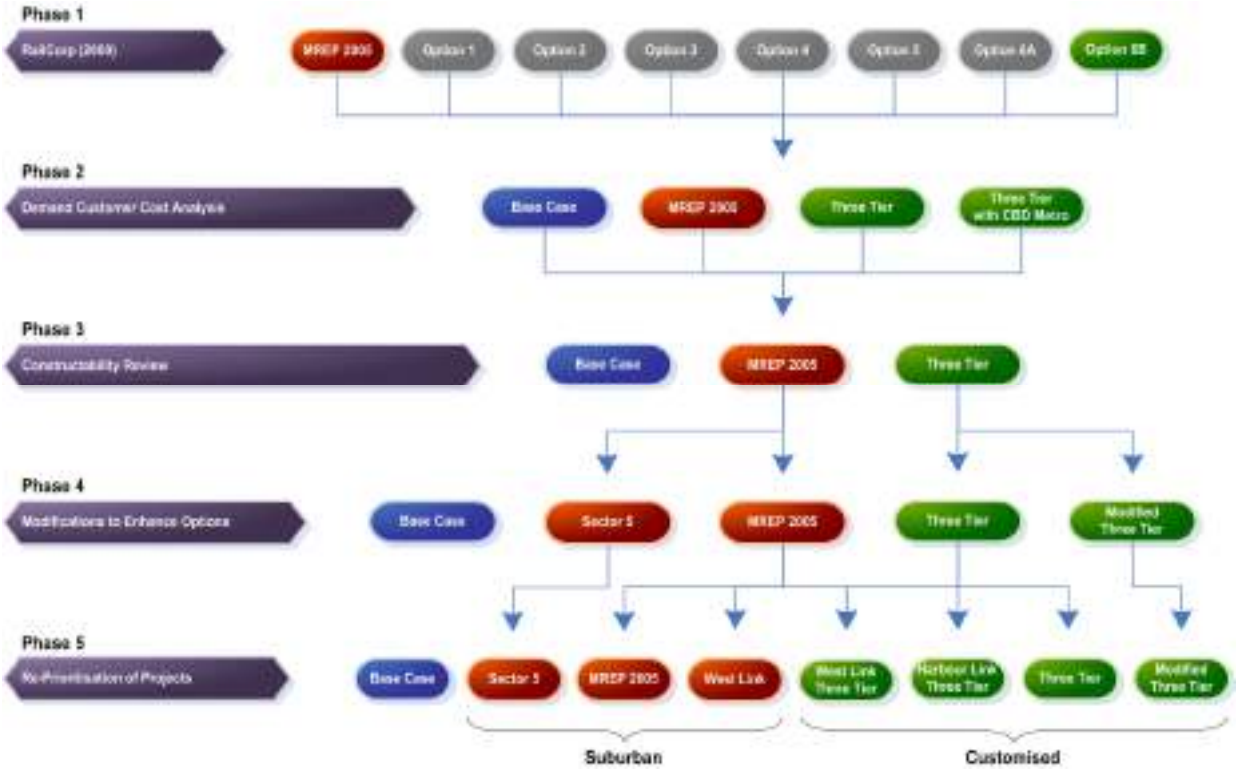
Phase 3 included a more detailed constructability review and analysis of the key options, which indicated that there were other options that should be considered – Sector 5 as a suburban approach and Modified Three Tier as an option for customising services.

Phase 4 consisted of a detailed analysis of the four options with respect to demand forecasts, customer implications, cost estimates, deliverability and operability, again compared to a base case. An outcome of the analysis was that there may be some benefits from options that combined the major features of both the suburban and customising services approaches – the additional harbour crossing which is featured in the suburban approach and the metro-style operations that feature in the customising services approach. These were developed into the West Link three Tier and the Harbour Link Three Tier options.

Phase 5 of the analysis process involved the most detailed analysis of all the phases, comparing seven options with a base case that included the re-prioritisation of projects by the new government. It is considered that these seven options represent the major viable variations available for either a suburban or customised approach.

The five phases are summarised in Figure 4.10.

Figure 4.10 Five phases and the options considered in each



The phase 5 evaluation framework consists of two primary forms of analysis:

- a Cost Benefit Analysis (CBA) or 'strategic economic analysis', and
- a Multi Criteria Analysis (MCA) or 'customer implications analysis'.

