



Australian Government
Department of Infrastructure,
Regional Development and Cities



Western Sydney Rail Needs Scoping Study

OUTCOMES REPORT



MARCH 2018



Western Sydney Rail Needs Scoping Study

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| | |
|---|-----------|
| 1. EXECUTIVE SUMMARY | 4 |
| 2. ABOUT THIS REPORT | 14 |
| 3. ABOUT THE SCOPING STUDY | 15 |
| 3.1 About this chapter | 15 |
| 3.2 Why a Scoping Study? | 15 |
| 4. COMMUNITY AND INDUSTRY CONSULTATION | 23 |
| 4.1 About this chapter | 23 |
| 4.2 Initial rail options for consultation | 23 |
| 4.3 Community and industry views | 26 |
| 5. WESTERN SYDNEY IS GROWING AND CHANGING | 30 |
| 5.1 About this chapter | 30 |
| 5.2 Population growth | 30 |
| 5.3 Jobs growth | 32 |
| 5.4 Key Australian and NSW government policy objectives | 34 |
| 6. GROWING TRANSPORT DEMAND IN WESTERN SYDNEY | 39 |
| 6.1 About this chapter | 39 |
| 6.2 Addressing transport demand in Western Sydney | 39 |
| 7. RAIL DEMAND AT WESTERN SYDNEY AIRPORT | 49 |
| 7.1 About this chapter | 49 |
| 7.2 The airport will grow with demand | 49 |
| 7.3 Low demand for rail to airport on opening | 51 |
| 8. THE LONG-TERM PREFERRED NETWORK | 54 |
| 8.1 About this chapter | 55 |
| 8.2 The long-term Preferred Network | 55 |
| 8.3 Rail links connecting to Western Sydney Airport | 55 |
| 8.4 Rail links supporting growth in Western Sydney and travel to Western Sydney Airport | 57 |
| 8.5 The rail services connecting to other parts of Greater Sydney | 59 |
| 8.6 Benefits of the Preferred Network | 60 |
| 8.7 How much would the Preferred Network's rail links cost to deliver? | 63 |
| 8.8 How options were assessed | 65 |
| 8.9 How soon can the airport links be delivered? | 68 |

| | |
|--|-----------|
| 9. HOW COULD THE PREFERRED NETWORK BE FUNDED? | 70 |
| 9.1. About this chapter | 70 |
| 9.2. Considering the large costs of rail projects | 70 |
| 9.3. Could the Preferred Network be funded by the government alone? | 70 |
| 9.4. The funding options | 70 |
| 10. FINDINGS AND RECOMMENDATIONS | 72 |
| 10.1. About this chapter | 72 |
| Finding 1 | 72 |
| Finding 2 | 73 |
| Finding 3 | 74 |
| Finding 4 | 75 |
| Finding 5 | 76 |
| Finding 6 | 77 |
| A. ACRONYMS AND DEFINITIONS | 79 |
| B. SUMMARY OF COMMUNITY AND STAKEHOLDER ENGAGEMENT ACTIVITIES | 82 |
| C. ALTERNATE OPTIONS | 84 |

1. EXECUTIVE SUMMARY

The Australian and NSW governments undertook a joint Western Sydney Rail Needs Scoping Study (the Scoping Study) to determine the long-term need, timing and service options for passenger rail to service both Western Sydney and Western Sydney Airport.

The Scoping Study has been a collaboration between the Australian Government's Department of Infrastructure, Regional Development and Cities and the NSW Government's Transport for NSW.

Purpose of the Scoping Study

The purpose of the Scoping Study was to investigate the economic, demographic and commercial drivers for various passenger rail connections, travel speeds and service types in the region.

The Scoping Study was required to address two separate but inter-connected questions:

- What are the rail needs for Western Sydney as a whole, including connectivity within Western Sydney and connectivity from Western Sydney to the rest of the city?
- What are the best options for providing rail network connectivity to Western Sydney Airport?

The Scoping Study was also asked to assess if and how passenger rail services could be provided for Western Sydney Airport when it opens in 2026 or, if not, how soon after the commencement of airport operations.

Consultation

A key component of the Scoping Study has been engagement through community consultation, industry engagement and stakeholder meetings.

Community consultation was undertaken during late 2016 and was supported by a discussion paper, a dedicated website and local events. More than 1,000 responses were received through the public consultation process, including around 120 written submissions.

A separate process was also established for industry engagement, including a separate briefing paper and industry forum for industry organisations, potential investors and local government.

A stakeholder reference group was established to provide guidance and feedback during the development of the Scoping Study. This group included representatives from business and community organisations, councils and government agencies. Meetings were held between late 2016 and mid-2017.

Key themes from the stakeholder engagement included:

- the current inability to travel easily and quickly between the growth precincts of Western Sydney is a deterrent to the use of public transport
- lack of connectivity within the region and long journey times by public transport encourage many to use their private car on a daily basis to reach their destinations.

Stakeholders also proposed a range of potential solutions to address these challenges. Most responses from stakeholders proposed the following solutions:

- a north-south link connecting Western Sydney to the new airport
- an east-west link connecting Western Sydney Airport with Greater Parramatta and the Sydney CBD
- increasing the capacity of the existing network
- a new rail line from Greater Parramatta to the Sydney CBD.

Feedback from stakeholders also identified additional rail options for consideration during the study process, including different options for rail interchanges and extensions of rail lines to new locations.

Western Sydney is growing

Delivering appropriate transport infrastructure at the right time will be essential to meet the needs of Western Sydney residents and workers now and into the future. It is important to consider all modes of transport and how they can work together to provide transport that works well for Western Sydney and that provides value for money to the taxpayer.

With a population of two million people, Western Sydney is expected to grow by a further one million by the early 2030s. Population densities are also expected to increase significantly across Greater Sydney's west and southwest areas including Blacktown, Greater Parramatta, Bringelly, Campbelltown and Liverpool. New land releases and urban renewal will also increase demand for services to support Western Sydney's growing population.

This growth will place increased pressure on Greater Sydney's transport network, including key rail lines that support travel across the region. Demand for rail services on the T1 Western & Richmond Line, from Penrith to Greater Parramatta and Sydney CBD, is forecast to increase by 57 per cent by 2056. Demand on the T8 Airport & South Line from Greater Sydney's southwest will increase by 119 per cent by 2056. These lines, which are already operating at close to capacity, will not cope with this level of passenger growth.

Western Sydney also has significantly more residents than jobs, which means about 300,000 Western Sydney residents currently travel outside the region to work or study.

There are a number of emerging opportunities for increasing both the number and diversity of jobs offered in Western Sydney, within the South West Growth Area, at Western Sydney Airport and in the Badgerys Creek Aerotropolis that will surround the future airport. However, demand for travel outside of the region is expected to continue into the longer term.

A rail line in Western Sydney would improve access to employment. Rail links, delivered alongside complementary land use planning, can provide local jobs in new and existing centres based upon increased transport accessibility.

Western Sydney Airport will start operations in 2026

The Australian Government announced that Badgerys Creek would be the site for Western Sydney Airport in 2014. The airport will create more jobs closer to home and bring new industries to Western Sydney it will also ensure the growing population and local businesses have access to the domestic and international aviation network.

In May 2017, the Australian Government announced that it will invest up to \$5.3 billion to establish WSA Co to build and operate Western Sydney Airport. The first construction on the airport will be the early earthworks and WSA Co expects this to commence before the end of 2018, with operations to start in 2026. The airport will initially have a single 3.7 kilometre runway and will be a full-service airport capable of handling the full range of international, domestic and freight aircraft.

The airport is expected to serve approximately 10 million passengers a year within five years after opening. As it grows over time, a second runway will be needed when demand approaches around 37 million passengers a year, which is expected around 2050. Around 2063, Western Sydney Airport could cater to approximately 80 million people per year.

Planning for the Western Sydney Airport site includes safeguarding space for future rail stations and has identified a rail corridor through the airport site. This corridor can cater for up to two independent rail lines (including up to four lines of track).

The airport will be rail ready when it opens.

Western Sydney Airport will be supported by ground transport options when it opens

The Australian and NSW governments recognise that a rail connection for Western Sydney Airport will be needed at the right time, alongside a range of other transport connections. Rail connections to Western Sydney Airport in the long-term will support airport passengers and workers' travel to the airport, reduce road congestion and support economic growth in the region.

There is likely to be weak demand for a rail link to Western Sydney Airport in its early years of operations. Based upon expected aviation patronage of Western Sydney Airport and research of international and Australian rail links to airports, projections suggest that there will be insufficient demand from the airport alone for a rail link in its early years. Rail to support the passengers and workers of Western Sydney Airport is not needed for at least its first decade of operations. However, a rail line that supports the growth of Western Sydney could be economically viable sooner.

In the early years of airport operations, road transport links will be important in providing connectivity for Western Sydney Airport customers and workers.

The Western Sydney Infrastructure Plan will support growth in the region and Western Sydney Airport in its early years

The Australian and NSW governments have partnered to deliver the Western Sydney Infrastructure Plan, a \$3.6 billion road investment program for Western Sydney. The plan includes road upgrades required to support Western Sydney's growth and the demand for travel to and from Western Sydney Airport during its early years of operation. This plan includes upgrades to The Northern Road and Bringelly Road, as well as the new M12 Motorway to link the airport to Sydney's motorway network.

The Western Sydney City Deal will help transform Western Sydney

The Australian and NSW governments are working with the eight Western Sydney local councils that make up the Western City District on the development of a Western Sydney City Deal.

The City Deal brings together all levels of government in a collaborative partnership to set the right conditions for growth.

The City Deal represents a collective program of planning, reform and investment that will help transform Sydney's outer west – stimulating jobs growth, tackling housing affordability and connectivity within and out of the region.

Developing the 'three cities' vision for Greater Sydney

The Greater Sydney Commission's vision for Greater Sydney is a metropolis of three distinct cities: the Eastern Harbour City (centred around the Harbour CBD), the Central River City (centred around Greater Parramatta) and the Western Parkland City (centred around Western Sydney Airport). This vision is further defined in the Future Transport 2056 draft strategy and the Greater Sydney Commission's draft Greater Sydney Region Plan.

The growth of Greater Sydney, in particular its Western Parkland City centred around Western Sydney Airport and the Badgers Creek Aerotropolis, has been considered in the development of the Scoping Study.

Rail can shape the growth of Western Sydney

Mass transport corridors such as rail could provide significant potential to shape or reshape how Greater Sydney functions. Rail corridors can strengthen the local and national economy and increase connectivity to key centres, improving the city's liveability for local residents.

The future of road and rail services in Western Sydney will influence how the Western Parkland City grows and offers an opportunity to shape the development of the city around its transport network. The provision of rail in Western Sydney will cater for the forecast population growth, offer opportunities for the development of increased housing supply, increase access to jobs and provide the necessary transport infrastructure to support the growth of the region over the coming decades. A rail line in Western Sydney can also improve access to employment by connecting local jobs based around new and existing centres with increased accessibility.

A city shaping rail link, designed in coordination with the Western Sydney City Deal and the planning work being undertaken for the Western Parkland City by the Greater Sydney Commission and the NSW Department of Planning and Environment, has the potential, if staged, to be economically viable around the time that Western Sydney Airport opens in 2026.

The Scoping Study has identified a long-term rail network for Western Sydney

A preferred long-term rail network (the Preferred Network for Western Sydney) has been identified, which balances the needs of the region with the needs of Western Sydney Airport. The Preferred Network provides a blueprint for expanding and enhancing rail services in Western Sydney over the coming decades.

The Preferred Network aligns with the Future Transport 2056 draft strategy and the Greater Sydney Commission's draft Greater Sydney Region Plan. The study outcomes have also informed discussions on the development of the Western Sydney City Deal.

Given the significant government funding that would be required to invest in new rail projects, the potential of each rail link identified in the Preferred Network should be explored through a business case assessment before progressing to construction. This is important as transport technology and transport network demands will evolve over time.

Key components of the Preferred Network, shown in Figure 1, are detailed below.

North-South Link via Western Sydney Airport to shape the future Western Sydney

A North-South Link between Schofields and Macarthur via Western Sydney Airport and a Badgerys Creek Aerotropolis interchange located to the south of the airport would improve rail connectivity and support city shaping objectives across Western Sydney.

This city shaping rail link would support the establishment of the Western Parkland City and help unlock housing opportunities in emerging growth areas of Western Sydney. The North-South Link would also connect Western Sydney Airport to local residents in the region, who will be the primary users of the airport in its early years of operation. Rail connecting Western Sydney could offer opportunities to stimulate local growth and connectivity within the region.

The Scoping Study has identified that a separated metro or light metro style of train would suit a North-South Link (see Section 8.8.2 for further details on train types). Metro or light metro trains could meet the growing needs of commuters in Western Sydney whilst also providing the opportunity to customise trains suitable for airport passengers with luggage.

A full North-South Link would cost an estimated **\$15-20 billion (2017 dollars)**. The Scoping Study recommends further assessment through the development of a business case by governments.

Using standard growth forecasts for Western Sydney, the North-South Link would be economically viable in the 2030s. However, the development of Western Sydney Airport and the city shaping planning work being undertaken by the NSW Department of Planning and Environment in collaboration with the Greater Sydney Commission are driving population and economic growth in the region, which could see the rail link become economically viable earlier.

To further improve its economic viability, a full North-South Link could be built in stages as Western Sydney continues to grow and demand from Western Sydney Airport increases. Badgerys Creek Aerotropolis to St Marys via the Western Sydney Airport would be a suitable first stage, with a subsequent extension to Schofields. This is due to the greater population densities in that region and the potential to connect to the Sydney Metro Northwest to increase accessibility to key centres in Sydney's north.

East-West Link to Greater Parramatta via Western Sydney Airport to connect the three cities

An East-West Link to connect Greater Sydney's 'three cities', would provide rail connectivity between the Western Parkland City, the Central River City and the Eastern Harbour City.

This East-West Link would support urban and airport passenger needs by connecting Western Sydney and Western Sydney Airport with key urban growth areas and strategic centres across Greater Sydney. The Scoping Study identifies that the East-West Link could be serviced by a rapid metro style of train that delivers a competitive journey time between the three cities and also provides the opportunity to customise trains suitable for airport passengers with luggage (see Section 8.8.2 for further details on train types). A rapid metro train would have greater benefits than an express airport customer-oriented train, as it would stimulate employment within the Western Parkland City, provide greater network capacity and connect more people in Western Sydney by providing additional stops along its route.

An East-West Link from a transport interchange located south of Western Sydney Airport within the Badgerys Creek Aerotropolis, to the airport and onto Greater Parramatta would cost an estimated **\$12-15 billion (2017 dollars)**. The Scoping Study recommends further assessment through the development of a business case by governments.

This link is expected to be economically viable in the 2030s. A direct connection between the three cities that removes the need to change trains at Greater Parramatta increases the economic viability of the East-West Link. This direct link could be delivered as an extension of the NSW Government's Sydney Metro West project from the Harbour CBD to Greater Parramatta. Sydney Metro West is already in detailed planning by the NSW Government and could be delivered in the late 2020s, subject to the results of its business case.

Rail links that support growth in Western Sydney and the airport

The Scoping Study has identified a range of other rail links that could support the growth of Western Sydney and also support access to Western Sydney Airport through the two direct rail links, the North-South Link and the East-West Link.

Sydney Metro West between Greater Parramatta and the Harbour CBD would support connectivity between the three cities, as well as provide congestion relief to the existing network. The East-West Link from Greater Parramatta to Western Sydney Airport and the Badgerys Creek Aerotropolis interchange could be an extension of Sydney Metro West.

An extension of the existing line from Leppington to the Badgerys Creek Aerotropolis interchange, connecting with the North-South Link and East-West Link, would provide extra connectivity across the south-west. This South West Link from Leppington to the Badgerys Creek Aerotropolis interchange would cost up to **\$2 billion (2017 dollars)**. Extending the South West Link from Leppington to Western Sydney Airport would cost **\$6 billion (2017 dollars)**. Under existing land use projections, this link is not required in the short-term as it does not provide immediate benefits for the rail network and is not preferred by the Scoping Study as a direct connection to Western Sydney Airport.

An extension of Sydney Metro Northwest from its current end at Cudgegong Road to Schofields would also support the North-South Link, connecting Western Sydney to jobs and major centres in Greater Sydney's north.

Rail links better connecting Western Sydney with Greater Sydney

Network upgrades and extensions have been identified across the existing rail network to increase public transport capacity between Western Sydney and Greater Sydney. These links would provide additional capacity and connectivity across the Western Parkland City and to the Harbour CBD.

Next steps

Before delivering projects identified in the Preferred Network for Western Sydney, governments will need to continue project development and business case investigations, which include: investigation of staging and station location options

- consideration of opportunities across Western Sydney to support long-term planning for housing and employment
- analysis of detailed transport demand
- assessment of detailed economic benefits and value sharing opportunities
- refinement of cost estimates based upon engineering work required for a preferred type of rail service, such as rapid metro or light metro.

Given the significant government funding that would be required to construct any rail projects identified in the Preferred Network, the potential of each project should be explored further through business case assessments to ensure that any project delivers value for money. These projects would also be subject to funding approval prior to construction.

These new rail links would also be considered as part of an integrated planning and city shaping approach.

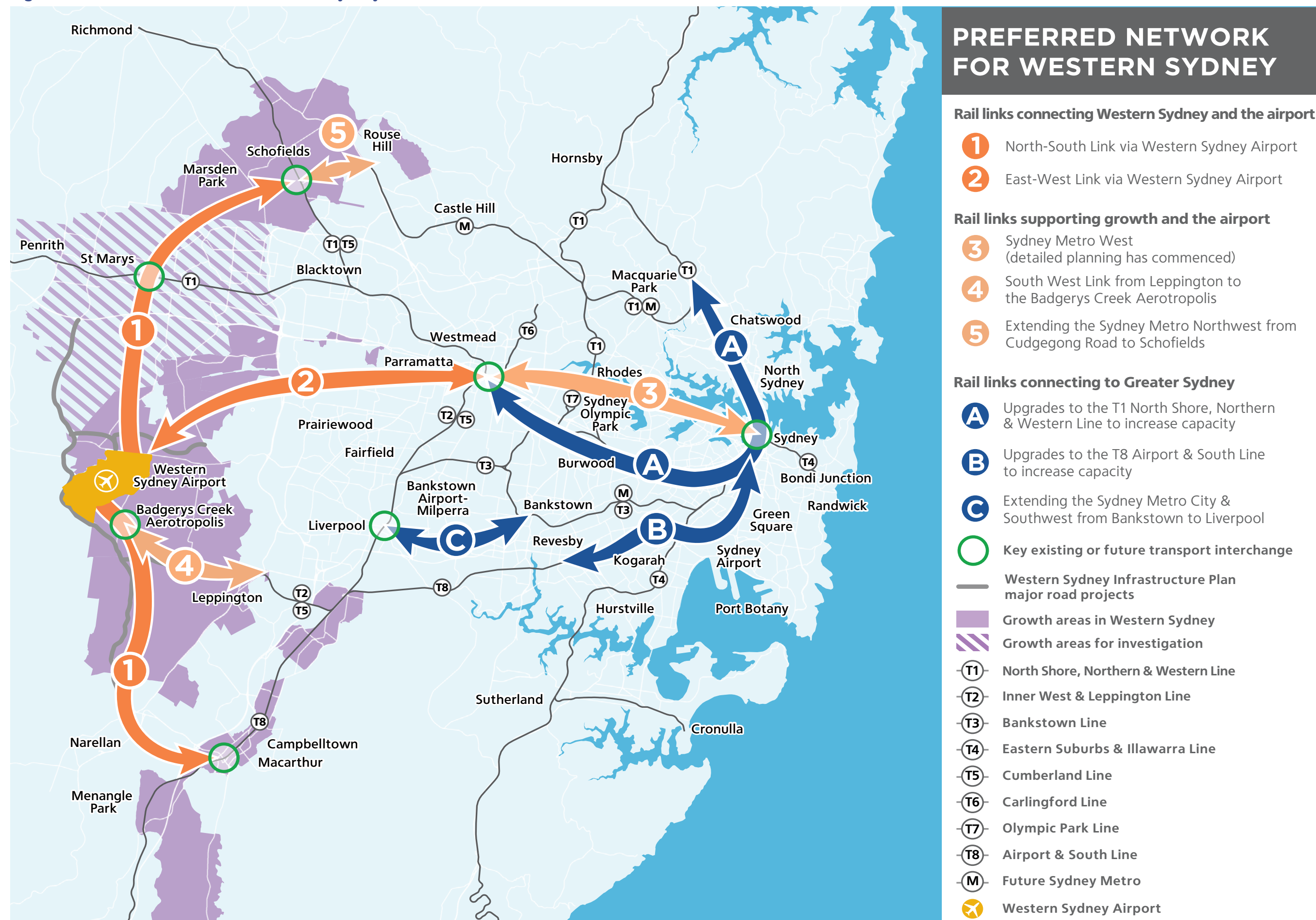
Protecting land for future rail corridors in Western Sydney will be critical to implementing the Preferred Network. Corridor protection is a key recommendation of the Scoping Study.

The community will continue to be involved as governments plan for Western Sydney's rail future.





Figure 1 The Preferred Network for Western Sydney



SUMMARY OF FINDINGS AND RECOMMENDATIONS

The following is a summary of the findings and recommendations of the Scoping Study for further consideration by governments. These are further detailed in Chapter 10.

Finding 1

There is an urgent need to strengthen capacity and manage growing transport demand between Western Sydney and the Harbour CBD

Recommendations

- 1.1 Accelerate short to medium-term capacity enhancements to the existing rail network.
- 1.2 Progress the development of Sydney Metro West to increase existing rail capacity.
- 1.3 Extend Sydney Metro Northwest from Cudgegong Road to Schofields.
- 1.4 Augment the capacity of the T8 Airport & South Line to enable increased services from Greater Sydney's southwest.
- 1.5 Investigate measures to encourage the spreading of demand across the peak period.
- 1.6 Continue to monitor the need for station upgrades to cater for continued growth in station passenger demand.
- 1.7 Investigate and implement policy measures to increase travel within Western Sydney and reduce travel outside of Western Sydney.

Finding 2

A North-South Link could be a game-changer for Western Sydney

Recommendations

- 2.1 Commence the business case process for the North-South Link, including options for staging its delivery and integrating with other modes.
- 2.2 Protect the corridor between Schofields and Macarthur.

Finding 3

There are strong economic grounds for an East-West Link which will connect the three cities and support a broader Western Sydney Airport catchment

Recommendations

3.1 Commence the business case process for a rapid metro connection between Greater Parramatta and Western Sydney Airport, including the preferred route, station locations and operating strategy.

3.2 Protect the corridor between the Badgerys Creek Aerotropolis and Greater Parramatta via Western Sydney Airport.

Finding 4

Protecting the South West Link corridor from Leppington to the Badgerys Creek Aerotropolis interchange, south of Western Sydney Airport, would support growing communities in the south-west

Recommendations

4.1 Protect the corridor between Leppington and Badgerys Creek Aerotropolis and consider alternative modes and staging through a business case process.

Finding 5

Rail could play an important role in shaping Western Sydney, but it is not essential to the success of Western Sydney Airport at opening in 2026

Recommendations

5.1 Continue to plan for rapid bus and coach services to Western Sydney Airport from key Western Sydney centres.

5.2 Consider the findings of this report to inform the nature and timing of rail infrastructure enabling works on the Western Sydney Airport site.

Finding 6

The high cost of the Preferred Network's individual links will require a range of funding approaches to improve affordability

Recommendations

6.1 Ensure value-sharing mechanisms are in place and communicated to land owners before confirming station locations.

6.2 Market testing of station location options and timing should occur with industry and major landowners to determine appetite for contributions to the project.

6.3 Value sharing mechanisms to be considered as part of business cases.

6.4 Consider implementing value-sharing mechanisms early.

6.5 Investigate additional revenue measures to reduce projected financial deficit.

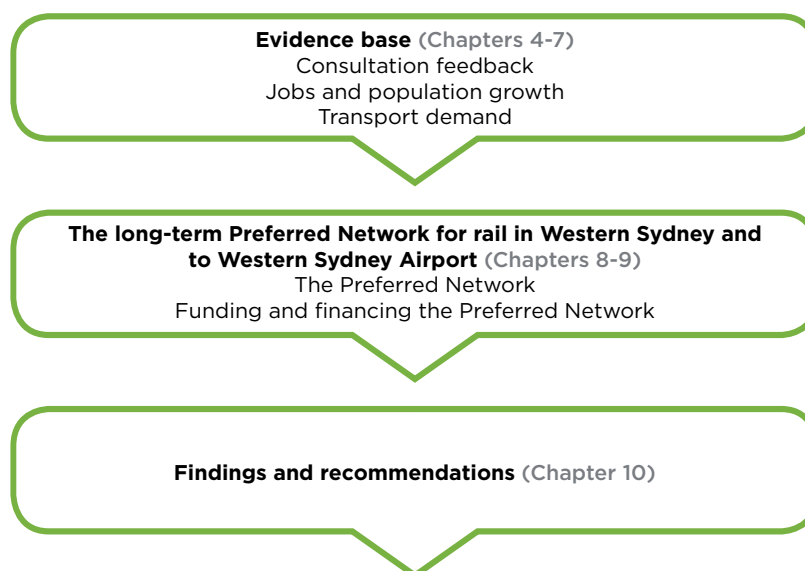
2. ABOUT THIS REPORT

This report presents the results of the Scoping Study, which was a collaboration between the Australian Government's Department of Infrastructure, Regional Development and Cities and the NSW Government's Transport for NSW.

