Appendix E

WestConnex M5 - King Georges Road interchange upgrade

WESTCONNEX DELIVERY AUTHORITY

Traffic and transport assessment

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WestConnex M5 - King Georges Road interchange upgrade

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Glossary of terms and acronyms

Term	Meaning
BTS	Bureau of Transport Statistics
CBD	Central business district
CCTV	Closed circuit television
CEMP	Construction Environmental Management Plan
DGRs	Director-General's Environmental Assessment Requirements
DMSS	(Draft) Metropolitan Strategy for Sydney to 2031
EIS	Environmental impact statement
EMME	Strategic travel modelling software
EPA	Environmental Protection Authority
GEC	Global Economic Corridor
HCV	Heavy commercial vehicle
HFV	Heavy freight vehicle
ITS	Intelligent Transport Systems
JTW	Journey to Work
LCV	Light commercial vehicle
LGA	Local government area
LinSig	Multi-intersection modelling software for corridor or small network analysis
LoS	Level of Service – An index of the operational performance of traffic on a given traffic lane, carriageway or road when accommodating various traffic volumes under different combinations of operating conditions.
LTTMP	NSW Long Term Transport Master Plan
PCU	Passenger car unit
RMS	(NSW) Roads and Maritime Services
SAMP	Sydney Airport Master Plan
SIS	State Infrastructure Strategy
SMBSC	Sydney Metropolitan Bus Service Contract
STM	Sydney Strategic Travel Model
TfNSW	Transport for NSW
TMC	Transport Management Centre
TMP	Traffic Management Plan
UAP	Urban Activation Precinct
VoC	Volume over capacity
VTTS	Value of Travel Time Savings
WDA	WestConnex Delivery Authority
WRTM	WestConnex Road Traffic Model

Executive summary

The overall purpose of this report is to identify and assess the traffic and transport issues related to the M5 Motorway / King Georges Road Interchange Upgrade project. WestConnex is a proposed 33 kilometre motorway, linking Sydney's west and south-west with Sydney central business district (CBD), Sydney Airport and Port Botany.

The WestConnex scheme will:

- Support Sydney's long-term economic growth through improved motorway access and connections linking Sydney's international gateways, Western Sydney and key places of business across the city.
- Relieve road congestion so as to improve the speed, reliability and safety of travel in the M4 Motorway, M5 Motorway and Sydney CBD/Sydney Airport/Port Botany corridors, including parallel arterial roads.
- Cater for the diverse travel demands along these corridors that are best met by road infrastructure.
- Create opportunities for urban revitalisation, improved liveability and public and active transport improvements along and around Parramatta Road.
- Enhance the productivity of commercial and freight generating land uses strategically located near transport infrastructure.
- Fit within the financial capacity of the NSW and Australian Governments, in partnership with the private sector.
- Optimise user pays contributions to support funding in a way that is affordable and equitable.

As identified in the *WestConnex M5 – King Georges Road interchange upgrade State Significant Infrastructure Application Report* (Roads and Maritime 2014), the following objectives have been established for the project:

- Facilitate the possible future delivery of WestConnex M5
- Reduce congestion on King Georges Road and the M5 Motorway in the vicinity of the interchange
- Improve access to and from the M5 Motorway and King Georges Road
- Maintain or improve road safety on King Georges Road and / or the M5 Motorway
- Minimise environmental and social impacts.

The King Georges Road interchange upgrade project would include the following key features:

In the west the project would tie into the completed M5 South West Widening three lane dual carriageways. In addition to tie-in with the M5 South West Widening project, works to the west facing ramps to / from King Georges Road are required to integrate the project with any future WestConnex M5 configuration.

The diverge for the eastbound off-ramp to King Georges Road would be lengthened. This would require widening of the eastbound carriageway from above 300m west of Penshurst Road. The nearside eastbound lane of the motorway would exit to King Georges Road and two lanes would continue eastbound under King Georges Road. The layout of the eastbound off-ramp would be reconfigured to improve vehicle storage

The M5 South West Widening project provides for three lanes in each direction. The westbound motorway carriageway is two lanes in each direction under King Georges Road and the westbound on-ramp from King Georges Road would become the third motorway lane.

Any design configuration for WestConnex M5 would require an increase in the number of lanes passing underneath King Georges Road from two to three. Work to the westbound off-ramp and widening of the bridge over Penshurst Road is proposed as part of this project in order to accommodate all future WestConnex M5 configurations.

East facing ramps

In the east, works to the east facing ramps to / from King Georges Road are required to meet the project objectives and to integrate the project with any future WestConnex M5 configuration.

The eastbound on-ramp from King Georges Road would be extended by moving the merge about 160 m further to the east. The on-ramp would be realigned and widened, merging to a single lane prior to passing below Cooloongatta Road overbridge via a new bridge span at its northern end.

The length of the westbound off-ramp to King Georges Road would be increased by moving the diverge of the off-ramp with the motorway about 190 m further to the east. The off-ramp would be realigned passing below Cooloongatta Road overbridge via a new bridge span at its southern end.

The King Georges Road and M5 Motorway interchange is located within the 'South' subregion of Sydney as defined in the *Draft Metropolitan Strategy 2013*. The south subregion has a population of about 609,000 people, and a combined Gross Regional Product (GRP) of 5.7 per cent ($16.5 billion). Population within the subregion is predicted to increase by about 43,000 by 2031.

The M5 East Motorway connects the M5 South West Motorway at King Georges Road, Beverly Hills (in the west) with Southern Cross Drive and the Eastern Distributor (in the east). The motorway is an important link connecting Sydney's Eastern Suburbs, the airport and Port Botany area, and the Princes Highway, with the wider southern and south-western Sydney road network including King Georges Road, the Cumberland Highway and the M7 Motorway.

The M5 transport corridor is the main passenger, commercial and freight route between Sydney Airport, Port Botany and South West Sydney, and links with the orbital road network and interstate routes. The greater M5 corridor supports planned residential and employment growth in South West Sydney and is also a well-established route serving suburbs and growth centres in South West Sydney.

King Georges Road forms part of the A3 arterial road corridor. South to north, the A3 corridor begins in Blakehurst and continues north through Sydney's southern and inner western suburbs to the northern beaches area where it finishes near Mona Vale. King Georges Road forms the southern section of the A3 corridor, ending at its intersection with Punchbowl Road. King Georges Road (and the greater A3) connects several major motorway corridors, being the M5 Motorway, the M4 Motorway, the M2 Motorway and the Pacific Highway.

The Port Botany/Sydney Airport precinct includes two of Australia's main international gateways and together with the surrounding industrial and commercial activities is collectively the largest and most important economic zone in Australia, generating an estimated $11 billion per annum to the NSW gross domestic product.

The efficiency of operation of the economic zone is vital to the wellbeing not only of the NSW economy but also to the many businesses that rely on the precinct's effective development. WestConnex would significantly improve access to Sydney's international gateways and enable more efficient road freight movement to the airport/port and contribute to higher productivity.

The M5 / King Georges Road interchange upgrade project, as part of the WestConnex scheme, would also support more effective and efficient movement of people and freight to and from Western Sydney to the Inner West, the Eastern Suburbs and the Sydney CBD. The WestConnex scheme would enable major opportunities to establish improved connectivity of other existing and potential future transport links over a wide area of Sydney.

The King Georges Road interchange currently experiences poor performance during peak hours. The east facing ramps are subject to long queuing, which impacts the performance of both King Georges Road and the M5 East Motorway.

Currently the on-ramps and off-ramps of the interchange experience queuing during morning and afternoon peak hours. This results in traffic congestion, slow speeds and unreliable travel times which impact the performance of the M5 South West motorway, M5 East motorway and King Georges Road.

The study area adopted for the M5 Motorway / King Georges Road interchange upgrade project covers approximately 2 kilometres of the M5 Motorway between the Penshurst Roadand Cooloongatta Road underpass, as shown in **Figure 3-1** Canterbury Road to the north and Stoney Creek Road to the south have been adopted as the northern and southern boundaries of the study area. The study area includes the suburbs of Roselands, Narwee, Beverly Hills and Kingsgrove.

The WRTM was developed to forecast traffic patronage and assess the most likely range of future traffic patronage across the WestConnex scheme network for the proposed franchise period. In considering the future traffic patronage, several scenarios need to be considered, reflecting the timeframe under which the infrastructure can be delivered and the extent of other infrastructure developments. Five scenarios have been explored through development of specific modelled scenarios, reflecting various future travel demands.

In considering the future, several scenarios need to be considered, reflecting the timeframe under which the infrastructure can be delivered and the extent of other infrastructure developments. Five scenarios have been explored through development of specific modelled scenarios, reflecting various future travel demands.

Examined demand cases were represented by specific modelled forecast years:

- 2014 was adopted as the existing case to correlate with the traffic survey undertaken for the King Georges Road Interchange Upgrade;
- 2017 was adopted as the project opening case for the King Georges Road Interchange Upgrade;

- 2027 was adopted as the case for 10 years after opening and was considered to allow for full ramp-up of traffic demand as travellers respond to the provision of the full WestConnex scheme and the associated toll.

The scenarios examined were modelled in WRTM by combining future year demands with future networks. Traffic was assigned using the calibrated road assignment model, taking suitable account for changes in toll choice behaviour over time. The modelled scenarios therefore were:

- **Existing case (2014)**: Current road network with no new projects or upgrades.
- **Base 'do minimum' (2017)**: The Base 'do minimum' case assumes that the King Georges Road Interchange Upgrade and the remainder of the WestConnex projects are not built. It is called 'do minimum' rather than 'do nothing' as it assumes that on-going improvements will be made to the broader transport network including some new infrastructure and intersection improvements to improve capacity and cater for traffic growth but does not include the M4 Widening or other WestConnex projects.
- **King Georges Road Interchange Upgrade (2017)**: The King Geirges Road Interchange Upgrade complete and open to traffic but without any other WestConnex projects.
- **Future 'do minimum' (2027)**: A future network including some upgrades to the broader transport network over time to improve capacity and cater for traffic growth but does not include the King Georges Road Interchange Upgrade or other WestConnex projects. The Future 'do minimum' case is at a time ten years later than the Base 'do minimum' case.
- **Full WestConnex (2027)**: With all WestConnex projects completed (Note: The NSW Government has committed to achieving completion of all WestConnex projects by 2023).

The assessment of interchange and intersection performance was undertaken using the traffic modelling software Q-Paramics (v6.8) which is a micro-simulation traffic modelling software. This software models individual vehicle behaviour and their interaction with the network and other road users. Micro simulation has its greatest strength in modelling congested road networks, due to its ability to simulate queuing conditions. This capability makes these types of models very useful for analysing traffic operations in urban areas and city centres, including interchanges, roundabouts, unsignalised and signalised intersections, signal coordinated corridors, and area networks.

In the assessment of intersection performance in the future with and without the project, the analysis is based on modelled traffic volumes extracted from the WRTM for the specific years adopted in each of the five scenarios.

The critical elements of the assessment of existing conditions are intersection Level of Service (LoS) and the traffic queue on the most affected leg of the intersection. Individual intersections have been assessed using Paramics. One of the major benefits of using this type of micro simulation software is the ability to assess intersections that form part of closely spaced networks and where their operation is likely to be influenced by adjacent intersections. This means that modelled queue lengths and delays at an intersection reflect the impact of downstream congestion effects. This results in a more accurate representation in the model of queue lengths and delays at affected locations when compared to on the ground observations.

The assessment has found that overall demand on the study road network is set to continue to grow strongly. It also shows that without the project, network performance will continue to

decrease with average speeds in 2027 falling to approximately 10km/h in both the AM and PM 'do minimum' scenarios.

With the King Georges Road Interchange Upgrade, average speeds on the network are maintained at a higher level. Furthermore, the performance of the network in 2027 with the fully completed WestConnex is better than the 'do minimum' scenario in 2017 despite the increased traffic demand expected over the preceding 10 year period.

The travel time results for 2017 show improvement for all routes with the Project compared to the situation without the Project. Eastbound M5 Motorway travel times in the AM peak show the most improvement, demonstrating decreased congestion for this route with the project implemented.

The travel time results for the fully completed WestConnex in 2027 also show significant improvement compared to without WestConnex. King Georges Road northbound travel times decrease by approximately 3 minutes in both the AM and PM peak periods.

With the project and WestConnex implemented, King Georges Road southbound traffic would experience travel time savings of approximately 4 minutes in the AM and 5 minutes in the PM.

The operational performance of intersections along King Georges Road remains generally consistent across both the 'do minimum' and Project scenarios. Under project conditions, improvements are observed at the M5 Motorway interchange with average delays decreasing slightly in both the AM and PM peaks.

The operational performance of intersections along King Georges Road is generally improved with the fully completed WestConnex in 2027 compared to the 'do minimum' scenarios. The M5 Motorway interchange experiences significant improvement in the PM peak. Some increased performance is also observed in the AM peak. These improvements occur despite the increased traffic demand that will arise under the Full WestConnex scenario.

WestConnex provides a significant opportunity to address freight and commercial business vehicle needs along the M5 Motorway and M4 Motorway corridors, the requirement for high quality links to the Port Botany/Sydney Airport and the connectivity of the broader strategic freight network of which it would form a critical part.

WestConnex would provide significant freight benefits by providing more efficient and higher standard access between critical freight generators. In addition to the step change in freight efficiency and accessibility that WestConnex would provide, there are also a range of complementary initiatives that would enhance the freight network more broadly post implementation, including:

- Better connectivity of the strategic freight network for restricted access vehicles such as higher productivity vehicles, higher mass limit vehicles and over-height vehicles.
- 'Last-mile' access to freight generators located close to WestConnex
- Priority freight access to strategic freight generators such as Port Botany, Sydney Airport and intermodal terminals.

In meeting these needs, the King Georges Road Interchange Upgrade project would assist WestConnex to contribute to the broader strategic objectives of the *NSW Long Term*

Transport Master Plan (LTTMP) (Transport for NSW (TfNSW) 2012) and strategic action areas in the *NSW Freight and Ports Strategy* (TfNSW 2013).

The King Georges Road Interchange Upgrade project would provide improved travel times for freight vehicles using the M5 Motorway in line with the improvement in operational performance of the motorway and contributes to the overall benefit once the rest of WestConnex is operational.

The King Georges Road Interchange Upgrade project would tie into the completed M5 South West Motorway Widening project in the west. Minor treatment would be required to the existing M5 dual carriageways to retain two through lanes in each direction and accommodate the possible future construction of WestConnex M5. The eastern end of the project would tie into the existing M5 East Motorway, near Kooemba Road, Beverly Hills.
The proposed construction methodology and program indicates that the proposed works can be completed by the first quarter of 2017.

Construction activities would have a temporary impact on existing traffic flows along the M5 Motorway, arterial roads and various local roads in close proximity to the motorway corridor. Those arterial and local roads that would experience some additional traffic during the construction period are the same roads that are expected to experience long-term benefits as a result of the project.

During construction, the motorway between Penshurst Street and Kooemba Road, Beverly Hills would generally have a reduced daytime speed limit of 80 kilometres per hour with some sections reduced to 60 kilometres per hour during night works. The speed limit reductions are required to facilitate reduced lane widths, works in the median and other works that would be undertaken in close proximity to travel lanes. Lane and shoulder widths would be consistent with *AS1742.3: Manual of Uniform Traffic Control Devices – Traffic control for works on roads.* The implementation of an 80 kilometres per hour roadwork speed limit through the works area would increase travel times on the M5 Motorway by less than one minute in free-flow conditions.

Routes for construction vehicles to and from compounds and work sites would be developed in the context of minimising impacts on local roads and maximising use of arterial roads. Based on the existing volumes and proportion of heavy vehicles it is expected that only the residential streets would have a noticeable increase in vehicle movements due to construction traffic accessing the work areas. Assessment of suitable routes and access points would be made as part of the Construction Environment Management Plan (CEMP) and associated Traffic Management Plans (TMPs) developed to limit the impact.

TMPs would be developed by the contractor to allow safe work sites to be created along the motorway and local roads. These work sites would be protected by temporary concrete barriers where applicable while maintaining the lane capacity on the road with the potential for changes to lane widths and realignment of lanes. The TMPs would consider the convenience and safety of all road users, including public transport, pedestrians and cyclists.

In some cases, works may be required to be undertaken at night or on weekends, subject to approval by Roads and Maritime and agencies if the impacts on traffic flow as a result of daytime activities are considered unacceptable by WDA.

Summary

The Traffic and Transport Assessment of the King Georges Road Interchange Upgrade project has found that the project would meet its stated objectives and would:

- Enable integration with the subsequent stages of WestConnex while minimising impacts on the surrounding environment in the interim period.
- Relieve road congestion so as to improve the travel time and safety of travel in the M5 Motorway in the vicinity of the King Georges Road Interchange.
- Improve road safety on the M5 Motorway in the vicinity of the King Georges Road Interchange.

Further, the Traffic and Transport Assessment has found that:

- The project is consistent with NSW Government and Transport for NSW (TfNSW) policy in respect to the LTTMP, NSW 2021: A plan to make NSW number one (NSW Department of Premier and Cabinet 2011) and the State Infrastructure Strategy (Infrastructure NSW 2012).
- The project is an integral component of WestConnex as outlined in the WestConnex Business Case (Sydney Motorways Project Office 2013).
- On traffic operational grounds, the existing M5 Motorway peak traffic volumes are at capacity and traffic growth is being constrained and peak periods extended. The King Georges Road Interchange Upgrade project would cater for diverse travel demands (such as freight and associated services) by providing the capacity required to service the new motorway corridors, WestConnex M5 and M5 East, then onto St Peters and Sydney Airport. These corridors would improve accessibility by providing new routes for through traffic and connection to a high standard road network for adjoining areas. The reduction in arterial road traffic would improve accessibility for local journeys.
- Road freight operations in the corridor, especially the long distance heavy vehicle movements on the network to and from Port Botany/Sydney Airport from Western Sydney experience increasing trip delay and unreliability as a result of the general traffic congestion. The King Georges Road Interchange Upgrade project would provide reductions in travel time along the M5 Motorway and would contribute to the overall benefit once the rest of WestConnex is operational
- Construction activity would largely be confined to the M5 Motorway corridor itself and during normal working hours the existing number of trafficable lanes would be maintained. Some minor delays are anticipated as a result of reduced road works speed limits. Some local residential streets are anticipated to experience a noticeable increase in vehicle movements due to construction traffic accessing the work areas however these are expected to be minor.
- Overall, the impact of the construction of the King Georges Road Interchange Upgrade project is anticipated to be minor and appropriate management plans would be applied to mitigate the impact.

1 Introduction

1.1 Purpose of this report

The overall purpose of this report is to identify and assess the traffic and transport impacts related to the King Georges Road Interchange Upgrade project. This assessment's focus is on the traffic and transport part of the Secretary's Environmental Assessment Requirements (SEARs), as detailed in **Table 1-1**.

Table 1-1: Traffic and transport SEARs

Secretary's Environmental Assessment Requirements	Where addressed
Traffic and transport – including but not limited to:	
• Consistency with the traffic and transport objectives of the WestConnex project;	Section 2.2
• an assessment and modelling of operational traffic and transport impacts on the local and regional road network and the Sydney motorway network, including any traffic induced impacts on the performance of the existing M5 southwestern Motorway, King Georges Road and the M5 East Motorway;	Chapter 7
• impacts on cyclists and pedestrian access and safety and consideration of opportunities to integrate cycleway and pedestrian elements with surrounding networks, including details of alternative cycle routes to replace use of the existing M5 Motorway shoulder by cyclists in the vicinity of the project, and	Section 7.6
Construction traffic and transport impacts of the project (including ancillary facilities) and associated management measures, in particular:	
• impacts to the road network (including safety and level of service, pedestrian and cyclist access, traffic impact on alternative routes due to avoidance of construction traffic impacts, and disruption to public transport services and access to properties);	Sections 8.7 and 8.8
• access route identification and scheduling of transport movements;	Section 8.6.1 and 8.6.2
estimates of the number, frequency and size of construction related vehicles (both passenger, commercial and heavy vehicles)	Section 8.6.1
the nature of existing traffic on construction access routes (including consideration of peak traffic times), and	Section 8.5
the need to close, divert or otherwise reconfigure elements of the road network associated with construction of the project, having reference to the cumulative construction impacts of other infrastructure preparing for or commencing construction;	Chapter 2

1.2 WestConnex

WestConnex is a proposed 33 kilometre motorway, linking Sydney's west and south-west with Sydney Airport and Port Botany. WestConnex is likely to comprise a number of projects staged over a period of 10 years. WestConnex is the next priority in the evolution of Sydney's motorway network, as shown in **Figure 1-1**, and brings together previous proposals for the M4 Motorway and M5 Motorway corridors that have been in development for over a decade. WestConnex will be a major investment in Sydney's road infrastructure that is intended to transform urban travel and reshape the localities through which it passes.