The CBA is being used to assess those costs and benefits that can be quantified while the MCA is being used to assess those costs and benefits that cannot be readily quantified within the timeframe of the assessment.

4.5 Possible staged delivery

The maps on the following pages provide indicative representations of changes to the network if some of the possible changes are made. These have been generated for five yearly intervals rather than firm dates for completion of specific projects.
Figure 4.11 illustrates completion of the SWRL. It will be constructed and open to customers in 2016, providing access to services for customers in Sydney's South West.

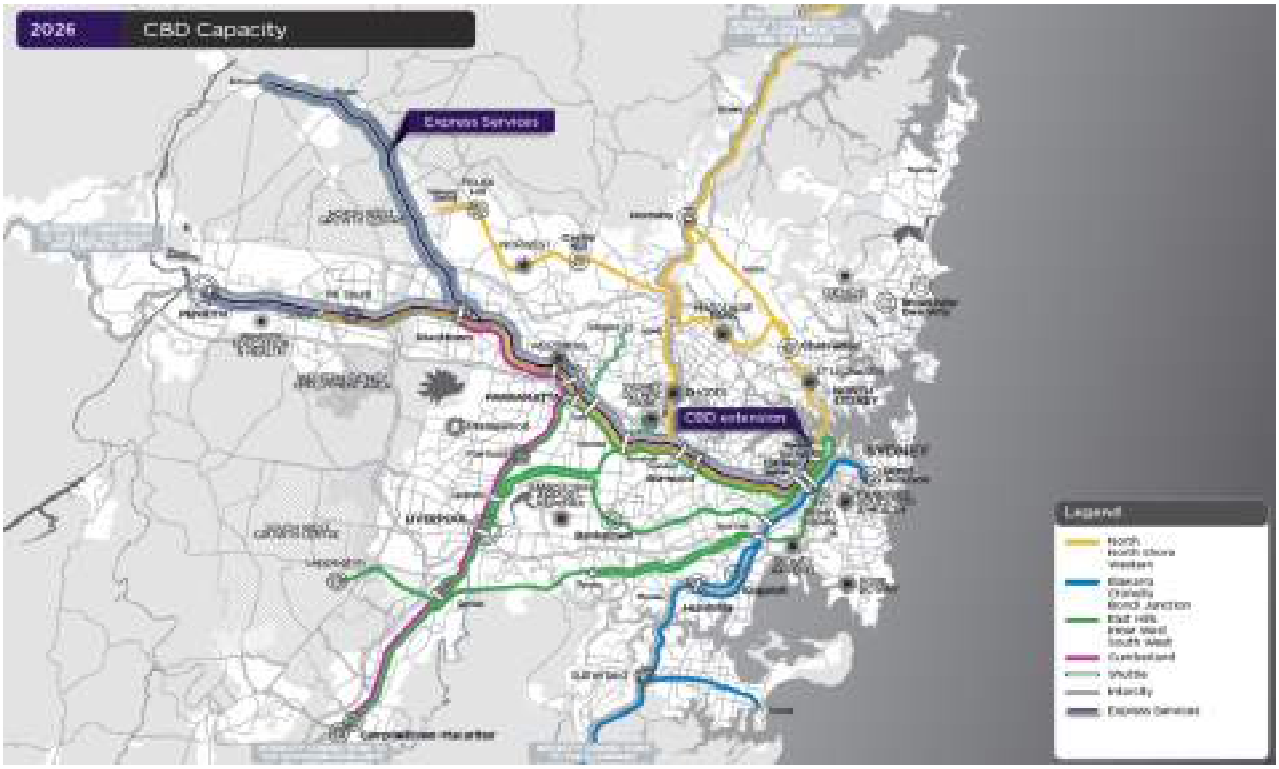
Figure 4.11 2016 South West Rail Link

By 2021, the North West Rail Link would have been completed. CBD efficiency measures could also be in place, as illustrated in Figure 4.12.

Figure 4.12 2021 North West Rail Link

Figure 4.13 illustrates the possible construction of a CBD Extension. This could enable Express Western Services to be offered on the Richmond line and to Blacktown and Penrith. This could free up capacity for improved services from Liverpool, Epping via Strathfield and Hurstville.