This report describes:

- Why the Scoping Study was initiated (Chapter 3)
- Community and industry consultation (Chapter 4)
- Growth and change in Western Sydney (Chapter 5)
- Transport demand in Western Sydney (Chapter 6)
- Rail demand at Western Sydney Airport (Chapter 7)
- A long-term Preferred Network for rail in Western Sydney and to Western Sydney Airport (Chapter 8)
- How the Preferred Network will be funded (Chapter 9)
- Key findings and recommendations (Chapter 10)

Figure 2 Report logic



3. ABOUT THE SCOPING STUDY

The Australian and NSW governments are planning for rail in Western Sydney and to Western Sydney Airport.

3.1 About this chapter

This chapter explains why the Australian and NSW governments initiated the Scoping Study and what it set out to achieve.

3.2 Why a Scoping Study?

The Australian and NSW Governments initiated the Scoping Study to better understand the long-term passenger rail needs of Western Sydney and Western Sydney Airport.¹ One of the Scoping Study's key questions is whether it is feasible to deliver rail services to Western Sydney Airport when it opens in 2026.

The outcome of this study is the identification of a preferred long-term rail network (the Preferred Network) for Western Sydney, which balances the needs of the region with the needs of Western Sydney Airport. The Preferred Network, presented in this report and its associated costs, will need to be carefully considered by governments before decisions are taken.

The long-term Preferred Network aligns with the NSW Government's Future Transport 2056 draft strategy and the Greater Sydney Commission and NSW Department of Planning and Environment's planning work for Western Sydney.

Figure 3 Stages in the development of the Scoping Study



¹ The focus of this study was passenger rail requirements for Western Sydney. Freight requirements for Western Sydney are being considered separately by the NSW Government.

Why the Scoping Study identifies a Preferred Network for rail

The key outcome of the Scoping Study is a Preferred Network that offers a vision for expanding and enhancing rail services in Western Sydney over the coming decades. The Preferred Network includes multiple new and enhanced rail links that will help to improve people's access to jobs, housing, services and Western Sydney Airport.

Importantly, the Preferred Network recognises that new rail services cannot be delivered in isolation from the rest of the transport network. This is why each of the Preferred Network's individual rail links will work in combination with each other and with the existing rail network. The Preferred Network is described in Chapter 8.

How does the Preferred Network align with the NSW Government's Future Transport 2056 draft strategy?

In 2016, the NSW Government commenced the development of the Future Transport 2056 draft strategy, which provides a 40-year transport vision for NSW, including the Greater Sydney region. The long-term Preferred Network identified in the Scoping Study aligns with the Future Transport 2056 draft strategy.

In order to align the Scoping Study with the Future Transport 2056 draft strategy, the NSW Government, in agreement with the Australian Government, determined that:

- rail connections that support Western Sydney Airport should be further explored in the Scoping Study
- rail connections between Western Sydney and Greater Sydney are examined in further detail by the Future Transport 2056 draft strategy.

The relationship between the Future Transport 2056 draft strategy to the Scoping Study is described in further detail in Section 5.4.3.

About Western Sydney Airport

The Australian Government announced that Badgerys Creek would be the site for Western Sydney Airport in 2014. The airport will create more jobs closer to home and bring new industries to the area and will ensure the growing population and local businesses have access to the domestic and international aviation network.

The airport will initially have a single 3.7 kilometre runway and will be a full-service airport capable of handling the full range of international, domestic and freight aircraft.

Western Sydney Airport will be developed in stages and expand to cater for the growing Western Sydney economy and population. Around five million people are expected to use the airport in its first year of operation, which is about the same number of annual passengers currently using Gold Coast Airport. Based on growth projections, Western Sydney Airport will cater to about 37 million annual passengers by around 2050, almost the same number of annual passengers using Sydney (Kingsford Smith) Airport today. In the long-term, Western Sydney Airport could cater for approximately 80 million passengers per year.

The airport will primarily serve the residents of Western Sydney from opening. As Sydney (Kingsford Smith) Airport reaches capacity, the importance of Western Sydney Airport as an airport that serves the rest of Greater Sydney will grow.

The Australian Government is planning for rail through the airport site

Planning for Western Sydney Airport includes safeguarding space for future stations and has identified a rail corridor on the airport site. This corridor can cater for up to two independent rail lines (four lines of track).

WSA Co

In May 2017, the Australian Government announced that it will invest up to \$5.3 billion to establish WSA Co to build and operate Western Sydney Airport. WSA Co, established in August 2017, is responsible for the design, construction and operation of the airport. The first construction on the airport will be the early earthworks and WSA Co expects this to commence before the end of 2018, with operations to start in 2026.

Greater Sydney Commission's vision for three cities

The Greater Sydney Commission is leading metropolitan planning to make Greater Sydney more productive, sustainable and liveable. Its role is to coordinate and align the strategic land use planning that will shape the future of Greater Sydney.

The Greater Sydney Commission is working towards developing Greater Sydney as a metropolis of three cities. This concept would see the development of three distinct cities of Greater Sydney – the Eastern Harbour City (centred around the Harbour CBD), the Central River City (centred around Greater Parramatta) and the Western Parkland City (centred around

Western Sydney Airport, the Badgerys Creek Aerotropolis and the surrounding areas of Camden, Campbelltown, Liverpool and Penrith). This is further discussed in Section 5.4.2.

These three cities will have different strengths and are at different stages of their evolution. The growth of Greater Sydney and especially the Western Parkland City, has been considered in the Scoping Study. Population and employment changes considered in the long term assessment of rail links were developed in consultation with the Greater Sydney Commission and the NSW Department of Planning and Environment and utilised the best information available at the time.

Figure 4 Summary map of the draft Greater Sydney Region Plan



Source: Greater Sydney Commission, Draft Greater Sydney Region Plan

The Badgerys Creek Aerotropolis

An aerotropolis is a metropolitan sub-region, with commercial, logistics, industrial and residential clusters centred around an airport.

Badgerys Creek Aerotropolis, the airport city, will be located within a precinct south-east of the Western Sydney Airport (at Badgerys Creek) and will feature trade, logistics, advanced manufacturing, defence, health, education and technology industries in connected precincts. Western Sydney Airport and the Badgerys Creek Aerotropolis will create a once-in-a-generation economic boom and an opportunity to connect the Western Parkland City with the world, delivering jobs and education opportunities for the community.

The development of Western Sydney Airport will drive economic change in Western Sydney, including though the establishment of a Badgerys Creek Aerotropolis. The successful development of Western Sydney Airport must remain a central objective of governments to ensure the effective growth of the Badgerys Creek Aerotropolis.

A rail interchange located to the south of the airport – within the Badgerys Creek Aerotropolis – would be part of new rail links across Western Sydney. These new rail links will help to ensure the airport's ability to catalyse economic growth in Western Sydney.

Land use and infrastructure planning for the Badgerys Creek Aerotropolis is being carried out across governments.

3.2.1 Scoping Study objectives

The Scoping Study's objectives were drawn from the Australian and NSW governments' published goals for Western Sydney, including A Plan for Growing Sydney and Sydney's Rail Future. The objectives also considered the draft Airport Plan for Western Sydney Airport, which was subsequently determined by the Minister for Urban Infrastructure in December 2016, authorising the development of Stage 1 of the airport.

The objectives have evolved as the Scoping Study has progressed over time to incorporate Australian and NSW government initiatives such as the Greater Sydney Commission and the NSW Department of Planning and Environment's strategic planning work for Western Sydney and the development of the Western Sydney City Deal.



Table 1 Scoping Study objectives

| Objective | Description | Criteria |
|-------------------------------------|---|--|
| Customer Focus | Deliver high-quality, customer-focused services that prioritise frequency, journey time and reliability | <ul style="list-style-type: none"> • Frequency • Reliability • Journey time |
| Connectivity | Develop a rail network that equitably improves access for Western Sydney to services and opportunities, connecting where people live to key destinations for work, education, health and lifestyle | <ul style="list-style-type: none"> • Increases connections between homes and centres • Increases connections between centres and Western Sydney Airport • Supports the 30-minute city objective |
| City shaping | Support Western Sydney's long-term housing needs and shape the location of housing and employment, particularly knowledge-intensive jobs, to achieve more efficient economic development and access to housing choice | <ul style="list-style-type: none"> • Increases housing within station catchments • Increases in number of jobs within rail corridors • Opportunities for land use change to support new knowledge and innovation employment |
| Network Capacity | Provide the capacity and flexibility required to cater for predicted demand and to shape Greater Sydney's growing demand for transport | <ul style="list-style-type: none"> • In-vehicle capacity (the number of people who can comfortably travel in each carriage) • Station capacity • Train-path capacity |
| Environmental Sustainability | Grow the proportion of travel by sustainable modes, ease congestion and improve asset utilisation and energy efficiency | <ul style="list-style-type: none"> • Grow the proportion of travel by rail • Contribute to improving the energy efficiency of the transport sector |
| Productivity | Contribute to and facilitate the sustainable and efficient economic development of Greater Sydney's metropolitan region and Western Sydney Airport | <ul style="list-style-type: none"> • Reduce travel time to knowledge hubs and high-productivity centres • Facilitate increased freight on rail |
| Social Inclusion | Support Western Sydney communities through providing more transport choice and opportunities to contribute to society | <ul style="list-style-type: none"> • Increase accessibility to high-value employment and education |

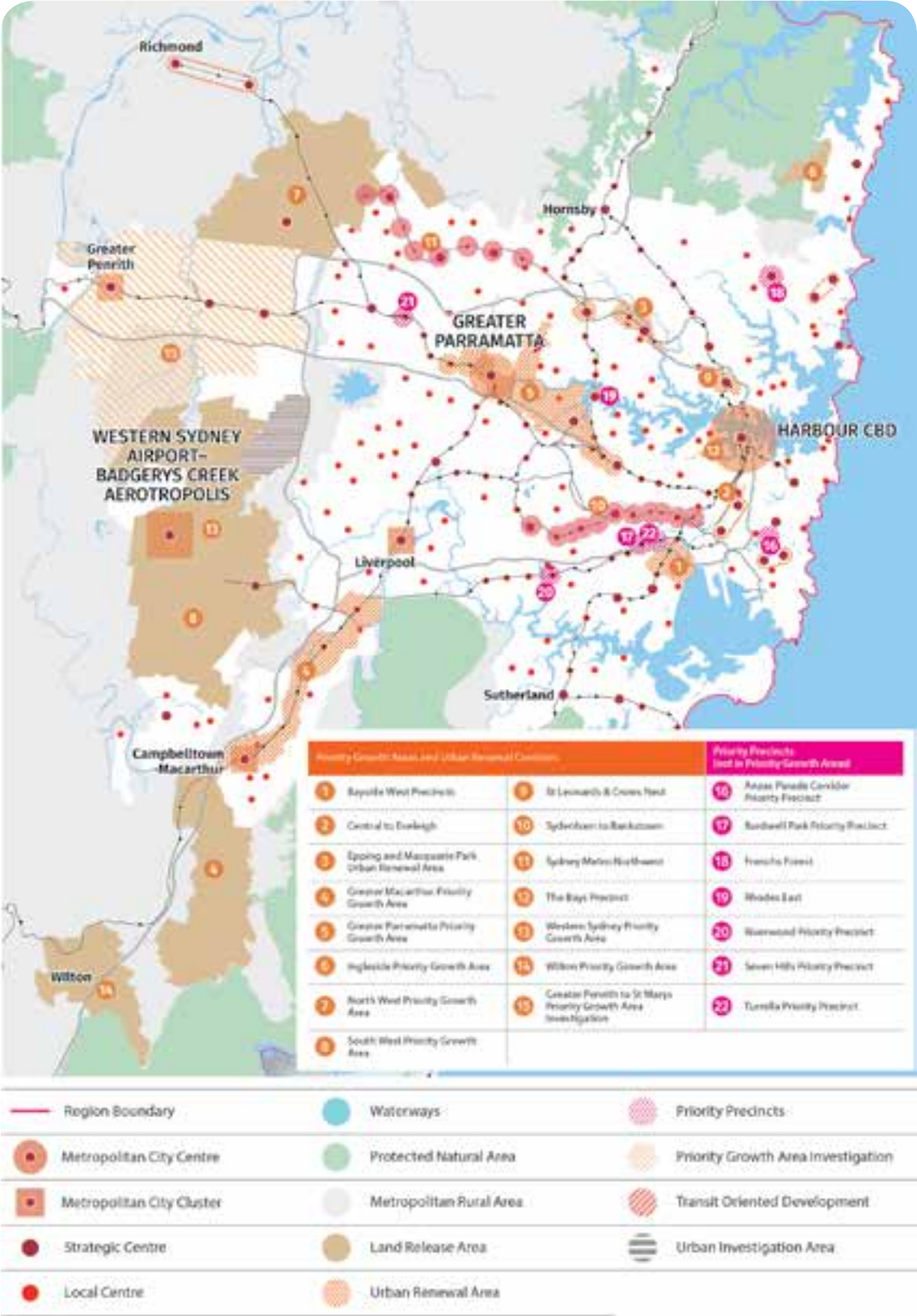
| Objective | Description | Criteria |
|---------------------------------|--|---|
| Financial Sustainability | Ensure the government has the financial capacity to meet the growing demand for infrastructure and services | <ul style="list-style-type: none"> • Capital and whole-of-life costs, including operations and maintenance • Potential to use value sharing as part of a comprehensive funding solution • Impact on timing of funding being available • Affordability |
| Delivery Risk | Modernise Greater Sydney's rail network in a responsible and seamless way that minimises disruptions to passengers | <ul style="list-style-type: none"> • Minimise project delivery risks • Minimise construction impact on residents, important community facilities and open spaces • Minimise operational impact during construction |
| Safety | All options will be designed to meet minimum safety requirements | <ul style="list-style-type: none"> • Ensure members of the public, passengers and employees can travel safely each day • Safety legislation and regulation will be the baseline for all operations |

Growth Areas and Land Use Infrastructure Implementation Plans

The NSW Department of Planning and Environment is planning for new communities in the growth areas of North West, South West, Greater Macarthur and Western Sydney to guide new infrastructure investment, identify new homes and jobs close to transport and coordinate services to growing communities.

Land Use and Infrastructure Implementation Plans for each growth area maximise the opportunities for open space, environmental management, housing and employment opportunities. These plans also form the basis for the rezoning and infrastructure planning process, providing a coordinated approach to housing, jobs and infrastructure delivery.

Figure 5 Growth areas in Western Sydney

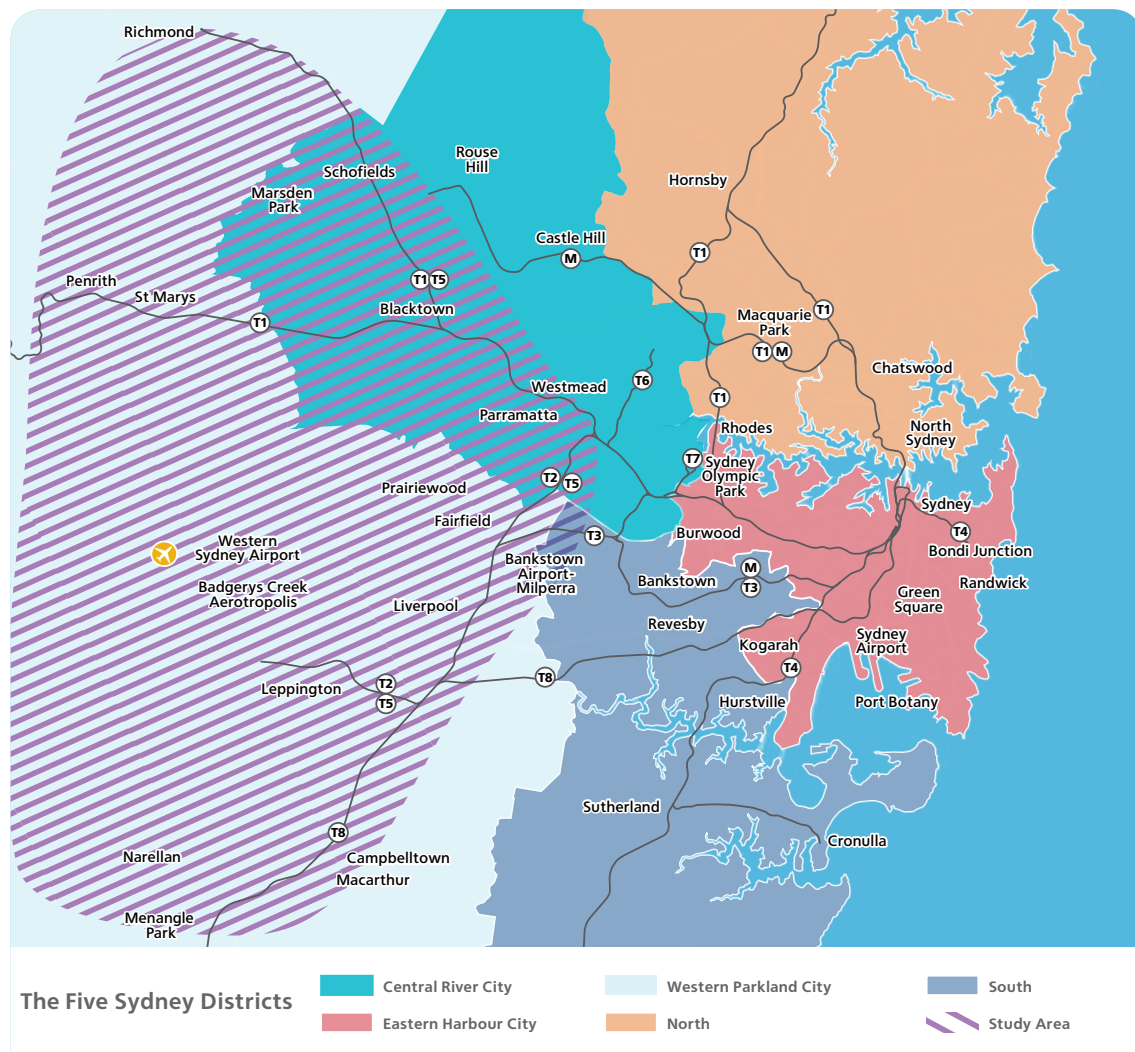


Source: Greater Sydney Commission, Draft Greater Sydney Region Plan 2017

The NSW Department of Planning and Environment defines the Western Sydney region as made up of 12 local government areas (LGAs): Blue Mountains, Hawkesbury, Penrith, The Hills, Blacktown, Cumberland, Greater Parramatta, Fairfield, Liverpool, Camden, Campbelltown and Wollondilly. These LGAs make up two districts: The Western City District and Central City District. The Study Area for the Scoping Study includes parts of these districts (shown in Figure 6).

The Study Area considered by the Scoping Study is broadly bounded by the T1 Richmond & Western Line from Richmond to Granville, the T2 Leppington & Inner West Line from Granville to Glenfield and the T8 Airport & South Line from Glenfield to Macarthur. To the west, the Study Area is bordered by the foot of the Blue Mountains. The Study Area includes the Western Parkland City, centred around Western Sydney Airport and encompasses significant growth areas around the airport, southwest and in the northwest (shown in Figure 5).

Figure 6 Study Area



4. COMMUNITY AND INDUSTRY CONSULTATION

The Scoping Study used community and industry feedback to better understand the rail needs of Western Sydney Airport and the Western Sydney region.

4.1 About this chapter

This chapter provides an overview of the feedback received from the community, industry and local government during the formal consultation period (16 September to 28 October 2016).

Consultation with the community was based on a discussion paper that provided an overview of forecast demand for transport in Western Sydney from population and jobs growth and the opening of Western Sydney Airport. The discussion paper presented 11 rail options, as well as funding and delivery options. Feedback was facilitated through a dedicated website and local events. A survey was also conducted to find out more about Western Sydney residents' views towards the development of rail in Western Sydney.

A separate briefing paper was prepared for industry organisations, potential investors and local government and a forum was held at Greater Parramatta to stimulate discussion.

In addition, a stakeholder reference group was established to provide guidance and feedback during the development of the Scoping Study. Members included representatives from business and community organisations, councils and government agencies. Meetings were held between late 2016 and mid-2017.

Information about engagement activities and the survey questions are provided in Appendix B.

4.2 Initial rail options for consultation

The focus of consultation was on an initial set of 11 rail options to service Western Sydney and Western Sydney Airport, shown in Figure 7. The community and industry were asked to provide feedback on which of these options should be prioritised.

The initial options were presented according to whether they:

- connect directly to Western Sydney Airport (Options 1-6)
- provide new or enhanced connections between the Western Sydney region and other parts of Greater Sydney (Options A-E).

Figure 7 Initial rail options



Consultation options connecting to Western Sydney Airport

1. Western Sydney Airport to the South West Rail Link

This option presented a train service to Western Sydney Airport via an extension from the South West Rail Link from Leppington via Bringelly using double-deck suburban trains. This would provide connections to Greater Sydney's southwest including Campbelltown through to Liverpool and ultimately to places such as Greater Parramatta and the Harbour CBD.

2. Western Sydney Airport to Sydney Metro Northwest

This option would provide a new rail link connecting Western Sydney Airport to Sydney Metro Northwest as a single-deck metro.

3. Western Sydney Airport to Liverpool

This option would provide a metro service from the airport to Liverpool. This could connect with an extension of the Sydney Metro City and Southwest from Bankstown to Liverpool (Option C below) to provide connectivity onto the Eastern Harbour City.

4. Western Sydney Airport to the T1 Western & Richmond Line via St Marys

This option would provide a branch of the existing T1 Western & Richmond Line to Western Sydney Airport, which could enable suburban double-deck services to start at the airport and travel up to St Marys and Mount Druitt and then express towards the east.

5. Direct rail express service: Western Sydney Airport to Greater Parramatta

This option would provide a direct rail express service from Western Sydney Airport to Greater Parramatta and through to the Harbour CBD.

6. A north-south link: Macarthur-Western Sydney Airport-St Marys-Schofields

A connection from Macarthur to Schofields via Western Sydney Airport and St Marys would provide both north-south connectivity and a connection between Western Sydney Airport and the existing rail network.

² Greater Sydney's suburban rail network is constrained by its line-side signalling system, its reliance on at-grade junctions and lines that combine express services, all-stops services and freight services. Improved line-side signalling systems, including automated systems such as those that will be used by Sydney Metro, can allow trains to safely run closer together and squeeze more capacity out of the existing rail infrastructure.

Consultation options connecting Western Sydney to other parts of Greater Sydney

A. New western metro-style service

This line would require a new tunnel between Greater Sydney and Greater Parramatta with stations located every few kilometres. It could operate as a stand-alone, metro-style, all-stops service using high-capacity single-deck trains.

The benefits of this option are being further assessed as a part of the NSW Government's Sydney Metro West project announced in November 2016.

B. Converting the T8 Airport & South Line between Revesby and the Harbour CBD to a separate metro-style service

The line from Revesby to the Harbour CBD via Sydney (Kingsford Smith) Airport could be separated from the suburban network and operated as a metro-style shuttle. Upgrades to this line would cater for expected passenger growth from the southwest and could provide a train more suited to customers with luggage travelling to and from Sydney (Kingsford Smith) Airport.

C. Extending the Sydney Metro City & Southwest

A direct connection to the metro line could provide faster journey times between Liverpool and Greater Sydney and could free up additional capacity on the suburban trains that travel through Liverpool.

The Future Transport 2056 draft strategy indicated that the extension of the train line from Bankstown to Liverpool is a visionary initiative in the 20 years+ timeframe.

D. Increasing the capacity of the existing suburban network

Introducing automated systems across Sydney's suburban rail network² could increase the number of trains on each line by up to 20 per cent. This would provide capacity on double-deck suburban trains for an additional 4,000 to 5,000 passengers every hour per line.

E. New higher speed tunnel linking Greater Parramatta and the Harbour CBD

This line would require a tunnel to be built between Greater Parramatta and the Harbour CBD. This could provide a quick connection between these two city centres and could enable express services from the Blue Mountains and Western Sydney to the Harbour CBD.

Like Option A, the benefits of this option are being further assessed as a part of the NSW Government's Sydney Metro West project.

4.3 Community and industry views

Below is an overview of feedback received during consultation through survey responses and submissions.

4.3.1 Survey feedback

The survey included 14 questions that sought the community's feedback about their needs and priorities for rail services in Western Sydney, including Western Sydney Airport. The survey was available in both online and paper format. Around 900 surveys were completed between September and October 2016.

This was an open participation survey and not randomised, which means the results are not statistically representative of the views of the general community. The questions asked in the survey are included in Appendix B.

About the reference group

A stakeholder reference group was established to provide guidance and feedback on the Scoping Study. This group included representatives from the Greater Sydney Commission, Western Sydney local councils and business and community groups.

Reference group meetings were held at key points during the Scoping Study.

Key challenges are train crowding and indirect connections

Overcrowding was the most frequently cited challenge for rail in Western Sydney by survey respondents, with many voicing their concern

about how this will worsen as the population grows. The next most frequently raised challenge was the lack of direct connections to key destinations and the poor connections between rail and other modes of transport. Key challenges are shown in Figure 8 below.