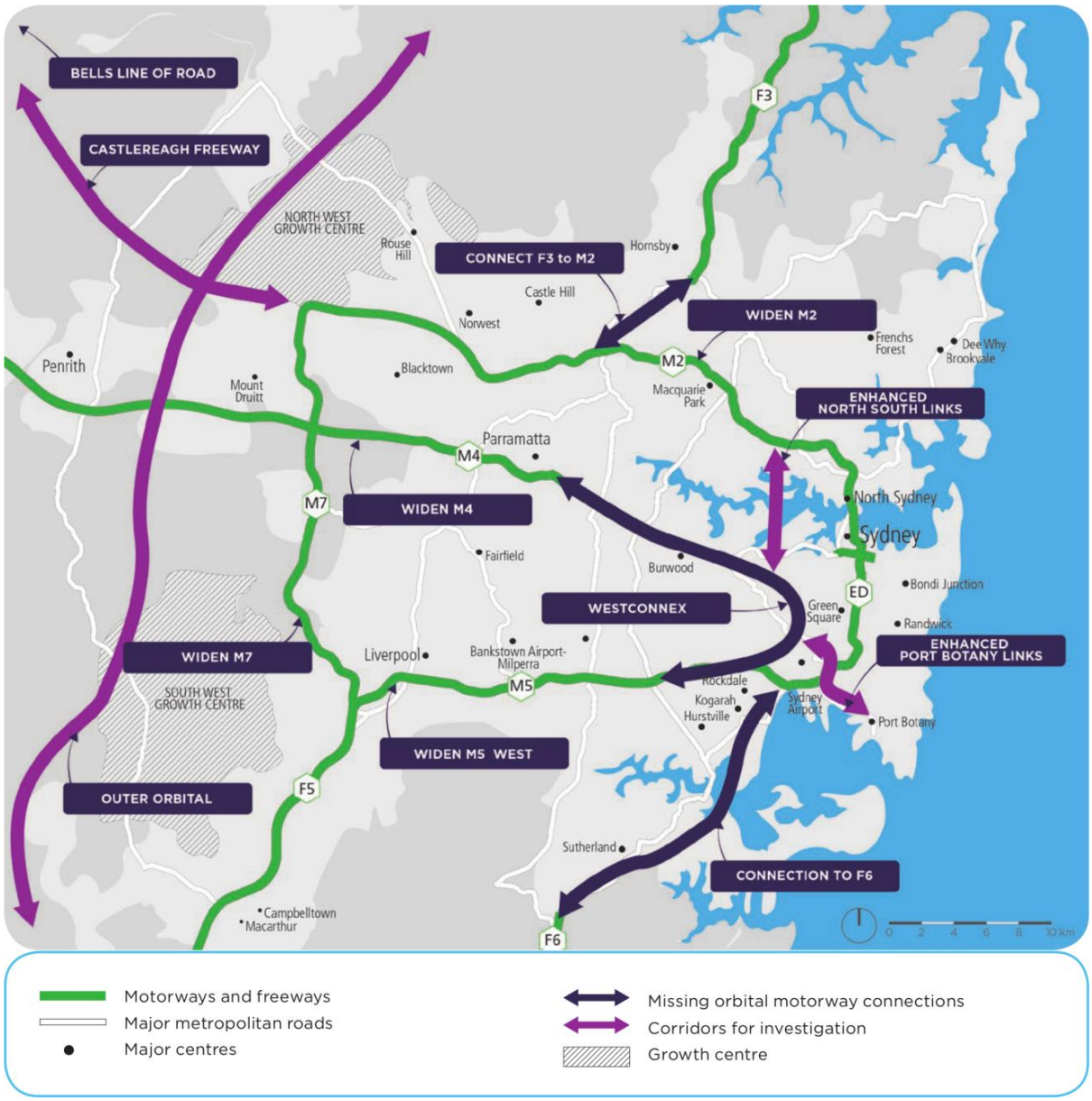


Figure 1-1: WestConnex as a key element of Sydney's motorway network

Source: Transport for NSW (TfNSW), *NSW Long Term Transport Master Plan,* 2012a p.140

The development of WestConnex has been guided by a set of objectives consistent with the strategic challenges and transport needs assessment. These objectives also reflect the reality that there are limited government funds available for infrastructure investment. As such, a balance is needed between responsible spending of state wide taxpayer funds and a user pay system to cover the cost of the project. WestConnex will:

- Support Sydney's long-term economic growth through improved motorway access and connections linking Sydney's international gateways, Western Sydney and key places of business across the city.
- Relieve road congestion so as to improve the speed, reliability and safety of travel in the M4 Motorway, M5 Motorway and Sydney central business district (CBD)/Sydney Airport/Port Botany corridors, including parallel arterial roads.
- Cater for the diverse travel demands along these corridors that are best met by road infrastructure.
- Create opportunities for urban revitalisation, improved liveability and public and active transport improvements along and around Parramatta Road.
- Enhance the productivity of commercial and freight generating land uses strategically located near transport infrastructure.
- Fit within the financial capacity of the NSW and Australian Governments, in partnership with the private sector.
- Optimise user pays contributions to support funding in a way that is affordable and equitable.

The NSW Government has established the WestConnex Delivery Authority (WDA) to deliver WestConnex. WDA is an independent subsidiary agency of the (NSW) Roads and Maritime Services (Roads and Maritime).

WestConnex comprises a number of component projects, to be delivered in stages as shown in

Figure 1-2. Further refinement of component projects will be required as the program progresses. Components of WestConnex include:

- M4 Widening project between Church Street and Homebush Bay Drive.
- M4 East – Homebush Bay Drive to Parramatta Road and City West Link, Haberfield.
- M5 East Airport Link – King Georges Road, Beverly Hills to St Peters.
- M4 South – Haberfield to St Peters via Camperdown.

These components will be assessed separately as each stage is developed further.

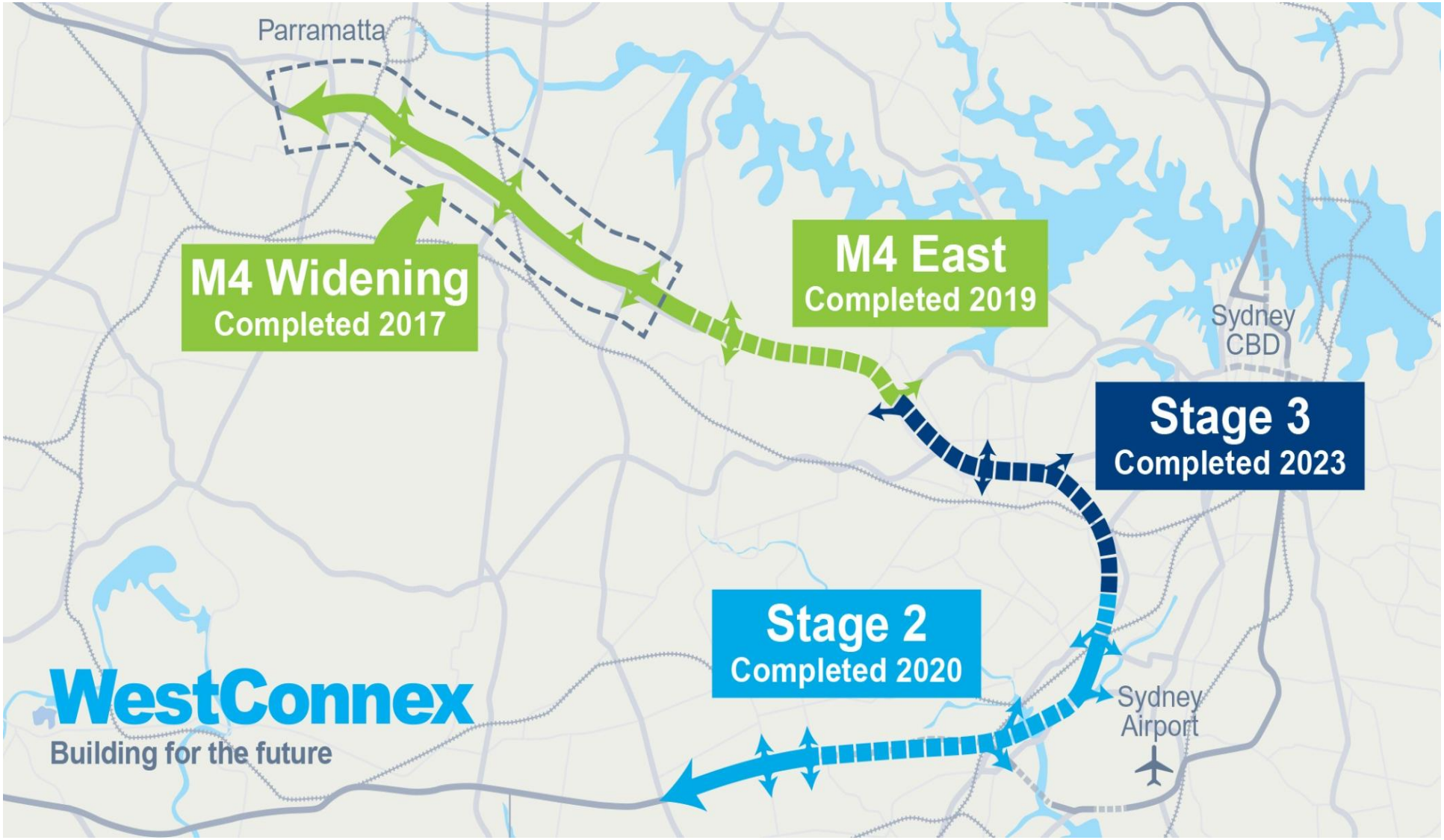


Figure 1-2: WestConnex project staging

Source: WDA, 2014

1.3 History of the M5 Motorway and the development of WestConnex

1.3.1 M5 South West Motorway

The M5 South Western Motorway replaced the Hume Highway (Liverpool Rd) as the primary route from Liverpool to the CBD. A privately constructed and operated motorway – the M5 South West Motorway – was built under a "Build-Operate-Transfer" agreement and opened in August 1992.

Privately operated by Interlink Roads, the M5 South Western Motorway is tolled at Hammondville, and will be transferred to the New South Wales State Government in 2026. Regular users of the motorway can claim a rebate from the state government for the cost of the toll, excluding GST, as part of a 1995 election commitment.

1.3.2 M5 East Freeway

The M5 motorway abruptly ended at King Georges Road, meaning that motorway traffic was forced onto congested arterial roads to complete the journey into the CBD. In response, a publicly built link, known as the "M5 East Freeway" was constructed between the existing motorway at King Georges Road and General Holmes Drive (M1) at Mascot, adjacent to Sydney Airport, and includes a tunnel, approximately 4km in length between Kingsgrove and Arncliffe, with another tunnel under the Cooks River. Construction was commenced in August 1998 and the M5 East was opened in December 2001.

As part of the construction of the M5 East, the eastern single laned section of the M5 South Western Motorway was widened to four lanes, finally bringing most of the M5 Motorway up to motorway standard. However, the at-grade intersection at Moorebank Avenue still remained, posing a constraint on traffic flow. In 2003, a new, grade separated interchange at Moorebank Avenue was constructed, meaning that the length of the M5 Motorway had grade separated access and that the entire route from Canberra to Sydney was a high-speed dual carriageway.

The strategic concept for WestConnex set out in the *State Infrastructure Strategy* (SIS) (Infrastructure NSW 2012) built upon a decade of studies into options to augment the M4 Motorway and M5 Motorway corridors. It was developed by a joint project team comprising representatives from Roads and Maritime, TfNSW and Infrastructure NSW.

1.4 What is the needs case for WestConnex and the M5 Motorway / King Georges Road interchange upgrade project?

Sydney's transport network faces complex challenges now and in the next 20 years. As part of a multimodal network-wide effort to tackling Sydney's transport challenges, a major investment in road capacity and efficiency in the eastern half of Sydney is required to address network underperformance, and support Sydney's long term economic growth.

The solution to Sydney's complex challenges is in identifying the right strategic investments to provide long term network capacity, including modern road infrastructure, freight and passenger rail, and public and active transport, consistent with the *NSW Long Term Transport Master Plan* (LTTMP) (TfNSW 2012a). This means that WestConnex alone will not solve all transport problems for Sydney, or respond to identified transport problems in isolation of other actions in the LTTMP.

1.4.1 Regional context

The King Georges Road and M5 Motorway interchange is located within the 'South' subregion of Sydney as defined in the *Draft Metropolitan Strategy 2013*. The south subregion has a population of about 609,000 people, and a combined Gross Regional Product (GRP) of 5.7 per cent ($16.5 billion). Population within the subregion is predicted to increase by about 43,000 by 2031.

The M5 East Motorway connects the M5 South West Motorway at King Georges Road, Beverly Hills (in the west) with Southern Cross Drive and the Eastern Distributor (in the east). The motorway is an important link connecting Sydney's Eastern Suburbs, the airport and Port Botany area, and the Princes Highway, with the wider southern and south-western Sydney road network including King Georges Road, the Cumberland Highway and the M7 Motorway.

The M5 transport corridor is the main passenger, commercial and freight route between Sydney Airport, Port Botany and South West Sydney, and links with the orbital road network and interstate routes. The greater M5 corridor supports planned residential and employment growth in South West Sydney and is also a well established route serving suburbs and growth centres in South West Sydney.

King Georges Road forms part of the A3 arterial road corridor. South to north, the A3 corridor begins in Blakehurst and continues north through Sydney's southern and inner western suburbs to the northern beaches area where it finishes near Mona Vale. King Georges Road forms the southern section of the A3 corridor, ending at its intersection with Punchbowl Road. King Georges Road (and the greater A3) connects several major motorway corridors, being the M5 Motorway, the M4 Motorway, the M2 Motorway and the Pacific Highway.

No regular bus services operate on the motorway. Bus routes in the area surrounding the motorway provide connections to commercial and residential areas and transport hubs (such as train stations and bus interchanges). The use of surrounding streets rather than the motorway supports multi-functional bus routes. King Georges Road is used by cross-regional bus routes to connect suburbs either side of the motorway.

The King Georges Road interchange currently experiences poor performance during peak hours. The east facing ramps are subject to long queuing, which impacts the performance of both King Georges Road and the M5 East Motorway.

Currently the on-ramps and off-ramps of the interchange experience queuing during morning and afternoon peak hours. This results in traffic congestion, slow speeds and unreliable travel times which impact the performance of the M5 South West motorway, M5 East motorway and King Georges Road.

The King Georges Road interchange upgrade project (the project) is a component of WestConnex, refer to **Section 1.2**.

As identified in the *WestConnex Strategic Environmental Review* (SMPO 2013b), WestConnex will deliver significant long-term benefits to the economic growth and development of NSW and Australia.

WestConnex, including the M5 Motorway / King Georges Road interchange upgrade project, would help alleviate transport problems as follows:

- WestConnex would address major underperformance of the road network – along critical demand corridors, ageing, narrow or lower order roads perform a traffic function that is better suited to motorway infrastructure, reducing amenity and resulting in congestion, growing travel times and higher numbers of traffic incidents.
- WestConnex would provide critical land transport network capacity international gateways and their surrounds – Port Botany and Sydney Airport are major trip generators, and economically critical to Sydney and the NSW economy. Even with the NSW Government's target to double the share of freight transported on rail, major new road capacity is needed to connect the gateways to markets and customers across Sydney.
- WestConnex would serve Sydney's wider, highly diverse freight and business travel task – Sydney's broader freight and commercial task is significantly larger than our port-related task, and is heavily reliant on the M4 Motorway and M5 Motorway corridors and on north-south roads to connect freight to employment lands and population centres.
- WestConnex would serve natural growth in demand from Sydney's growing population and economy – population and employment growth are major drivers of transport demand. Over the next 20 years, average weekday trips in Sydney will grow in line with the population by around 30 per cent, while freight trips in Sydney will grow with gross state product by around 70 per cent. Much of both types of growth will occur within the WestConnex areas of influence.
- WestConnex would better serve the fragmented land use patterns across Sydney by supporting efficient transport connections for trips that are not well served by other transport modes due to uneven or fragmented economic or residential development. WestConnex would support employment growth opportunities in Western Sydney through improved freight connections from that region to Sydney's ports. WestConnex would also support improved access from Western Sydney, where public transport choice is limited, to employment opportunities in Sydney's east connecting residents across Sydney.

WestConnex will also deliver substantial amenity benefits, improve the function of the city, improve traffic flow along key corridors and provide an important catalyst for urban renewal in areas of the city that currently experience poor amenity due to excessive traffic on local and arterial roads. Further detail on the need for the project is provided in **Chapter 2**.

The project would improve performance of the King Georges Road interchange and facilitate construction of WestConnex M5 by allowing construction of WestConnex M5 without the need for further modification of the King Georges Road interchange.

1.4.2 Travel demand from economic growth

The Port Botany/Sydney Airport precinct includes two of Australia's main international gateways and together with the surrounding industrial and commercial activities is collectively the largest and most important economic zone in Australia, generating an estimated $11 billion per annum to the NSW gross domestic product.

The efficiency of operation of the economic zone is vital to the wellbeing not only of the NSW economy but also to the many businesses that rely on the precinct's effective development. WestConnex would significantly improve access to Sydney's international gateways and enable more efficient road freight movement to the airport/port and contribute to higher productivity.

The M5 / King Georges Road interchange upgrade project, as part of WestConnex, would also support more effective and efficient movement of people and freight to and from Western Sydney to the Inner West, the Eastern Suburbs and the Sydney CBD. WestConnex would enable major opportunities to establish improved connectivity of other existing and potential future transport links over a wide area of Sydney.

Growth of Sydney Airport

Passenger throughput at Sydney Airport is currently about 27 million passengers of which about 55 per cent are domestic traffic. The airport is a significant employment zone in its own right and large volumes of journey to work trips and commercial trips servicing the airport precinct and its activities are made each day. The *Sydney Airport Master Plan 2033* (SAMP) (Sydney Airport Corporation Limited 2014) states that passenger throughput at the airport is predicted to double to 60 million passengers by 2031; the *Joint Study on Aviation Capacity for the Sydney Region* (Australian and NSW Governments 2012) predicts 67 million passengers by 2035, effectively doubling the airport related traffic volumes on the arterial and motorway networks over the next 20 years.

For the purpose of the current investigation, it is assumed that actions from the SAMP would proceed. Even though a recent announcement regarding a future second Sydney airport indicated that it would be in operation by 2026, it is not yet an approved project and, consequently, is not included in the Sydney Strategic Transport Model (STM). Undoubtedly if a second airport were to proceed there would be resultant changes to employment and residential land use which would generate changes to trip distribution across the Sydney road network. These changes are not reflected in the traffic forecasts generated by the WestConnex Road Transport Model (WRTM) for the reasons stated above and described in more detail in **Chapter 5**.

The LTTMP recognises the investment needed to progress options to improve public transport services to the airport and to manage the growing traffic congestion in the airport precinct in the short and medium term. WestConnex would enable surface traffic changes to better manage congestion and facilitate the potential for new and dedicated bus services and routes serving the airport.

Commercial and freight growth at Port Botany

Container throughput at Port Botany is expected to twice the current volumes by 2031 (TfNSW 2013a).

Current planning indicates that major changes to freight distribution and rail infrastructure and services are likely to be implemented by 2021. This includes new freight facilities at Cooks River, Enfield and Moorebank by 2018, affecting freight distribution on the road and rail networks. The freight mode share at Port Botany is also likely to change once the freight rail improvements, including the Southern Sydney Freight Line and Northern Sydney Freight Corridor, are fully operational by 2021.