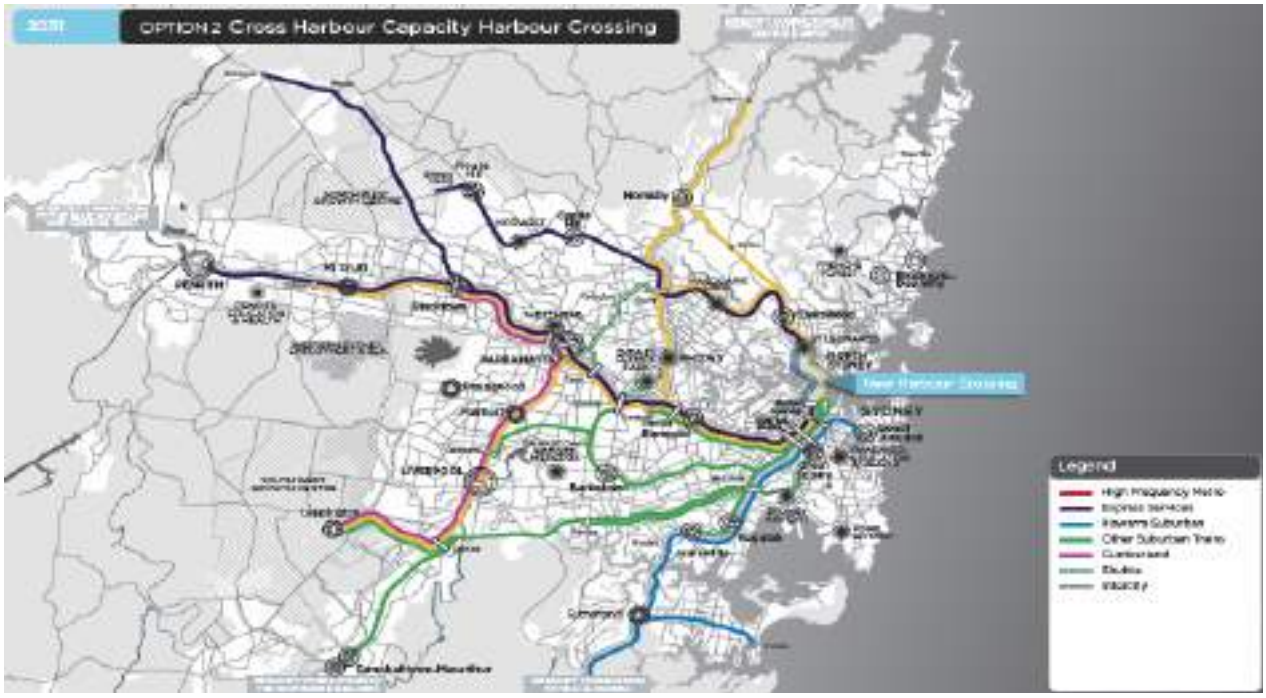
Figure 4.13 2026 CBD Capacity



By 2031, one of the primary challenges for the rail network will be meeting demand for cross-harbour trips. This could be addressed by either first introducing high frequency metro style services, or by extending the CBD Extension to deliver a second harbour crossing. These two options are not mutually exclusive and both could ultimately be delivered one after the other, in either order.

Figure 4.14 2031 Option 1 Cross Harbour Capacity Metro Services

Figure 4.15 2031 Option 2 Second Harbour Crossing



Many of the draft options, combined with South West Rail Link, North West Rail Link and the network efficiency program, will meet demand beyond 2036. However, analysis indicates that for some

corridors, such as the Main North line between Epping and Strathfield, capacity will be reached by or soon after 2036.

To meet demand in key transport corridors, a series of strategic corridors have been identified for future development as part of the whole transport network and are shown in Figure 4.16.

These corridors have the potential to transform Sydney's transport network from a radial system focused on the CBD, to a matrix which allows customers to interchange and move around the network with relative ease. Transport for NSW is conducting studies of demand and will determine future plans for these corridors. As demand requires, some of these corridors may become part of a future rail network, either integrated into the existing CityRail network or part of a stand-alone rail system. Some of these corridors may also attract investment prior to 2040 and not necessarily as rail corridors. For example, light rail may be investigated for the Eastern suburbs corridor. The identification of transformative corridors does not preclude these corridors from more immediate investments as needed.