Figure 8 Feedback on key challenges for rail in Western Sydney

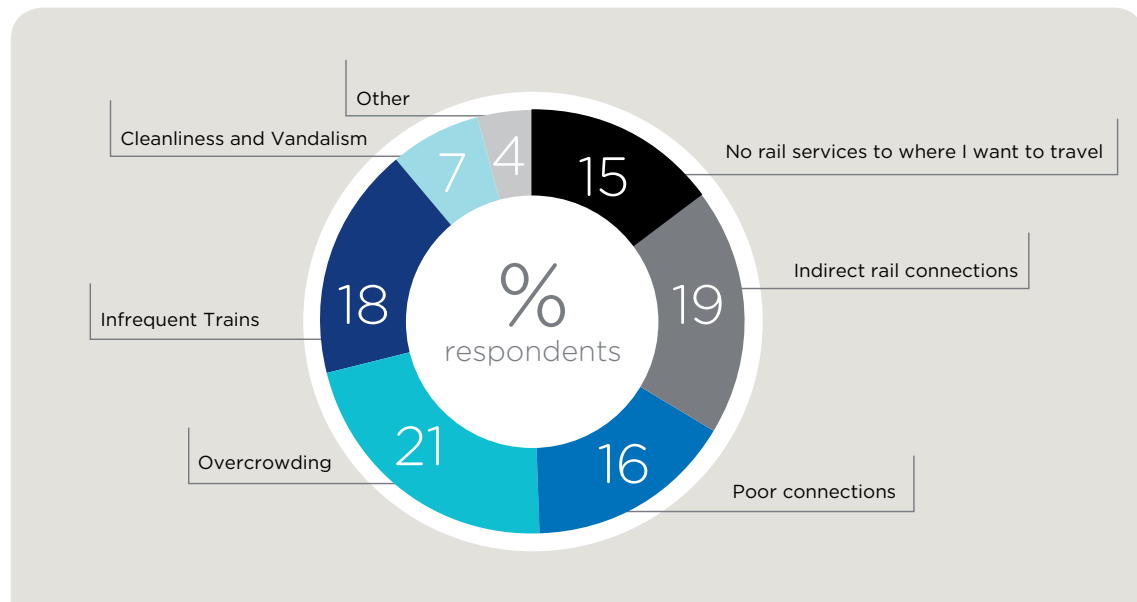


Figure 9 Feedback on Western Sydney Airport rail options
The north-south option was the most popular airport link

Survey respondents' preferred airport link was *Option 6: north-south link: Macarthur-Western Sydney Airport-St Marys-Schofields*. This was followed by *Option 1: Western Sydney Airport to the South West Rail Link*. A breakdown of preferences for Options 1-6 is provided in Figure 9 below.

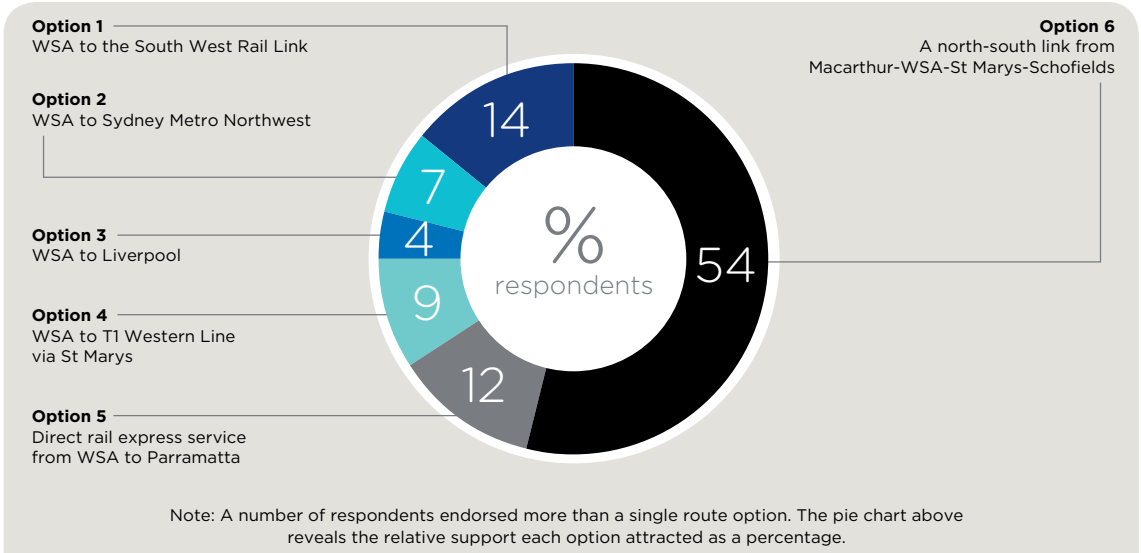
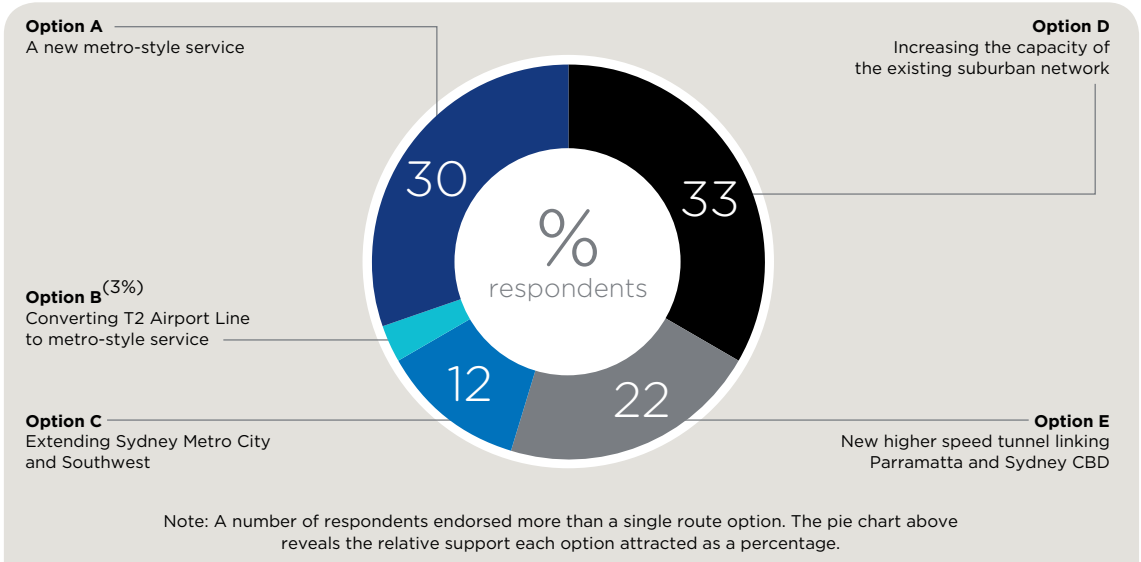


Figure 10 Feedback on Western Sydney region rail options (percentage of respondents)

Increasing the capacity of the existing Western Sydney network identified as a priority

The preferred rail option to connect Western Sydney to the rest of Greater Sydney (Options A-E) was *Option D: increase the capacity of the existing suburban network*, closely followed by *Option A: a new Western Sydney metro service*. A breakdown of survey respondents' preferences for (Options A-E) is provided in Figure 10 below.



Should rail to the airport be prioritised over rail to other parts of Western Sydney?

The community was divided over this question. Just over half of respondents (53 per cent) wanted rail to Western Sydney Airport given priority in order to make travel to the airport easier. The remaining respondents (47 per cent) wanted rail connections to other parts of Western Sydney prioritised in order to relieve pressure on existing rail services and manage congestion across Western Sydney.

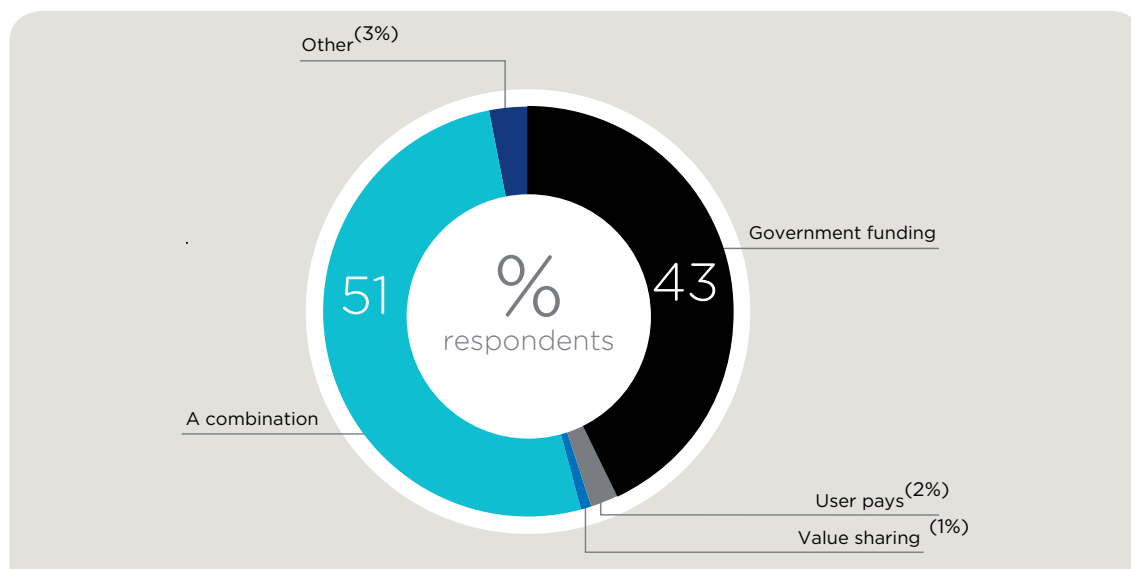
Rail should be funded by a range of approaches

Given the significant costs of any new rail service and constraints on government budgets, the community was asked for their preference for how these services could be funded. The most popular funding option was a combination of funding sources (government funding, user pays

and value sharing), followed by government funding alone. This is shown in Figure 11 below.

While it is difficult to draw too many conclusions from the survey, responses suggest that a segment of the community is open to funding approaches other than traditional government funding.

Figure 11 Feedback on funding options



4.3.2 Written submission feedback

The community, industry and other key stakeholders were invited to provide feedback through written submissions. These submissions were an opportunity to provide more detailed feedback, which could not be accommodated in survey responses.

Around 120 written submissions were received via email and post from a range of community members, industry representatives and local councils. These submissions were provided in confidence and therefore individual submissions are not suitable for public release.

A high-level summary of the feedback received across all submissions is provided below, including a breakdown of the themes and issues raised by industry and local councils.

Connectivity and city shaping are key priorities

The majority of submissions highlighted the difficulty of using public transport to travel between Western Sydney's key centres. They noted that many journeys within Western Sydney are impacted by overcrowding, indirect rail connections and long commute times. As a result, private car travel is often a more attractive option for many people.

The north-south option was the most popular airport link

In line with the survey results, the most popular route option for travelling to Western Sydney Airport was *Option 6: A north-south link*.

A fast connection between Greater Parramatta and the Harbour CBD was a priority for Western Sydney

Popular route options connecting Western Sydney to the rest of Sydney were *Option E: New higher speed tunnel linking Greater Parramatta and the Harbour CBD* and *Option A: New western metro style service*.

There is a need to meet current and future rail demand in Western Sydney

Many submissions raised concerns about travel demand to Western Sydney Airport compounding the existing problems of road congestion and train crowding in Western Sydney. A number of these submissions emphasised the need for rail to address these existing challenges prior to developing rail for Western Sydney Airport.

Feedback aligns with Sydney Metro West

In November 2016, the NSW Government announced plans for Sydney Metro West – a new metro rail line linking Greater Parramatta and the Harbour CBD, as well as communities along the way. This announcement was made after the community consultation period for the Scoping Study.

Consultation feedback was supportive of the aim to improve connections between Greater Parramatta and the Harbour CBD. More than half of survey respondents said they wanted either a metro or express service for travelling between Greater Parramatta and the Harbour CBD (Options A and E).

Local government feedback

Submissions were received from multiple local councils. Across local council submissions there was broad support for:

- Western Sydney Airport to the South West Rail Link (Option 1)
- A north-south link: Macarthur-Western Sydney Airport-St Marys-Schofields (Option 6)
- Fast or metro-style east-west rail link between Greater Parramatta and the Harbour CBD (Options A and E)

Most local council submissions did not say whether rail to Western Sydney Airport or other parts of Western Sydney was the higher priority.

Industry feedback

Broad support for north-south, east-west and south west airport links

Industry submissions expressed even support for the options connecting to Western Sydney Airport, with Option 6: a north-south link: Macarthur-Western Sydney Airport-St Marys-Schofields (27% of respondents) receiving marginally more support than Option 5: direct rail express service Western Sydney Airport to Greater Parramatta (25% of respondents).

Faster rail services were preferred

Many industry submissions highlighted support for fast and high frequency rail services connecting Western Sydney Airport to Greater Parramatta.

Value sharing, user pays and Public Private Partnerships

A majority of industry submissions expressed strong support funding new rail services through value sharing, user pays and Public Private Partnerships (PPPs). Most submissions want governments to provide an early indication about the likely direction and scope of development opportunities associated with new rail services.

Positive response to early and ongoing engagement

Many industry respondents were positive about the Australian and NSW governments engaging with industry early in the planning stage of new rail services for Western Sydney. They also expressed a strong interest in governments continuing to engage with industry throughout subsequent stages of the planning process.

4.3.3 Other rail options proposed in surveys and submissions

The community, industry and other stakeholders made a number of suggestions for other rail options to cater for Western Sydney and

Western Sydney Airport. In broad terms, these suggestions were variations of the 11 initial rail options. A summary of additional options identified during consultation and the outcomes of their assessment is provided in Appendix C.

5. WESTERN SYDNEY IS GROWING AND CHANGING

The Scoping Study conducted a detailed analysis of population and employment trends to better understand where rail is most needed.

5.1 About this chapter

This chapter presents the population and employment growth that formed the basis of the Scoping Study's analysis, which allowed a better understanding of future role and priorities of rail in Western Sydney. This analysis took into account:

- population growth
- jobs growth
- the impact of Western Sydney Airport
- key government policies shaping Western Sydney.

Land use assumptions used by the Scoping Study

The Scoping Study used the NSW Government's 2016 land use forecast, the **LU16 projections**, as the basis for understanding how Western Sydney's resident and worker population will grow over the next 40 years. The latest forecasts are available on the NSW Government's Department of Planning and Environment website.

The Scoping Study also used **alternative land use projections** to test the feasibility of rail options under more intensive patterns of population and employment growth in the Study Area.

Both land use futures are further described in detail in Section 8.8.1.

5.2 Population growth

Over the next 40 years, Greater Sydney's population is projected to grow by 75 per cent, from about 5 million today to approximately 8.8 million people in 2056. In Western Sydney alone, the population is set to grow by more than 1 million people over the next 20 years, including more than 450,000 in the Western City District. Population densities in the Study Area will increase significantly for Greater Sydney's west and southwest in a number of suburbs including Blacktown, Greater Parramatta, Bringelly, Campbelltown and Liverpool. Figure 12 and Figure 13 show Greater Sydney's population densities in 2016 and projected to 2056, under the NSW Government's existing land use forecast for the region.

This growth in Western Sydney presents two broad transport challenges:

- ensuring the transport network has the capacity to support population growth in established areas
- ensuring transport services are integrated with the planning of new land releases and areas of urban renewal.

Figure 12 Greater Sydney population densities in 2016

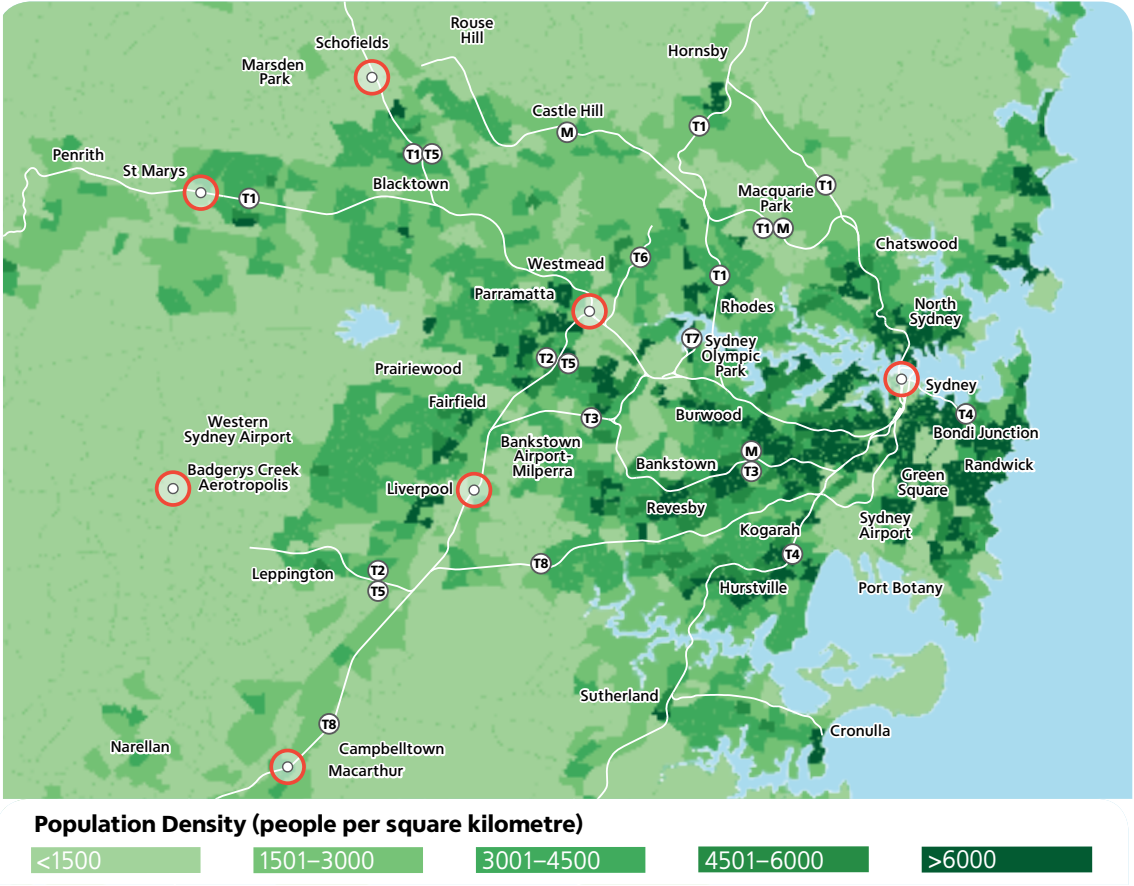
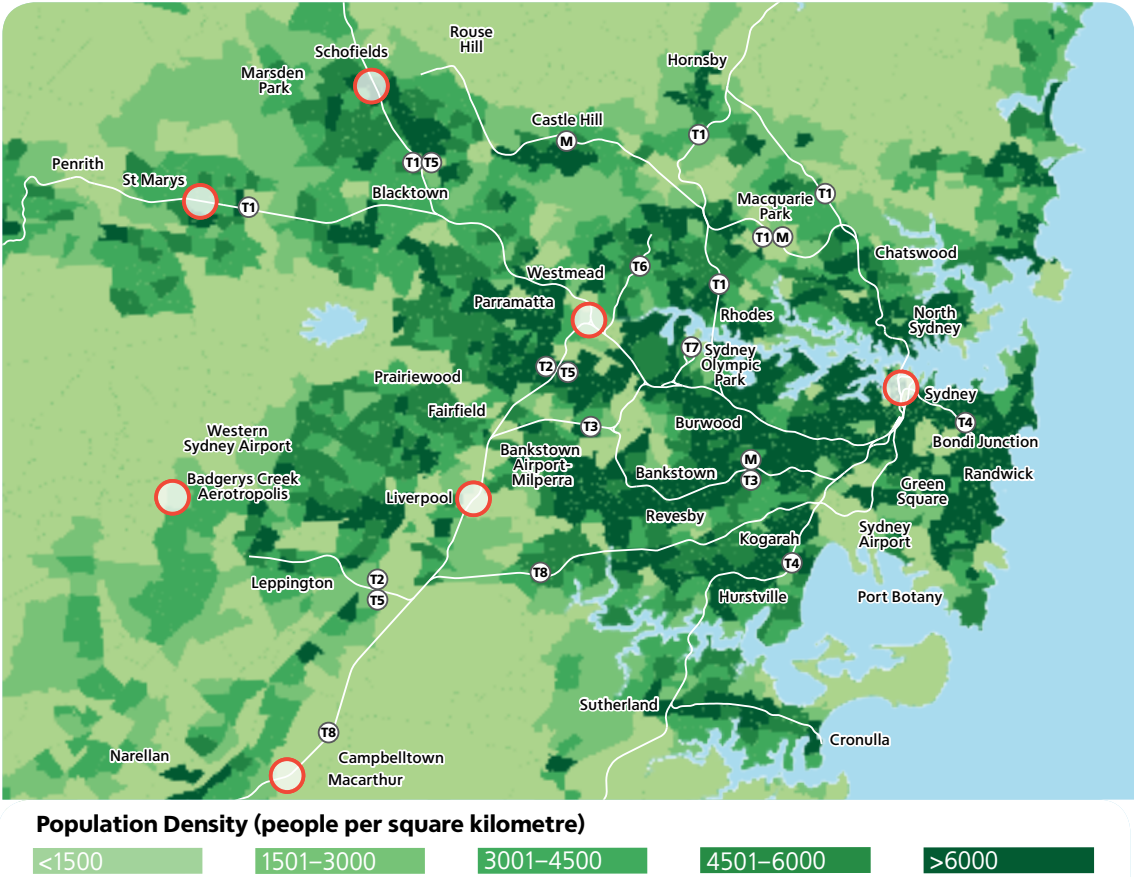


Figure 13 Forecast Greater Sydney population densities in 2056



Source: NSW Department of Planning and Environment, Land Use 16 (Population), Transport Performance and Analytics, 2016 Release Population and Employment Forecasts. Figure 12 and Figure 13 show Greater Sydney's population densities in 2016 and projected to 2056, under the NSW Government's existing land use forecast for the region.

5.3 Jobs growth

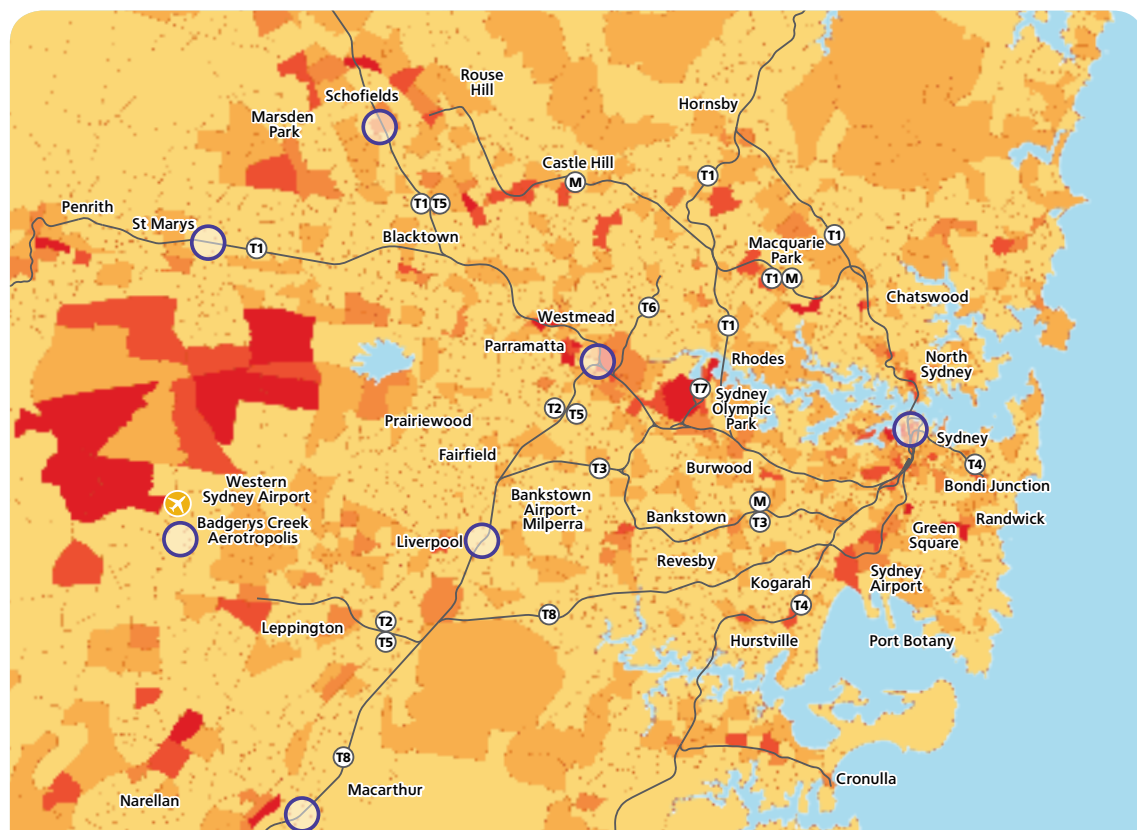
While Western Sydney is growing and emerging as a major economic region, the Western Sydney jobs gap continues to widen. Some 300,000 Western Sydney residents need to travel outside the region for work or study each day.

However, there will be a number of significant opportunities for increasing both the number and diversity of jobs offered in Western Sydney over the coming decades, including in the South West Growth Area and around Western Sydney Airport, including the Badgerys Creek Aerotropolis (see Figure 14 below).

In spite of these opportunities, job growth is expected to be slower than the rate of population growth. NSW Government forecasts (as at 2016) indicate that, without intervention, the jobs deficit in Western Sydney will grow to more than 340,000 by 2056. As a result, many Western Sydney residents will continue to travel long distances towards economic hubs concentrated in the Eastern City, particularly the Harbour CBD. Population and employment growth across Greater Sydney is shown in Figure 15 below.

A rail line in Western Sydney could improve access to employment. Rail links, with complementary land use planning, can provide local jobs based around new and existing centres with increased accessibility. Western Sydney Airport will also help generate jobs directly and indirectly related to its construction and operation phases.

Figure 14 Jobs growth between 2016 and 2056 in Greater Sydney



Employment Density (jobs growth per square kilometre)



Source: Regional Development Australia Sydney, RDA Sydney Report - Strategic industries development around the Western Sydney Employment Area.