The primary north-south freight route from the current eastern end of the M4 Motorway at Parramatta Road to the Port Botany/Sydney Airport precinct relies on the surface arterial and sub-arterial road network. This route includes West Street, Sydenham Road, Livingstone Road, Stanmore Road, Edgeware Road, Canal Road and Gardeners Road. These inner city roads were not suited to carrying high volumes of heavy vehicles, with narrow lane widths, largely undivided carriageways without adequate turning lanes to accommodate heavy vehicles. The result is that heavy vehicles have difficulty navigating these roads, with traffic incidents causing significant disruption.

Due to the poor north-south connectivity in the inner west, the M7 Motorway, M5 Motorway and A3 corridor bear a heavier load with traffic from the M4 Motorway travelling south via the A3 corridor and onto the M5 East to head east towards the Port Botany/Sydney Airport precinct. This is not an efficient movement for traffic and increases congestion, wear and tear, and safety risks.

WestConnex creates an additional route to the Port Botany/Sydney Airport precinct, relieving current freight routes such as the M5 Motorway, the A3 corridor and Sydenham Road. Some heavy vehicles are expected to switch from these routes to WestConnex to continue west on the M4 Motorway. This means more route options for freight and commercial vehicles, improving flexibility and the resilience of the road network to respond to incidents. It also provides a level of network redundancy for freight connections into the Port Botany/Sydney Airport precinct, as heavy vehicles could be diverted north via WestConnex to the M4 Motorway corridor if there were significant delays or traffic incidents on the M5 Motorway corridor.

Travel to jobs at non-centre locations

Fragmented economic development across Sydney has meant that, many jobs are in non-centre locations that are poorly served by public transport. There are more jobs in Sydney's east compared to Sydney's west, generating a net flow of journey to work (JTW) trips from west to east. Furthermore, many jobs in the east are also out of centre jobs not in Sydney CBD (eg. the southern part of the Global Economic Corridor). Strategic centres hold 41 per cent of jobs within Sydney's east. These areas are not well served by public transport, particularly from Sydney's west and WestConnex would support travel to these out of centre jobs..

The strategic centres in Sydney's west, such as the regional cities of Parramatta, Penrith and Liverpool, hold only 20 per cent of the jobs in Sydney's west. As such, 80 per cent of employment is not in major centres and therefore is less efficiently served by public transport. **Figure 1-3** shows the existing distribution of Sydney's employment in non-centre locations across the west and east.

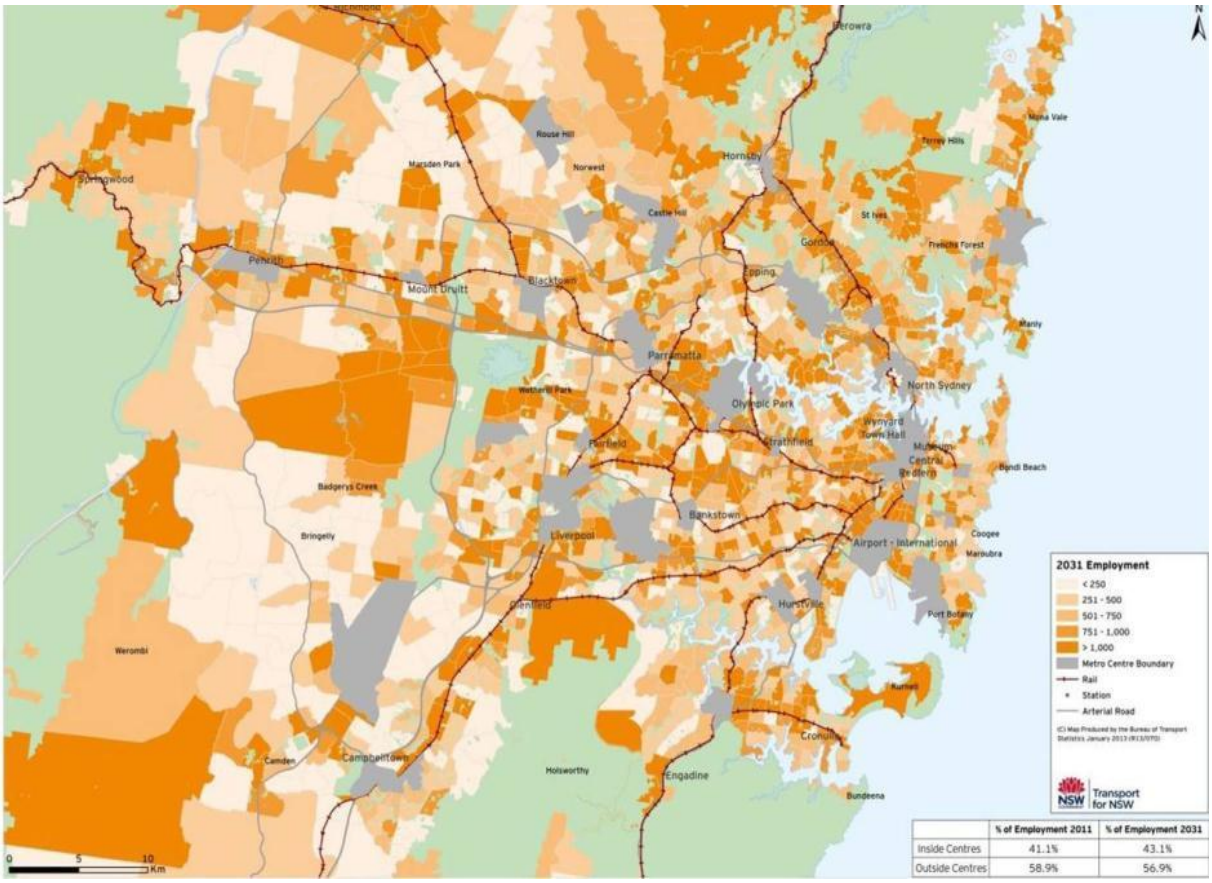


Figure 1-3: Sydney employment not located in major centres in 2031

Source: BTS, *Employment Forecasts 2006-2046*, 2012b

Consequently, around 85 per cent of people travelling to work from Sydney's west travel by car, compared to around 55 per cent of people travelling to work in Sydney's east. Residents in Sydney's west are more car dependent, with a Campbelltown resident, for example, on average driving two and half times the vehicle kilometres of an inner Sydney resident.

Table 1-2 demonstrates the imbalance in car usage for travel to and from Sydney's east and west.

Table 1-2: Trips between Western Sydney and Eastern Suburbs, 2011

From	To	2011 journey to work trips		
		Total	Car	Car %
Western Sydney	Eastern Suburbs	205,257	112,383	54.8
Western Sydney	Western Sydney	490,398	419,032	85.4
Eastern Suburbs	Eastern Suburbs	796,435	439,391	55.2
Eastern Suburbs	Western Sydney	88,798	75,088	84.6
Total		1,580,888	1,045,894	66.2

Source: BTS, *2010/11 Household Travel Survey,* 2012a

It has been estimated that by 2031 (SIS 2012) a combined total population growth of around 235,000 people and employment growth of 160,000 in the combined M4 Motorway and M5

Motorway corridors will generate significant additional demand for travel on an already constrained network (BTS 2012a, 2012b). This represents about one-quarter of Sydney's expected population growth and nearly one third of new jobs.

1.5 King Georges Road Interchange Upgrade project description

1.5.1 General project description

The project would tie into the completed M5 South West Motorway Widening project in the west. Minor treatment would be required to the existing M5 dual carriageways to retain two through lanes in each direction and accommodate the possible future construction of WestConnex M5. The eastern end of the project would tie into the existing M5 East Motorway, near Kooemba Road, Beverly Hills.

To the west of King Georges Road work would be required to the eastbound off-ramp and the westbound on-ramp to make provision for the possible future construction of the WestConnex M5 project and tie in with the completed M5 South West Motorway widening project respectively.

To the east of King Georges Road the eastbound on-ramp would be extended by shifting the merge further to the east and a new bridge span would be constructed to the north of Cooloongatta Road overbridge. Similarly the westbound off-ramp diverge would be shifted further to the east and a new bridge span would be constructed to the south of Cooloongatta Road overbridge.

Figure 3-1 shows the general location of the project including the key components outlined in **Sections 1.5.3** to **1.5.13**.

The project description presented in this EIS is based on the WestConnex Delivery Authority (WDA) concept design. That design would be refined during detailed design. It may also be modified in response to any submissions received following the exhibition of the environmental impact statement or to minimise environmental impacts. The final design of the project that is built could therefore vary from its description in this chapter

1.5.2 Design standards

The M5 Motorway was constructed in three stages, M5 South West in 1992 and 1996 and the M5 East in 2001. The parameters utilised in developing the design for the project were guided by the criteria applied for development of the existing motorway. The concept design for the project has been developed to:

- Utilise the space within the motorway corridor provided as a result of the original design
- Deliver a design that meets the project objectives (refer **section 1.6**)
- Consider community and environmental constraints.

The project has been designed generally in accordance with Australian Standards, Austroads Design Standards, Guides and Codes and the Roads and Maritime supplements. Other parameters applied to the design include:

- Existing roads and structures would not be modified to meet current standards
- The design speed for the main carriageways is generally 100 km/h.
- Lane widths, shoulder widths and crossfall would be variable.

1.5.3 Road work

West facing ramps

In the west the project would tie into the completed M5 South West Widening three lane dual carriageways. In addition to tie-in with the M5 South West Widening project, works to the west facing ramps to / from King Georges Road are required to integrate the project with any future WestConnex M5 configuration.

The diverge for the eastbound off-ramp to King Georges Road would be lengthened. This would require widening of the eastbound carriageway from above 300m west of Penshurst Road. The nearside eastbound lane of the motorway would exit to King Georges Road and two lanes would continue eastbound under King Georges Road. The layout of the eastbound off-ramp would be reconfigured to improve vehicle storage

The M5 South West Widening project provides for three lanes in each direction. The westbound motorway carriageway is two lanes in each direction under King Georges Road and the westbound on-ramp from King Georges Road would become the third motorway lane.

Any design configuration for WestConnex M5 would require an increase in the number of lanes passing underneath King Georges Road from two to three. Work to the westbound off-ramp and widening of the bridge over Penshurst Road is proposed as part of this project in order to accommodate all future WestConnex M5 configurations.

East facing ramps

In the east, works to the east facing ramps to / from King Georges Road are required to meet the project objectives and to integrate the project with any future WestConnex M5 configuration.

The eastbound on-ramp from King Georges Road would be extended by moving the merge about 160 m further to the east. The on-ramp would be realigned and widened, merging to a single lane prior to passing below Cooloongatta Road overbridge via a new bridge span at its northern end.

The length of the westbound off-ramp to King Georges Road would be increased by moving the diverge of the off-ramp with the motorway about 190 m further to the east. The off-ramp

would be realigned passing below Cooloongatta Road overbridge via a new bridge span at its southern end.

The proposed work to the interchange ramps are shown in **Figure 1-5** and **Figure 1-6**.

Figure 1-5 Project elements - West of King Georges Road

Information on noise walls, retaining walls, drainage features and temporary construction facilities is subject to detailed design

New infrastructure

Upgraded infrastructure (including resurfacing and line marking)

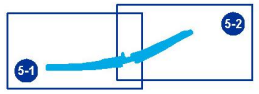
New noise walls

Existing noise walls

Motorway gantry

Lane direction

Recreation areas



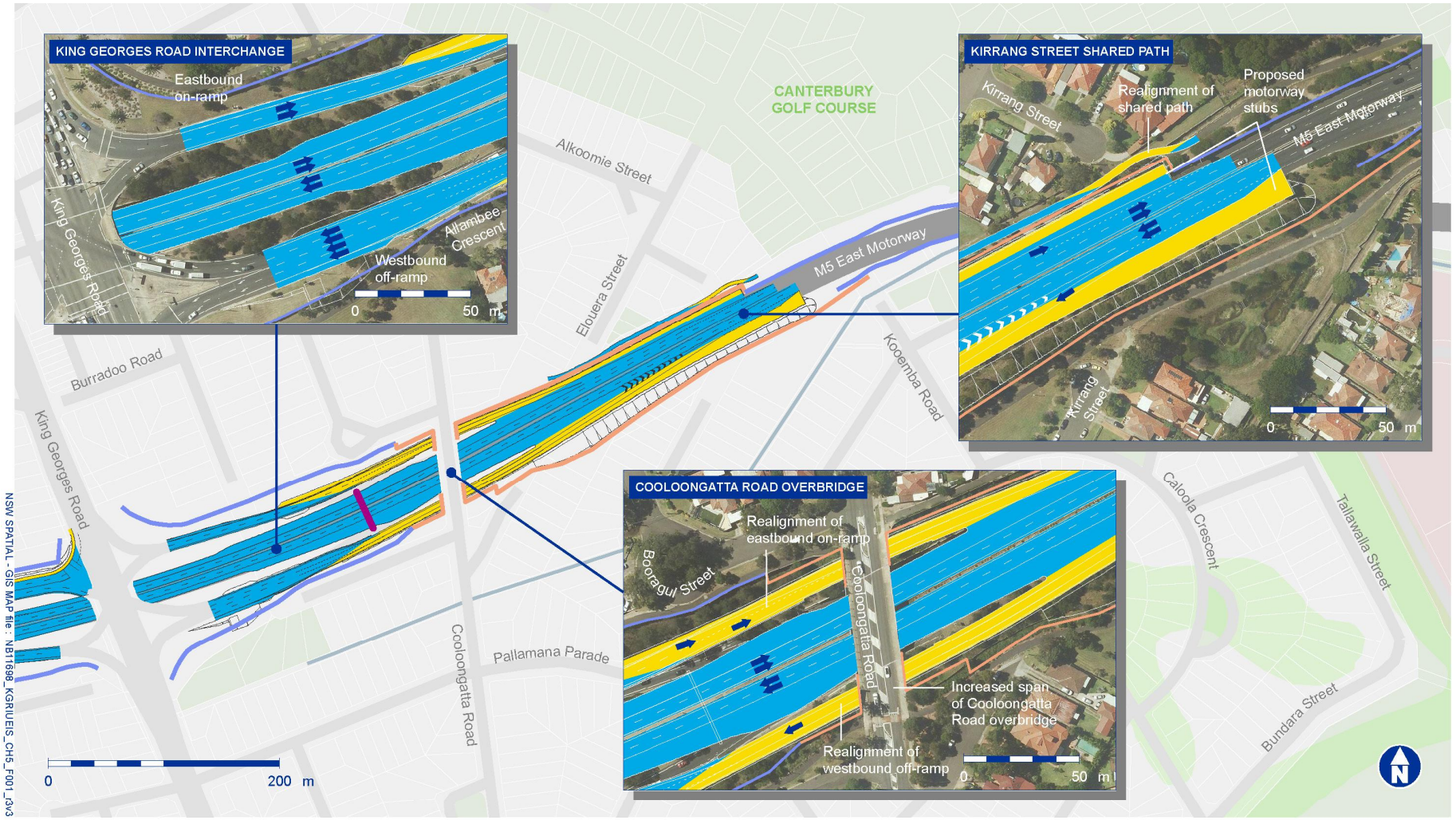


Figure 1-6 Project elements - East of King Georges Road

Information on noise walls, retaining walls, drainage features and temporary construction facilities is subject to detailed design

New infrastructure
Upgraded infrastructure (including resurfacing and line marking)
New noise walls
Existing noise walls
Motorway gantry
Lane direction
Industrial areas
Recreation areas

1.5.4 Road surface

At opening the project would tie into the existing M5 East Motorway two lane dual carriageway. Work to widen the motorway would include the provision of motorway 'stubs' that would accommodate any design configuration for WestConnex M5 at the eastern extent of the project. The location of the proposed motorway 'stubs' are shown in **Figure 1-6**.

Where road widening is required, new road surface would be constructed to match the M5 South West and M5 East motorway surfaces.

Within the project extent, the motorway would need to be re-surfaced. This work may include milling and re-sheeting or just re-sheeting of the full length and width of the road surface prior to line marking. The finished surface would be consistent across all project elements, including for the motorway carriageways and the on- and off-ramps. The road surface material is subject to further investigation and detailed design, however it is likely that an open grade asphalt would be used.

1.5.5 Bridges and structures

Bridges

Work to the west facing ramps (eastbound off-ramp and westbound on-ramp) would extend west of Penshurst Road, and therefore require work to the bridge over Penshurst Road. Widening of the existing structure would be required to its north and south.

Additional bridge spans would be required on both the northern and southern ends of the Cooloongatta Road overbridge to accommodate the east facing ramp configurations.

Structures

The alignment of the west facing ramps would require the introduction of new cut retaining walls on the outside of the ramps to provide maintenance bay access to infrastructure such as Variable Speed Limit Signs (VSLS) that would be required by WestConnex M5.

Fill retaining walls would be required to support the widened motorway east and west of the bridge over Penshurst Road.

New cut retaining walls would be required to support the existing and / or realigned shared path and noise walls above motorway ramp level to the north and south of the motorway.

Figure 1-4 shows a cross section of the proposed widening of the bridge over Penshurst Road and **Figure 1-5** shows a cross section of the proposed additional spans for Cooloongatta Road overbridge.

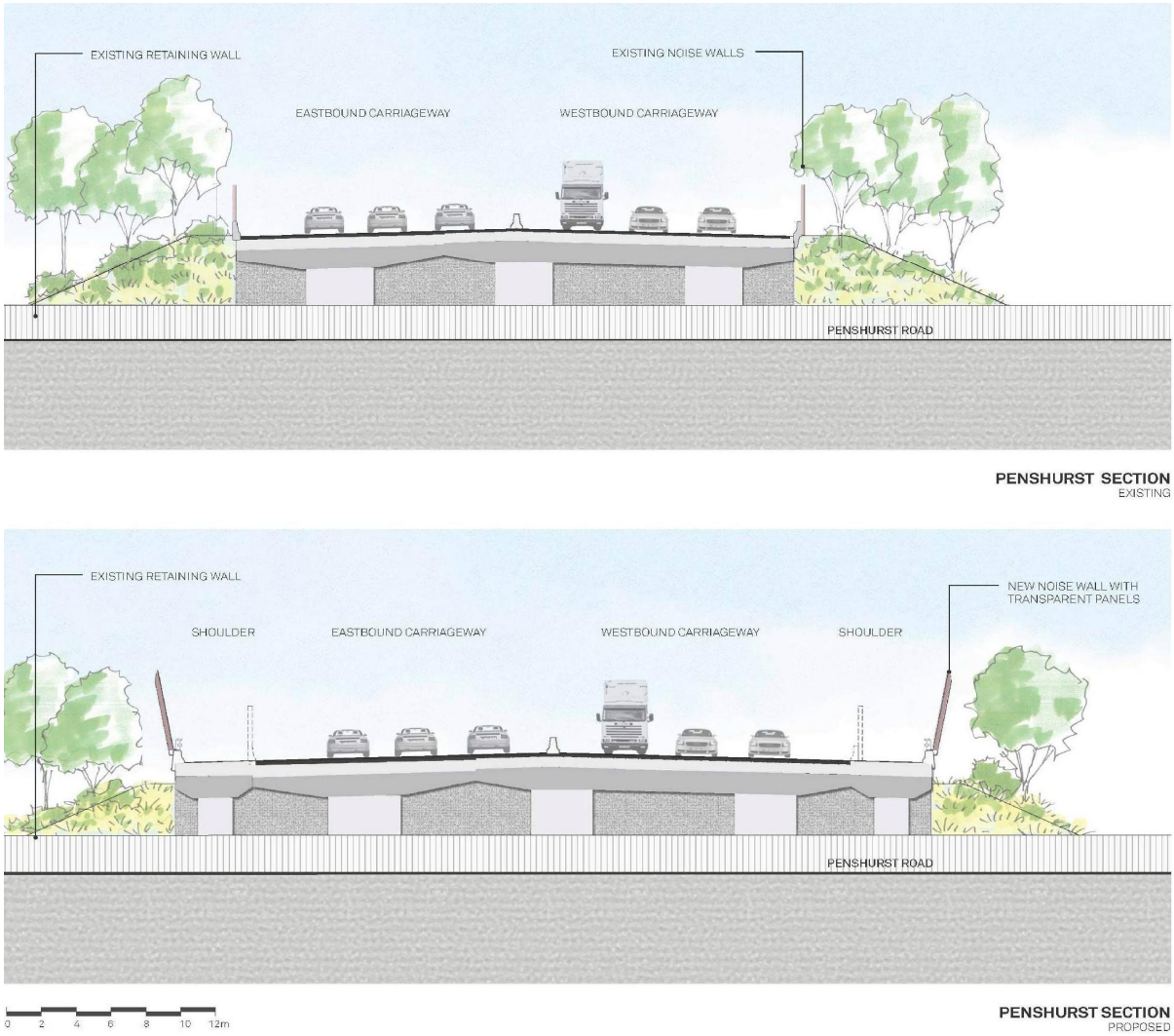


Figure 1-4: Indicative cross section of the proposed widening of the bridge over Penshurst Road

Figure 1-5: Indicative cross section of the proposed additional spans for Cooloongatta Road overbridge

1.5.6 Noise attenuation

Existing noise walls on both sides of the motorway may require adjustment, relocation and/or extension. The indicative heights and extents of noise walls would be reviewed during the detailed design process.