Figure 4.16 Beyond 2040 Long term ideas

5 Next Steps

The Government has already committed to extending the network to through completion of the South West Rail Link and construction of the North West Rail Link. It is also investing in ongoing programs to maintain and upgrade rail network infrastructure and facilities so that the network is more accessible and convenient for customers.

Public release of these draft options, following Government consideration of them, will provide context for a public discussion and debate to help arrive at a preferred direction for the network for the next 25 years.

This direction will inform the Transport Masterplan to be developed in 2012. The Masterplan will guide important investment decisions for the future, including the types of rollingstock that will need to be designed and acquired in future, priorities for infrastructure investment and for adapting the existing network to expected future train patterns and use. All of these decisions have long lead times to implementation. For example, acquiring rollingstock with a completely new design has a seven year lead time and the rollingstock itself may have a 30 to 40 year service life.

The Government has established a new integrated transport authority, Transport for NSW. Transport for NSW is responsible for the co-ordinated delivery of transport across all modes and is charged with major procurement and long-term planning and policy. It will lead the development of the Transport Masterplan.

Appendix A Acronyms

ACT	Australian Capital Territory
ARTC	Australian Rail Track Corporation
ATO	Automatic Train Operation
ATP	Automatic Train Protection
CBD	Central Business District
ETCS	European Train Control System
MFN	Metropolitan Freight Network
NSW	New South Wales
NWRL	North West Rail Link
PERL	Parramatta Epping Rail Link
SWRL	South West Rail Link

Appendix B Glossary

Accessibility	The extent to which people have access to employment, goods and services, either through proximity or transport links to connect places.
Active transport	Walking, cycling and the use of other mainly human-powered transport including wheelchairs, strollers, scooters and power-assisted pedal cycles
Arterial road	Main roads that link centres that carry high volumes and generally form the main freight routes.
Automatic train operation	A system of controlling the movement of trains to optimise consistency in acceleration, speed and deceleration.
Automatic train protection	A system of controlling the movement of trains to ensure that trains do not exceed allowable speeds or enter a section of track too close to another train.
Blue Mountains	The local government area of The Blue Mountains City Council.
Central Coast	The local government areas of Gosford and Wyong.
CityRail	Provider of the passenger rail service covering suburban Sydney and extending to the Hunter, Central Coast, Blue Mountains, Southern Highlands and South Coast regions. Part of RailCorp.
CBD Extension	A new rail alignment that connects to the existing rail system south of or in the vicinity of Redfern and continues through the CBD terminating south of Sydney Harbour. Different street alignments (i.e. Metro Pitt or West) are sub options of a CBD Extension and the term is applicable to all scenarios requiring a new alignment through the CBD without or prior to a harbour extension.
Clearways	A number of projects to simplify the CityRail network to allow more reliable and frequent services, and to increase capacity for future growth.
Community transport	Programs that provide transport disadvantaged groups with access to services and social contact where conventional public transport systems are not generally viable or appropriate.
Corridor	A broad geographic area or band, that follows a general directional flow - essentially a linear transportation service - connecting major sources of trips (e.g. urban centres; flow of people, goods and services). Some corridors are vacant and remain proposed for future transport uses.
CountryLink	Provider of passenger rail and some bus services outside the CityRail network in regional NSW. Part of RailCorp.
Electronic ticketing scheme	Technology that allows for the electronic payment and distribution of passenger revenue for public transport. The provision of electronic ticketing will deliver an integrated ticketing policy
Global Economic Corridor	The part of Sydney stretching from Sydney Airport and Port Botany through Sydney City and North Sydney to Chatswood and Macquarie Park.
Greenfield	Undeveloped land on the urban fringe that is potentially suitable for future urban development.
Growth Centre	A Growth Centre is an area that has been designated for significant

	growth over the next 25 to 30 years. For example, the North West and South West Growth Centres are areas in Sydney which over the next 25 to 30 years will accommodate 181,000 new homes and employment for around half a million new residents.
Harbour Extension	The Harbour Extension is essentially a second Sydney Harbour crossing. The Harbour Extension involves extending the CBD Extension north across Sydney Harbor. When the Harbour Extension is complete, along with the CBD Extension, it will be referred to as the Harbour Rail Link.
Harbour Rail Link	A description of a line from Redfern or further south to north of Sydney Harbour. A single introduction of such a line should be referred to as a Harbour Rail Link. Should a Harbour Extension be added to a CBD Extension, the combination will be referred to as a Harbour Rail Link.