Jobs at Western Sydney Airport

Western Sydney Airport will be a major source of direct and indirect employment for thousands of Western Sydney residents both during the airport's construction and its operation.

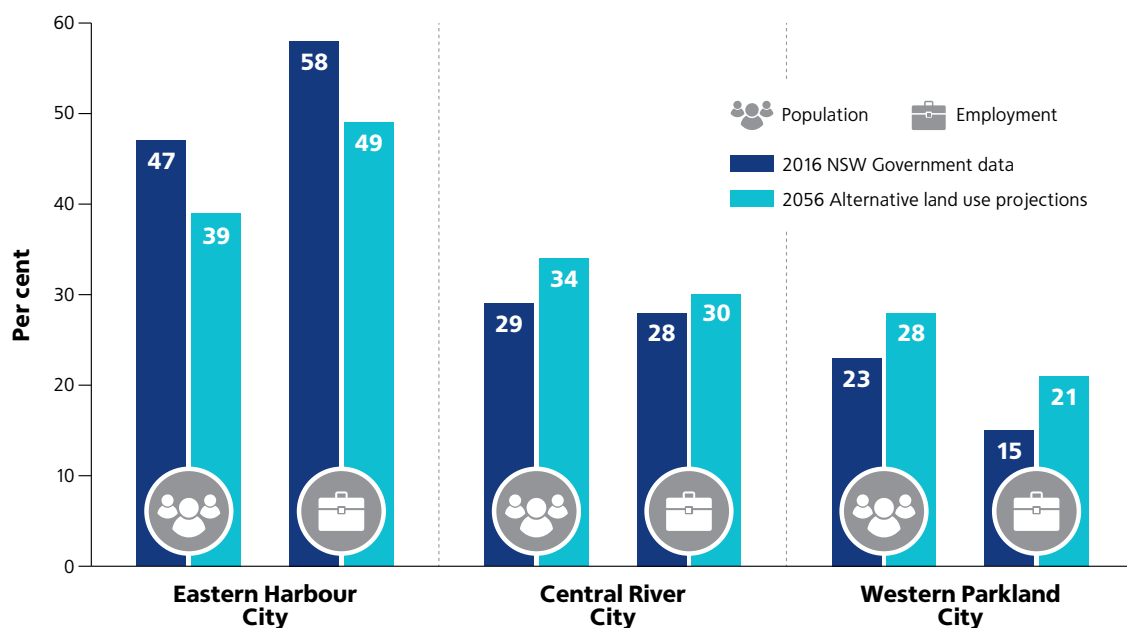
Jobs during the airport's construction

There will be around 11,000 direct and indirect jobs needed during the airport's construction phase. The majority of these jobs will be concentrated in construction roles and the range of industries that support construction such as manufacturing, retail and transport and warehousing. As the airport will continue to expand after it opens in 2026, there will be an ongoing need for construction workers and supporting industries over many years.

Jobs once the airport is operational

Once the airport opens in 2026, demand will be generated for a range of aviation-related jobs such as pilots and crew, engineers and ground staff. In addition, the onsite business park will attract many different businesses into the area, servicing both the airport's needs and enjoying nearby access to Australia's domestic and international aviation network.

Figure 15 Population and employment growth projections in the three cities



Source: NSW Department of Planning and Environment, Transport Performance and Analytics, 2016 Release Population and Employment Forecasts

5.4 Key Australian and NSW government policy objectives

Below is an outline of some of the key Australian and NSW government policy objectives that informed the Scoping Study.

5.4.1 Western Sydney City Deal

The Australian and NSW governments are working with local governments across the Western City District towards a landmark Western Sydney City Deal (the City Deal) under the Australian Government's Smart Cities Plan.

The City Deal is bringing together all levels of government in a collaborative partnership to realise the potential of Western Sydney.

The City Deal is focussed on the Western City District that is made up of the local government areas of Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith, the Blue Mountains and Wollondilly. The Scoping Study has considered all local government areas of the Western City District and the City Deal.

The population of Western Sydney is set to grow by more than 1 million people over the next 20 years, including more than 450,000 in the Western City District. The Australian Government's commitment to develop the Western Sydney Airport presents an opportunity for long-term growth and to support Western Sydney emerge as a city in its own right.

The City Deal will capitalise on the unique opportunities presented by this significant economic and population growth and will support a region that is more liveable and more productive. The City Deal will improve coordination between governments to better integrate infrastructure, land use, housing and environmental planning decisions to facilitate growth.

Development of the City Deal is focusing on:

- Transformative transport infrastructure to unlock the economic potential of the region, reduce congestion and support local needs.
- A package of employment, skills development and investment attraction initiatives to create jobs in Western Sydney.
- Supporting housing diversity and affordability through improvements to planning and zoning regulations.
- Improved environmental and liveability outcomes, including streamlined biodiversity conservation, support for clean air, green spaces and community infrastructure.

In assessing rail options outlined in this paper, consideration was given to the extent that rail options maximise land use and transport opportunities and drive the broader objectives of the City Deal.

5.4.2 Greater Sydney's three cities

The draft Greater Sydney Region Plan (The Plan) is a 20-year strategic plan supported by a 40-year vision to accommodate Greater Sydney's projected population of 8 million people by 2056, whilst improving Greater Sydney's liveability, sustainability and productivity.

The Plan presents a vision for Greater Sydney that moves away from the dominance of the Harbour CBD towards the following three cities (shown in Figure 16):

- Harbour CBD – the established Eastern Harbour City
- Greater Parramatta – the developing Central River City
- An emerging Western Parkland City around Western Sydney Airport (see box below).

To support the three cities' vision, the transport network will need to provide a greater focus on providing interconnections within and across each city.

About the Western Parkland City

The NSW Government is planning a city for Greater Sydney around Western Sydney Airport, known as the Western Parkland City.

While the planned centre of the Western Parkland City will be located close to the airport, the city's boundaries will extend from Richmond in the north to Campbelltown-Macarthur in the south. By 2056, the Western Parkland City is expected to have a population the size of Adelaide.

The transport decisions governments make today will shape the Western Parkland City of tomorrow. These decisions will not only determine how accessible the city is for residents and workers, but will have a profound influence on the shape of the city. The location and design of roads and the type of public transport services will influence where shops and services locate, where attractive centres can emerge and how well congestion will be managed.

The 30 minute city

Transport for NSW is working with the Greater Sydney Commission to make Greater Sydney a 30 minute city - one where most people can access jobs, services and other everyday needs within 30 minutes of where they live using public transport. The growth of a 30 minute city is also a priority for the Australian Government, which is being pursued through the development of the Western Sydney City Deal. There are two aspects of the 30 minute city that the transport network will need to satisfy:

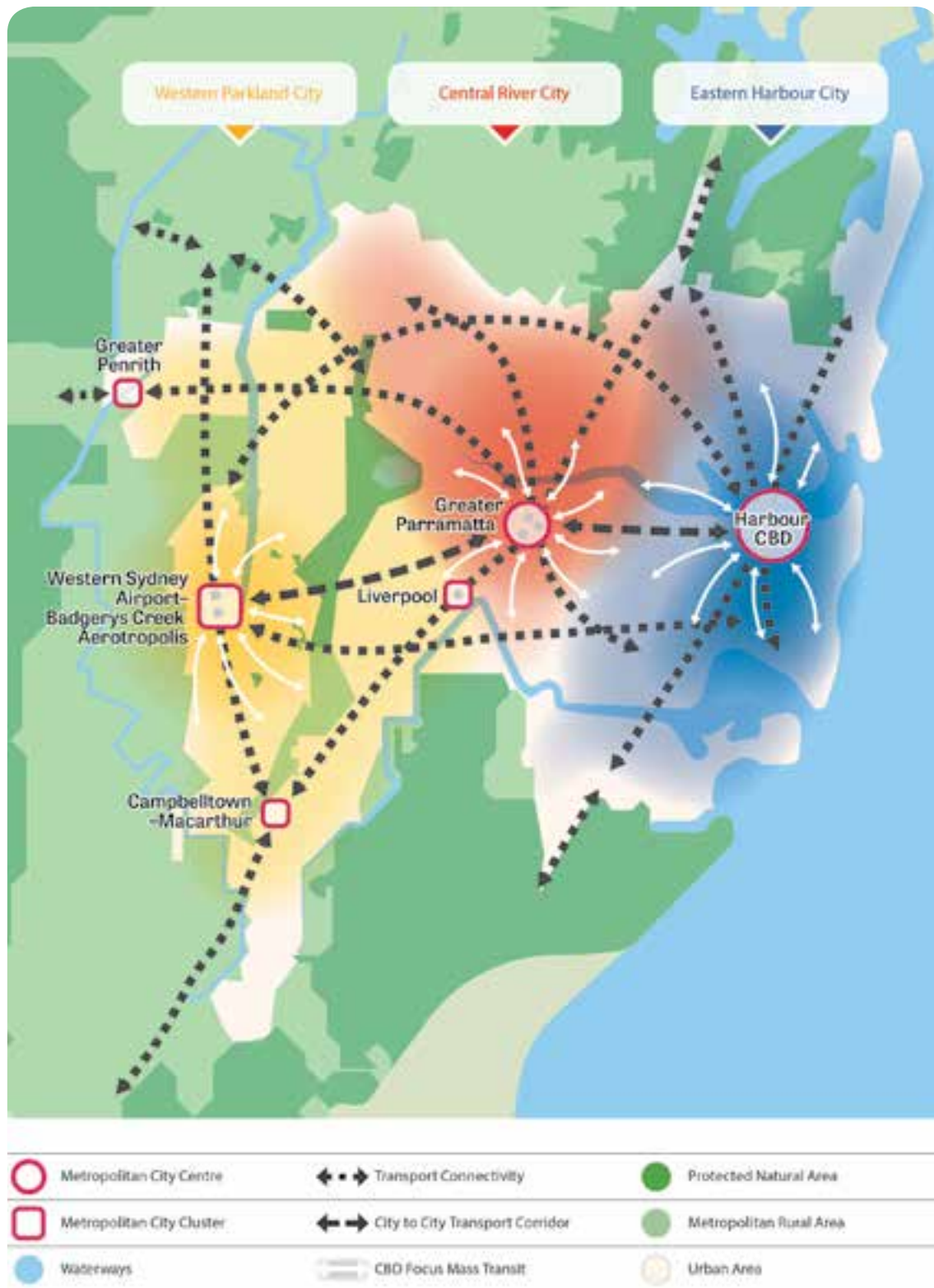
1. **Access to jobs:** relates to the peak hour commute by connecting residents to the metropolitan centre of the city in which they live by public transport - thus supporting productivity.
2. **Access to services and everyday needs:** connecting residents in each of the five districts to at least one strategic centre by public transport, giving people access to local jobs, goods and services, health and education facilities throughout the week - thus supporting liveability and sustainability.

The emerging Western Parkland City will bring together the existing centres of Campbelltown-Macarthur, Penrith and Liverpool and their commercial, health and education assets will support the growing communities. A new economic corridor, with Western Sydney Airport at its heart, will agglomerate the economic activities of the emerging city.

Transport corridors support the movement of people and goods around the city. Transport for NSW has developed a plan for transport corridors that align with the Greater Sydney Commission's land use vision for Greater Sydney, connecting the three cities and local areas and the centres within each of these.



Figure 16 Vision for three cities, supporting a 30 minute Greater Sydney



Source: Greater Sydney Commission, Draft Greater Sydney Region Plan 2017

Infrastructure Australia's Priority List

Infrastructure Australia is an independent statutory body established by the Australian Government with a mandate to prioritise and progress nationally significant infrastructure.

Infrastructure Australia's Infrastructure Priority List identifies the nationally significant infrastructure investments needed over the next 15 years. Using data from the Australian Infrastructure Audit and extensive consultation with state and territory governments, this list provides independent, evidence-based advice on the projects that will most benefit Australian communities.

The most recent Priority List (November 2017) includes the following projects of relevance to the Scoping Study:

- Western Sydney Airport (High Priority Project)
- corridor preservation for Western Sydney Airport rail connection (High Priority Initiative)
- public transport connections for Western Sydney Airport (Priority Initiative).

The Priority List also includes a range of infrastructure projects that will support the delivery of Western Sydney Airport, including the Western Sydney Infrastructure Plan.

Strategic planning for Greater Sydney

The analysis behind the joint Scoping Study has informed two important strategic documents that will define the future of Sydney and New South Wales - the Future Transport 2056 draft strategy and the draft Greater Sydney Region Plan.

The Future Transport 2056 draft strategy is an update of NSW's Long Term Transport Master Plan and sets the 40-year vision to guide transport investment. The draft Future Transport 2056 draft strategy is available online at future.transport.nsw.gov.au.

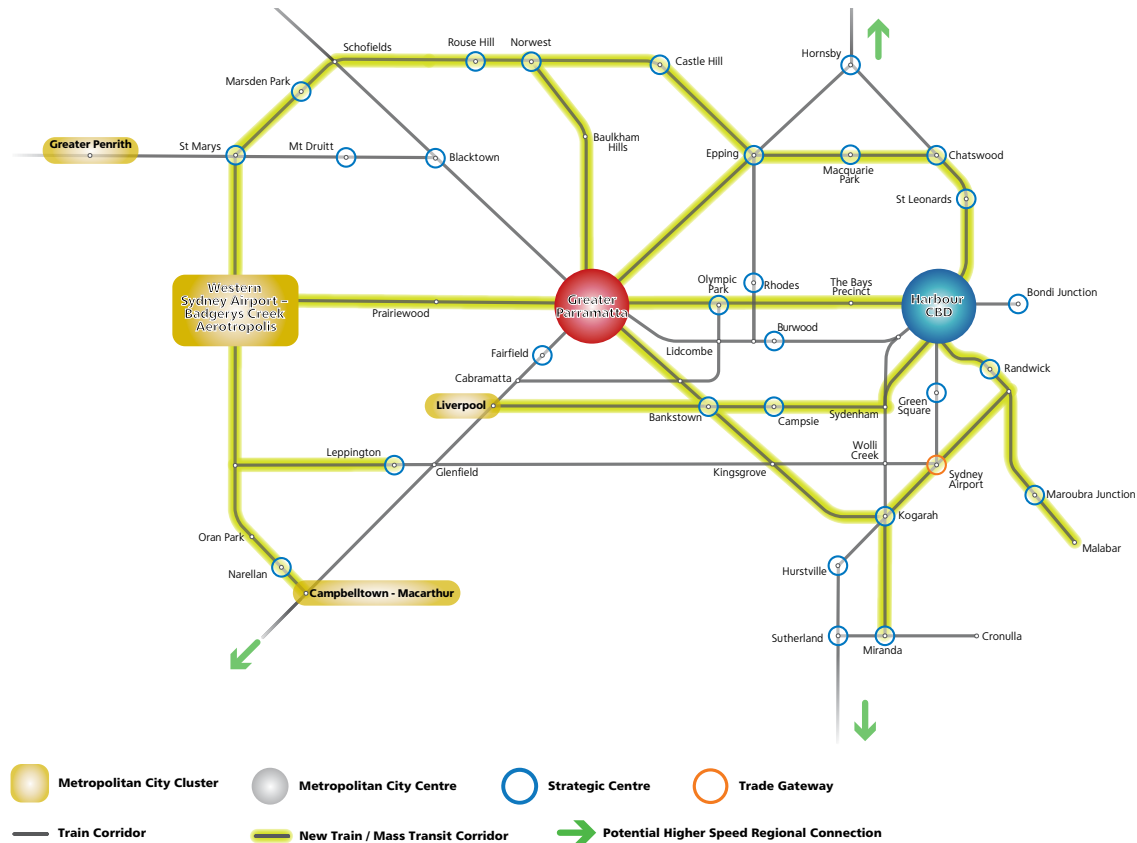
The draft Greater Sydney Region Plan supports the vision for a metropolis of three cities that will rebalance growth and deliver benefits to residents across Greater Sydney. The draft Greater Sydney Region Plan can be accessed online at greater.sydney.

5.4.3 Future Transport 2056

The NSW Government has developed the Future Transport 2056 draft strategy, which will provide a 40-year transport vision for NSW. This strategy looks beyond the projects under construction and planning in order to make the long-term decisions needed to tackle the big challenges, like congestion, our growing and ageing population and climate change. To do this, the Future Transport 2056 draft strategy looks at new approaches to delivering transport in NSW, whether through emerging technologies, new or adaptive infrastructure or different business models.

The Preferred Network identified by the Scoping Study was considered as part of the Future Transport 2056 draft strategy. The outcomes of the Preferred Network (shown in Figure 1) have been included in the long-term 2056 Greater Sydney mass transit/train network, shown in Figure 17.

Figure 17 Visionary 2056 Greater Sydney mass transit/train network



Source: Transport for NSW, Future Transport 2056 draft strategy

5.4.4 Rail investment can shape the growth of Western Sydney

Investment in rail provides significant potential to shape how Western Sydney functions over the coming generations and can contribute to a stronger economy and increased liveability for residents.

The development of rail infrastructure in Western Sydney offers opportunities to shape the development of a Western Parkland City around both the transport network and

Western Sydney Airport. The provision of rail in Western Sydney will provide the necessary transport infrastructure to support the growth of the region over the coming decades.

Rail investment could help shape the Western Parkland City by:

- fostering housing, commercial and community services development to cater for forecast population growth
- offer opportunities for development of affordable housing supply
- enabling liveable, well connected and productive development oriented around new stations or future transport interchanges
- facilitating agglomeration, with businesses encouraged to locate in areas with good access to the rail network
- enhancing connections between homes and jobs within Western Sydney and Greater Sydney more broadly
- supporting access to growing centres including Liverpool, Penrith, Campbelltown-Macarthur, Western Sydney Airport and the Badgerys Creek Aerotropolis.

Rail shaping new communities

Rail stations and interchanges can be more than just tracks and platforms. They can be vibrant landmarks in their own right, offering communities retail, open space, residential and commercial opportunities.

Good planning, including transit-oriented development based around well-designed stations and interchanges, can both improve amenity for residents through enhanced connectivity and encourage new development to shape the city's future.

6. GROWING TRANSPORT DEMAND IN WESTERN SYDNEY

6.1 About this chapter

This chapter provides an overview of the growing demand for transport across Western Sydney, work underway to address this demand and the need for further rail investment.

6.2 Addressing transport demand in Western Sydney

To develop a long-term rail plan for Western Sydney, the Scoping Study analysed existing and future transport demand in Western Sydney across the transport network. A high level overview of the growing transport demand in Western Sydney and the projects underway to address this demand follows.

While the information is presented by transport mode (rail, road and bus), transport demand is being addressed through a network-wide perspective that considers how these modes work together.

6.2.1 Growing demand for rail

The Scoping Study's Study Area is served by the following rail lines:

- T1 North Shore, Northern & Western Line
- T2 Inner West & Leppington
- T3 Bankstown Line
- T5 Cumberland Line
- T8 Airport & South Line

While Greater Sydney's suburban railway network covers a large geographical area, many parts of Western Sydney are not well served by rail. This is the result of a variety of factors including Western Sydney's large geographical area and its relatively low population densities.

Trips on the Greater Sydney rail network during the one-hour morning peak are predicted to double between 2016 and 2056. Without investment in new rail lines or enhancements to the existing network, the morning peak hour demand will negatively impact the performance of rail transport in Greater Sydney by 2056. Within the Study Area, demand is expected to be greatest on the T1 Western & Richmond Line between Blacktown and the Harbour CBD and the T8 Airport & South line from around Revesby through Sydney (Kingsford Smith) Airport to the Harbour CBD.

Figure 18 Map of the current Sydney rail network



6.2.2 Growing demand on Greater Sydney's roads

The primary road transport arteries connecting Western Sydney with the Harbour CBD are:

- the M4 Motorway
- the M5 Motorway
- the M7 Motorway
- Parramatta Road
- Liverpool Road
- Victoria Road.

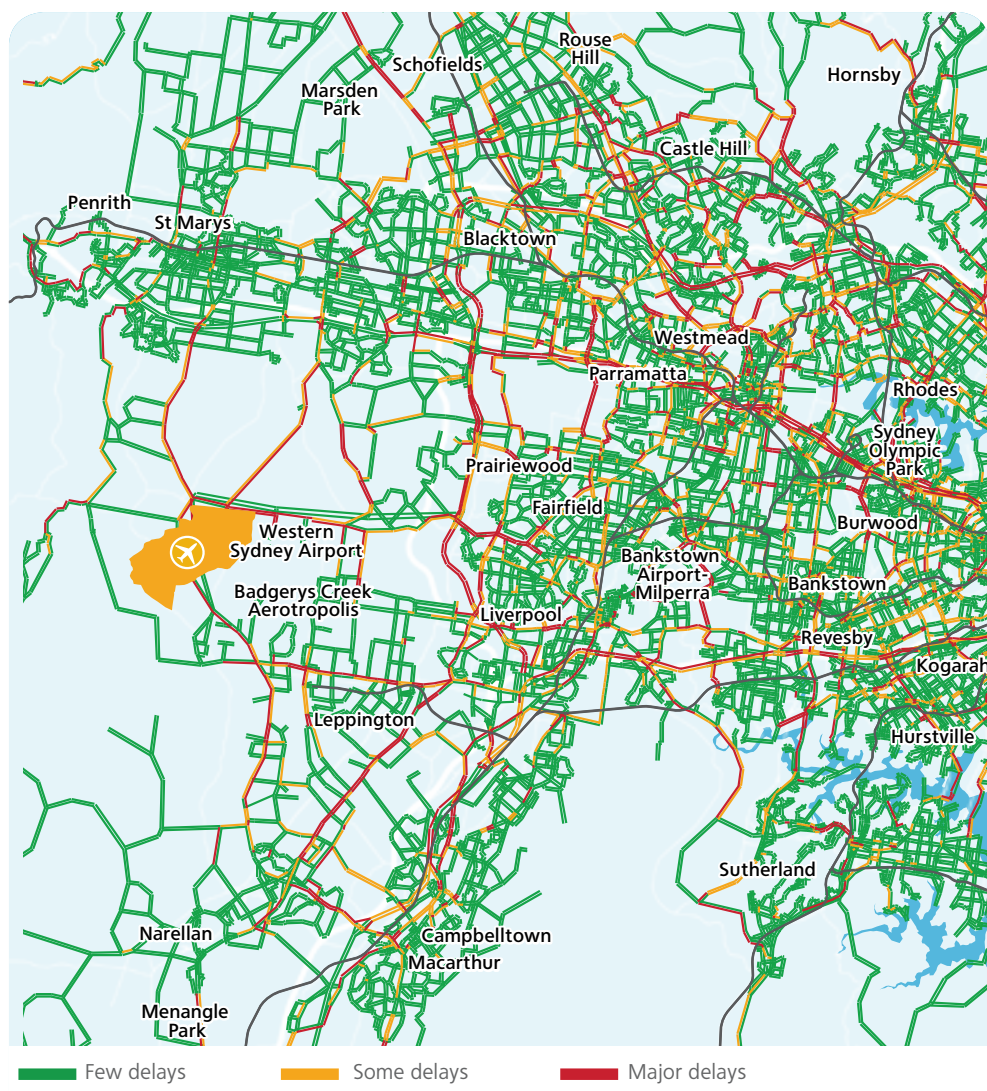
For many Western Sydney residents and businesses, the M2 Motorway also serves as a connection between Western Sydney and Northern Sydney.

Traffic volumes on the M4, M5 and M2 motorways exceed 100,000 vehicles per day. Figure 19 below shows the capacity of major road corridors in Western Sydney in 2056, without any new rail investment.

A number of the roads are exceeding capacity, which has an impact on average speeds and journey time. Strong trip growth is expected around Greater Parramatta as well as around greenfield urban development south of Western Sydney Airport and in Marsden Park. An increase in demand is noticeable along the corridor between the Harbour CBD and Western Sydney Airport.

Private car is currently the predominant means of transport in Western Sydney, with about 80 per cent of the 900,000 road trips to, from or within the Study Area in the morning peak by private vehicle. For trips wholly within the Study Area, about 90 per cent are by private vehicle. On average, people living further away from the Harbour CBD own more vehicles and drive more than those living closer to the Harbour CBD.