1.5.7 Drainage work

Some adjustments and extensions to motorway cross drainage would be required to accommodate the project. New surface and subsurface drainage and / or improvements to the existing system would be required in areas where the motorway would be widened.

1.5.8 Pedestrian and cyclist facilities

Cyclists can currently use the M5 Motorway for travel in both directions west of Bexley Road. Shared paths are also available north and south of the motorway east of King Georges Road. Construction and operation of the project would not allow cyclists to use the motorway shoulder east of King Georges Road. This permanent change would be implemented at the start of construction.

Eastbound cyclists would use the shoulder on the upgraded eastbound off-ramp and signalised crossing facilities at the King Georges Road intersection to access the shared path facility located to the east of King Georges Road. Westbound cyclists would not be

allowed to access the motorway at Bexley Road and would be required to use the existing shared path and would be able to access the motorway at King Georges Road via the westbound on-ramp.

Some realignment of the existing shared path network would be required between Cooloongatta Road and Beverly Park to accommodate the motorway widening work. Minor work may also be required between Bexley Road and King Georges Road, and is subject to further investigation. The proposed realignment of the shared path east of King Georges Road is shown on **Figure 1-5 and Figure 1-6**.

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1.5.9 Management control systems and emergency facilities

Operational Management Control Systems

The M5 East Motorway currently has Operational Management Control Systems to support management of the motorway. The existing system would be upgraded to make provision for the future WestConnex M5 configuration including relocation of Variable Speed Limit Signs (VSLS) and Variable Message Signs (VMS).

Emergency facilities

While moving slightly to accommodate widening of the motorway, breakdown bays between King Georges Road and Cooloongatta Road would be retained generally in their current location. The break down bays opposite Kooemba Street would not be affected by the work.
In addition to the breakdown bays referenced above, maintenance bays that will be introduced to provide access to additional operational management control infrastructure can also be utilised as breakdown bays.

There are no emergency vehicle crossovers within the project area.

1.5.10 Road furniture, street lighting and signage

Existing kerbs, barriers and fencing would be upgraded where required to accommodate any future WestConnex M5 configuration. Existing static signage would be relocated to accommodate the project footprint and would also be positioned to make provision for WestConnex M5.

Lighting at the interchange, including on- and off-ramps currently extends from Penshurst Road to Kirrang Street and at other selected locations along the motorway corridor. Any new lighting or modifications to existing lighting would be designed in accordance with *AS4282-1997 Control of the Obtrusive Effects of Outdoor Lighting*.

1.5.11 Other infrastructure

Provision for tolling infrastructure as part of WestConnex M5 (ie footings and base plates) forms part of this project; however the installation of toll gantries or collection of tolls from road users does not form part of this project.

1.5.12 Utility adjustments and protection

Telecommunications, gas and sewer lines cross the M5 Motorway within the project area. Utility modifications and/or protection would be required as part of the project..

1.5.13 Ancillary facilities

Temporary work areas such as construction site compounds, stockpiles and storage areas would be established at locations inside and outside the existing motorway corridor. The indicative location of these are described in **section 8.5** and shown on **Figure 8-1**.

1.6 Objectives of the M5 Motorway / King Georges Road interchange upgrade project

The core objectives of WestConnex are to:

- Support Sydney's long-term economic growth through improved motorway access and connections linking Sydney's international gateways and Western Sydney and places of business across the city
- Relieve road congestion so as to improve the speed, reliability and safety of travel in the M5 corridor including parallel arterial roads
- Cater for the diverse travel demands along these corridors that are best met by road infrastructure
- Enhance the productivity of commercial and freight generating land uses strategically located near transport infrastructure
- Fit within the financial capacity of the State and Federal Governments, in partnership with the private sector
- Optimise user pays contributions to support funding in a way that is affordable and equitable.

As identified in the *WestConnex M5 – King Georges Road interchange upgrade State Significant Infrastructure Application Report* (Roads and Maritime 2014), the following objectives have been established for the project:

- Facilitate the possible future delivery of WestConnex M5
- Reduce congestion on King Georges Road and the M5 Motorway in the vicinity of the interchange
- Improve access to and from the M5 Motorway and King Georges Road
- Maintain or improve road safety on King Georges Road and / or the M5 Motorway
- Minimise environmental and social impacts.

These objectives are consistent with the core objectives of WestConnex. An additional specific objective of the M5 Motorway / King Georges Road interchange upgrade project is to enable integration with the subsequent stages of WestConnex while not significantly impacting on the surrounding environment in the interim period.

1.7 Project development and alternative options

1.7.1 WestConnex development

As discussed in **section 1.2**, WestConnex was set out in the *NSW State Infrastructure Strategy 2012-2032* (State Infrastructure Strategy), as a strategic concept, developed as a response to a series of strategic challenges faced by Sydney and NSW. The WestConnex strategic concept built upon a decade of studies into options to augment the M4 and M5 corridors. It was developed by a joint project team comprising representatives from Roads and Maritime, Transport for NSW and Infrastructure NSW. WestConnex Delivery Authority (WDA) has subsequently been established to further develop and deliver the scheme.

The *NSW Long Term Transport Master Plan* (LTTMP) sets out how transport projects will be planned and developed in NSW. The principles used in developing the integrated approach to transport planning for the state of NSW include:

- Putting customers first
- Integrating transport with land use planning
- Identifying corridors of demand
- Defining performance required from the transport infrastructure, using a network hierarchy approach
- Moving towards a connected and integrated system.

The transport planning principles adopted for WestConnex align with the broader principles identified in the LTTMP and are as follows:

- Serves key market and customer needs
- Integrates with the existing transport system
- Transforms the city and reshapes local travel
- Future proofs for long term growth and change.

Previously, WDA has involved industry partners comprising of key construction and engineering consultancies, in the development of options and design solutions and to ultimately identify a feasible, affordable and functional design solution for WestConnex. The outcome of this work has been incorporated into the project design development process.

There have also been a number of studies and investigations, which have been carried out as part of the development and evaluation of potential options to enhance the operational capacity of the M5 corridor. Alternatives were considered as part of the *M5 Transport Corridor Feasibility Study* (RTA, 2009).

The M5 East Motorway opened in 2001 and from this time has operated at or near capacity. The project has attracted ongoing community concern in relation to tunnel air quality and a filtration trial has recently been undertaken. A proposal for the M5 East duplication was publicly exhibited in 2009 and since that time the scheme has undergone further development including consideration of options to reduce impacts on sensitive community land such as Tempe Reserve.

Section 1.7.2 discusses a range of alternatives that were considered as part of the project.

1.7.2 Alternatives

WestConnex has been developed as a key transport component of the LTTMP integrated with the strategic land use outcomes as identified in the *Draft Metropolitan Strategy for Sydney to 2031* (Draft Metropolitan Strategy). As an integrated transport solution it brings together planning for freight and passenger movements, as well as all modes of transport including road, rail, bus, ferries, light rail, cycling and walking.

Public transport options such as rail/light rail or bus would be a potential feasible alternative if WestConnex was primarily about transporting people between specific nodes. However the transport demands in the context of WestConnex are highly dispersed and diverse in nature including a multitude of road user requirements. Public transport will only partially address these demands. Similarly freight rail transport is effective for long distance transport of goods to regional centres however much of the freight coming into Port Botany is for

distribution within the Sydney Basin – so again more diverse and dispersed point to point transport connections are required, for which WestConnex would provide the most optimal solution.

Alternatives to the project were considered based on the extent to which they could meet the project objectives and how well they performed with reference to other transport, environmental, engineering, social and economic factors. The merits of this project were considered in the context of the following alternatives:

- Base case or 'do nothing/do minimum'
- Delivery of the project as part of WestConnex M5
- Investment in public transport and freight rail improvements.

These alternatives are described below.

Alternative 1 – the base case or 'do nothing/do minimum'

The base case option would involve retaining King Georges Road interchange in its current configuration. The interchange at the M5 Motorway and King Georges Road in Beverly Hills currently experiences poor performance during peak hours. The east facing ramps are subject to long queuing, which impacts the performance of both King Georges Road and the M5 East Motorway.

The LTTMP considered that there are no feasible strategic transport alternatives such as heavy or light rail options, demand management, bus augmentation/enhancement or similar that would address the core project objectives as effectively as WestConnex.
Future transport demand in the M5 corridor represents a significant challenge for Sydney and NSW. Without upgrading, the interchange would continue to operate at and over capacity in peak hours. Substantial traffic delays are experienced eastbound in the AM peak period and westbound in the PM peak period. The result of this congestion is delays in the AM and PM peaks that extend beyond peak hours.

Planned commercial and industrial growth at Port Botany and Sydney Airport, as well as planned population growth and employment growth along the M5 and M7 corridors is expected to add further pressure to the interchange and the M5 corridor.

The base case option would not help address congestion issues or improve traffic flow and the performance of major arterial routes such as King Georges Road.

Additionally, the do nothing approach would not allow the realisation of early performance improvements to the interchange ahead of WestConnex M5 completion.

In the context of the identified transport challenges, a 'do nothing/do minimum' option is considered unrealistic.

Alternative 2 - Delivery of the project as part of WestConnex M5

This alternative would defer delivery of the project as currently proposed and combine it with the WestConnex M5 scope of work. This alternative retains the same functionality and operational arrangements as the project, however it does not:

- Facilitate the future construction of WestConnex M5 western tunnel portals and connection to the M5 East without requiring further future modification to the King Georges Road interchange

- Allow for early realisation of performance improvements to the King Georges Road Interchange ahead of WestConnex M5 completion (ie early realisation of project benefits).

Deferred delivery of the project and deferred realisation of the associated project benefits is not considered an appropriate alternative and does not meet the project objectives as well as the preferred strategic option.

Alternative 3 – investment in public transport and rail freight improvements

As discussed in **Chapter 2**, WestConnex is a key component of the LTTMP, the State Infrastructure Strategy and the Draft Metropolitan Strategy. As part of a broader integrated transport solution, the project supports the coordinated approach to the management of freight and passenger movements, as well as all modes of transport including road, rail, bus, ferries, light rail, cycling and walking.

Public transport

The East Hills railway line serves the southern and south-western suburbs of Sydney and runs parallel to the M5 corridor. Most services along the line form part of the Airport, Inner West and South lines operated by Sydney Trains.

The NSW Government's *Sydney's rail future, modernising Sydney's trains* (Transport for NSW 2012), identifies the need for service improvements on the East Hills line due to growth in South Western Sydney and in the Sydney Airport Precinct. This growth is putting pressure on the East Hills line which must share track through the CBD with the busy Bankstown line.

No regular bus services operate on the motorway. Bus routes in the area surrounding the motorway provide connections to commercial and residential areas and transport hubs (such as train stations and bus interchanges). The use of surrounding streets rather than the motorway supports multi-functional bus routes. King Georges Road is used by cross-regional bus routes to connect suburbs either side of the motorway.

Given the project scope is an interchange upgrade and less than two kilometres in length (ie it is not a long linear project), public transport options such as rail/light rail or bus are not seen as a feasible alternative to the King Georges Road interchange upgrade project.

Public transport options could be a feasible alternative if WestConnex was primarily about transporting people to and from centres. In addition to dispersed and longer distance passenger movements, the key customer markets identified for WestConnex include heavy and light freight and commercial services and businesses that have highly diverse requirements for the transfer of goods and services (ie containerised freight, use of rigid and articulated trucks through to small trucks, vans utility vehicles and cars) and whose travel patterns are highly dispersed and diverse in nature.

Public transport would only partially address these customer demands. There are no feasible strategic transport alternatives such as heavy or light rail options or bus corridor enhancements that will meet the diverse range of customer needs for travel in this corridor and address the core project objectives as effectively as the project and WestConnex more broadly.

Rail freight improvements

Apart from moving passengers, Sydney's rail network plays a significant role in moving freight between Sydney's ports and destinations within Sydney, regional NSW and other states. The *Trade and Logistics Report 2011-12* (Sydney Ports Corporation 2012) indicates that some 98 per cent of imported containers through Port Botany and over 60 per cent of exported containers have their origin and destination within Greater Sydney.

The LTTMP identifies a number of current and future freight-related projects that complement the existing freight network. These include:

- Development of an intermodal terminal at Enfield (under construction)
- Development of an intermodal terminal at Moorebank
- Completion of the Southern Sydney Freight Line (under construction)
- Stage one of the Northern Sydney Freight Corridor Program (under construction)
- A Western Sydney Freight Line (future proposal)
- Western Sydney Intermodal Terminal (future proposal).

There are opportunities to shift more freight onto rail and this remains a priority for the NSW Government. However, assuming the target of doubling the share of container freight moved by rail is achieved by 2020, more than 70 per cent of Port Botany's trade would still be moved by road, requiring investment in an efficient road network to support the port and airport precincts.

The *Sydney Airport Preliminary Draft Master Plan 2033* (Sydney Airport Corporation 2014) highlights that currently Sydney Airport handles 48 per cent of Australia's international air freight, 76 per cent more than any other Australian airport. The volume of freight handled by Sydney Airport is projected to double over the period to 2033 to over one million tonnes.
In combination with the freight-related projects identified above, the project and WestConnex would provide a robust freight solution.

Alternative four – demand management

Demand management can be defined as a policy, planning and operational approaches to the movement of goods or people. Demand management encompasses policies intended to reduce individual trip lengths and make various mode options more viable. These policies include:

- Urban consolidation and 'centre' policies (land use planning) to reduce the need for travel.
- Other planning control policies such as limitations to parking provisions.
- Road network management and network connectivity policies; including implementation of intelligent transport systems to improve public transport operation, management of clearways and transit lanes, and to provide greater priority over general traffic.
- Transport pricing to reduce travel demand; including demand based, tolling or transport pricing to discourage discretionary use by private vehicle for trips that can be served by public transport.

The DMSS indicates that strong population growth is forecast across Sydney, with the population expected to grow from 4.3 million today to 5.6 million in 2031. Jobs are also forecast to grow from 2.2 million today to 2.8 million by 2031.

The LTTMP highlights that Western Sydney is currently home to 47 per cent of Sydney's residents but only 37 per cent of Sydney's jobs. This disparity is due to a number of factors that include greater housing affordability in Sydney's west, and the existing agglomerations and infrastructure that support stronger business investment (and therefore location decisions) in the Global Economic Corridor and Sydney's east more generally.

For a demand management option to achieve relevant outcomes, it needs to reduce the overall level of demand for travel, as well as create a shift to more sustainable transport modes. A demand management option can take many years to achieve changes in travel behaviour, as existing practices need to be modified and existing investment priorities changed. In the context of this project, travel demand management is about modifying travel decisions and reducing dependence on travel by cars, especially during peak periods.

Demand management measures are seen as complementary initiatives rather than a viable stand-alone alternative to the project. To have a major impact on road traffic, demand management measures would also require "major changes in social attitudes, travel behaviour and government policy.

1.7.3 Preferred strategic alternative

Upgrading the King Georges Road interchange was confirmed as the preferred option because, comparatively, it performs best against the project objectives and would have similar or lower costs and comparable environmental and social impacts than other options.

The preferred option best meets the identified needs and objectives, which include supporting Sydney's long term economic growth through improved motorway access and connections, providing for the possible future delivery of WestConnex M5 and reducing congestion on King Georges Road and the M5 Motorway in the vicinity of the interchange.

A number of project specific design options have been developed and refined for the project (refer **section 4.3**) that include consideration of possible future alignments and arrangements for the WestConnex M5 western extent of work. Traffic modelling has been undertaken to determine demand levels for proposed ramps and vehicle forecasts for the interchange. The preferred option supports WestConnex.

The preferred option comprises work to the eastbound off-ramp and the westbound on-ramp to make provision for the possible future construction of the WestConnex M5 project and tie in with the completed M5 South West Motorway widening project respectively.

To the east of King Georges Road the eastbound on-ramp would be extended by shifting the merge further to the east and a new bridge span would be constructed to the north of Cooloongatta Road overbridge. Similarly the westbound off-ramp diverge would be shifted further to the east and a new bridge span would be constructed to the south of Cooloongatta Road overbridge.

1.8 Interchange design options

This section describes various design options considered for the project.

1.8.1 Ramp configuration

The existing west facing ramps at the King Georges Road interchange require modification to achieve the project objectives and to comply with the design criteria developed for the project. Options investigation has been informed by traffic analysis, the Roads and Maritime design guide and existing conditions on adjacent sections of the motorway.

Eastbound off-ramp

Options considered for the arrangement of the eastbound off-ramp to King Georges Road include:

- A design that fully conforms with Roads and Maritime design requirements. This design starts west of Penshurst Road and is based on a design speed of 100 km/h. It includes 3.5 m wide travel lanes and conforming shoulder width. This design requires widening of the bridge over Penshurst Road
- A number of designs that had features, specifically including diverge lengths, that did not conform with Roads and Maritime design requirements. These designs were based on a design speed of 100 km/h. The travel lane and shoulder widths were reduced (non-conforming) to allow the design to fit within the existing pavement.

The conforming design option was identified as the preferred option as it provides a number of benefits over any of the non-conforming design option including:

- A fully conforming 100 km/h off-ramp design that matches the current M5 South West and M5 East Motorway design speeds
- Widening of the Penshurst Road bridge removes a number of design non-conformances associated with the other options
- Cyclists would be catered for on the eastbound off-ramp and motorway through the provision of a full width shoulder
- Better site distance for motorists to the start of the auxiliary lane is provided
- A large volume of storage is available for turning traffic, outside of M5 South West motorway through lanes that substantially reduces the likelihood of traffic queues tailing back onto the motorway.

Westbound on-ramp

In order to tie-in with the M5 South West project design, the current westbound lane configuration would be modified so that the westbound on-ramp from King Georges Road becomes an added (third) lane continuing west.

A number of options have been investigated for this westbound on-ramp including:

- Two design options that fully conform with Roads and Maritime design requirements. These designs end west of Penshurst Road and are based on a design speed of either 100 km/h or 110 km/h. They include 3.5 m wide travel lanes and a conforming shoulder width of 2.5 m. These two design options require widening of the bridge over Penshurst Road
- A number of designs that had features, specifically including merge lengths, that did not conform with Roads and Maritime design requirements. These designs were based on a design speed of either 90 km/h or 110 km/h. The travel lane and shoulder widths were reduced (non-conforming) to allow the design to fit within the existing pavement.

The conforming design option with a 100 km/h design speed was identified as the preferred option as it provides a number of benefits over any of the non-conforming design option including:

- Cyclists would be catered for on the westbound on-ramp and motorway through the provision of a full width shoulder
- Widening of the Penshurst Road bridge removes a number of non-conformances associated with the other options
- The westbound on-ramp merge length is reduced compared with the 110 km/h design speed and therefore the project footprint is reduced comparatively.

1.8.2 Shared-path options

Within the study area, the existing motorway provides a two-lane dual carriageway with relatively wide shoulders which support emergency and broken-down vehicles and allow cyclists to travel along the motorway.

Cyclists can currently use the motorway shoulders from just west of Bexley Road and can enter or exit this facility from the grade separated intersection at King Georges Road. Construction and operation of the project would remove cyclist access to the motorway shoulder east of King Georges Road. This permanent change would be implemented in mid-2015 at the commencement of the construction phase.

Table 1-3 identifies the options that have been considered to cater for cyclists within the study area that are also illustrated in **Figure 3-13.**

Table 1-3: Options considered to cater for cyclists

Option	Description	Decision and justification
Option 1	Two shared path underpasses (one for eastbound and one for westbound cyclists) beneath the King Georges Road interchange.	Not the preferred option based on the overall cyclist benefit relative to cost.
Option 2	The introduction of a new 'east / west' signalised surface crossing of King Georges Road for eastbound cyclists. The new crossing would be located on the northern side of the King Georges Road signalised intersection.	Not the preferred option based on cyclist safety considerations and substantial impacts to performance of the King Georges Road intersection.
Option 3	Minor line marking and signage to guide all cyclists to the existing 'east / west' signalised surface crossing of King Georges Road on the southern side of the King Georges Road intersection.	Preferred option given that it: • Provides cyclists with the most flexibility to cross King Georges road in an efficient manner • Can be readily accommodated as part work to the eastbound off-ramp • Can be implemented at relatively low cost in comparison to the overall cost of the project and other cyclist options
Option 4	A new cycleway connection from the eastbound motorway shoulder to Welfare Avenue, enabling eastbound cyclists access to the shared path via the existing King Georges Road / Shorter Avenue signalised intersection.	Not the preferred option based on the moderate cyclist benefit relative to cost. This option has a longer route and possible safety considerations associated with travel past a school zone (vehicle / cyclist conflict at peak school times).
Option 5	Improvements to existing pedestrian facilities on King Georges Road to provide a new surface connection from the eastbound King Georges Road off-ramp to Shorter Avenue (via King Georges Road). This allows access to the shared path east of King Georges Road for eastbound cyclists via the existing King Georges Road / Shorter Avenue signalised intersection.	Not the preferred option given it is a less optimal outcome from a safety and performance perspective compared with the preferred option. In addition to multiple crossings at the King Georges Road / Shorter Avenue signalised intersection, there is also potential conflict with about 10 private residence driveways between the off-ramp and Shorter Avenue.

1.8.3 Other design options

Other options were also considered as part of the project development process to address specific design issues. Many of these design issues relate to requirements for WestConnex M5. The project has been developed to deliver against the project objectives, including provision of ultimate flexibility for the future design and development of WestConnex M5.

New spans under Cooloongatta Road bridge

Design criteria for development of the project include a need to accommodate five lanes for WestConnex M5. Initial design development sought to accommodate traffic within the existing Cooloongatta Road bridge spans. Subsequent investigations have identified that vehicles cannot be safely accommodated into five lanes under Cooloongatta Road Bridge due to the distance available between concrete barriers (ie not sufficient space to accommodate safe lane widths). As such, the project reflects that the eastbound on-ramp passes below Cooloongatta Road overbridge via a new bridge span.

Eastern limit of work

The project ties into an existing curve on the M5 East motorway at about Kooemba Road, Beverley Hills. Other tie-in locations further to the east were considered, however the proposed eastern tie-in location is preferred because it provides the greatest flexibility for development of the WestConnex M5 design while still accommodating all key design requirements associated with the project's westbound off-ramp diverge and the eastbound on-ramp merge.

1.9 Project refinement

Development of the project's concept design has continued since lodgement of the State Significant Application with the Department of Planning and Environment. This has included refinement of the design to address issues identified during environmental investigations and in order to confirm that the project meets Roads and Maritime design guide requirements. Further refinements to the concept design may occur as new information is obtained during the detailed design phase.

1.10 Structure of the report

This remainder of the report is structured in the following manner:

- **Chapter 2** describes the strategic planning context of WestConnex
- **Chapter 3** details the existing land use and transport environment
- **Chapter 4** assesses the existing road network performance.
- **Chapter 5** describes the approach to traffic forecasting.
- **Chapter 6** assesses the future performance of the existing road network.
- **Chapter 7** assesses the operational performance and impacts of the project.
- **Chapter 8** addresses the traffic impacts of construction of the project.
- **Chapter 9** provides a conclusion to the report.

2 Strategic planning context

This chapter summarises the strategic planning considerations for the M5 Motorway / King Georges Road interchange upgrade project, including its contribution to achieving the overall objectives of WestConnex.

Historically, the vision for a Sydney Orbital was first articulated in the plan known as *Roads 2000 Sydney* ((NSW) Department of Main Roads 1987). This orbital vision was delivered as eight incremental projects which were realised in 2007, with the opening of the Lane Cove Tunnel. The Sydney Orbital is now a vital part of Sydney's transport network, and is ultimately the result of more than 20 years of strategic effort in NSW.

The *State Infrastructure Strategy* (SIS) (Infrastructure NSW 2012) identified the need for Sydney's next motorway priority to be part of a holistic network solution, not an isolated road project, and one that delivers on both liveability and productivity outcomes.

As a consequence, WestConnex addresses the most urgent and strategically important elements of the *NSW Long Term Transport Master Plan* (LTTMP) (TfNSW 2012a). The LTTMP highlights the importance of improving integrated transport connections between Sydney's west, Sydney Airport and Port Botany. WestConnex has been identified as the first part of the long term vision for the Sydney motorway network to be delivered in Sydney. Consequently, it is proposed to be the strategic focus for motorways in NSW over the next 10 years.

Section 4.2.1 of the LTTMP identifies the six most highly constrained strategic transport corridors in Sydney, three of which are served by WestConnex: Parramatta to Sydney via Strathfield, Sydney Airport to Sydney City, and Liverpool to Sydney Airport. WestConnex has been driven by a series of ideas that have sought to address issues constraining motorway development in Sydney. It has been five years since completion of Sydney's last motorway project and schemes for the M4 Extension have been under development for over 10 years. Schemes for the M5 East Duplication have been under development for almost 10 years.

Community and stakeholder engagement has been part of this development process, and local communities are well versed in the critical issues around motorway development in their local areas. WestConnex seeks to address the challenges that road users and the community encounter on a daily basis, including:

- The missing link in the Sydney motorway network's east-west spine created by the M4 Motorway terminating at North Strathfield – constraining movements between Sydney's west, its international gateways and key places of business in Sydney's east.
- Congestion, low travel speeds and unreliable travel times on the M4 Motorway, M5 East Motorway, Parramatta Road and in the Sydney Airport/Port Botany precinct that delay freight, public transport and add cost to business.
- Poor urban amenity along Parramatta Road due to heavy traffic volumes and congestion throughout weekdays and on weekends.

The impacts of these challenges are significant given around 30 per cent of Sydney's population (1.2 million people) and around 30 per cent of its employment (600,000 jobs) is located within the broader M4 Motorway and M5 Motorway corridors, as stated in the *WestConnex Business Case Executive Summary* (Sydney Motorways Project Office 2013a). These corridors comprise highly urbanised and complex communities with local concerns and issues which need to be incorporated into the detail of the transport solutions for the area.

WestConnex also responds to future strategic challenges pertinent to Sydney's economic productivity and liveability, including:

- Population growth of around 235,000 people and jobs growth of 160,000 by 2031 in the combined M4 Motorway and M5 Motorway corridors generating significant demand for travel on an already constrained network. This represents almost one-quarter of Sydney's population growth and around one-third of new jobs. Those figures are drawn from the NSW Bureau of Transport Statistics data (2012) based on a five kilometre width spanning from Penrith through to Parramatta to Glebe, Sydney Airport, Port Botany, Bexley, Liverpool and Campbelltown, excluding Sydney central business district (CBD). Growth is from a 2011 base.
- Urban revitalisation, liveability and growth centres along the Parramatta Road corridor, identified in the (*Draft) Metropolitan Strategy for Sydney to 2031* (DMSS) ((NSW) Department of Planning and Environment 2013a) as a 'City Shaper'. The Parramatta Road corridor connects Global Sydney and Parramatta via Sydney Olympic Park. WestConnex will provide opportunities to transform the local centres that exist alongside the corridor and better connect them. The Parramatta Road corridor offers prime revitalisation opportunities to create lively, well-designed centres with improved north-south and east-west linkages currently limited by the busy Parramatta Road.
- An additional 40.3 million passengers forecast at Sydney Airport by 2035, resulting in significant vehicle trip generation on a heavily constrained and complex part of the road network according to the *Joint Study on Aviation Capacity for Sydney Region* (Australian Government, NSW Government 2012) (p.12). Those figures assume unconstrained growth at Sydney Airport and based on a 2010 growth base. Traffic in the Sydney Airport precinct is a mixture of airport traffic and through traffic destined for Port Botany, Sydney CBD and Sydney's north.
- Trade at Port Botany is growing at a faster rate than previously forecast. Given available capacity at the port itself, it is assumed that Port Botany will remain the primary container facility for NSW if landside access is improved. While freight rail will play an increasing role in the future, the majority of this growth is expected to be accommodated by road due to the dispersed nature of the freight.
- In line with population and employment growth, non-containerised freight and commercial trips are also forecast to grow across a wide range of sectors all of which by their nature will be road based trips.

2.1 M5 Motorway / King Georges Road interchange upgrade project – a component of WestConnex that will transform Sydney's transport network

WestConnex is a public commitment and priority project in the LTTMP. WestConnex will complete one of the missing links in Sydney motorway network, as shown in **Figure 1-1**. The M5 Motorway / King Georges Road interchange upgrade project is an important part of WestConnex and contributes to achieving its overall objectives. Therefore, this road project will help transform and contribute to defining the success of the future urban structure and transport network in the M5 Motorway corridor.

The *WestConnex Business Case* (SMPO, 2013b) outlines the benefits of WestConnex and identifies the M5 Motorway / King Georges Road interchange upgrade as an early project in that program of works.

2.2 Consistency with Government policy and objectives

The M5 Motorway / King Georges Road interchange upgrade project, as part of the fully completed WestConnex, addresses broader government objectives set in *NSW 2021*: *A plan*

to make NSW number one (NSW 2021) (NSW Department of Premier and Cabinet 2011) and is recognised in strategic plans including:

- *NSW Long Term Transport Master Plan* (LTTMP) (Transport for NSW (TfNSW) 2012a).
- *State Infrastructure Strategy* (SIS) (Infrastructure NSW 2012).
- *NSW Freight and Ports Strategy* (TfNSW 2013a).
- (*Draft) Metropolitan Strategy for Sydney to 2031* (DMSS) ((NSW) Planning and Infrastructure 2013).

2.2.1 NSW 2021

Within the context of NSW 2021, the M4 Widening project, as part of WestConnex will help to achieve priority actions within NSW 2021 by delivering key road infrastructure identified by the NSW government which will enhance and expand capacity on road corridors including Parramatta Road and M4 Motorway and the link from Sydney's CBD to Sydney Airport and Port Botany.

2.2.2 State Infrastructure Strategy

The SIS identifies that the most pressing investment needs to occur on the M4 Motorway and M5 Motorway corridors due to their importance to the freight and business transport tasks and connections to Global Sydney and the international gateways. WestConnex is identified in the SIS as a critical program of work with a range of benefits including reducing congestion, providing opportunities for urban renewal along Parramatta Road, providing improved access to the major international gateways of Sydney Airport and Port Botany and improving industrial access and business efficiency along the M5 Motorway corridor.

2.2.3 NSW Long Term Transport Master Plan

The M5 Motorway / King Georges Road interchange upgrade project, as part of WestConnex, is aligned to the strategic objectives in the LTTMP:

- Improve the quality of service – The project is a key component in a multimodal solution to Sydney's transport network and offers the opportunity to meet the needs of existing and future customers. The widening has the potential to reduce travel times and improve reliability for freight, commercial and passenger markets.
- Improve liveability – The project, when considered as part of the fully completed WestConnex, could reduce traffic on lower order roads, improving liveability particularly in the Parramatta to Sydney CBD corridor.
- Support economic growth and productivity – The project will support more efficient freight and commercial movements, reducing the cost of congestion to the NSW economy.
- Support regional development – The project, as part of the existing M4 Motorway corridor and the future WestConnex, would improve connections between the city and regional NSW, particularly with the international gateways at Sydney Airport and Port Botany.
- Improve safety and security – The project could improve road safety by reducing congestion on this part of the M4 Motorway, ease traffic on the surrounding arterial roads, and reduce impacts on other road users such as pedestrians and cyclists.
- Reduce social disadvantage – The project, when considered as part of WestConnex, would improve access to job opportunities across Sydney through reduced travel times between homes and jobs.
- Improve sustainability – The project could reduce congestion in a major part of the Sydney's road network and the impact of that congestion on the environment.
- Strengthen transport planning processes – WestConnex is an outcome of a long term transport planning framework to address the transport needs of NSW over the next 20 years.

2.2.4 NSW Freight and Ports Strategy

The NSW Freight and Ports Strategy is a core component of NSW's overall strategic planning framework and supports the goals identified in NSW 2021. One of the objectives of the strategy includes delivering a freight network that efficiently supports the projected growth of the NSW economy.

WestConnex is a key component in the strategy to connect and complete Sydney's motorway network including priority freight movement and expanding capacity on NSW roads which will provide benefits for freight movement, particularly around major freight activity centres including Sydney's international gateways, Port Botany and Sydney Airport, which are concentrated around the M4 Motorway and M5 Motorway corridors.

2.2.5 (Draft) Metropolitan Strategy for Sydney to 2031

WestConnex is described in the DMSS as a key element of the Parramatta Road 'City Shaper'. WestConnex adds to the Parramatta Road corridor 'City Shaper' and provides a strong link between Parramatta, Sydney and the Global Economic Corridor (GEC). WestConnex will link Parramatta and Global Sydney with key centres and precincts including Burwood, Sydney Olympic Park and Rhodes Business Park.

2.3 Strategic planning consideration – serving the right markets

By supporting the appropriate markets, the performance of WestConnex can be optimised, resulting in improved productivity of the freight task, improved travel times and increased amenity and business investment opportunities for centres.

2.3.1 Target markets for WestConnex

WestConnex has adopted a market based approach, consistent with the LTTMP which places a strong emphasis on identifying customers and meeting their needs. The corollary of this is that WestConnex should also support existing markets best served by other transport modes rather than compete with them.

The market analysis for WestConnex is supported by best practice nationally and internationally on motorway function and design, which treats motorways as best serving longer distance and inter- regional trips connecting to or bypassing major urban centres. The *Guide to Road Design* (Austroads 2010) likewise states that motorways have an exclusive function to carry traffic within cities and ensure the continuity of the national or regional primary road system. These functions particularly the continuity of the regional road system indicate that motorways are aimed at the long distance and inter-regional trips connecting to or bypassing major urban centres.

WestConnex has been designed to serve customer needs that are well suited to road-based and private vehicle-based travel on a motorway. Serving the right trips on the right mode will mean that WestConnex does not undermine important objectives for the wider network, and that it optimally performs its own role.

There are eight target markets for WestConnex, defined by trip purpose:

- Passenger and freight movements to and from the airport, involving dispersed levels of demand across metropolitan Sydney, and strong east-west air travel for low volume, high-value freight such as fresh food imports and exports.
- Container freight from Port Botany, involving longer metropolitan freight trips to freight hubs and employment lands along the M4 Motorway and M5 Motorway corridors, and just-in-time empty container movements.

- Heavy freight movements, involving moderately dispersed trips across metropolitan Sydney to areas of production, consumption, construction, transport and logistics.
- Light freight movements to highly dispersed locations, including employment lands, major centres, localised centres, specialised precincts such as the Westmead health precinct or Bankstown Airport, and even households.
- Commercial service vehicles, again to highly dispersed locations including major centres, localised centres, specialised centres and households.
- Commercial business vehicles, which tend to be moderately dispersed across major centres, specialised precincts and employment lands.
- Long distance personal trips to non-centre locations, involving diffuse origins and destinations where locations are set away from public transport trunk lines and interchanges.
- Interregional and interstate personal trips, including trips between Sydney's east and the Southern Highlands, Goulburn, Canberra, Blue Mountains, and trips from diffuse areas to high value recreational, cultural or other services and events.

2.3.2 Non-target markets for WestConnex

WestConnex should complement the function of the wider transport network. This means it should not serve those markets that are better served by other modes of transport or are not a target market of WestConnex.

There are four non-target markets for WestConnex:

- Personal travel within the area surrounding WestConnex to centres are to highly concentrated areas of activity accessible from WestConnex and are better served by passenger rail. These are short to medium trips seeking access to work, education and personal business.
- Personal travel between centres in Sydney's west and Sydney's east are relatively longer trips between centres which can be efficiently served by passenger rail. A large part of this travel is concentrated in the morning and evening peak during the week as people travel to and from work.
- Short to medium length personal trips to non-centre based locations should not require the use of the motorway and instead can be efficiently served by local and arterial roads. These are trips seeking access to work, education and personal business from highly dispersed locations to non- centres locations that are not well served by public transport.
- Long haul freight movements to regional and interstate areas can be efficiently served by freight rail. These trips have a relatively higher value than personal travel, and occur at all times of the day, notwithstanding curfews in metropolitan areas.

To varying degrees, these markets may use WestConnex depending on the performance of the rest of the network. However, it is not desirable for the motorway to serve these trips, and if it were to do so, the productivity and performance of the new motorway would be impaired.

2.4 Conclusion

Sydney's transport network faces complex challenges now and in the next 20 years. As part of a multimodal network-wide effort to tackling Sydney's transport challenges, a major investment in road capacity and efficiency in the eastern half of Sydney is required to address network underperformance, and support Sydney's long term economic growth.

The solution to Sydney's complex challenges is in identifying the right strategic investments to provide long term network capacity, including modern road infrastructure, freight and passenger rail, and public and active transport, consistent with the LTTMP. This means that the M5 Motorway / King Georges Road interchange upgrade project and WestConnex alone will not solve all transport problems for Sydney, or respond to identified transport problems in isolation of other actions in the LTTMP.

The 'needs case' for WestConnex and therefore the M5 Motorway / King Georges Road interchange upgrade project, which establishes the strategic case for government action, is the response to a set of transport problems that major road investment and capacity through WestConnex would directly help tackle for the long term.

The King Georges Road interchange currently experiences poor performance during peak hours. The key benefits of the King Georges Road interchange upgrade project include:

- Facilitates the possible future construction of WestConnex M5 western tunnel portals and connection to the M5 East without requiring further modification to the King Georges Road interchange
- Improved performance of the M5 Motorway, M5 Motorway on-ramps and off-ramps, and King Georges Road
- Early realisation of performance improvements to the King Georges Road Interchange ahead of WestConnex M5 completion.

The King Georges Road interchange upgrade project is an initial stage of WestConnex M5. It is a NSW Government commitment to deliver WestConnex for Sydney in response to the recommendations from Infrastructure NSW in its *State Infrastructure Strategy* (Infrastructure NSW 2012) and the LTTMP. In addition, the *Draft Metropolitan Strategy* identifies WestConnex as an important corridor and a catalyst for major urban renewal.

In the context of the broader WestConnex, the King Georges Road interchange upgrade project will support NSW's key economic generators and provide a strategic response to the currently inadequate and highly congested, road network. Improvements to the transport network, including as a result of the King Georges Road interchange upgrade project, will support the Global Economic Corridor by enabling domestic and international trade and therefore underpin a sustainable NSW economy and Sydney's role as a global city.

Sydney's freight, service and business task requires distribution of goods and services across the Sydney Basin, which relies on more diverse and dispersed point-to-point transport connections. The King Georges Road interchange upgrade project supports this task by improving the reliability of the motorway network and King Georges Road.

3 Existing land use and transport

3.1 Study area

The study area adopted for the M5 Motorway / King Georges Road interchange upgrade project covers approximately 2 kilometres of the M5 Motorway between the Penshurst Road and Cooloongatta Road underpass, as shown in **Figure 3-1** overleaf. Canterbury Road to the north and Stoney Creek Road to the south have been adopted as the northern and southern boundaries of the study area. The study area includes the suburbs of Roselands, Narwee, Beverly Hills and Kingsgrove.

3.2 Land use

Figure 3-2 overleaf shows the generalised land uses within the M5 Motorway corridor. These are described in detail below.

3.2.1 Regional Context

The King Georges Road and M5 Motorway interchange is located within the 'South' subregion of Sydney as defined in the *Draft Metropolitan Strategy 2013*. The south subregion has a population of about 609,000 people, and a combined Gross Regional Product (GRP) of 5.7 per cent ($16.5 billion). Population within the subregion is predicted to increase by about 43,000 by 2031.