Figure 19 Indicative road congestion in 2056 AM peak, without rail



6.2.3 Growing demand for bus services

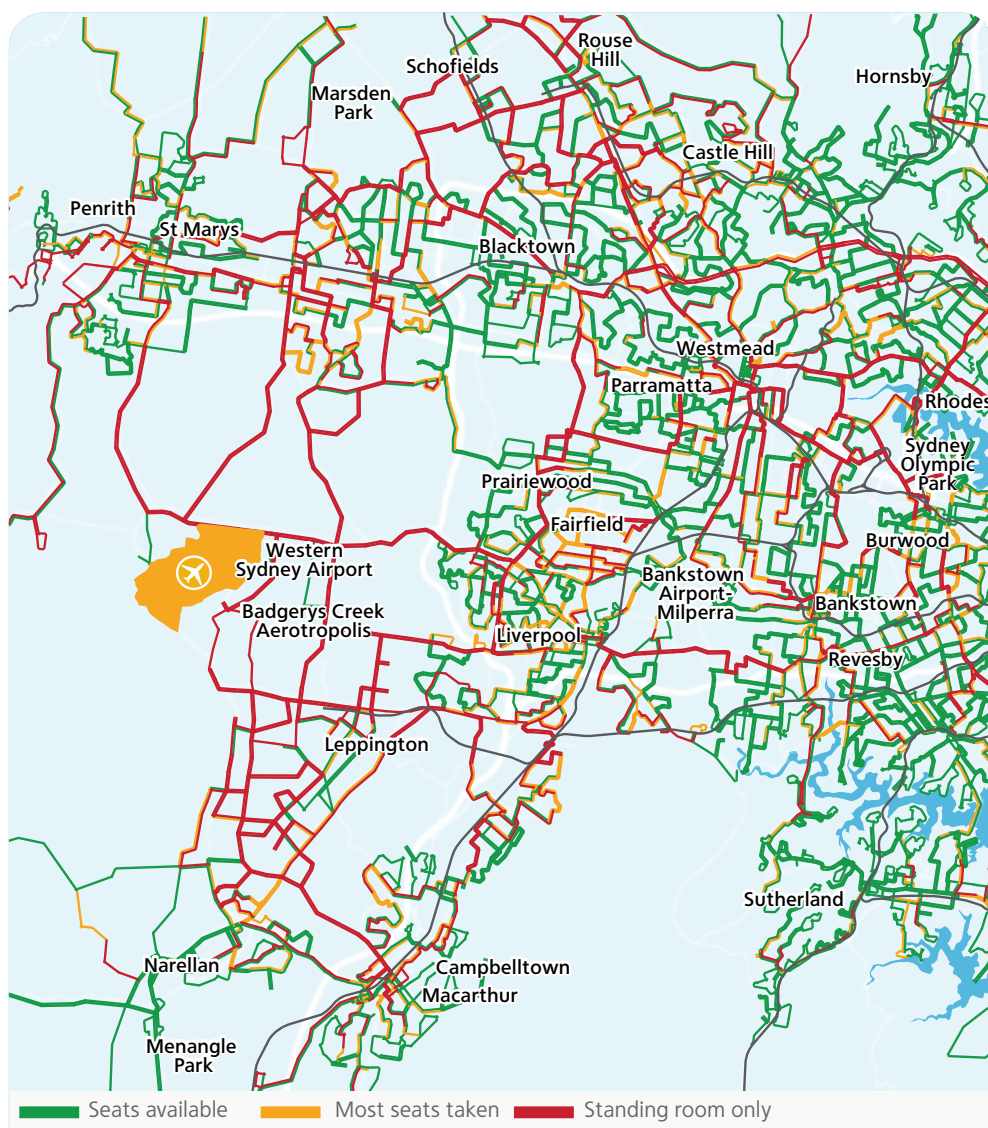
Bus services play an important role in providing transport options for Western Sydney residents. Bus services in Western Sydney consist of local services connecting to local centres and railway stations, suburban services providing end-to-end access between centres and rapid services using bus priority infrastructure, such as T-ways. Currently there is over 170 km of bus priority infrastructure in Western Sydney, including:

- the Liverpool to Greater Parramatta T-way that connects Liverpool and Greater Parramatta via Bonnyrigg and Prairiewood
- the North-West T-way that connects Rouse Hill to Greater Parramatta and Parklea to Blacktown, with connections to rail at Parramatta, Westmead and Blacktown.

These T-way connections are expected to continue to be well patronised, even as Sydney Metro services become operational. Forecasts suggest there will be 37 per cent growth in bus patronage for the corridor between Greater Parramatta and the Harbour CBD to 2031.³ Many of the heaviest demand corridors in the 2030s will be related to Western Sydney, including the Liverpool to Greater Parramatta T-way and Victoria Road bus services, as well as M2 Motorway buses.

Figure 20 shows forecast bus demand in Western Sydney in 2056 without rail links, with red indicating demand to be higher than seated capacity.

Figure 20 Indicative bus demand in 2056, without rail



³Transport for NSW, Future Transport 2056 draft strategy

6.2.4 Transport network projects underway and under investigation to address demand

The Australian and NSW governments are addressing growing transport demand through investments in transport infrastructure. Some of the key road and rail projects under construction and under investigation in Greater Sydney are described below.

Sydney Metro Northwest and City & Southwest

The NSW Government's Sydney Metro is Australia's largest public transport project. It will transform Greater Sydney, delivering more trains and faster services for customers across the network.

Construction is underway for the Sydney Metro Northwest, which will deliver fast, safe and frequent services between Rouse Hill and Chatswood. It is anticipated the Sydney Metro Northwest will open in the first half of 2019.

Work has begun on the Sydney Metro City & Southwest, which will extend the metro rail from Chatswood to Bankstown. This will include a new crossing beneath Sydney Harbour, new railway stations in the lower North Shore and Harbour CBD and the upgrade and conversion of the current line between Sydenham and Bankstown. Investigations are also underway into the potential extension of the metro rail from Bankstown to Liverpool.

The Sydney Metro Northwest will provide significant relief to the T1 Western & Richmond Line. The opening of Sydney Metro City & Southwest in 2024 and associated improvements in the operations of the Sydney Trains network will improve capacity on the T2 Inner West & Leppington Line and T8 Airport & South Line and provide some relief for the T1 Western & Richmond line.

Sydney Metro West

The NSW Government has announced plans for a new metro rail line linking Greater Parramatta and the Harbour CBD, as well as communities along the way. Sydney Metro West will be a new, turn-up-and-go rail service that would support at least four key precincts, including Greater Parramatta, Sydney Olympic Park, the Bays Precinct and the Harbour CBD. It is an integrated land use and transport project that supports productivity, housing, liveability, urban renewal and transport outcomes. Sydney Metro West will:

- provide additional capacity from Western Sydney to the Harbour CBD
- encourage the revitalisation and development of the corridor between Greater Parramatta and the Harbour CBD, particularly in Sydney Olympic Park and The Bays Precinct
- increase the reliability of other Sydney Trains and inter-city services in the city's outer west in areas like Blacktown, Penrith and the Blue Mountains.

The Scoping Study considered Sydney Metro West in its Preferred Network.

Parramatta Light Rail

The NSW Government has committed to a preferred light rail network for Parramatta. Stage 1 will connect Westmead to Parramatta and Carlingford via Camellia with a two-way track spanning 12 kilometres. The Parramatta Light Rail will be over 20 kilometres long, connecting residential, employment, cultural and education precincts. It is anticipated that construction of Stage 1 will commence in late 2018 and be open in 2023.

In October 2017, the NSW Government announced the preferred route for Stage 2, which will connect to Stage 1 and run north of the Parramatta River through the suburbs of Ermington, Melrose Park and Wentworth Point to Sydney Olympic Park along a 9 kilometre route. Stage 2 will connect to the future Sydney Metro West underground stations, heavy rail in Parramatta and Olympic Park and ferry services at Rydalmere and Olympic Park. A Final Business Case for Stage 2 is expected to be completed in 2018.

The Scoping Study considered the preferred light rail network for Greater Parramatta in its analysis.

More Trains, More Services Program

The NSW Government will invest more than \$1.5 billion over the next three years on the More Trains, More Services program, which will boost capacity through hundreds of extra services, better infrastructure and new trains for Greater Sydney.

Over the next three years the More Trains, More Services program will deliver:

- hundreds of extra services across the network, starting with peak hour express services between Greater Parramatta and the Harbour CBD
- new trains added to the suburban network that will spend less time in maintenance and more time on the tracks
- upgraded rail infrastructure allowing our complex network to operate at an even greater capacity, including better signalling systems, power supply upgrades and station improvements.

These measures will be critical for addressing crowding on rail services in Western Sydney in the short-medium term, particularly on the T1 Western & Richmond Line.

Western Sydney Infrastructure Plan

The Western Sydney Infrastructure Plan will deliver major road infrastructure upgrades to support an integrated transport solution for the Western Sydney region and capitalise on the economic benefits from developing Western Sydney Airport. This is a 10 year, \$3.6 billion road investment program that is funded by the Australian and NSW governments. The Australian Government is contributing \$2.9 billion to the program. The NSW Government is contributing the remaining \$700 million.

This investment in roads will relieve pressure on existing infrastructure and unlock the economic capacity of the region by cutting travel times, easing congestion and providing quality road connections to the airport and across the Western Sydney region.

The Australian Government is also investing \$200 million in a Local Roads Package as part of the Western Sydney Infrastructure Plan, supporting Western Sydney councils to deliver improved road connections that support the Western Sydney Infrastructure Plan.

Key features of the Western Sydney Infrastructure Plan

The Western Sydney Infrastructure Plan (shown in Figure 21) includes:

- The Northern Road upgrade, which will see around 35 kilometres of the road upgraded between The Old Northern Road at Narellan and Jamison Road and South Penrith. This will cater for future traffic from planned residential and commercial developments in time for the opening of Western Sydney Airport in 2026.

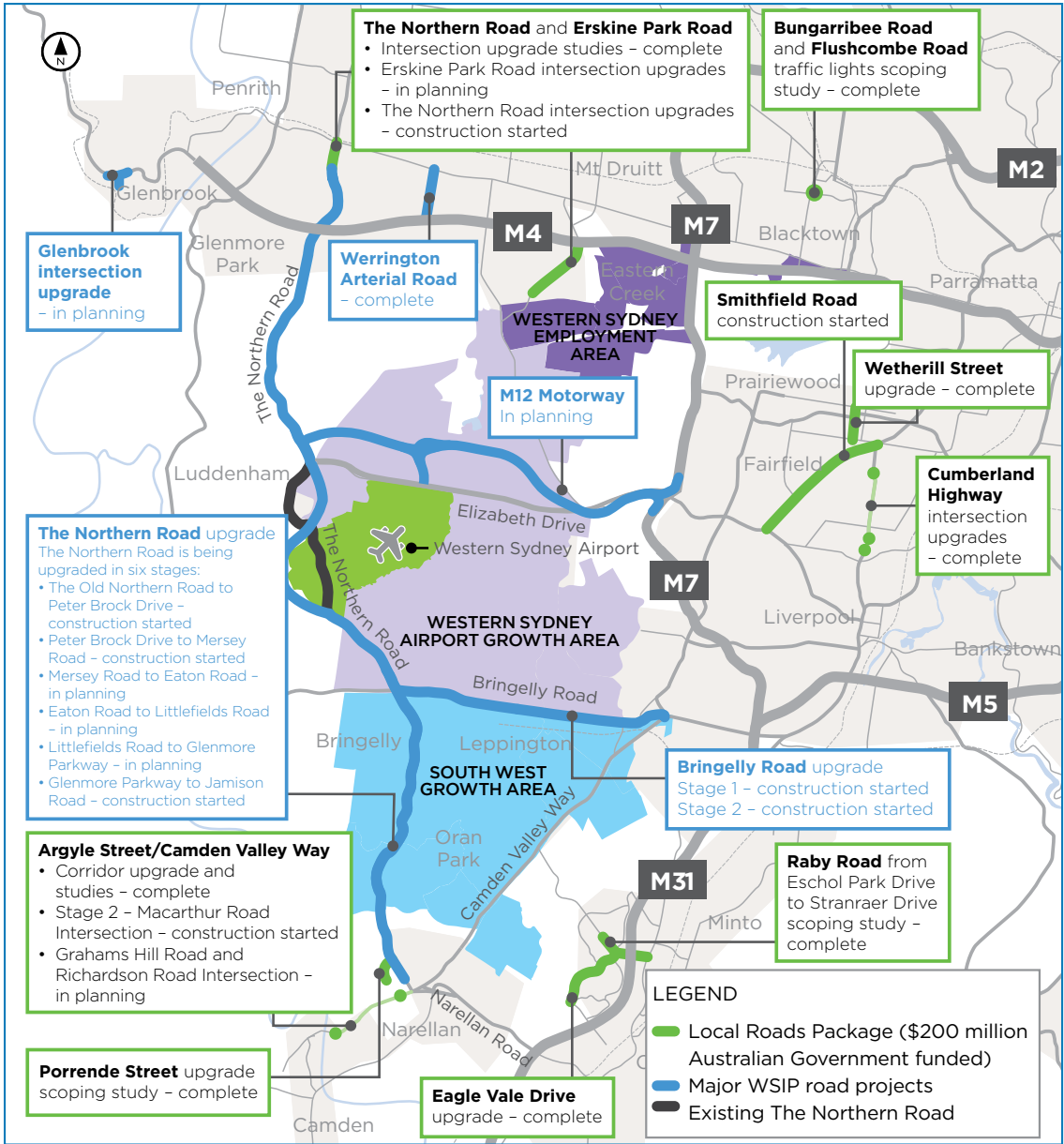
- The 10 kilometre Bringelly Road upgrade, which is being delivered in two stages between Camden Valley Way at Leppington and The Northern Road at Bringelly, with work underway on Stage 1 between Camden Valley Way, Leppington and King Street, Rossmore.
- The new M12 Motorway, which will provide direct access to Western Sydney Airport and Greater Sydney's motorway network, connecting The Northern Road and the M7, and meeting increased traffic demand from Western Sydney Airport.
- The Werrington Arterial Road upgrade, which opened to traffic in May 2017. This is the first project to be completed as part of the Western Sydney Infrastructure Plan, providing road users with faster and safer access between the M4 Motorway and the Great Western Highway.
- The Ross Street Intersection upgrade, which will improve safety and access at the intersection of Ross Street and the Great Western Highway, Glenbrook.

All seven Local Roads Package Round

One projects have also been completed.

Eleven projects announced as part of Round Two are either in planning or under construction. Applications for Round Three are expected to be invited in mid-2018.

Figure 21 Western Sydney Infrastructure Plan



Source: Australian Government and NSW Government, Western Sydney Infrastructure Plan

M4 Smart Motorway and WestConnex

The M4 Motorway's capacity is being enhanced through two complementary projects – WestConnex and the M4 Smart Motorways Project.

WestConnex

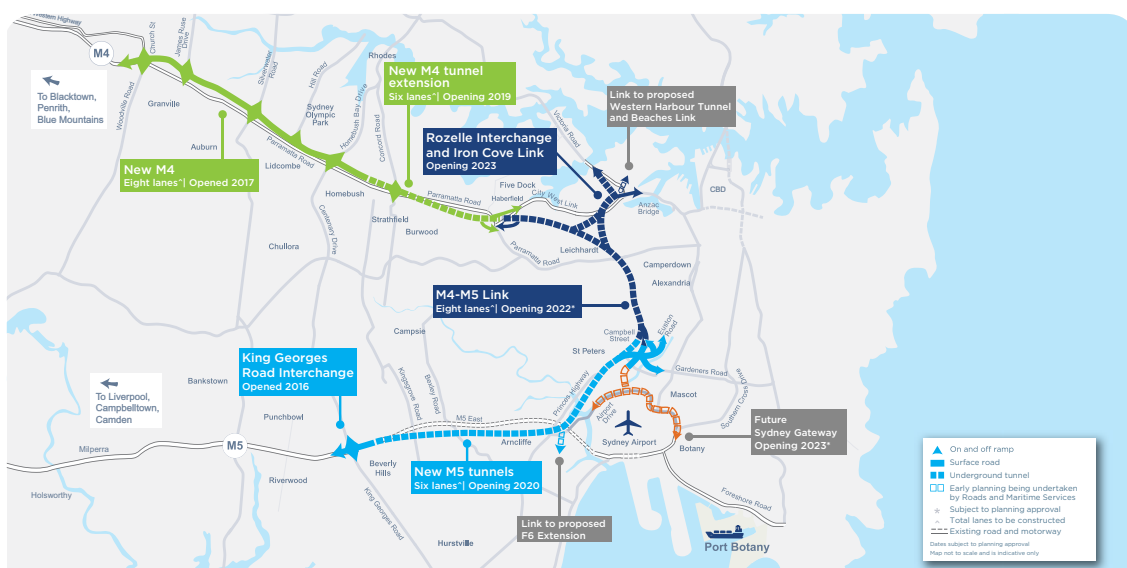
The WestConnex motorway will ease congestion and improve access and connections to Western Sydney and key employment hubs across the city. WestConnex New M4, the widening of the existing M4 Motorway between Greater Parramatta and Homebush is complete and was opened to traffic in July 2017. This is improving road capacity between Western Sydney and Sydney Olympic Park and easing existing pinch points on the motorway. East of Strathfield, the motorway will be extended towards the city to provide a contiguous motorway link to the Harbour CBD, Sydney (Kingsford Smith) Airport and Port Botany. WestConnex New M5 is expanding the capacity of the M5 East to east of Kings Georges Road.

Stages 1 and 2 will be connected with WestConnex Stage 3 (the M4-M5 link) which comprises tunnels connecting the new M4 East at Haberfield and the new M5 at St Peters, which may also include improved connections to Sydney (Kingsford Smith) Airport and Port Botany.

M4 Smart Motorways

This project will improve the operational efficiency and safety of the motorway west of Greater Parramatta by introducing ramp metering and in selected sections, variable speed limit signs and lane use signs to make merging easier and to forewarn motorists and navigate them around incidents. The motorway will be widened to four lanes in each direction between the M7 Motorway and Roper Road as part of the project.

Figure 22 WestConnex



6.2.5 Future proofing: corridor protection

The NSW Government is identifying land for transport corridors that can be used to meet future transport demand in Western Sydney. There are several key corridors that the NSW Government is investigating the South West Rail Link Extension, the Outer Sydney Orbital, the Bells Line of Road-Castlereagh Connection and the Western Sydney Freight Line.

South West Rail Link extension corridor west of Leppington

In the 2012 NSW Long Term Transport Master Plan, the South West Rail Link extension corridor west of Leppington was included as one the 19 identified major transport corridors across Greater Sydney requiring protection to enable the cost efficient, long-term development of the transport network. Protecting the South West Rail Link extension corridor was identified as a means of providing future public transport capacity within the South West Growth Area.

Work has been underway since late 2013 to identify the extent and location of the corridor to be protected for a Western Sydney Airport passenger rail corridor. A broad study corridor from Leppington to the T1 Western & Richmond Line near St Marys, via Western Sydney Airport site and south to Narellan was identified at that time. The possibility of extending the corridor further south to the existing T8 Airport South line at Macarthur was also considered.

In 2014-15, a community consultation process relating to the South West Rail Link extension was undertaken recommending a corridor and proposed station locations in the region. A recommended corridor for the South West Rail Link extension to an interchange west of Leppington has been developed and will need to be protected to facilitate the cost-effective delivery of rail infrastructure.

With the commencement of the Scoping Study, further work for corridor protection was put on hold subject to the assessment of rail links for Western Sydney and to Western Sydney Airport.

Further planning for an extension from Leppington could be considered as part of any future business case development for rail in Western Sydney.

The Outer Sydney Orbital

The NSW Government has been investigating a suitable corridor to provide a north-south connection for a future motorway and freight rail line for Western Sydney between Box Hill in the north and the Hume Motorway at Menangle in the south. A corridor between Bringelly and the

T1 Western & Richmond Line is being included as part of the Outer Sydney Orbital Corridor study.

The NSW Government has consulted with local communities and key stakeholders about this project, seeking their feedback on the possible alignment of the Orbital. The NSW Government is using this feedback, together with technical investigations, to identify and protect the most suitable location for the Orbital.

The Western Sydney Freight Line

The NSW Government has also been investigating a suitable corridor to provide a connection between the Southern Sydney Freight Line near Villawood and the new Outer Sydney Orbital identified corridor and a connection through to the T1 Western & Richmond Line near St Marys. The Western Sydney Freight Line will enable a double rail track dedicated to freight for up to 52 trains per day. Confirmation of the corridor in the Western Sydney Airport Growth Area will facilitate the development of a new major intermodal terminal servicing that growth area.

Transport for NSW has informed industry and the community on the Western Sydney Freight Line through the 2013 NSW Freight and Ports Strategy and the Long Term Transport Master Plan 2012 and has also undertaken stakeholder discussions with agencies and local government. Rail authorities including the Australian Rail Track Corporation and freight operators have been consulted on the corridor alignment options for the Western Sydney Freight Line.

6.2.6 The need for further rail investment in Western Sydney

The transport infrastructure investments above will offer part of the solution for addressing the growing transport demand in Western Sydney. The Scoping Study has identified the need for additional rail investment in Western Sydney over the longer term for a range of reasons:

Address capacity constraints on the existing rail network

Without investment, congestion will worsen on existing rail services. Over the short-medium term, initiatives such as the NSW Government's More Trains More Services will address some of these capacity constraints. However, increasing customer demand will result in Western Sydney's existing rail lines reaching peak capacity over the medium to longer term, with current projections seeing the T1 Western & Richmond Line and T2 Airport & South Line operating beyond peak capacity by approximately 2030.

Finding 1: There is an urgent need to strengthen capacity and manage growing transport demand between Western Sydney and the Harbour CBD

The Harbour CBD will continue to play an important role for workers in Western Sydney. Travel demand between Western Sydney and the Harbour CBD is already high and will continue to grow over the coming years. Progressing and accelerating enhancements to Greater Sydney's rail network is needed to reduce the growing demands for transport between Western Sydney and the east, in particular the Harbour CBD.

Expand the coverage of the network

As Western Sydney's population grows and densities increase, there will be opportunities to widen the coverage of the rail network in Western Sydney both for travelling within the region and to the Harbour CBD. This will be important to support locations with growing demand for public transport across Western Sydney, such as the Western Parkland City and Western Sydney Airport. This will not only assist in managing road congestion, but could be part of the solution to addressing Greater Sydney's job deficit by encouraging jobs growth along new rail lines in Western Sydney (see Section 5.3).

Shape the further development of Western Sydney

The development of rail infrastructure in Western Sydney offers opportunities for the transport network to shape the development of the region around a Western Parkland City (centred around Western Sydney Airport), as well as maximising opportunities for growth from the north to the south of Western Sydney. This city shaping effect will enable the growth in Western Sydney to be integrated with optimal infrastructure and land use planning, coordinated with work currently being undertaken by the Greater Sydney Commission and the NSW Government's Department of Planning and Environment.



7. RAIL DEMAND AT WESTERN SYDNEY AIRPORT

The Scoping Study assessed the potential demand for rail at Western Sydney Airport at its opening in 2026 and over the following decades.

7.1 About this chapter

This chapter provides an overview of the projected rail demand at Western Sydney Airport from the time of opening in 2026 and over the following 40 years.

7.2 The airport will grow with demand

The first stage of the airport (the Stage 1 development) will cater for up to 10 million international and domestic passengers per year, primarily serving Western Sydney residents and businesses when it commences operations in 2026. It is expected that Western Sydney Airport will be progressively developed in further stages as demand increases over time.

While Sydney (Kingsford Smith) Airport will continue to be a major focus for international and domestic airlines operating in and out of Sydney for the foreseeable future, Western Sydney Airport will play a major role in expanding the aviation capacity of Greater Sydney. Once Sydney (Kingsford Smith) Airport reaches capacity, expected to occur around the 2040s, Western Sydney Airport will accommodate further growth in aviation demand in Greater Sydney.

Figure 23 shows the forecast airport catchment in the Greater Sydney region at opening. The large and growing catchment of Western Sydney would be expected to support Western Sydney Airport's growth in passengers. In the early years of airport operations, road transport links will be important in providing connectivity for Western Sydney Airport customers and workers.

Figure 23 Greater Sydney aviation catchment distribution during the early years of operation of Western Sydney Airport



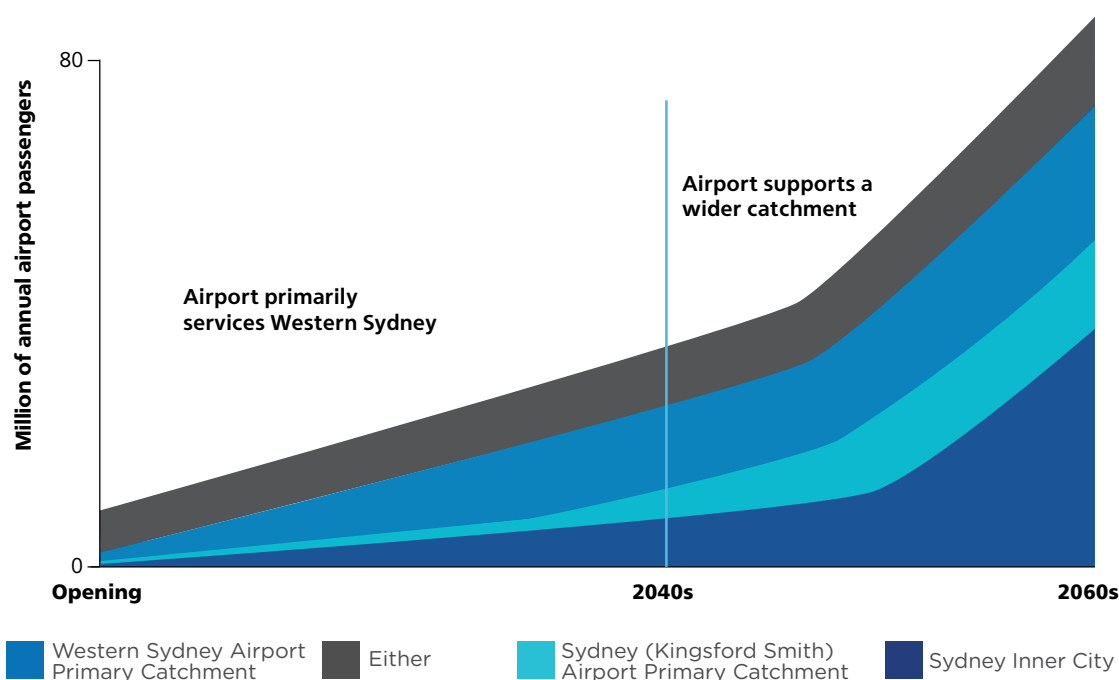
7.2.1 Transport links within Western Sydney will be most important in the short-term

Given the primary catchment for Western Sydney Airport will be within Western Sydney until around the 2040s, the short term transport priority for the airport should be supporting connections to the airport within the region. However, as Sydney (Kingsford Smith) Airport reaches its long-term aircraft movement capacity around the 2040s, Western Sydney Airport will need to cater for more passengers who live in the broader Greater Sydney basin and not just Western Sydney. By the 2060s,

passengers from the Harbour CBD and Greater Sydney's inner suburbs could account for almost half of Western Sydney Airport's forecast 80 million passengers. To support this growing catchment in the long-term, transport links between the Harbour CBD and Western Sydney Airport will become more important.