The M5 East Motorway connects the M5 South West Motorway at King Georges Road, Beverly Hills (in the west) with Southern Cross Drive and the Eastern Distributor (in the east). The motorway is an important link connecting Sydney's Eastern Suburbs, the airport and Port Botany area, and the Princes Highway, with the wider southern and south-western Sydney road network including King Georges Road, the Cumberland Highway and the M7 Motorway.

The M5 transport corridor is the main passenger, commercial and freight route between Sydney Airport, Port Botany and South West Sydney, and links with the orbital road network and interstate routes. The greater M5 corridor supports planned residential and employment growth in South West Sydney and is also a well-established route serving suburbs and growth centres in South West Sydney.

King Georges Road forms part of the A3 arterial road corridor. South to north, the A3 corridor begins in Blakehurst and continues north through Sydney's southern and inner western suburbs to the northern beaches area where it finishes near Mona Vale. King Georges Road forms the southern section of the A3 corridor, ending at its intersection with Punchbowl Road. King Georges Road (and the greater A3) connects several major motorway corridors, being the M5 Motorway, the M4 Motorway, the M2 Motorway and the Pacific Highway.

No regular bus services operate on the motorway. Bus routes in the area surrounding the motorway provide connections to commercial and residential areas and transport hubs (such as train stations and bus interchanges). The use of surrounding streets rather than the motorway supports multi-functional bus routes. King Georges Road is used by cross-regional bus routes to connect suburbs either side of the motorway.

Figure 3-1 M5 Motorway / King Georges Road Interchange Upgrade project study area

Information on noise walls, retaining walls, drainage features and temporary construction facilities is subject to detailed design

New infrastructure

Upgraded infrastructure (including resurfacing and line marking)

New noise walls

Existing noise walls

Motorway gantry

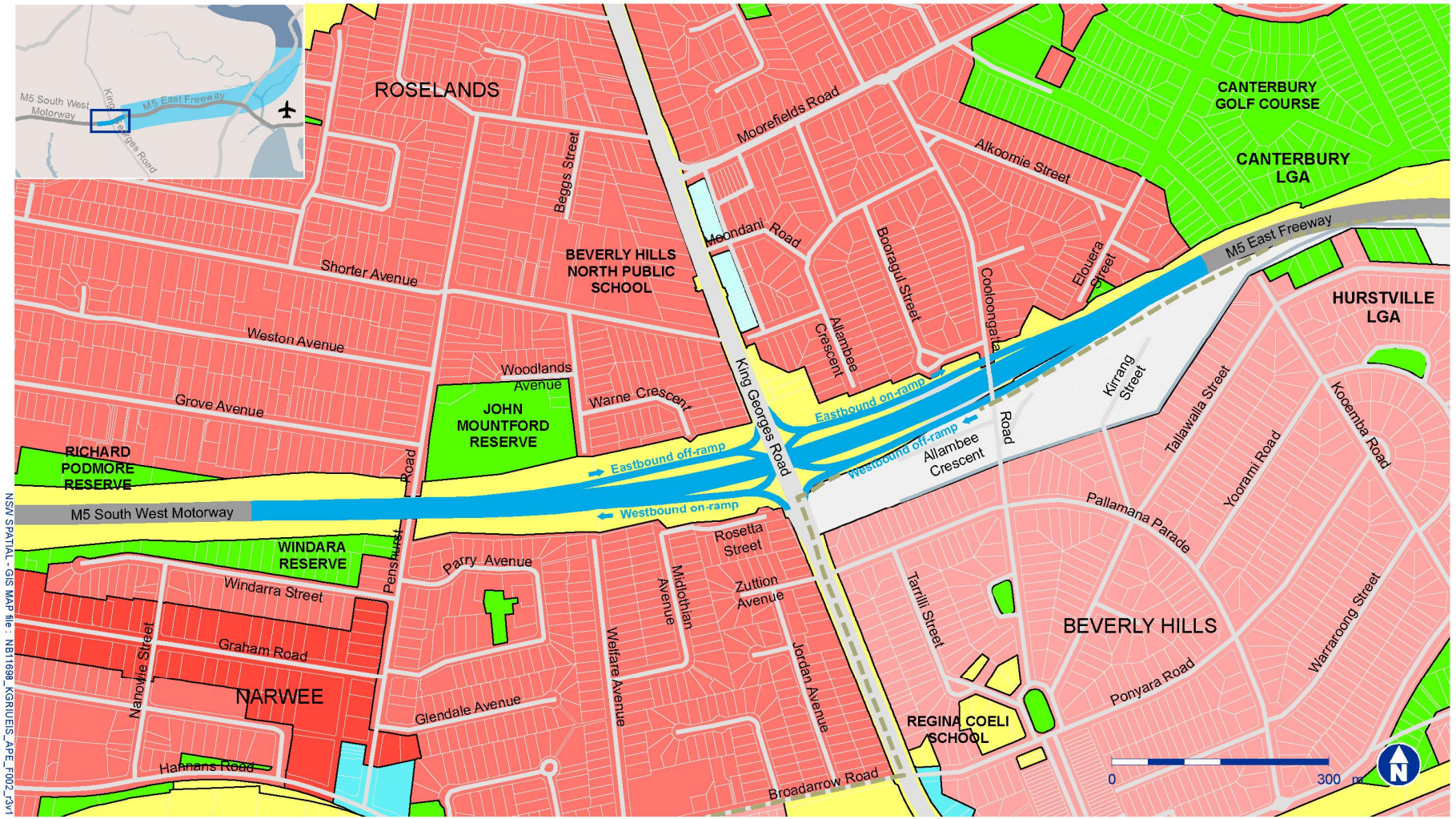

Figure 3-2 Land uses in the M5 Motorway corridor

Information on noise walls, retaining walls, drainage features and temporary construction facilities is subject to detailed design

The project

Local Government Area boundary

LEP Standard Instrument Zone - Hurstville LEP 2012, Canterbury LEP 2012

- B1 Neighbourhood Centre
- B2 Local Centre
- R2 Low Density Residential
- R3 Medium Density Residential
- R4 High Density Residential
- RE1 Public Recreation
- SP2 Infrastructure

3.2.2 The South West Growth Centre

The South West Growth Centre (SWGC) which spans the local government areas (LGAs) of Liverpool, Camden and Campbelltown is planned to accommodate around 110,000 new homes in the next 30 years in greenfield areas around Leppington and Oran Park.

It covers approximately 17,000 hectares of land that will require an extensive transport network to support the need for access to education, work, recreation and health facilities. Progressive land release has already commenced at Edmondson Park. Existing roads will be placed under increasing pressure. Growth in the SWGC would rely heavily on access via the M5 corridor to the eastern parts of Sydney.

3.2.3 Western Sydney Employment Hub

Located at the junction of the M7 and M4 motorways the Western Sydney Employment Hub comprises 1,500 hectares of land for industrial use – with the potential to generate more than 1,000 net hectares of additional employment land.

Distribution centres for major companies that import goods from overseas are attracted to the site situated at the junction of two motorways and offering a large area of land suitable for major warehousing uses.

LG Electronics is operating on the site and a national distribution centre for Coles Myer is being constructed. At present the most reliable route between Eastern Creek and Port Botany/Sydney Airport is via the M7 Motorway and M5 corridor.

3.2.4 The M5 Transport Corridor

The NSW Government's Metropolitan Strategy identifies that along the M5 South West Motorway land is being protected to enable the enhancement of employment lands. Protection of employment lands is required as the M5 corridor has a number of significant sites that are potentially important industrial areas that could be attractive for conversion to residential uses. The major strategic areas are Milperra/Bankstown Airport, Moorebank, Ingleburn, Minto and Campbelltown. As these develop into more intense employment uses they will generate commercial and freight demand for more road capacity in the corridor.

Figure 3-3 details the annual population increases in key centres along the M5 corridor up to 2021 and 2031.

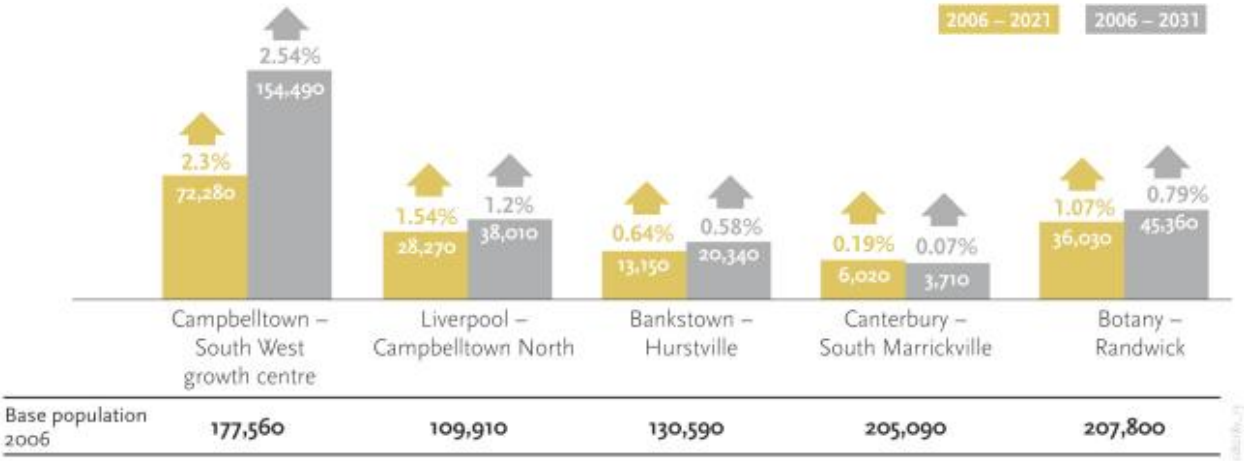

Figure 3-1: Predicted change in population in key centres

Source: BTS, Population Forecasts, 2006

Figure 3-4 details the annual employment changes in key centres along the M5 corridor up to 2021 and 2031.

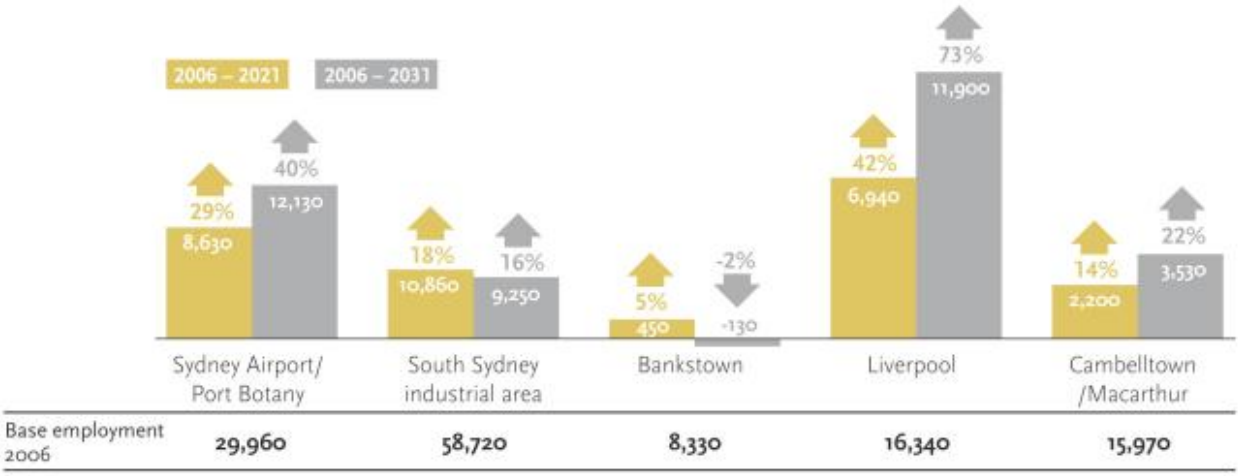

Figure 3-2: Predicted change in employment in key centres

Source: BTS, Employment Forecasts, 2006

Figure 3-5 details the predicted change in freight movements to and from key centres along the M5 corridor.

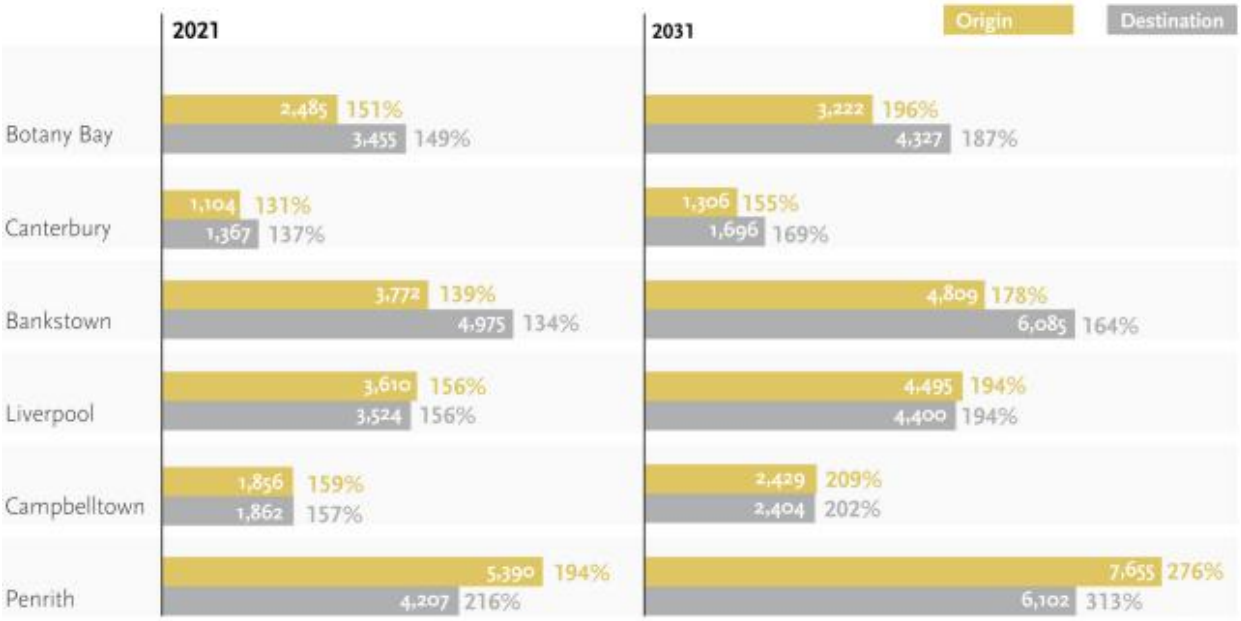

Figure 3-3: Predicted change in freight movements to and from key centres 2021 and 2031

Source: BTS (2006)

3.3 Road Network

3.3.1 M5 East Freeway and M5 South Western Motorway

The M5 East Freeway and M5 South Western Motorway form part of the Sydney Orbital Network and comprise the east-west route between Prestons and Mascot. Continuing on the M1 from Mascot, motorists can ultimately access the Sydney CBD and Sydney's eastern and northern suburbs. The M5 Motorway is the main road freight, commercial and passenger route between Sydney Airport, Port Botany, the St George area, south-western Sydney and beyond to the Southern Highlands.

The M5 East Freeway runs from King Georges Road in Beverly Hills to the M1 at Mascot. The freeway is untolled, and includes a 4 kilometre tunnel from Kingsgrove to Arncliffe. Two lanes are provided in each direction. In the eastbound direction, the speed limit is 90 kilometres per hour from King Georges Road to Kingsgrove Road, and then 80 kilometres per hour to the M1. In the westbound direction, the speed limit is 80 kilometres per hour from the M1 to Kingsgrove Road, and then 100 kilometres per hour to King Georges Road.

The M5 South Western Motorway runs from the M31 Hume Motorway and the M7 Motorway in Prestons to King Georges Road in Beverly Hills. The motorway is privately operated and is tolled in both directions. Generally, two lanes are provided in each direction, with a few short sections of three lanes. Normally, the speed limit is 100 kilometres per hour between the M31 Hume Motorway and the toll booths in Hammondville, and 110 kilometres per hour thereafter until King Georges Road. However, the motorway is currently being widened to three lanes in each direction, with a roadwork speed limit of 80 kilometres per hour.

3.3.2 King Georges Road

King Georges Road is an arterial road running south-north from the Princes Highway in Blakehurst to Punchbowl Road in Wiley Park. It forms part of the A3, which is a major route through Sydney from the A1 in Blakehurst to the A8 in Mona Vale, crossing the M5 Motorway, M4 Motorway, M2 Motorway and the A1 (Pacific Highway). It is the main north-south freight route east of Parramatta, and connects southern Sydney to Sydney Olympic Park, Macquarie Park, the North Shore and Northern Beaches.

King Georges Road provides three lanes in each direction in the study area, and is divided by a median. Both directions are 'clearways' in the morning and evening peaks. Parking is permitted on short stretches of the road outside peak times. The speed limit is 60 kilometres per hour, with frequent school zones.

3.3.3 Other arterial roads

Canterbury Road is at the northern boundary of the study area, forming part of the east-west A34 from the A28 in Liverpool to the A36 in Newtown. It is one of the primary parallel routes of the M5 from the Sydney CBD to south-western Sydney, via the Inner West. Near the study area it is generally undivided, with two lanes in each direction. The speed limit is 60 kilometres per hour.

Stoney Creek Road is at the southern boundary of the study area, forming part of an east-west route from Forest Road in Peakhurst to Forest Road in Bexley. It is a parallel route of the M5 East Freeway through southern Sydney, and is part of the D5 detour route of the M5 East Freeway. Near the study area it is generally undivided, with two lanes in each direction. The speed limit is 60 kilometres per hour.

3.3.4 Local roads

The following are significant local or collector roads between Canterbury Road in the north of the study area and Stoney Creek Road to the south:

- Roselands Drive and Roseland Ave connect King Georges Road to Centro Roselands.
- Moorefields Road connects King Georges Road to Kingsgrove Road, towards Clemton Park and Earlwood.
- Shorter Avenue connect connects King Georges Road to Karne Street North.
- Cooloongatta Road crosses the M5 Motorway and connects Moorefields Road to Vanessa Street north of the T2 Airport Line
- Penshurst Road crossed the M5 Motorway and connects the suburb of Narwee (Narwee Station) to King Georges Road.
- Broad Arrow Road connects King Georges Road to Narwee and Riverwood, crossing the T2 Airport Line in Narwee.
- Tooronga Terrace connects King Georges Road to Kingsgrove and Bexley North via Vanessa Street and Kingsgrove Avenue, north of the T2 Airport Line.
- Morgan Street connects King Georges Road to Kingsgrove, south of the T2 Airport Line.

3.3.5 Key markets served by road

Background

Sydney has historically had a radial transport network, developed with Sydney CBD as the centre of activity. Over time this has evolved, with the Sydney Orbital Network, consisting of the M2, M5 and M7 Motorways, completed in 2007 providing a continuous motorway standard network.

With the population growing faster in Western Sydney, and many employment centres located towards the east in the Global Economic Corridor (GEC) spanning from Macquarie Park to Sydney Airport and Port Botany, more people are commuting further to access employment, leading to congestion and capacity constraints at certain times of day. This has implications for the economic development of Western Sydney and within the GEC itself.

The *NSW Long Term Transport Master Plan* (LTTMP) (Transport for NSW (TfNSW) 2012a) identified 46 strategic transport corridors. Of these 46 corridors, six were identified as highly constrained in their ability to meet forecast travel demand growth over the next 20 years. These corridors connect activity centres such as CBDs, airports, ports or residential centres and reflect travel demand between them.

The M5 Motorway corridor is one of the most highly congested in Sydney, with sections already operating above capacity. This heavy congestion reduces travel speeds, and increases travel time variability. Peak travel times on a range of strategic routes in 2011 and 2031 were reported in the LTTMP and are shown below in **Figure 3-6.**

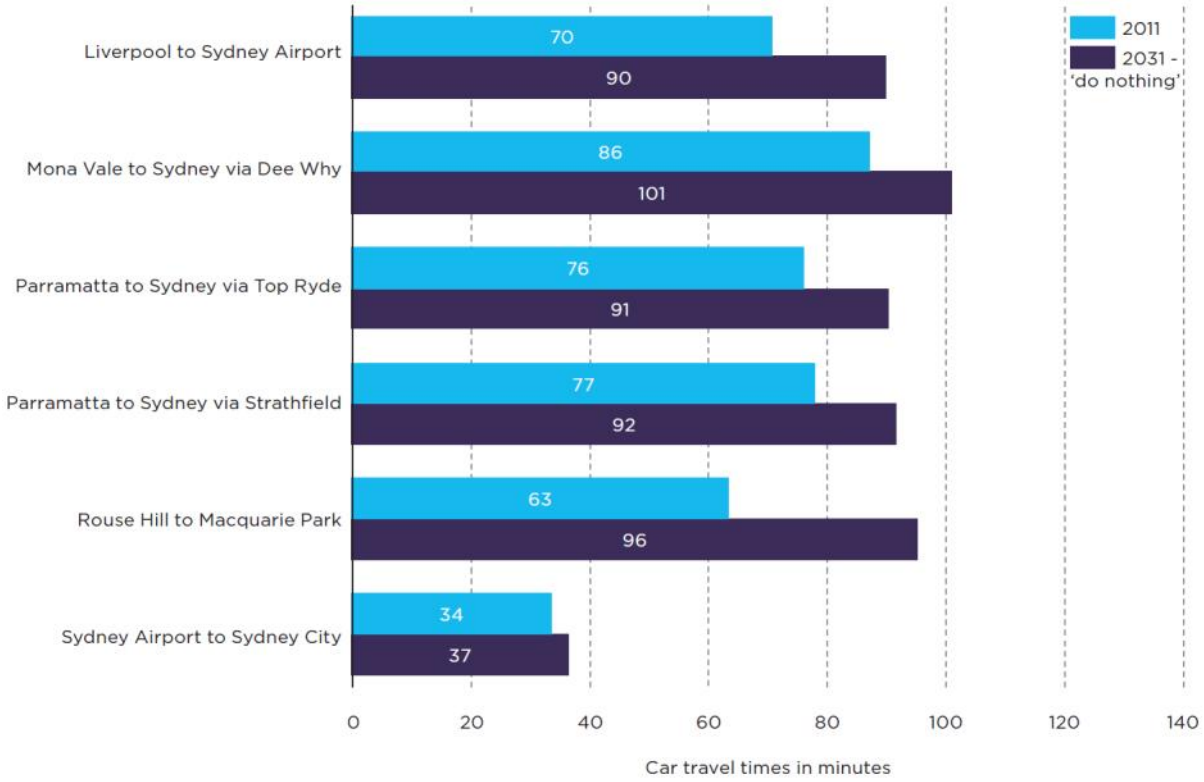

Figure 3-4: Peak travel times along strategic corridors for cars (in minutes), 2011 and 2031 'do nothing' scenario

Source: TfNSW, LTTMP, 2012a p.83

The primary cause of underperformance along the M5 Motorway and north-south corridors is that the M5 East is operating at capacity for large parts of the day and that lower-order roads (such as General Holmes Drive, Princes Highway, King Georges Road and the remainder of the A3 corridor, Canterbury Road and Stoney Creek Road) are performing a higher transport workload than they were originally intended for, particularly for heavy vehicles. The result is increased congestion, travel time variability and a higher risk of traffic collisions. However, the fully completed WestConnex would provide the means for freight to reach destinations more directly relieving congestion on some of the lower order roads.

The M5 Motorway corridor (Liverpool to Sydney CBD) serves seven key markets as defined by their trip purpose:

- Passenger and freight movements to and from Sydney Airport, involving dispersed levels of demand across metropolitan Sydney, and strong east-west travel for low volume, high-value freight such as fresh food imports and exports.
- Container freight from Port Botany, involving longer metropolitan freight trips to warehousing and logistics centres and employment lands along the M5 Motorway corridor.
- Heavy freight movements, involving moderately dispersed trips across metropolitan Sydney to areas of production, consumption, construction, transport and logistics.
- Light freight movements to highly dispersed locations, including employment lands, major centres, localised centres, specialised precincts such as Westmead health or Sydney Olympic Park.
- Commercial business and service vehicles, again to highly dispersed locations including major centres, localised centres, specialised centres and households.

- Long distance personal trips to non-centre locations, involving diffuse origins and destinations where locations are set away from public transport trunk routes.
- Interregional and interstate personal trips, including trips between Sydney's east and the Southern Highlands, Goulburn, Canberra, Blue Mountains, and trips from diffuse areas to high value recreational, cultural or other services and events.

Freight

The *NSW Freight and Ports Strategy* (TfNSW 2013a) states that the NSW freight task is expected to almost double over the next 20 years. The 'miscellaneous' metropolitan freight volume, the largest freight commodity by volume after coal, is expected to grow from 70 million tonnes per annum in 2011 to over 130 million tonnes per annum by 2031. In the Sydney Statistical Subdivision, heavy freight vehicle (HFV) trips include a range of freight tasks including supermarket deliveries, deliveries to car yards, construction sites, fuel deliveries and waste removal. One reason for this is that for every import container, additional light commercial and freight trips are generated as containers are emptied and their goods distributed to their place of consumption.

Growth has immediate implications for the capacity of the road network. Over the next 20 years, strong growth in HFV movements is forecast on the M4 Motorway, M5 Motorway and M7 Motorway as shown in **Figure 3-7**. Without additional motorway capacity, it is estimated that the M5 Motorway will not be able to accommodate the additional traffic by 2031.

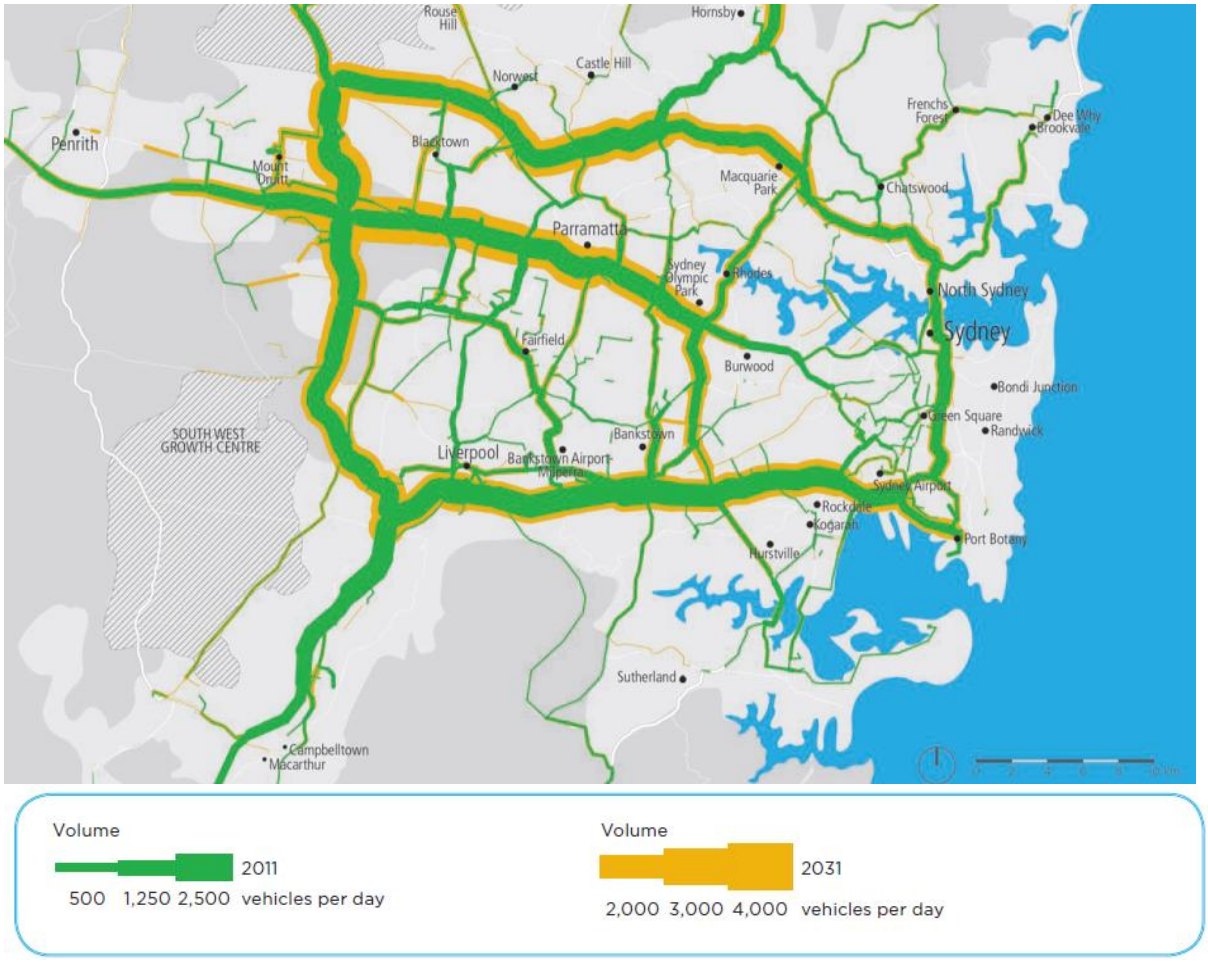

Figure 3-5: Heavy vehicle movements in Sydney, 2011 and 2031

Source: TfNSW, LTTMP, 2012a p.282

Sydney's heavy vehicle freight task is highly dependent on the motorway network. More than 37 per cent of all HFV kilometres travelled in the Sydney Metropolitan Area are on the motorway and highway network, even though the network represents less than 17 per cent of the arterial road network. A key reason for this is that while strategic centres have largely grown up around the rail network, the location of industrial activity post World War Two has largely been linked to the motorway and highway networks.

The M5 Motorway is a key component of the primary freight network within the Sydney road freight hierarchy (refer to **Figure 3-8**). It performs a strategic role of serving the freight routes between Port Botany / Sydney Airport, freight and intermodal terminals and industrial hubs.

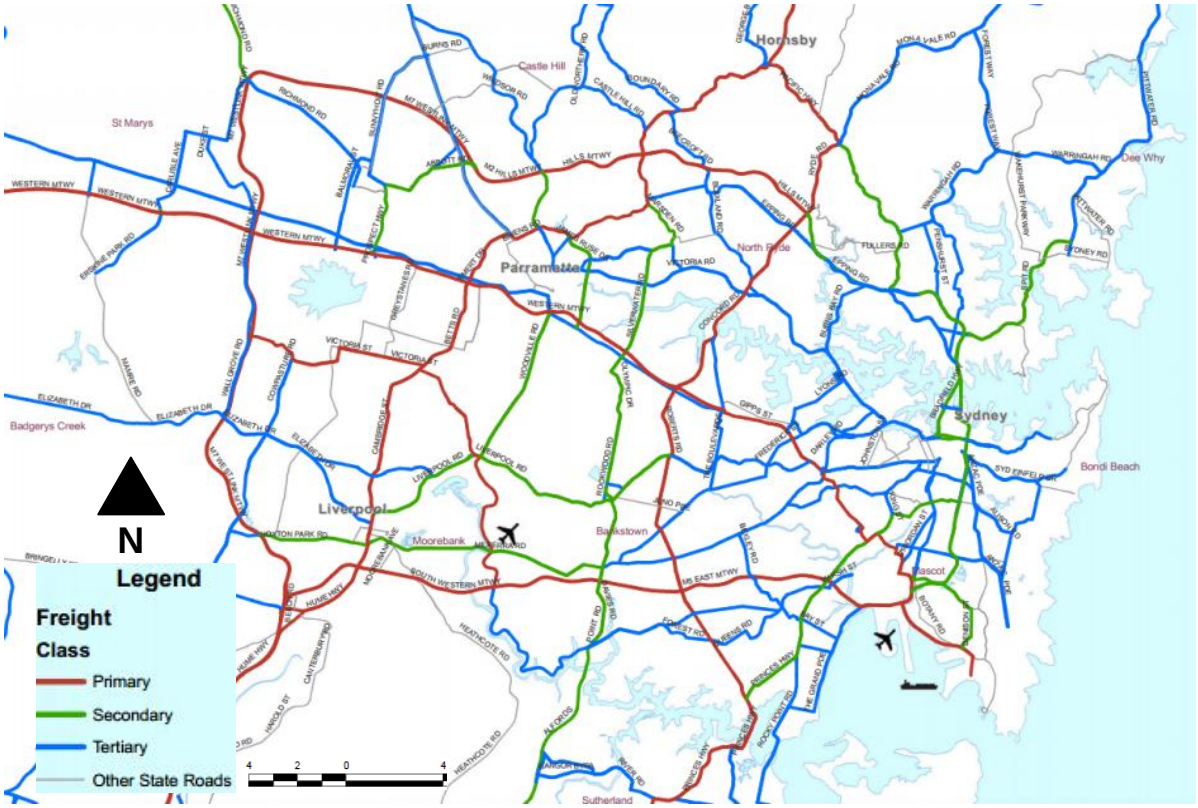

Figure 3-6: Sydney road freight hierarchy showing the M5 Motorway

Source: TfNSW, *Metropolitan Road Freight Hierarchy on the State Road Network Practice Note,* 2011

Commercial

Business and commercial trips are an important part of the transport task, with the majority of these trips being undertaken by private vehicles or taxis.

This market segment includes a wide range of trip purposes and vehicle types, with origins and destinations being network-wide. Light commercial vehicles (LCV) are a broad range of vehicles that are used for direct movements of goods for commercial purposes (light goods vehicles), and to support tools of trade (service vehicles).

Business and commercial trips are relatively more focused on centres of activity than heavy vehicle freight trips, and may include white-collar workers travelling on work business (not commuting) and other mobile workers such as district nurses, tradesmen, sales personnel and others whose workplaces are not static. Both business and commercial trips rely heavily

on the east-west distributor function that the M5 Motorway plays, and rely on lower order roads for north-south connections within and to the GEC.

Passenger

The M5 Motorway corridor will serve natural growth in Sydney's transport demand that results from a growing population and economy. The number of jobs in Sydney is expected to grow from 2.3 million in 2011 to 2.9 million in 2031 (BTS, 2012a) and any change in the spatial distribution of employment will have a large impact on Sydney's transport task. Much of the forecast employment growth by 2031 will occur in the GEC. However, outside the GEC, pockets of significant jobs growth are expected along the M5 Motorway corridor, around Milperra/Bankstown Airport, Moorebank, Ingleburn, Minto and Campbelltown.

3.4 Rail freight

3.4.1 Key markets served by rail

Background

A dedicated rail freight route exists to the north of the M5 Motorway corridor and is used by freight trains travelling between the Illawarra/Port Botany and the Main South Line. Some freight trains also travel via the T2 Airport Line (formerly East Hills Line), taking advantage of the track quadruplication.

Additional freight traffic may be expected in the future as a result of developments in the corridor such as the proposed major Intermodal Freight Terminal at Moorebank at the western end of the T2 Airport Line.

Existing freight network and volumes

Road freight accounted for 63 per cent of total freight tonnes carried in NSW in 2011. If the coal freight task is excluded, which is predominantly rail-borne, the road share of the freight task was 90 per cent in 2011 (TfNSW 2013a, p.23).

Current rail mode share of the whole NSW freight task is approximately 33 per cent by tonnage in 2011 (TfNSW 2012a). The key freight markets for rail are currently for bulk commodities such as coal, minerals and grains. To and from Port Botany, the current rail freight mode share is about 14 per cent.

Within Sydney there is a dedicated rail network for freight operations between Port Botany and the intermodal terminals at places such as Cooks River, Yennora, Chullora, Leightonfield and Minto. To access this network, however, freight trains must negotiate the congested suburban passenger network as shown in **Figure 3-9**. As a consequence, freight train operations are severely constrained, operating on lines shared with commuter train services at peak periods.

There is considerable investment underway to upgrade rail freight infrastructure on Sydney's northern and southern approaches (further details are given in **section 3.4.2**) but there will still be considerable constraints on rail freight operations where they interface with the passenger network on the Main Western Rail Line.

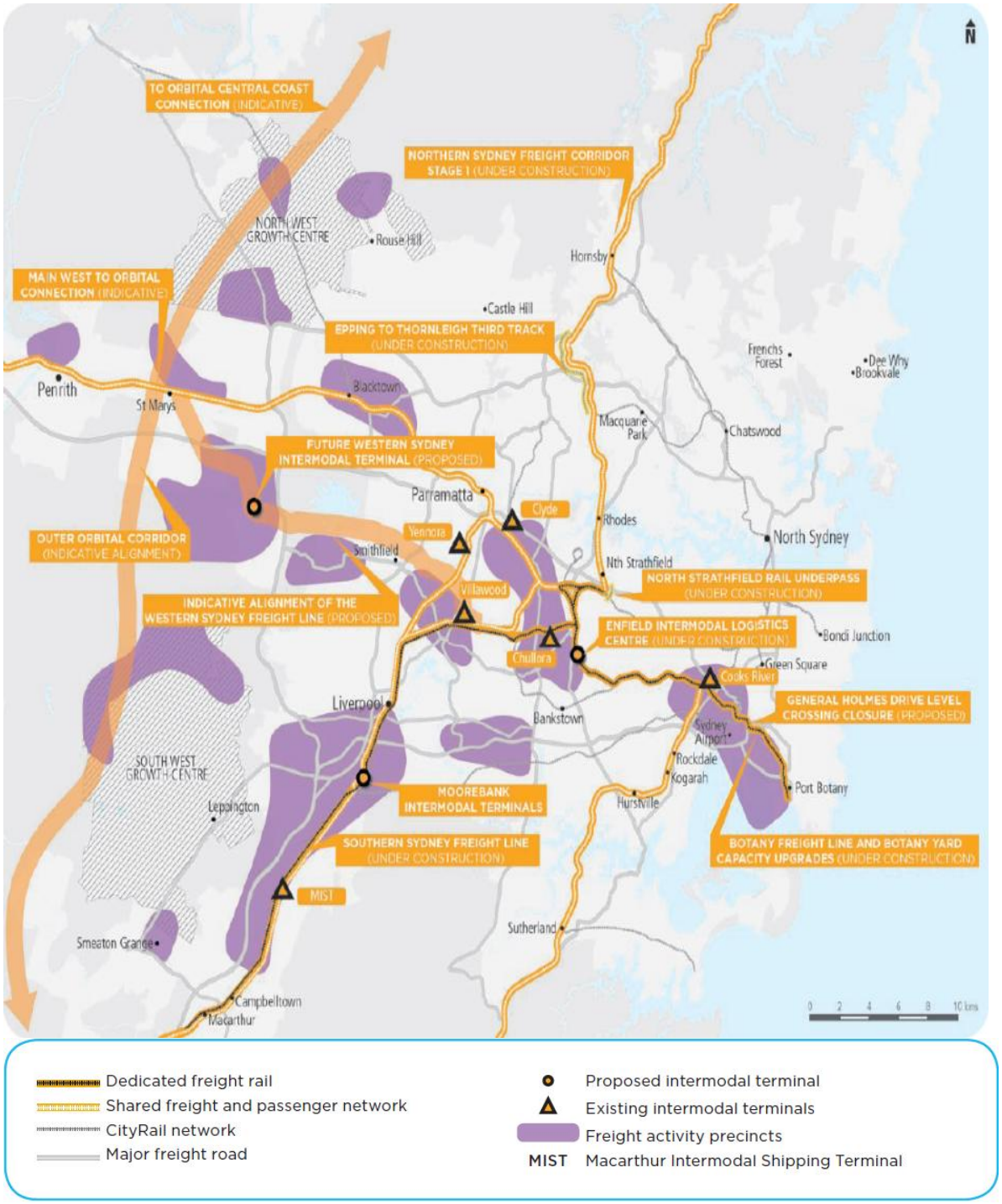

Figure 3-7: Metropolitan freight network including intermodal terminals

Source: TfNSW, *NSW Freight and Ports Strategy,* 2013a

3.4.2 Concurrent projects

The intermodal terminals at Chullora, Villawood and Enfield (refer to **Figure 3-9**Figure 3-7), and the planned terminal at Moorebank, allow for freight to be redistributed from rail to road for onward distribution within metropolitan Sydney using the urban road network.

3.5 Public transport

3.5.1 Travel mode share

Travel by car is the predominant travel mode for the M5 Motorway / East Hills railway corridor residents. **Figure 3-8** shows the Journey to Work (JTW) modal shares for the East Hills rail catchment area (Holsworthy - Turella) and, for comparison, the JTW modal shares for the Sydney metropolitan area (excluding the Blue Mountains, Central Coast and Southern Highlands).