Figure 24 details modelling of the origin of the passengers travelling to and from Western Sydney Airport. This provides a good indication of where passengers will be travelling to and from as the new airport expands over the coming decades.

Figure 24 Origin-destination of Western Sydney Airport customers



What will make rail to Western Sydney Airport appealing for passengers?

For rail to be attractive to Western Sydney Airport customers and workers, it must be competitive with road services. A rail link must provide frequent services that enable airline passengers to get to and depart from the airport without a long wait. Rail must also provide access to key destinations across Western Sydney and on to the rest of Greater Sydney, to make sure that passengers can always get to where they need to go.

In addition, there will be several distinct customer preferences associated with providing an airport rail service. Customised rail services that meet the unique needs of airport passengers, such as luggage storage, will provide the rail options that are the most competitive with road options. Road services will be capable of effectively serving Western Sydney Airport's passengers in the early years.



7.2.2 Preparing road and rail connections to Western Sydney Airport

The following work is underway to ensure that the transport network supports people travelling to and from Western Sydney Airport when it opens in 2026.

Investing in roads to enhance connections to the airport

The Australian and NSW Governments are already delivering the 10-year, \$3.6 billion Western Sydney Infrastructure Plan to support Western Sydney Airport with a range of necessary local transport links. These new and upgraded road links will support the transport needs of Western Sydney Airport in the early years by connecting its localised primary catchment of the Western Parkland City with its new airport and allowing for both private car access as well as public transport.

Safeguarding a corridor for two rail lines through the airport

The Australian and NSW governments recognise that rail links will be important to Western Sydney Airport's future transport connections.

They are working closely to develop the design for rail works on the Western Sydney Airport site. This design work is being informed by the outcomes of the Scoping Study and will help to ensure that rail services for Western Sydney Airport meet the needs of future passengers and workers as the airport expands over time.

Planning for the Western Sydney Airport site includes safeguarding space for future stations and passenger rail infrastructure through the airport site. This space can cater for up to two independent rail lines (four tracks) that could accommodate, in the long-term, local passenger rail services as well as metro services. As a comparison, both Sydney (Kingsford Smith) Airport and Brisbane Airport each only have one rail line.

While the demand for rail to Western Sydney Airport may not justify two different connections immediately, planning for the airport site will allow for this in the longer term, future proofing both the airport and the region.

The corridor through Western Sydney Airport site, catering for up to two independent rail services, was considered as part of the Preferred Network.










7.3 Low demand for rail to airport on opening

The Australian and NSW Governments recognise that a rail connection for Western Sydney Airport will be needed at the right time, alongside a range of other transport connections. Rail connections to Western Sydney Airport will support airport passengers' and workers' travel to the airport, reduce road congestion and support economic growth in the region.

Western Sydney Airport will be a full service airport providing international, domestic and freight services. On opening in 2026, it is estimated approximately 5 million passengers (equivalent to Gold Coast Airport today) will use the airport in its first year.

However, there is likely to be weak demand for rail to Western Sydney Airport in its early years of operation, as illustrated in Table 2 below. Research of international airports around the world suggests that around 20 per cent of airport passengers use rail transport to get to and from the airport. The significant investment in roads around and to the airport means that road based transport, including private cars and buses, will be an effective transport option for airport customers initially. It is unlikely that a 20 per cent mode share for rail transport will be achieved for airport customers in the early years of Western Sydney Airport's operations.

Table 2 Estimated numbers of Western Sydney Airport customers and daily rail users

| Western Sydney Airport | | | | |
|------------------------|---|--|---|--|
| | Estimated Airport passenger numbers (per annum) | Share of airport passengers travelling by rail (per annum) | Estimated daily rail passengers | Number of Waratah ⁴ trains needed to fit daily rail customers |
| Airport Opening | 5m |  20% (1m) |  2,750 |  |
| Early 2030s | 10m |  20% (2m) |  5,500 |  |
| 2060s | 80m |  20% (16m) |  43,800 |  |

7.3.1 Comparing Australian airport rail links

Both national and international examples were studied to understand the potential rail customer volumes at Western Sydney Airport.


































Currently only two airports in Australia, Sydney (Kingsford Smith) Airport and Brisbane Airport, are directly serviced by rail. Australia's busiest airport is Sydney (Kingsford Smith) Airport with over 42 million annual air passengers. This airport is serviced by a single rail service, the T8 Airport & South Line between the Harbour CBD and Macarthur, which is used by around 20 per cent of airport passengers. Rail to Sydney (Kingsford Smith) Airport was opened in 2000, before Sydney hosted the Olympics, when the airport was serving around 24 million passengers per year. This level of rail patronage is considered high in the Australian context and is associated with increasing road congestion around Sydney (Kingsford Smith) Airport.

Brisbane Airport is also serviced by a single rail service providing connections to Brisbane CBD and the Gold Coast. This rail connection was opened in 2001 when the airport was servicing around 13 million annual air passengers. Around 9 per cent of Brisbane Airport passengers currently use the rail link, in part, due to lower levels of road congestion and lower car parking charges.

Rail's global average mode share of ground transportation for airport passengers is about 20 per cent. However, there are significant variations between airports overseas. Table 3 provides an overview of rail's mode share at major international airports in Australia and across the globe. It also allows for comparison with demand at Western Sydney Airport as it grows over time, as shown in Table 2.

⁴ The NSW Government's new Waratah double-deck suburban trains can carry around 1,200 passengers each.

Table 3 Overview of rail services to major international airports

| Airport | Airport passenger numbers (per annum) | Approximate share of airport passengers travelling by rail | Time to city by rail (minutes) | Distance from CBD centre (kilometres) |
|------------------------|---------------------------------------|--|---|---|
| London | | | | |
| Heathrow | 75.7m |  20% (15.1m) |  15-51 |  24 |
| Gatwick | 43.1m |  34% (14.7m) |  30 |  43 |
| Paris | | | | |
| Charles de Gaulle | 65.9m |  27% (17.8m) |  35 |  25 |
| Orly | 31.3m |  11% (3.4m) |  35 |  13 |
| Tokyo | | | | |
| Narita | 39.1m |  48% (18.8m) |  51-100 |  76 |
| Haneda | 79.2m |  30% (23.8m) |  27-41 |  14 |
| New York | | | | |
| JFK | 58.8m |  13% (7.6m) |  35-50 |  20 |
| Newark Liberty | 40.2m |  7% (2.8m) |  30 |  23 |
| Australia | | | | |
| Sydney Kingsford Smith | 41.9m |  20% (8.4m) |  12-25 |  10 |
| Brisbane | 22.9m |  9% (2.1m) |  23 |  16 |
| Hong Kong | | | | |
| Hong Kong | 70.5m |  23% (16.2m) |  24 |  35 |

8. THE LONG-TERM PREFERRED NETWORK FOR WESTERN SYDNEY

The Scoping Study identified a long-term Preferred Network to support Western Sydney and Western Sydney Airport over the next 40 years. The prioritisation, staging, sequencing and timing of links will be further considered by governments.

Figure 25 The Preferred Network for Western Sydney



8.1 About this chapter

This chapter provides an overview of the long-term Preferred Network and why it was chosen. This chapter also provides an insight into the possible first rail links to Western Sydney Airport.

8.2 The long-term Preferred Network

The Scoping Study has identified a long-term Preferred Network for Western Sydney, which comprises rail links that connect to Western Sydney Airport and improve connectivity across Western Sydney.

The Preferred Network provides a blueprint for expanding and enhancing rail services in Western Sydney over the coming decades. this long-term preferred network aligns with the Future Transport 2056 draft strategy.

8.3 Rail links connecting to Western Sydney Airport

The Australian Government is working with WSA Co to ensure that space is reserved at Western Sydney Airport for two independent rail services by preserving two rail corridors on the site and safeguarding space for two train stations.

The Scoping Study identified that the North-South Link and the East-West Link offered the greatest potential to serve Western Sydney Airport and shape future development in Western Sydney. The Preferred Network envisages that the South West Link would provide connectivity to Western Sydney Airport via an interchange at the Badgerys Creek Aerotropolis. The North-South Link and East-West Link would provide a direct connection to Western Sydney Airport.

8.3.1 North-South Link via Western Sydney Airport

This service links Macarthur in the south to Schofields in the north via the Badgerys Creek Aerotropolis interchange, Western Sydney Airport and St Marys.

A full North-South Link would cost an estimated **\$15-20 billion (2017 dollars)**.

The North-South Link offers a city shaping opportunity for the Western Parkland City

The North-South Link would represent a major investment in enhancing cross-regional rail capacity in Western Sydney. This link would not only connect large areas of the Western Parkland City to Western Sydney Airport, but also connect growth areas in the north-

west, west and southwest. Importantly, this link would provide onward rail connections to strategic centres such as Penrith, Liverpool, Greater Parramatta and Campbelltown.

Over the longer term, a North-South Link could provide a key element for structuring and shaping the significant growth of Western Sydney along the rail line and would complete a missing link in Western Sydney's transport network. By connecting Sydney's southwest and north-west, this rail link broadens Greater Sydney's focus from the Harbour CBD and opens new possibilities for homes, jobs and investment in Western Sydney. Benefits may include supporting the delivery of affordable housing and increased housing supply, reducing levels of car dependence, facilitating a 30 minute city and improved social inclusion outcomes.

The North-South Link reduces rail network congestion and connects to more employment

A connection with Sydney Metro Northwest at a new interchange at Schofields, combined with an extension of Sydney Metro Northwest from Cudgegong Road to Schofields, would also provide an important link from the west and northwest of Sydney to employment centres north of Greater Sydney. By connecting with Sydney Metro, rail links are greatly enhanced to locations including Norwest, Macquarie Park, Chatswood and North Sydney. This will reduce crowding on the congested T1 Western & Richmond Line.

Delivering the North-South Link in stages would improve its economic viability

The Scoping Study showed that while the full link has lower economic benefits if delivered around the opening of Western Sydney Airport in 2026, the North-South Link could provide a range of city shaping and economic benefits if delivered in stages as Western Sydney and demand at the airport grows from 2026 onwards. These assessments suggested that north of the airport would likely be first due to the greater population densities in that region and the potential to connect to Sydney Metro Northwest and key centres in Greater Sydney's north such as Macquarie Park and North Sydney.

Metro trains to support Western Sydney and the airport

A metro or light metro style of train would suit the North-South Link (see Section 8.8.2 for further details on train types). These trains could meet the growing needs of commuters in Western Sydney, whilst also providing the opportunity to customise trains suitable for airport passengers with luggage.

Finding 2

A North-South Link could be a game-changer for Western Sydney

The North-South Link would broaden Greater Sydney's focus from the Harbour CBD and open new possibilities for housing, jobs and investment in the Western Parkland City, centred around Western Sydney Airport. This could be achieved by connecting an extended Sydney Metro Northwest at Schofields with Macarthur via Western Sydney Airport, an interchange at Badgerys Creek Aerotropolis and an interchange with the T1 Western & Richmond Line at St Marys.

How could a North-South Link be staged?

The North-South Link could provide a range of city shaping and economic benefits if delivered in stages as urban development occurs and Western Sydney Airport grows.

The Scoping Study's analysis suggests that north of the airport provides the most benefits for a first stage because of greater population densities and the potential to connect to the T1 Western & Richmond line at St Marys and Schofields and Sydney Metro Northwest.

One possible approach to staging could be:

| Stages | Centres to be served |
|------------------------|--|
| Around airport opening | Badgerys Creek Aerotropolis to St Marys via Western Sydney Airport |
| + 5 years | St Marys to Schofields and Sydney Metro Northwest |
| + 10-15 years | Badgerys Creek Aerotropolis to Macarthur |



8.3.2 East-West Link to Greater Parramatta via Western Sydney Airport

This would link the Badgerys Creek Aerotropolis and the Western Parkland City through an interchange located to the south of the Western Sydney Airport, with Western Sydney Airport and Greater Parramatta.

The East-West Link to Greater Parramatta would cost an estimated **\$12-15 billion (2017 dollars)**.

Connects Greater Sydney's 'three cities'

The Scoping Study identifies the East-West Link to connect Greater Sydney's 'three cities'. This link would provide much need rail capacity as the airport catchment expands beyond Western Sydney to Sydney's east, around the 2040s. This direct link could

be delivered as an extension of the NSW Government's Sydney Metro West project from the Harbour CBD to Greater Parramatta.

Metro train supports more passengers than express service

The Scoping Study concluded that a rapid metro train would provide greater benefits than an express service as it would support both airport customers and people's daily travel in Western Sydney. Increasing the patronage of this service will ensure that it provides more support to Western Sydney's growing residential areas and relieves road congestion.

A metro service offers a competitive journey time compared to road or a comparable suburban rail service. See Section 8.8.2 for further details on train types.

Finding 3

There are strong economic grounds for an East-West Link that will connect the three cities and support a broader Western Sydney Airport catchment

An East-West Link would support the vision for the growth of Greater Sydney around the three cities. It would also connect Western Sydney Airport to new customers as the airport's catchment expands eastward from around the 2040s. A direct link between the three cities could be delivered as an extension of Sydney Metro West.

8.4 Rail links supporting growth in Western Sydney and travel to Western Sydney Airport

8.4.1 Sydney Metro West

Sydney Metro West between Greater Parramatta and the Harbour CBD would support connectivity between the three cities, as well as provide congestion relief to the existing network. The East-West Link from Greater Parramatta to Western Sydney Airport and the Badgerys Creek Aerotropolis could be an extension of Sydney Metro West.

Provides a significant increase in transit amenity

Sydney Metro West is envisaged to provide a significant increase in transit amenity throughout Sydney. The increased transit amenity would enable increased land-use efficiency, meaning that more people, dwellings and jobs can be located in the corridor.

Faster and more direct connections

Sydney Metro West would substantially improve travel times and provide more direct services to key destinations for existing customers and customers from new rail catchments.

Additional and more frequent high capacity public transport link from Greater Parramatta to the Harbour CBD gives customers an alternative (and more flexible) travel option with more stations and new interchange options with the T1 Northern and Western lines.

8.4.2 South West Link to the Badgerys Creek Aerotropolis

Creating a South West Link to extend the existing line from Leppington to a Badgerys Creek Aerotropolis interchange south of Western Sydney Airport would support the heart of the Western Parkland City, growth in the southwest and access to the airport.

This extension provides additional transport connectivity for the growing south-west and access to Western Sydney Airport by rail via the Badgerys Creek Aerotropolis interchange. The South West Link could connect to the North-South Link, making the area quickly accessible

to the rest of Western Sydney and could also connect to the East-West Link. This would also provide a connection from Liverpool to Western Sydney Airport by rail with the interchange with the North-South Link and East-West Link at the Badgerys Creek Aerotropolis.

A South West Link from Leppington to a Badgerys Creek Aerotropolis interchange would cost up to **\$2 billion (2017 dollars)**. This cost does not include a direct link to Western Sydney Airport. Passengers could connect to Western Sydney Airport by interchanging with the North-South Link and East-West Link.

Supports the growth in Greater Sydney's southwest

Over the longer term, this would provide important benefits to the longer term growth of Greater Sydney's southwest, serving as the principal link between Western Sydney Airport and development at the Badgerys Creek Aerotropolis, Bringelly and Liverpool.

Airport customers change at a Badgerys Creek Aerotropolis interchange

This proposed link does not connect directly to Western Sydney Airport. A possible future key transport interchange at a Badgerys Creek Aerotropolis interchange, located south of the airport, would allow customers to board rail services on either the North-South Link or East-West Link, which would both provide direct connections to the airport in the long-term.

South West Link would support connections to Western Sydney Airport via the Badgerys Creek Aerotropolis interchange

The Scoping Study investigated options to connect the South West Link to Western Sydney Airport. As a direct connection from Leppington, the South West Link would cost approximately **\$6 billion (2017 dollars)**, including the cost of rail infrastructure on the airport site. Although this would be the most affordable direct connection to the airport, the Scoping Study analysis highlighted some significant limitations:

- Patronage projections show significantly greater demand for travel to the airport using the East-West Link and the North-South Link. Accordingly, the South West Link delivers limited benefits in the long-term.
- Planning for Western Sydney Airport has made provision for only two separate rail services on the airport site. The Scoping Study recommends that these should be the North-South Link and the East-West Link in the long-term. The South West Link would connect to the airport via an interchange at the Badgerys Creek Aerotropolis.
- There are significant road investments underway near the South West Link route as part of the \$3.6 billion Western Sydney Infrastructure Plan, which will contribute towards the connectivity of regional centres in Western Sydney, including Liverpool.
- Extending the current T2 and T5 Leppington services provides the least convenient service for airport passengers. An extension of current services to Western Sydney Airport would result in a lower frequency service using the existing suburban double-deck trains that do not feature luggage storage facilities.
- Patronage projections indicate little demand for rail connections between Sydney (Kingsford Smith) Airport and Western Sydney Airport. The two international airports are forecast to act as independent aviation hubs, not as a single network.

The Scoping Study analysis determined that the South West Link would be most viable by providing connectivity to Western Sydney Airport via an interchange at the Badgerys Creek Aerotropolis. The Scoping Study determined the South West Link would not directly connect to Western Sydney Airport.

Finding 4

Protecting the South West Link corridor from Leppington to the Badgerys Creek Aerotropolis interchange, south of Western Sydney Airport, would support growing communities in the southwest

The South West Link would provide support for growing communities in the region and rail connectivity to Western Sydney Airport through an interchange at Badgerys Creek Aerotropolis. While the South West Link could provide a direct connection to Western Sydney Airport, the Scoping Study's analysis determined that this option is the least preferred direct link to the airport.

The North-South link and the East-West link are the preferred long-term direct links to Western Sydney Airport.

8.4.3 Extending the Sydney Metro Northwest from Cudgegong Road to Schofields

Connects a growing Western Sydney to Sydney's north

A future key transport interchange at Schofields, combined with the North-South Link connecting communities between Macarthur, Western Sydney Airport and St Marys, provides an important link to Greater Sydney's north and north-west through an easy transfer.

Reduces crowding on trains for Western Sydney

In the longer term, this link will also lead to more passengers using Sydney Metro, reducing crowding on the already busy T1 Western & Richmond Line.

8.5 The rail services connecting to other parts of Greater Sydney

Although important to the long-term success of Western Sydney's transport network, the Preferred Network's connections to the rest of Greater Sydney are closely related to projects outside of the Study Area. Services connecting to other parts of Greater Sydney were investigated as part of the Future Transport 2056 draft strategy, ensuring that the Preferred Network would provide benefits across the whole transport network.

Below is a summary of the key benefits of the rail links in the Preferred Network that will support people travelling across Western Sydney and into other parts of Greater Sydney.

8.5.1 Upgrades to the T1 North Shore, Northern & Western Line to increase capacity

Meeting growing demand from Western Sydney

The capacity of the T1 North Shore, Northern & Western Line would be increased through automated systems and other infrastructure upgrades, increasing capacity to address congestion and support future growth by enabling up to 24 trains per hour during peak periods between Greater Parramatta and the Harbour CBD. This would provide capacity on double-deck suburban trains for an additional 4,000 to 5,000 passengers every hour per line.

8.5.2 Upgrades to the T8 Airport & South Line to increase capacity from the southwest

Provides more frequent and higher capacity services

The capacity of the T8 Airport & South Line would be increased to support connections between the growing south-west and the Harbour CBD. The Scoping Study tested converting the existing line through Sydney (Kingsford Smith) Airport to a single-deck metro to achieve the desired increase in rail capacity. Services along this upgraded line could run more frequently, which would minimise wait times for passengers. This would reduce crowding for passengers from the south-west, and provide a faster and more reliable service. This would also reduce crowding on the T8 Airport & South Line through Sydney (Kingsford Smith) Airport and growing areas around Mascot and Green Square.

8.5.3 Extending the Sydney Metro City & Southwest from Bankstown to Liverpool

Improving services in southwest Sydney

This service would reduce travel times from Liverpool to Bankstown and the Harbour CBD and reduce crowding on other existing rail lines that travel through Liverpool.

The Future Transport 2056 draft strategy indicated that the extension of the train line from Bankstown to Liverpool is a visionary initiative in the 20 years+ timeframe.

Supports the growth of the south-west

This line has the potential to support urban development between Liverpool and Bankstown.

8.6 Benefits of the Preferred Network

8.6.1 Supporting the growth of Western Sydney

Rail investment has the potential to change how a city functions. Rail can shape how and where people live and work, influence business decisions, provide access to recreational and lifestyle opportunities and enable greater citizen participation in the life of the city. The Preferred Network's new rail links, especially the North-South Link, have the potential to guide the growth of the emerging Western Parkland City, centred around Western Sydney Airport.

The Preferred Network would:

- provide opportunities for urban renewal and regional transformation
- unlock housing growth and assist in absorbing Greater Sydney's population growth
- offer opportunities for development of affordable housing supply
- foster economic development in easily accessible station precincts
- improve social equity and access to services
- provide the transport infrastructure needed to support growth.

8.6.2 Supporting thousands more rail journeys

The Preferred Network's new and enhanced rail services could allow for thousands more people to travel by rail across Greater Sydney, providing significantly increased connectivity to Western Sydney and to Western Sydney Airport. By providing an attractive alternative to private vehicles, the Preferred Network can also have a significant impact on managing road congestion and vehicle emissions as Greater Sydney continues to grow.

8.6.3 Relieving crowding on network

The Preferred Network would provide significant relief to the crowding on the existing train network, particularly on the T1 North Shore, Northern & Western Line, the T2 Leppington & Inner West Line, as well as the T8 Airport & South Line. This is demonstrated by Figure 26 and Figure 27 below, which show projected crowding on Greater Sydney's train network in 2056 with and without the delivery of the Preferred Network.

8.6.4 Reducing commute times

The Preferred Network would offer significant improvements in travel times for people across Greater Sydney, as shown in Figure 28 below. Most of the economic benefits provided by the Preferred Network are the result of the travel time savings on the public transport system and on the road network.

Figure 26 Morning peak hour train crowding in the absence of investment in 2056

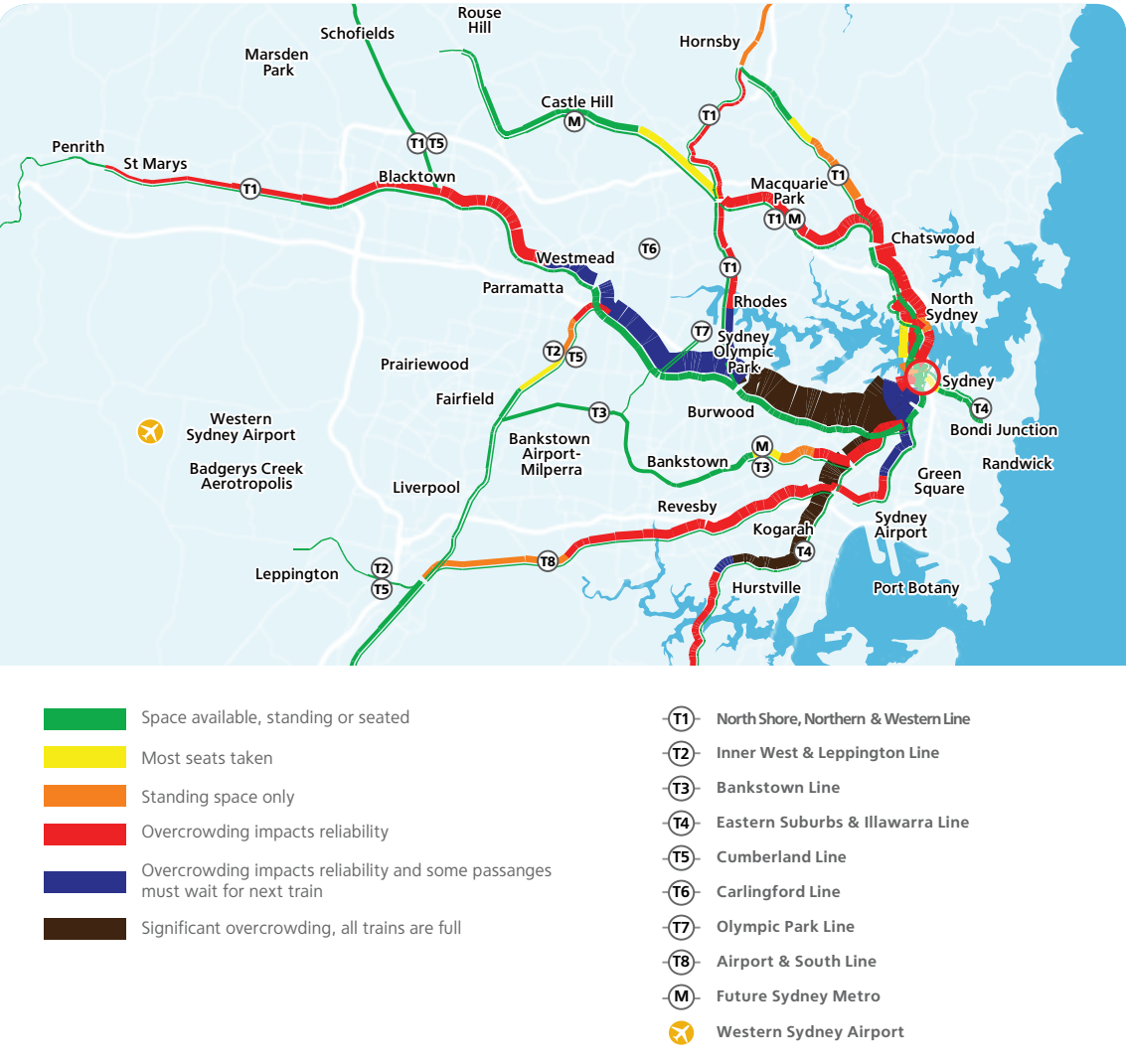


Figure 27 Morning peak hour train crowding relief provided by the Preferred Network in 2056

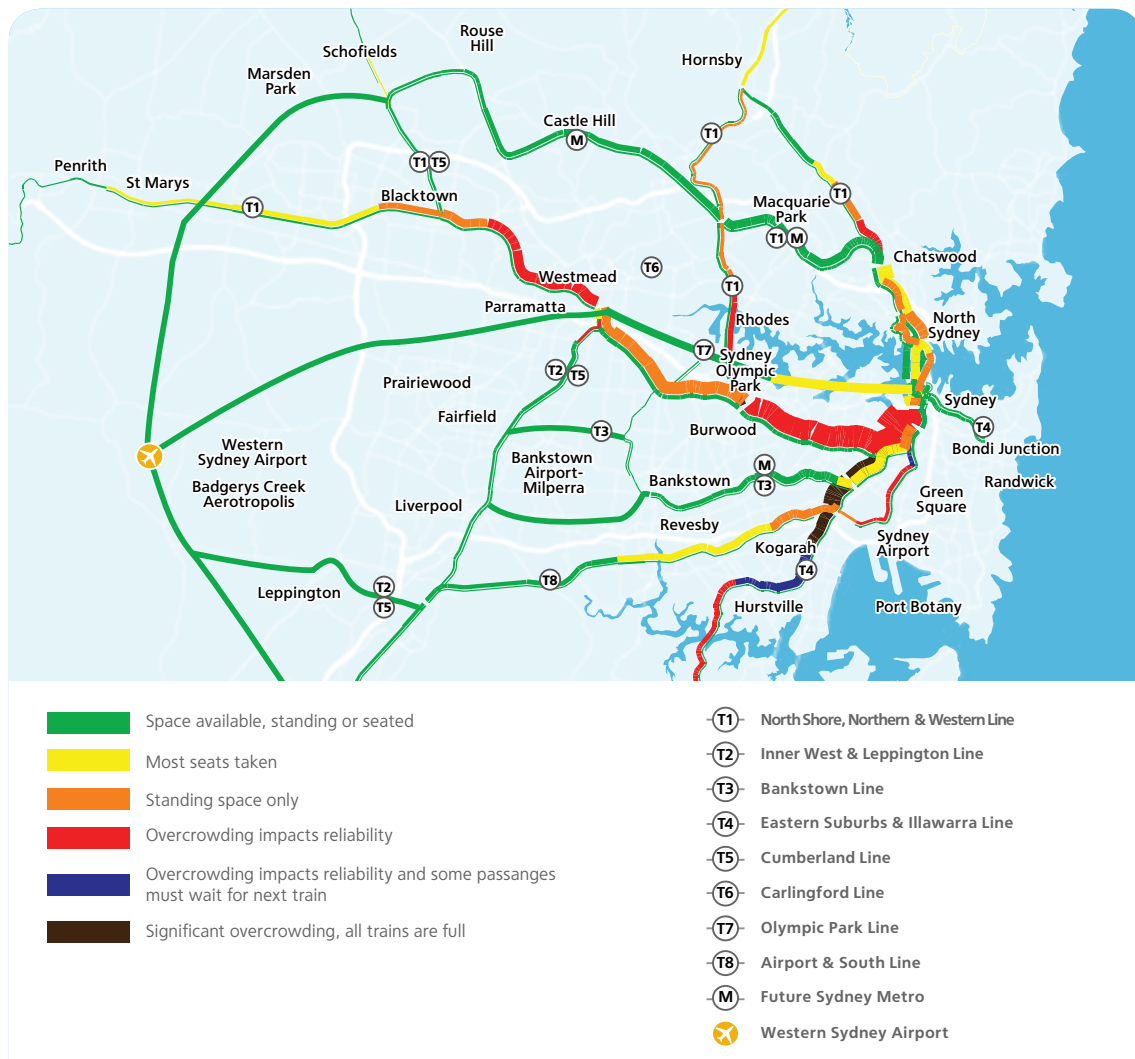
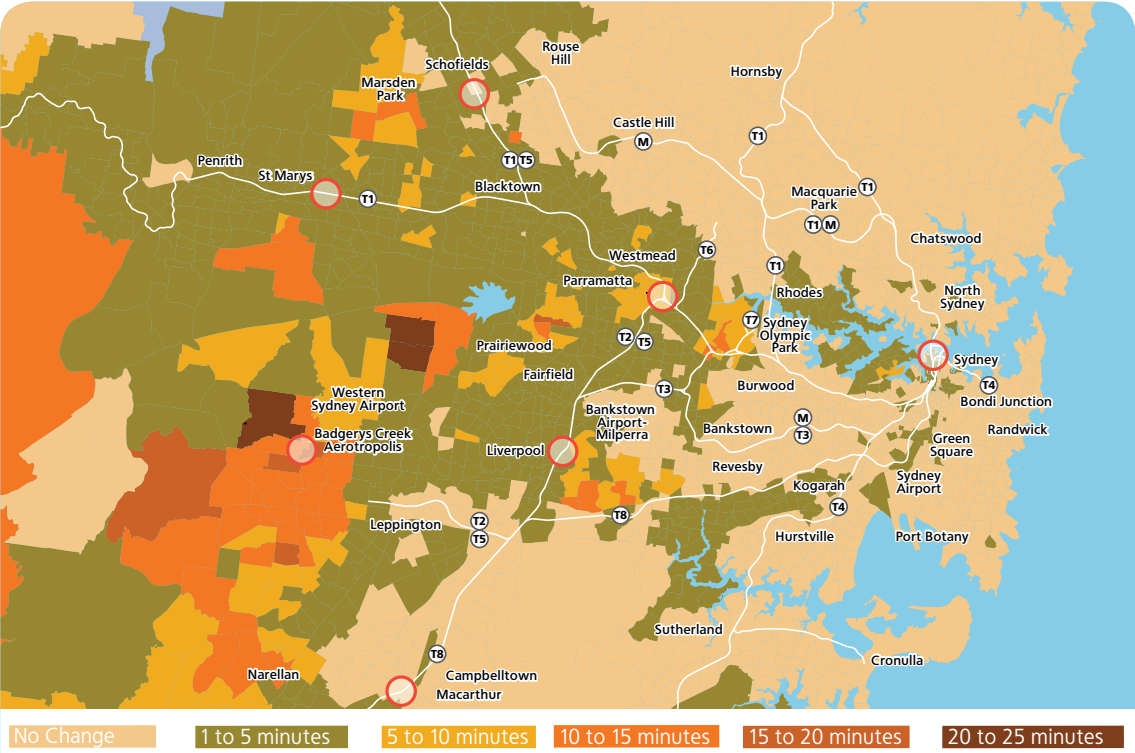


Figure 28 Indicative travel time savings provided by the Preferred Network in 2056



8.6.5 Supporting Western Sydney Airport when a rail link is needed

The Preferred Network provides two direct rail links to Western Sydney Airport and a range of other links that support these two direct links.

Beyond supporting the growth of the Western Parkland City, the North-South Link will support connections to the airport within Western Sydney until Sydney (Kingsford Smith) Airport reaches capacity around the 2040s.

In addition to supporting connections between the three cities of Greater Sydney, the East-West Link will cater for passengers who live in the broader Greater Sydney region. This will become particularly important from when Sydney (Kingsford Smith) Airport reaches capacity.

8.7 How much would the Preferred Network’s rail links cost to deliver?

While more detailed costings are required, the initial estimates displayed in Table 5 show the magnitude of the challenge of paying for these services, particularly as governments work to provide health, education or other services to meet the needs of a growing community. The significant cost of the Preferred Network highlights the need to harness a range of funding approaches

Detailed assessment, including engineering and costs of these supporting rail links should be explored further through business case investigations.

Table 5 Cost Estimates of rail links providing connectivity to Western Sydney Airport

| | Estimated Length (kilometres) | Estimated Cost (2017 Dollars) |
|--|----------------------------------|----------------------------------|
| Potential rail links direct to the airport | | |
| These include the cost of rail infrastructure on the airport site | | |
| North-South Link via Western Sydney Airport | | |
| Schofields–St Marys–Western Sydney Airport– Badgerys Creek Aerotropolis–Macarthur. | 60-70 | \$15-20 billion |
| This link could be staged to spread the costs of the project over time. | | |
| See section 8.3.1 for the benefits of this rail link. | | |
| East-West Link via Western Sydney Airport | | |
| Badgerys Creek Aerotropolis–Western Sydney Airport–Greater Parramatta. | 30-35 | \$12-15 billion |
| This cost does not include the costs of a rail link from Greater Parramatta to the Harbour CBD. | | |
| See section 8.3.2 for the benefits of this rail link | | |
| South West Link to Western Sydney Airport | | |
| Leppington–Badgerys Creek Aerotropolis/ Western Sydney Airport. | 14 | \$6 billion |
| This is not preferred by the Scoping Study as a direct link to Western Sydney Airport. In the long term, a North-South Link and East- West Link provide more benefits than an extension of the existing line to the airport. | | |
| See section 8.4.2 for more details on why this rail link is not part of the Preferred Network. | | |
| Potential rail link providing connectivity to the airport | | |
| This includes an interchange at Badgerys Creek Aerotropolis | | |
| South West Link to Badgerys Creek Aerotropolis | | |
| Leppington–Badgerys Creek Aerotropolis. | 7 | \$2 billion |
| Passengers could connect to Western Sydney Airport by interchanging with the airport links at Badgerys Creek Aerotropolis. | | |
| See section 8.4.2 for the benefits of this rail link. | | |

8.8 How options were assessed

8.8.1 Evidence used in the assessment

The merits of all options were assessed through analysis against the Scoping Study objectives and strategic economic assessment. A range of evidence was used in the assessment and the major components are outlined below. This evidence was based on the best available information during the course of the Scoping Study's analysis.

A detailed study of the below elements is a necessary part of any further assessment of the rail links outlined in the Scoping Study's Preferred Network.

Engineering work

The constructability of each option was assessed taking into account major engineering challenges, such as rivers and areas of dense development.

Costings

Strategic cost estimates for each option were developed based on possible alignment designs and the assumed construction needed. These costings provided a comparative guide on the costs of delivering rail for Western Sydney and to Western Sydney Airport.

Capital and recurrent costs were both considered. These include:

- construction
- land acquisition
- new trains
- project management
- contingency (P90)⁵
- inflation (2.8 per cent annual rate)⁷
- cash flows over the timeline of the project
- operating costs.

Land use futures

Western Sydney is growing rapidly. As a result, the following two land use futures were used to assess the benefits of each of the rail options under different patterns of growth and development:

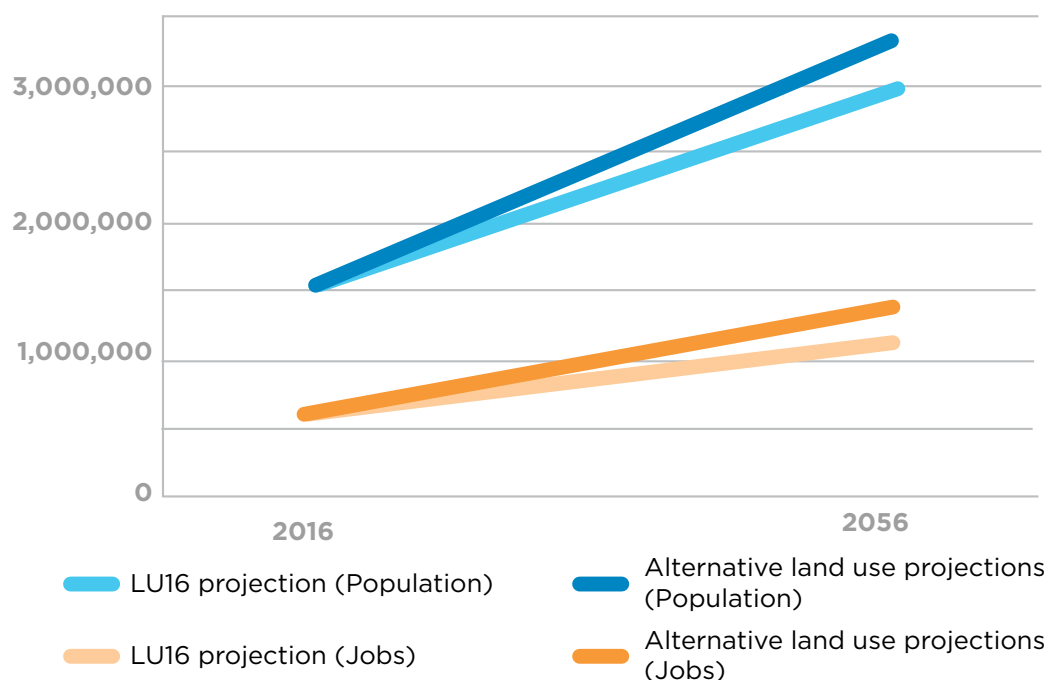
- LU16 projections: the standard NSW Government land use forecasts that were developed by the NSW Government's Department of Planning and Environment in 2016.
- Alternative land use projections: land use projections that incorporated more intensive development to support more homes and jobs in the Study Area. These alternate land use projections were developed in consultation with the Greater Sydney Commission and the NSW Government's Department of Planning and Environment. These were based on the best available information at the time of assessment in early 2017.

The Study Area's forecast jobs and residential growth under both of these land use scenarios is illustrated in Figure 29 below. Growth beyond the Study Area was also considered.

⁵A P90 contingency means that there is a 90% statistical probability that the total capital cost of the project will be equal to or less than the estimated construction cost.

⁷A 2.8 per cent annual inflation rate is the NSW Government standard rate for major infrastructure projects.

Figure 29 Two land use futures for the Study Area



It is important to note that these land use assumptions are not targets. They are projections based on trends of birth, deaths and migration using information available at the time. If these trends change, then the projections will change accordingly.

Network-wide impacts

The Scoping Study considered how each rail option needs to operate within a larger transport network, including both existing and future transport infrastructure and services. These assessments determined the potential for the rail option to relieve congestion on the road and rail network.

Patronage modelling

Customer volumes for each option were assessed using land use forecasts, taking into account growth in residential and employment areas and planned transport infrastructure. Western Sydney Airport customer volumes were based on projected flight volumes and international benchmarking of airport rail services (see also Section 7.3).

Funding and financing opportunities

The Scoping Study examined a range of approaches for reducing taxpayer costs and accelerating the timeframes for delivering new rail services to Western Sydney. Given the high cost of delivering a new rail service, it is

unlikely that it could be funded by government alone without implications on funding for other publicly funded work. For this reason, the following funding and financing approaches were assessed for each option: user pays, value sharing and public-private partnerships.

Rapid economic assessment

The rapid economic assessment considered a set of conventional economic benefits and costs. These were evaluated over a 50-year period with the benefits and costs discounted at a real discount rate of seven per cent per annum.

The benefits assessment has been undertaken using both the LU16 land use forecasts and alternative land use settings.

8.8.2 Different rail service products assessed

The Scoping Study assessed the relative merits of the following rail service products for the Preferred Network: suburban, metro, light metro and express. Each of these different service products has specific strengths and limitations regarding key features such as speed, frequency, comfort levels and carrying capacity. For example, a metro service offers the potential for higher frequency and higher capacity than a suburban service.

A comparison of key features of these different rail service products is described in Table 6.

Table 6 Rail Service offerings

| | SUBURBAN TRAINS | METRO TRAINS | LIGHT METRO | EXPRESS |
|---------------------------|---|---|--|---|
| |  |  |  |  |
| Comparable Product | Sydney Trains | Sydney Metro | Vancouver SkyTrain London Docklands Light Rail Copenhagen Metro | London Heathrow Express Stockholm Arlanda Express Tokyo Narita Express |
| Maximum Frequency | Currently every 3 minutes, but with investment in automated systems could be every 2.5 minutes. Currently up to 20 trains per hour, but with investment in automated systems could be up to 24 trains per hour. | Every 2 minutes Up to 30 trains per hour | Every 2-10 minutes Up to 30 trains per hour | Every 2.5 minutes Up to 24 trains per hour |
| Maximum Speeds | 110 km/h Average of 40 km/h | 100-130 km/h Average of 65 km/h | Up to 100 km/h Average of 50 km/h | Up to 160 km/h Average of 80 km/h |
| Capacity | 28,800 per hour | 46,000 per hour | 24,000 per hour | 26,000 per hour |
| Stopping Patterns | Mixture of all-stop, limited stop and express services in many corridors | All stop services | All stop services | Express services with few intermediate stops |
| Train Crewing | Currently crewed by a driver and a guard. | Automatic Train Control with driverless train | Automatic Train Control with driverless train | Typically crewed with a driver and customer service attendants |
| Seating Style | Row seating to maximise seating capacity and comfort | Longitudinal seating to maximise carrying capacity | Seating can be row or longitudinal | Row seating to maximise seating capacity and comfort |
| Luggage Storage | Provides option to customise for passenger storage | Potential to be customised to allow for luggage storage | Potential to be customised for passenger storage | Customised fit out to allow for luggage storage and first/economy class seating |



What is the difference between the fast rail services in the Scoping Study and high speed rail?

Rapid metro

The preferred type of rail for the East-West Link from Western Sydney Airport to Greater Parramatta is a rapid metro. This provides high frequency, all stop services and competitive journey times while connecting communities along the route. These trains are designed to operate at up to 130km/h.

Direct rail express service

The direct rail express service considered in the Scoping Study (Option 5 in the Discussion Paper) would provide a fast service between Western Sydney Airport and Greater Parramatta. This express service could operate at speeds up to 160km/h with few intermediate stops. Whilst providing very competitive journey times, fewer stops provide less connectivity to jobs and services for the communities located along its route.

High speed rail

High speed rail is capable of moving people at speeds of at least 250km/h usually over long distances on dedicated tracks. Internationally, high speed rail is used between major cities but also provides opportunities for stops in regional areas and fast commuter rail services from outer metropolitan areas. High speed rail stations are typically located within city centres, close to population and business centres. High speed rail was not assessed as part of the Scoping Study given the focus on the Study Area in Western Sydney (see Section 3.2).

The Australian Government announced \$20 million in May 2017 to investigate faster rail options across the nation, which could include segments of higher speed rail. A Faster Rail Prospectus was released by the Australian Government in September 2017 which outlines the next steps in the faster rail assessment process.

8.9 How soon can the airport links be delivered?

This Section provides an overview of the possible timing of the rail links supporting travel to Western Sydney Airport.

8.9.1 North-South Link via Western Sydney Airport

A first stage (Badgerys Creek Aerotropolis to St Marys) of the North-South Link could be built in the years around the opening of Western Sydney Airport in 2026.

Using standard growth forecasts for Western Sydney, a full North-South Link would be economically viable in the 2030s. However, the development of Western Sydney Airport and the city shaping planning work being undertaken by the Greater Sydney Commission on the Western Parkland City is driving population and economic growth in the region, which would improve the benefits of a city shaping rail link.

The Scoping Study's economic analysis

suggested that the North-South Link could be viable at or close to the time Western Sydney Airport opens if complemented by a range of other measures. These include:

- Delivery in stages, beginning with the northern section of the rail line between the Badgerys Creek Aerotropolis, Western Sydney Airport and an interchange at St Marys (see Section 8.3.1 for more).
- Accelerating the timeframes for developing land around stations along this line to make this corridor more viable, noting the work being undertaken by the Greater Sydney Commission to identify opportunities for growth in housing in Western Sydney and the development of the Western Sydney City Deal.
- Reducing the costs of construction through smarter and more detailed engineering study.

8.9.2 East-West Link to Greater Parramatta via Western Sydney Airport

The East-West Link to Greater Parramatta via Western Sydney Airport as a rapid metro would be difficult to deliver in the years soon after the opening of the airport in 2026. This is because there are significant engineering challenges along the route, including the need for extensive and expensive tunnelling under existing urban areas.

Based on the preliminary economic assessment, delivering the East-West Link from Western Sydney Airport to Greater Parramatta would become economically viable in the 2030s.

An East-West Link from the airport to Greater Parramatta that continues onto the Harbour CBD would be economically viable sooner than a line from the airport that ends at Greater Parramatta. This is due to removing the need for passengers to transfer onto other transport services at Greater Parramatta. There will also be cost savings associated with constructing an interchange in Greater Parramatta with fewer underground terminating lines.

This direct link could be delivered as an extension of the NSW Government's Sydney Metro West project from the Harbour CBD to Greater Parramatta.

8.9.3 Rail links being assessed through the Future Transport 2056 draft strategy

The Future Transport 2056 draft strategy has examined timeframes for delivering the Preferred Network's rail links from Western Sydney to other parts of Greater Sydney. This ensures that these links are considered in the context of the infrastructure and services being delivered outside of the Study Area of the Scoping Study.

The Future Transport 2056 draft strategy provides further guidance on the potential timing of these links.

Finding 5 **Rail could play an important role in shaping Western Sydney, but it is not essential to the success of Western Sydney Airport at opening in 2026**

Western Sydney Airport will need to be connected by rail in the future, but there is likely to be low demand for rail to Western Sydney Airport in its early years after opening. The Scoping Study found that, with low demand for rail from Western Sydney Airport and under existing land use projections for Western Sydney, it would be challenging to make any airport rail link economically viable if introduced with the opening of Western Sydney Airport in 2026. However, there are a range of opportunities to enhance the economic viability of a rail link that can shape the growth of Western Sydney.

9. HOW COULD THE PREFERRED NETWORK BE FUNDED?

The Scoping Study examined a range of approaches to funding the individual rail links that make up the Preferred Network.

9.1 About this chapter

This chapter provides a summary of initial assessment of the options for funding the individual rail links in the Preferred Network.

9.2 Considering the large costs of rail projects

The large costs of new rail infrastructure in Western Sydney and to Western Sydney Airport, discussed previously in Section 8.7, show that building new railways is a significant investment and is not a decision governments can take lightly. Not only are there substantial costs associated with engineering works and purchasing new, modern trains, but there are also extensive land purchases or expensive tunnelling that need to occur so that trains can operate smoothly in dedicated corridors within existing urban development.

New rail lines are under construction in Greater Sydney in the Sydney Metro Northwest and Sydney Metro City & Southwest projects. However, these projects have also been a significant investment, costing around \$8.3 billion and \$12.5 billion respectively. Both projects have specific engineering challenges and requirements similar to elements of the Preferred Network.

Identifying and planning for the Preferred Network now means that governments can plan for the future of rail in Western Sydney while still providing the region's growing population with high quality services, such as in health and education.

9.3 Could the Preferred Network be funded by the government alone?

Western Sydney's growing population will need the right infrastructure and services at the right time. This is not limited to roads and rail transport, but also includes education, health and essential services. Governments will always have to find the right balance in making investments in all of these necessary services.

Delivering new rail services through government funding alone may take some time. To find out if the Preferred Network could be delivered sooner, the Scoping Study assessed a range of alternative funding approaches that could be used to accelerate the delivery timeframes for each element of the Preferred Network.

9.4 The funding options

The Scoping Study examined a range of funding options, including value sharing, which could be used to help fund the Preferred Network. Each funding option was assessed to determine how effective it would be in generating revenue and whether it was equitable for the community.

Over station development and residential development levies

Land and property near train stations or transport hubs are usually considered desirable and new or improved transport infrastructure and services can increase development opportunities and the value of those opportunities. One possible approach is that the NSW Government could levy all new dwellings developed near new stations to assist with funding new rail infrastructure. This levy is assumed to apply to new dwellings within the walking distance of new stations as identified by the land use analysis in the Scoping Study. A levy on construction costs is in line with Special Infrastructure Contribution levies currently being adopted in the market.



What is value sharing?

A value sharing or value capture approach considers how a project delivers value to different parties and what mechanisms are available to enable some of this increased value to be realised as revenue streams that can help bring forward project funding.

Value sharing can allow governments to invest in rail infrastructure earlier, or deliver a better project than might be possible using government funding alone. Contributions should be based on the principle of proportional, fair and appropriate benefit sharing.

Value sharing can successfully be implemented with long-term planning in mind. Successful examples of value sharing ensure good outcomes are achieved for the growth of the region and the project.

Although not sufficient to cover a large proportion of costs, the absolute worth of the value sharing mechanisms may be sufficiently large to consider capturing. However, detailed financial analysis of the timing, risk and commercial quality of cash flows is required to confirm these estimates.

Special infrastructure contributions on land surrounding stations

The benefits of transport investments may extend well beyond new transport corridors. For instance, new capacity provided in one part of the network may serve to relieve another part of the network. Therefore, improvements in accessibility across Greater Sydney generated by a new rail investment may result in widespread improvements in land value over a broad area, upon which levies may be applied. Based on accessibility improvements, changes in land values from this improvement in accessibility provide the tax base from which to apply this levy.

Airport train service fares

Cities such as London and Hong Kong have premium express rail services that offer superior journey times compared with other local train or bus services to and from their respective airports.

An additional fare placed on a faster service for a dedicated airport rail service to Western Sydney may help pay for some of the cost of rail. Incremental standard fare revenues are projected to cover only a small amount of costs over the lifetime of the rail link. Further consideration will be given to finding the balance between offsetting some of the cost of the network through an additional fare, while still incentivising the use of rail as a transport mode to Western Sydney Airport.

Higher costs associated with an early delivery airport rail links

The sooner Western Sydney Airport is served by rail, the greater the funding that will be needed, due to:

- the low rail patronage from the airport producing low fare revenues
- lower population densities along the rail corridors providing less development potential, including the associated value sharing opportunities.

Financing

Financing solutions cannot be identified with certainty until a business case has been completed. This further assessment in the form of a business case is a next step for any investment in rail infrastructure for Western Sydney and Western Sydney Airport.

Funding versus financing

The term **funding** refers to how infrastructure is paid for. Ultimately, there are only two sources of funding for infrastructure: government investment made available through the tax base, or charges on users or beneficiaries of the infrastructure.

Financing refers to the way in which the upfront capital is raised to allow the delivery and operation of an infrastructure project. This can include the use of equity and/or debt, such as loans.

Finding 6: The high cost of the Preferred Network's individual links will require a range of funding approaches to improve affordability

It is necessary for governments to map out options, identify priorities and plan for future stages of investment. Consideration of alternative funding measures, such as value sharing, is required. Further investigations beyond this Scoping Study are recommended.

10. FINDINGS AND RECOMMENDATIONS

10.1 About this chapter

This chapter presents the key findings and accompanying recommendations from the Scoping Study.

Finding 1

There is an urgent need to strengthen capacity and manage growing transport demand between Western Sydney and the Harbour CBD

The Harbour CBD will continue to provide high value opportunities for workers in Western Sydney and increased capacity is required to allow workers in Western Sydney to access these opportunities.

Travel demand between Western Sydney and the Harbour CBD is already high, resulting in road congestion and public transport crowding during peak periods. As Western Sydney's population grows, congestion and crowding will increase. These pressures were raised during the consultation period, with community feedback highlighting overcrowding on existing train services as a key challenge facing Western Sydney's rail network.

The Scoping Study provides a range of measures to better utilise the existing network and recommendations for progressing and accelerating enhancements to Greater Sydney's rail network to reduce the growing demands for transport between Western Sydney and the east. These recommendations also align with the Future Transport 2056 draft strategy.

Recommendations

- 1.1. Accelerate the implementation of short to medium-term capacity enhancements to the existing rail network, including the rollout of automated systems and train control technology to enable 24 trains per hour on the T1 Western & Richmond Line.
- 1.2. Progress the development of Sydney Metro West to increase existing rail capacity between the Harbour CBD and Western Sydney, cater for key urban development areas along the route and facilitate a new direct rail connection between the Harbour CBD and Western Sydney Airport.
- 1.3. Extend Sydney Metro Northwest from Cudgegong Road to Schofields to provide additional connectivity to the North West Growth Area and crowding relief to the T1 Western & Richmond Line.
- 1.4. Augment the capacity of the T8 Airport & South Line through the existing Airport Link or other appropriate means to enable increased services from south-west Greater Sydney.
- 1.5. Investigate measures to encourage the spreading of demand across the peak period to ease the need to accelerate height of peak capacity enhancement measures.
- 1.6. Continue to monitor the need for station upgrades to cater for continued growth in station passenger demand.
- 1.7. Investigate and implement policy measures to increase travel within Western Sydney and reduce travel outside of Western Sydney, in particular creating new employment opportunities within Western Sydney, as well as land use measures to strengthen current key employment centres including Greater Parramatta, Sydney Olympic Park and the Western Parkland City.

Finding 2

A North-South Link could be a game-changer for Western Sydney

By providing a rail service that connects Greater Sydney's southwest to the northwest, the North-South Link would broaden Greater Sydney's focus from the Harbour CBD and promote urban development and growth in Western Sydney. Rail connectivity can open new possibilities for communities in Western Sydney, through improving accessibility to major centres, supporting the delivery of affordable housing, encouraging investment and creating new jobs.

However, this proposed rail link carries a number of risks because it includes large areas that are earmarked for future development. This brings uncertainty about factors that will determine the economic viability of this rail line such as housing numbers and densities, demographics, employment prospects and services required like education and health. Key to resolving these uncertainties is the development of a clear plan to define a city that would develop around Western Sydney Airport. The Greater Sydney Commission is undertaking the planning work for a Western Parkland City and has released its draft Greater Sydney Region Plan and the Western City District Plan (see Section 5.4.2 for more about the Western Parkland City).

The northern part of the North-South Link warrants prioritisation

Consideration should be given to delivering the North-South Link in stages. The northern part of the North-South Link, from Badgerys Creek Aerotropolis and Western Sydney Airport to St Marys and Schofields, would provide enhanced rail connectivity from the airport, the west and northwest of Greater Sydney to significant employment centres in the north. Combined with an extension of Sydney Metro Northwest from Cudgegong Road to Schofields, rail links would be greatly enhanced to strategic centres including Norwest, Macquarie Park, Chatswood and North Sydney. The northern part of the North-South Link would also increase rail connectivity from Western Sydney to Greater Parramatta and the Harbour CBD through connections to the existing rail network. Connecting Western Sydney to Sydney Metro Northwest at Schofields would also reduce future crowding on the T1 Western & Richmond Line.

High level analysis suggested that north of the airport would be the most appropriate first stage. However, the full corridor should be protected to ensure future delivery of the long-term plan for Western Sydney.

Recommendations

2.1. Commence the project development and business case process for the North-South Link. The business case development process should include:

- Consideration of alternative mode and route options that may deliver improved value for money and affordability. Testing of the attractiveness of routing the alignment to Menangle Park to avoid the major tunnelling costs should be considered as part of a business case.
- Further assessment of land use changes and the nature of these change, in consultation with the Greater Sydney Commission and the NSW Government Department of Planning and Environment.
- Revalidating the economic case and timing/staging.
- Investigating options for delivery and market test its potential.

2.2. Implement steps to preserve the corridor between Schofields and Macarthur for future transport infrastructure to minimise development costs and to maximise future service reliability and speeds.

Finding 3

There are strong economic grounds for an East-West Link that will connect the three cities and support a broader Western Sydney Airport catchment

By providing connectivity between Western Sydney Airport (the Western Parkland City), Greater Parramatta (the Central River City) and the Harbour CBD (the Eastern Harbour City), the Preferred Network supports the vision for the growth of Greater Sydney around the three cities. This East-West Link will be important to:

- provide highly skilled workers access to knowledge intensive industries across the three cities
- strengthen the role of the emerging Central River City, which in turn, supports the growth of the Western Parkland City
- connect Western Sydney Airport to Greater Parramatta and the Harbour CBD as the airport's catchment expands eastward from around the 2040s.

The preliminary economic assessment undertaken in the Scoping Study suggests that the East-West Link would be best delivered as a direct service connecting the three cities. This direct link could be delivered as an extension of the NSW Government's Sydney Metro West project from the Harbour CBD to Greater Parramatta.

Recommendations

3.1. Commence the project development and business case process for the rapid metro connection between Greater Parramatta and Western Sydney Airport. Building upon the Sydney Metro West Strategic Business Case, the business case development process should include:

- Detailed assessment to confirm preferred route, station location and operating strategy, including assessment of a separate metro line versus an extension of Sydney Metro West
- Further assessment of the relative merits of a rapid metro versus a more express, limited stopping service, noting the trade-off between urban development and value sharing versus faster travel times and a dedicated airport service product
- Revalidating the economic case and timing in coordination with Greater Sydney Commission District Plans and the NSW Government Department of Planning and Environment.
- Investigating options for delivery and market test its potential.

3.2. Implement steps to preserve the corridor between the Badgerys Creek Aerotropolis, Western Sydney Airport and Greater Parramatta for future transport infrastructure, to minimise development costs and to maximise future service reliability and speeds.

What is a business case and what would it do?

A business case is a detailed assessment of a problem that needs solving, identifying possible solutions needed to turn a plan into reality. Preparing an infrastructure business case is important to demonstrate that the proposal will provide sufficient benefits that exceed the cost of the project, offers value for money and enables governments to take informed decisions.

Multiple types of business cases can be used by government, ranging from strategic assessments that consider the problem and possible solutions, to more detailed assessments that determine the probable costs and design of the project.

A business case for rail in Western Sydney would need to:

- consider the problem to be solved and the service need
- develop options for delivering the transport corridor, including giving consideration to transport modes to understand in greater detail their costs and benefits
- identify a preferred solution to deliver rail by refining route alignments, interchanges and other aspects of the design
- ensure that relevant factors, such as operations, land use planning and governance structures are comprehensively considered and addressed.

A business case for rail in Western Sydney would need to be assessed by Infrastructure NSW and Infrastructure Australia. This Scoping Study would help inform the business case.



Finding 4

Protecting the South West Link corridor from Leppington to the Badgerys Creek Aerotropolis interchange, south of Western Sydney Airport, would support growing communities in the southwest

In the longer term, the South West Link would support the Growth of Greater Sydney's southwest. This Link would become economically viable after the North-South Link and East-West Link are developed and as the population in the southwest grows. While the South West Link could provide a direct connection to Western Sydney Airport, the Scoping Study's analysis determined that this option is the least beneficial link to the airport. The South West Link is most viable as a terminating service providing an interchange for airport passengers at Badgerys Creek Aerotropolis.

Protecting the South West Link corridor from Leppington to a Badgerys Creek Aerotropolis interchange will protect the long term Western Sydney rail network.

Recommendations

4.1. Implement steps to preserve the corridor between Leppington and Western Sydney Airport for future transport infrastructure to minimise development costs and to maximise future service reliability and speeds. As part of future planning there should be:

- Consideration of alternative modes, such as light metro, bus rapid transit and route options that may deliver improved value for money and affordability.
- Revalidation of the economic case and timing after confirmation of land use changes.



Finding 5

Rail could play an important role in shaping Western Sydney, but it is not essential to the success of Western Sydney Airport at opening in 2026

Western Sydney Airport will need rail in the years after opening

Western Sydney Airport will need to be connected by rail in the future, but there is likely to be low demand for rail to Western Sydney Airport in its early years after opening in 2026.

In the initial years of airport operations, road transport links will play the most important role in providing connectivity for Western Sydney Airport customers and workers. These road links, including those delivered under the Australian and NSW governments' \$3.6 billion Western Sydney Infrastructure Plan, will also be important in fostering economic growth in the region.

In the early years of operations, Western Sydney Airport is expected to primarily cater for passengers from Western Sydney. The Scoping Study found that, with low demand for rail from Western Sydney Airport and under existing land use projections for Western Sydney, it would be challenging to make any airport rail link economically viable if introduced with the opening of Western Sydney Airport in 2026. However, as Sydney (Kingsford Smith) Airport approaches capacity in the 2040s, patronage at Western Sydney Airport will grow. The North-South Link and East-West Link are projected to become economically viable in the 2030s.

Rail in Western Sydney is about more than just the airport, it can shape the city

The Scoping Study recognises that while there is not an immediate need for rail based on the airport alone, it could shape the future development of Western Sydney and shape the growth of the Western Parkland City. Rail can service the airport as well as service the needs of Western Sydney region as it grows over time.

A rail link could influence how the Western Parkland City grows and offer the potential to shape the development of the city around the transport network. The provision of rail infrastructure in Western Sydney would provide an opportunity to improve the city's liveability, creating well connected centres with good access to employment and education opportunities and supporting the growth of the region over the coming decades.

These land use changes generated through the development of rail and ahead of the demand need, can improve the economic viability of rail in Western Sydney over time.

The economic viability of a city shaping rail link, such as the North-South Link, could be enhanced through a range of measures, such as:

- increased population and employment densities along these respective corridors
- locating important public facilities such as hospitals and universities in areas with high levels of public transport access
- targeted road user charges, such as paid parking in major centres to encourage public transport use
- detailed bus network planning and park-and-ride facilities to feed patronage into the rail network
- opportunities to reduce cost estimates through further design development
- options for staging the delivery of rail.

Recommendations

5.1. Continue to plan and implement rapid bus and coach services to Western Sydney Airport from key Western Sydney strategic centres to provide public transport links to the airport. This planning should consider measures to prioritise public transport accessibility to and through the airport precinct to ensure that these services are fast and reliable.

5.2. Consider the findings of this report in the Rail Concept Design work being undertaken by the Australian Government, in consultation with TfNSW, to inform the nature and timing of rail infrastructure enabling works on the Western Sydney Airport site.

Finding 6

The high cost of the Preferred Network's individual links will require a range of funding approaches to improve affordability

Initial cost estimates suggest that rail infrastructure in Western Sydney and to Western Sydney Airport would be expensive. There are opportunity costs of investing in rail infrastructure that governments will need to consider in taking funding decisions. This is why it is necessary for governments to map out options, identify priorities and plan for future stages of investment.

In addition to government funding, consideration of a range of funding measures is required, including further exploration of measures such as value sharing.

Initial analysis showed that, in addition to government funding, the following funding approaches have the potential to be used in combination to fund the Preferred Network:

- premium train service fares such as charged by Heathrow Express
- station access charges such as currently charged at Sydney (Kingsford Smith) Airport stations
- over station development
- special infrastructure contributions on lands surrounding stations
- residential and business property levies.

Further investigations are recommended

Given the significant government funding that would be required to invest in new rail projects, the potential of each rail link identified in the Preferred Network should be explored through a business case assessment before progressing to construction. This is important as transport technology and transport network demands will evolve over time.



Recommendations

- 6.1. Ensure value sharing mechanisms are in place and communicated to land owners before confirming station locations.
- 6.2. Market testing of station location options with industry and major land owners to determine appetite for contributions to the project.
- 6.3. As part of business case development processes for the North-South Link and East-West Link, reassess the value sharing mechanisms to identify additional revenue sources.
- 6.4. Consider implementing value sharing mechanisms early where possible to capture value uplift that occurs in advance of service commencement and to deter speculation.
- 6.5. Investigate additional revenue measures to reduce the projected financial deficit. This may include additional value sharing measures, road pricing and more sophisticated fare revenue and ticketing initiatives.



A. ACRONYMS AND DEFINITIONS

Acronyms

| Acronym | Description |
|-------------|---|
| CBD | Central Business District |
| LGA | Local Government Area |
| LU16 | NSW Government's official 2016 land use projections |
| P90 | A P90 contingency means that there is a 90 per cent statistical probability that the total capital cost of the project will be equal to or less than the estimated construction cost. |
| PPP | Public Private Partnership |

Definitions

| Term | Definition |
|------------------------------------|--|
| Badgerys Creek Aerotropolis | An aerotropolis is a metropolitan sub-region, with commercial, logistics, industrial and residential clusters centred around an airport. Badgerys Creek Aerotropolis will be located in the areas surrounding Western Sydney Airport and will feature trade, logistics, advanced manufacturing, defence, health, education and technology industries in connected precincts. More information can be found in Section 3.2. |
| Business case | A detailed assessment of a proposed infrastructure project that enables governments to take informed decisions. A business case evaluates a range of considerations, including whether benefits exceed the costs of the project and whether the project offers value for money. More information can be found in Chapter 10. |
| Capacity | The number of people who can comfortably travel in each rail carriage (in-vehicle capacity), or fit within a station (station capacity), or travel on a particular part of the rail network (train-path capacity). |
| Capacity enhancement | Improvements to rail network capacity. This may be supported by improvements such as upgrades to train signalling systems, power supply and stations. |
| Catchment | In the Scoping Study, catchment refers to the area from where a particular group of users of a particular mode of transport are drawn. For example, the catchment for Western Sydney Airport aviation passengers will be primarily within Western Sydney until around the 2040s. |

| Term | Definition |
|--|---|
| Central River City | The developing city centred around Greater Parramatta. It would form part of Greater Sydney's three cities described in Section 5.4.2. |
| Corridor protection | A variety of actions that governments can take to identify and protect the land required to deliver future infrastructure. Corridor protection is based on a range of land use, engineering and environmental studies, together with two stages of community and stakeholder consultation. |
| Cudgegong Road | Located in Rouse Hill, Cudgegong Road is the most western station on the Sydney Metro Northwest, due to open in 2019. |
| Eastern Harbour City | The established city centred around the Harbour CBD. It would form part of Greater Sydney's three cities described in Section 5.4.2. |
| Economically viable (or economic viability) | For an infrastructure project to be economically viable, its benefits to the economy must outweigh its costs. |
| Greater Parramatta | Greater Parramatta is at the core of the Central River City and includes Parramatta CBD and the Westmead health and education precinct, connected via Parramatta Park. |
| Greater Sydney | The broader Sydney metropolitan area. The Greater Sydney Commission's vision for Greater Sydney is as a metropolis of three distinct cities: the Eastern Harbour City (centred around the Harbour CBD), the Central River City (centred around Greater Parramatta) and the Western Parkland City (centred around Western Sydney Airport). A map can be found in Figure 16 in Section 5.4.2. |
| Growth Areas | Areas identified by the NSW Department of Planning and Environment for priority infrastructure investment, new homes and jobs close to transport and services. In Sydney, Priority Growth Areas are in the North West, South West, Greater Parramatta, Greater Macarthur and Western Sydney. More information can be found in Section 3.2.2. |
| Harbour CBD | The Harbour CBD includes the areas of Sydney CBD, North Sydney CBD, Barangaroo, Darling Harbour, Pyrmont, The Bays Precinct, Camperdown-Ultimo health and education precinct, Central to Eveleigh and Sydney East. It forms the core of the Eastern Harbour City, described in Section 5.4.2. |
| Interchange | A key station where rail passengers may connect to other lines or connect to other modes of transport. Interchanges can be vibrant landmarks and offer communities retail, space, residential and commercial opportunities. |
| Morning peak | The hour between 8.00am and 9.00am. |
| Preferred Network | The preferred long-term rail network for Western Sydney, identified by the Scoping Study. The Preferred Network provides a blueprint for expanding and enhancing rail services in Western Sydney over the coming decades. It balances the needs of the region and Western Sydney Airport and aligns with strategic planning for Western Sydney. More information can be found in Section 8.2. |

| Term | Definition |
|--|--|
| Rapid Economic Assessment | <p>An assessment of conventional economic benefits and costs, undertaken as part of the Scoping Study. Benefit and costs were evaluated over a 50 year period with the benefits and costs discounted at a real discount rate of seven per cent per annum.</p> <p>The benefits assessment was undertaken using both the LU16 land use forecasts and alternative land use projections.</p> |
| Transport mode (or mode of transport) | Type of transport. This may include transport by train, bus or car. |
| Value sharing | A funding approach that considers how a project delivers value to different parties and explores the use of mechanisms to capture some of this increased value as revenue. Value sharing can allow governments to invest in rail infrastructure earlier, or deliver a better project than what might be possible using government funding alone. Contributions should be based on the principle of proportional, fair and appropriate benefit sharing. More information can be found in Section 9.4. |
| Western Parkland City | The emerging city centred around Western Sydney Airport. It includes the existing centres of Campbelltown-Macarthur, Penrith and Liverpool. The Greater Sydney Commission is undertaking the planning work for a Western Parkland City and has released its draft Western City District Plan. The Western Parkland City would form part of Greater Sydney's three cities described in Section 5.4.2 |
| Western Sydney City Deal | <p>The Australian and NSW Governments are working with the eight local governments that make up the Western City District on the development of a Western Sydney City Deal. The City Deal will bring together all levels of government in a collaborative partnership to set the right conditions for growth.</p> <p>The Western Sydney City Deal represents a collective program of planning, reform and investment that will help transform Sydney's outer west – stimulating jobs growth, tackling housing affordability and connectivity within and out of the region. More information can be found in Section 5.4.1.</p> |
| WSA Co | Western Sydney Airport Company (WSA Co) is responsible for the design, construction and operation of the airport. In May 2017, the Australian Government announced that it would invest up to \$5.3 billion in WSA Co to deliver Western Sydney Airport. |

B. SUMMARY OF COMMUNITY AND STAKEHOLDER ENGAGEMENT ACTIVITIES

Discussion Paper

The Western Sydney Rail Needs Scoping Study Discussion Paper was released in September 2016. This paper provided an overview of forecast demand for transport in Western Sydney from population and jobs growth and the opening of Western Sydney Airport. The discussion paper presented initial 11 rail options, funding and delivery options and how the community could provide their feedback

Industry Engagement Briefing Paper

The Western Sydney Rail Needs Scoping Study Industry Briefing Paper was released in September 2016. This paper was developed to brief industry and potential investors about the Scoping Study and to encourage them to be a part of the conversation.

Community engagement

Pop-up stalls were held at train stations and markets across the Study Area in Western Sydney. These stalls were used to raise awareness about the project, answer questions and encourage people to give their feedback.

Supporting communication materials

The Scoping Study was promoted through a range communication methods, including:

- a dedicated website at: westernsydneyrail.transport.nsw.gov.au
- a project brochure
- fact sheets
- social media
- media release announcement.

Briefings and stakeholder meetings

A number of activities were conducted to raise awareness about the Scoping Study, answer questions and encourage people to give feedback, including:

- a dedicated industry briefing
- meetings with key stakeholders including a Stakeholder Reference Group
- collaboration with the Parramatta Light Rail, Sydney Metro and Western Sydney Airport project engagement activities.

Feedback from other rail projects

The Scoping Study also considered the community feedback provided on the following rail projects that were situated within the study area:

- Sydney Metro Extension Study – Bankstown to Liverpool
- South West Rail Link Extension
- Outer Sydney Orbital Corridor Study.

C. ALTERNATE OPTIONS

Alternate Western Sydney Airport Options

A summary of additional options of the Western Sydney Airport rail links identified during consultation and the outcomes of their assessment is provided in the table below.

| Description | Outcome | Assessment |
|--|---|--|
| St Marys interchange (variation of Option 2) | | |
| This variation of Option 2 provides a direct connection from Western Sydney Airport to an interchange at St Marys rather than around Werrington. | Interchange with the T1 Western & Richmond Line at St Marys included in the Preferred Network's North-South Link. | This relatively minor variation to Option 2 showed potential for St Marys to provide a superior interchange than Werrington, increasing network capacity and development opportunities. |
| Western Sydney Airport to Sydney Metro Northwest via Mount Druitt (variation of Option 2) | | |
| This variation to Option 2 proposes a deviation to Mount Druitt to interchange with the T1 Western & Richmond Line. | Not taken forward for further investigation at this time. | This option presented a high level of risk due to the costs and property impacts of travelling through more established communities than Option 2. |
| Bringelly to Leppington "Y-junction" (variation of Options 1 and 6) | | |
| This proposal suggests a full rail junction catering for all movements between the South West Rail Link Extension (Option 1) and the north-south link to Macarthur (Option 6). | Not taken forward for further investigation at this time. | A "Y-junction", instead of an interchange, would decrease train operating efficiencies while not providing significant benefits to patronage, land use uplift and connectivity to centres. |

| Description | Outcome | Assessment |
|--|---|--|
| Western Sydney Airport to Menangle Park (variation of Option 6) | | |
| <p>This proposal is a variation of Option 6, offering a southern link to Menangle Park on the Southern Line. This would provide rail services to the growing southwest beyond Macarthur, including Menangle Park and reduce costs of connecting to Macarthur through difficult terrain.</p> <p>This option requires an extension of the existing passenger and freight line from Macarthur to create an interchange.</p> | <p>Referred to the NSW Government for further assessment as part of the Future Transport 2056 draft strategy.</p> | <p>This variation on Option 6 showed potential to support the South West Growth Area.</p> |
| Western Sydney Airport to Blacktown and Norwest (variation of Option 2) | | |
| <p>This alternate proposal to the original Option 2 suggests a deviation to an interchange with the T1 Western & Richmond Line at Blacktown, followed by a north-eastern extension to the Sydney Metro Northwest at Norwest station.</p> | <p>Not taken forward for further investigation at this time.</p> | <p>This alternative would be expected to attract similar patronage as the original Option 2 but more expensive to construct. It would pass through more established communities near Blacktown, requiring significant property acquisitions or longer underground sections.</p> |
| North-south metro Macarthur to Greater Parramatta then to Sydney Metro Northwest at Norwest (variation of Option 6) | | |
| <p>This option suggests upgrading the T2 Leppington and T5 Leppington Richmond line to a metro from north of Macarthur through Liverpool to Greater Parramatta and then establishing a new corridor to the Sydney Metro Northwest via Norwest Station.</p> | <p>Not taken forward for further investigation at this time.</p> | <p>This option is likely to be a very expensive project. It would require either the rebuilding of the busy T2 Leppington & Inner West Line from Macarthur to Greater Parramatta while in operation, or be delivered by acquiring adjacent properties to widen the corridor or to build an underground metro along the same alignment.</p> |

| Description | Outcome | Assessment |
|--|--|---|
| High speed/limited stops from the Harbour CBD to Greater Parramatta to Western Sydney Airport and onto Macarthur (variation of Options 5 and E) | | |
| <p>This proposal is a variation of Options 5 and E.</p> <p>It proposes an additional high speed/limited stops link between Western Sydney Airport and Macarthur.</p> | <p>Not taken forward for further investigation at this time.</p> | <p>High speed rail is used between major cities and regional centres and is not considered suitable for intra-urban transport within Greater Sydney. While delivering a faster service for a very high cost, this option would bypass most stations along the route and provide only minimal connectivity benefits.</p> |

Alternate options from Western Sydney to the rest of Greater Sydney

| Description | Outcome | Assessment |
|---|---|--|
| Greater Parramatta to Baulkham Hills and Castle Hill | | |
| <p>This option proposes a northern metro link through the built-up Hills precinct to the Sydney Metro Northwest at Castle Hill.</p> | <p>Referred to the NSW Government for further assessment as part of the Future Transport 2056 draft strategy.</p> | <p>Presented significant opportunity to improve connections between Greater Sydney's northwest and Greater Parramatta.</p> |
| Greater Parramatta to Epping | | |
| <p>This option proposes a new metro link from Greater Parramatta to the Sydney Metro Northwest at Epping.</p> | <p>Referred to the NSW Government for further assessment as part of the Future Transport 2056 draft strategy.</p> | <p>Presented significant opportunity to improve connection to Greater Parramatta.</p> |





This document contains important information about public transport projects in your area. If you require the services of an interpreter, please contact the Translating and Interpreting Service on **131 450** and ask them to call Transport for NSW on **(02) 9200 0200**. The interpreter will then assist you with translation.

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