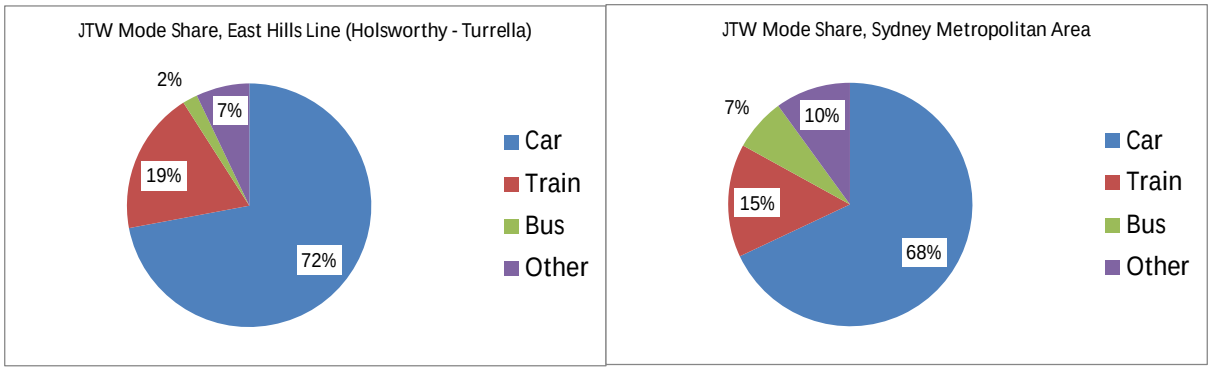

Figure 3-8a: Journey to work mode shares

Source: BTS, *Compendium of Sydney Rail Statistics,* 2012b
Note (1): Data from the 2011 census was not available at the time of publication of the Compendium; therefore data from the 2006 census was used.
Note (2): "Other" includes walk, cycle and other non-motorised modes

The 2011 census shows that 68 per cent of all JTW trips by residents of the M5 East Motorway corridor between King Georges Road and Arncliffe are made by private vehicle as a driver or as a passenger. Public transport accounts for 26 per cent of work trips, with 23 per cent of all JTW trips made by train, predominantly for commuting to Sydney CBD (57 per cent of all trips to work in the CBD are by train). This data was sourced from the BTS website by selecting the origin zones in the M5 East Motorway corridor (See map of selected zones below).

For JTW travel into this corridor, the 2011 census data shows that 83 per cent of all trips are made by car as driver or passenger and 7 per cent are made by rail. This compares with 50 per cent of all trips to Sydney CBD and the Sydney metropolitan JTW rail mode share average of 15 per cent (BTS 2012b).

3.5.2 Bus services

There is an extensive network of bus services in the local area, providing connections to centres, retail and employment areas, residential areas and railway stations. Some of these services may be impacted by the construction of the interchange upgrade.

No regular bus services use the M5 East Freeway or M5 South Western Motorway. However, intercity coach services, such as those operated by Murrays or Greyhound, do use the M5 East Freeway or M5 South Western Motorway.

There are eight daytime bus routes which use King Georges Road between Canterbury Road and Stoney Creek Road. These services are delivered as part of three TfNSW Sydney Metropolitan Bus Service Contract (SMBSC) regions:

- Region 5 – Hurstville/Punchbowl/Strathfield and limited peak hour services into Sydney Olympic Park, operated by Punchbowl Bus Company.
- Region 6 – Inner-western and south-western suburbs, operated by State Transit Authority.
- Region 10 – South-western suburbs and Sutherland Shire, operated by Transdev.

Table 3-1 lists the eight daytime bus routes along with the number of services per weekday.

Table 3-1: List of daytime bus services on King Georges Road

Route number	Route description	Operator	Buses per weekday (bi-directional)
446	Roselands to Kogarah via Earlwood and Bexley North	Punchbowl Bus Company (Region 5)	43
450	Burwood to Hurstville via Strathfield, Lakemba and Roselands	Punchbowl Bus Company (Region 5)	82
452	Beverly Hills to Rockdale via Kingsway West Shops, Hurstville and Bexley	Transdev (Region 10)	96
487	Bankstown to Canterbury via Punchbowl, Roselands, Lakemba and Campsie	State Transit Authority (Region 6)	53
493	Roselands to Rockdale via Roselands, Kingsgrove and Bexley North	State Transit Authority (Region 6)	14
942	Lugarno to Campsie via Riverwood, Roselands, Wiley Park, Lakemba and Belmore	Punchbowl Bus Company (Region 5)	57
946	Bansktown to Hurstville via Greenacre, Lakemba, South Belmore, Roselands and Beverly Hills	Punchbowl Bus Company (Region 5)	43
S14	Lakemba to Mt Lewis via Roselands and Punchbowl	Punchbowl Bus Company (Region 5)	4

Figure 3-10 shows the map of the eight daytime bus routes along with their stops on King Georges Road and Penshurst Road.

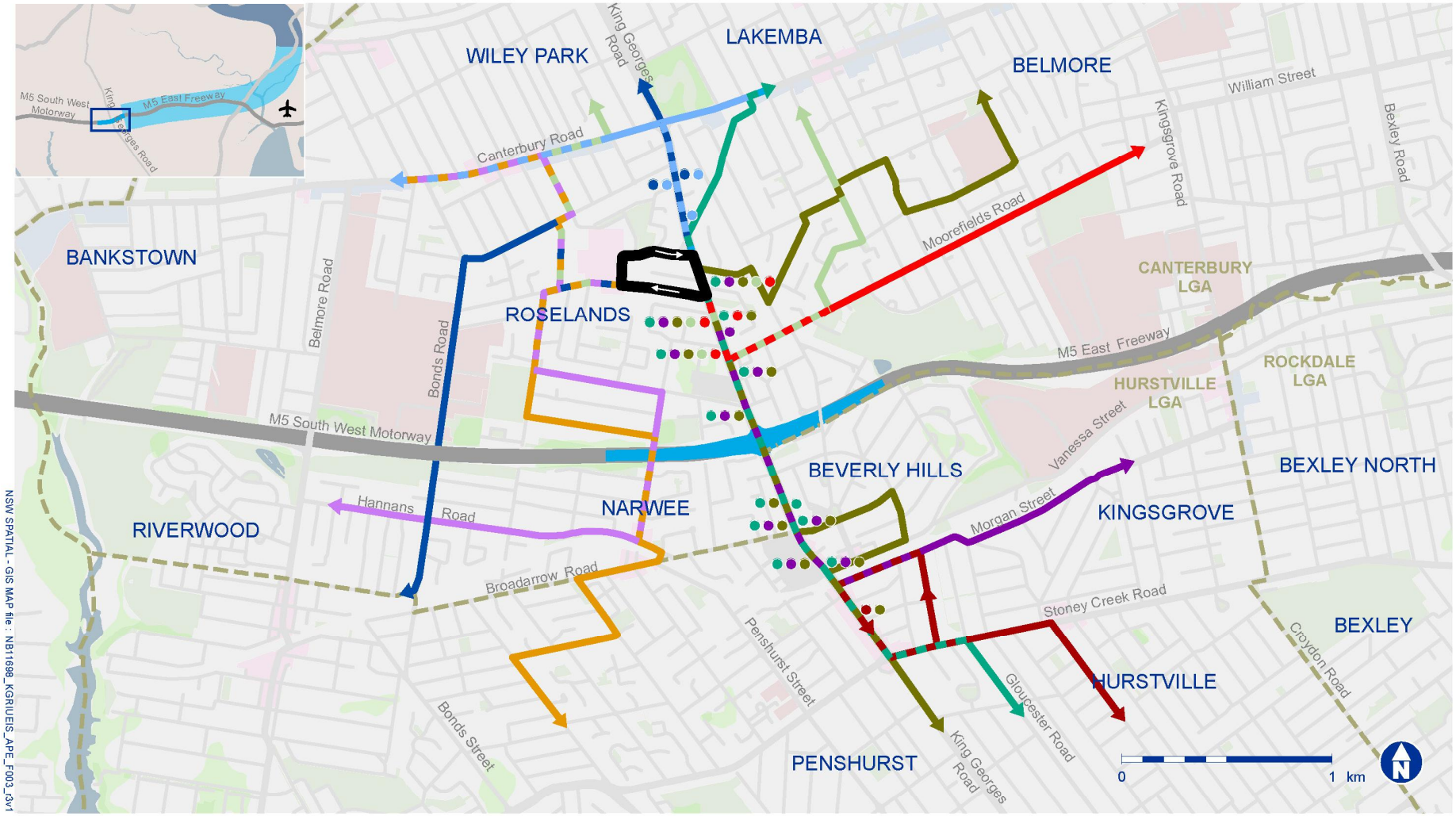

Figure 3-10 Key north/south bus routes

Information on noise walls, retaining walls, drainage features and temporary construction facilities is subject to detailed design

The project
LGA boundary
446
450
452
487
493
941
942
944
946
S14
Key bus stops

In addition, Punchbowl Bus Company uses King Georges Road to provide school bus services for Beverly Hills Girls High School, Regina Coeli School and Beverly Hills North Public School. NightRide bus N20 also uses King Georges Road between Morgan Street and Broad Arrow Road.

3.5.3 Existing bus facilities

Facilities for bus passengers along King Georges Road are fairly basic, consisting of an unsheltered stop in most cases. There are minimal bus priority facilities on King Georges Road.

3.5.4 Rail network

The T2 Airport Line (formerly East Hills Line) is located 750 metres to the south of the King Georges Road / M5 East Freeway / M5 South Western Motorway interchange. The line is generally parallel to the M5 East Freeway and M5 South Western Motorway, and is four tracks wide between Wolli Creek and Revesby. This allows the operation of additional fast trains between Campbelltown and the City able to overtake the slower all stops services between East Hills or Revesby and the City. During off peak periods, freight trains can also be scheduled along the line without conflicting with the scheduled frequent passenger train movements.

Sydney Trains runs regular commuter services on the line. Trains generally run as all-stop services from Macarthur to Revesby, then express to Wolli Creek and the airport stations, or as all-stop services from Revesby to the city. Some peak hour services travel via Sydenham and Redfern rather than the airport stations. In total, there are 300 services per weekday (bi-directional).

Stations on the T2 Airport Line near the King Georges Road / M5 East Freeway / M5 South Western Motorway interchange include Beverly Hills and Narwee. In particular, Beverly Hills Station is located directly underneath King Georges Road approximately 1km to the south of the M5 Motorway interchange. 148 services per weekday (bi-directional) stop at Beverly Hills and Narwee. Limited interchange facilities are provided at Beverly Hills Station.

Southern Highlands Line trains operated by Sydney Trains occasionally use the T2 Airport Line, but do not stop between Central and Glenfield.

The next closest train line is the T3 Bankstown Line, located 2.4 kilometres to the north of the King Georges Road / M5 East Freeway / M5 South Western Motorway interchange.

The rail network in the M5 Motorway corridor is shown in **Figure 3-11** overleaf.

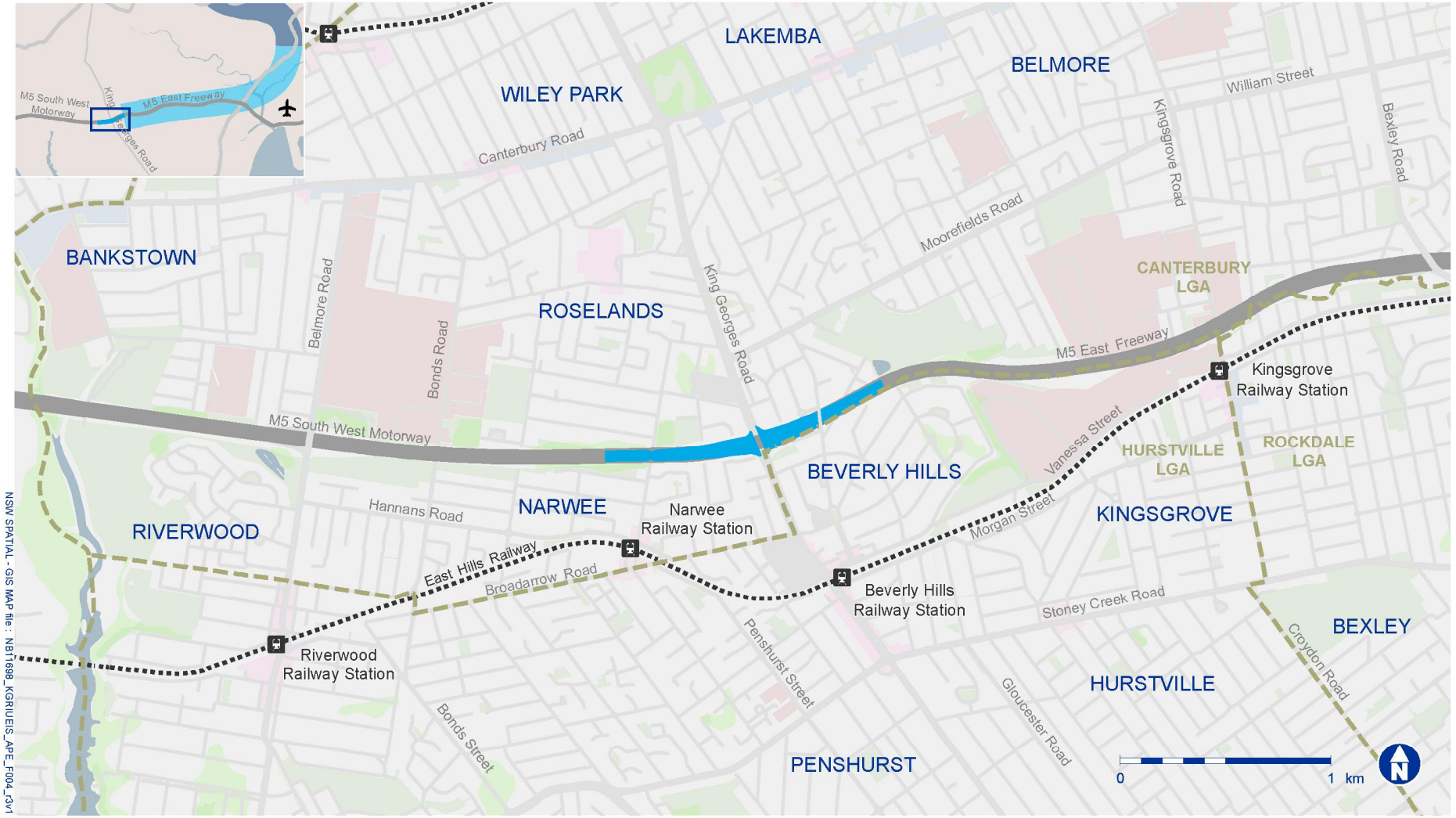

Figure 3-11 Rail network in the Motorway corridor

Information on noise walls, retaining walls, drainage features and temporary construction facilities is subject to detailed design

The project | LGA boundary | Railway station | Railway

3.6 Cyclists and pedestrians

3.6.1 Cycling network

The M5 Motorway corridor currently provides for cyclists through a mix of shared paths and motorway shoulders. West of King Georges Road a shared path is only found south of the motorway, with wide motorway shoulders designated as cycleway eastbound and westbound. East of King Georges Road the road shoulders are designated as cycleway and shared paths are provided north and south of the M5 corridor through to the Bexley Road ramps. The shared path is typically 3m wide east of KGR, meanders through parks, and travels adjacent to Wolli Creek.

Cycle lanes are provided on the King Georges Road overbridge in the north and southbound road shoulders and taper through the interchange. Provision currently exists for road cyclists at the right turning bay stop lines for eastbound and westbound movements via the on ramps.

WestConnex Delivery Authority (WDA) commissioned TTM Consulting Pty Ltd, to undertake cycling count surveys within the study area between 12th May and 18th May 2014. A detail analysis has been undertaken to assess the existing cycling conditions for the proposed 16 locations. The details are discussed below.

The bicycle network in the study area (the M5 Motorway between Moorefields Road and Pallamana Parade) contains a mixture of off-road and on-road facilities. The cycling data based on the traffic survey has been extracted and summarized below in **Table 3-2** and shown on **Figure 3-12.**

Table 3-2: Cyclist survey data

Site		Direction	Average weekday	Average weekend
1	Eastbound main carriageway along M5	EB	5	3
2	Westbound main carriageway along M5	WB	9	6
3	Eastbound Off-ramp to M5	EB	3	7
4	Westbound On-ramp to M5	WB	3	1
5	Eastbound On-ramp to M5	EB	7	12
6	Westbound Off-ramp to M5	WB	6	0
7	South-west of Rosebank Ave	EB	21	31
		WB	29	25
8	North of The Crescent	EB	19	17
		WB	18	24
9	Tallawalla St entry/exit prior to split	EB	30	22
		WB	22	26
10	North-east of Kirrang St	EB	7	10
		WB	12	25
11	South-west of Elouera St	EB	10	22
		WB	18	30
12	South of Shorter Ave	EB	2	1

Site		Direction	Average weekday	Average weekend
	(eastern side of Rd)	WB	1	2
13	South-West of Allambee Cres (north of M5)	EB	5	7
		WB	3	4
14	West of Allambee Cres (south of M5)	EB	12	12
		WB	11	13
15	West of Rosetta Ln	EB	5	11
		WB	4	10
16	West of Penshurst Rd (nth of Windarra St, sth of M5)	EB	5	14
		WB	6	14

Results of the cycling survey show that the off-road bicycle path receives significantly more cycle traffic than the M5 motorway. No survey site on the motorway registered more than 10 cyclists throughout an average weekday indicating very low cycling use. The off-road facilities to the east of King Georges Road receive substantially more use with average weekday figures between 20 and 50 cyclists. These cyclists are not expected to be affected by the proposed works.

There is a noticeable increase in average daily traffic on weekends compared to weekdays. The majority of sites experience more cycling traffic on Saturdays and Sundays. The off-road cycling paths are particularly busier on the weekends with volumes approximately doubling at survey sites 11, 15 and 16. Survey sites 7, 8 and 9 at the far eastern end of the study area experience consistent flows across both weekdays and weekends. Sites on the motorway remained very low over the weekend survey period.

The bicycle network along the M5 Motorway and King Georges Road corridor is shown in **Figure 3-12**.

Figure 3-12 Existing cyclist survey area

Information on noise walls, retaining walls, drainage features and temporary construction facilities is subject to detailed design

The project
Existing cycle routes
Bi-directional survey
One-directional survey
Survey site ID
Weekday (Weekend)

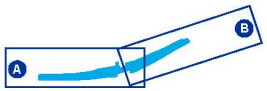

Figure 3-13 M5 Motorway corridor bicycle routes, Belmore Road to Bexley Road

Information on noise walls, retaining walls, drainage features and temporary construction facilities is subject to detailed design

The project
Cycle and pedestrian paths
Freeway/motorway
On-road - high difficulty
On-road - moderate difficulty
On-road - low difficulty
No cycling allowed

Adapted from NSW Government, Bicycle information for NSW Cycleway Finder v2.0, 2014

3.6.2 Pedestrian network

In addition to the shared paths described in **Section 3.6.1**, footpaths are provided along both sides of King Georges Road. All ramps at the King Georges Road / M5 East Freeway / M5 South Western Motorway interchange have signalised pedestrian crossings.

The majority of signalised intersections on the arterial road network provide pedestrian crossing facilities. Whilst pedestrians are generally well catered for at most intersections, there are there no signalised pedestrian crossings at the intersections Tooronga Terrace, Morgan Street and Edgbaston Road. There is a pedestrian underpass beneath King Georges Road at Beverley Hills Rail Station and a mid-block signalised pedestrian crossing of King Georges Road south of Edgbaston Road.

3.7 Concurrent transport projects and proposals

3.7.1 M5 West Widening

The M5 West Widening will expand the M5 South West Motorway from two to three lanes in each direction from King Georges Road in Beverly Hills to Camden Valley Way in Prestons. Construction commenced in August 2012 and is expected to be completed before M4 Widening road works commence. The project aims to:

- Reduce congestion on the M5 South West Motorway and improve reliability and travel times
- Provide relief to existing congestion on parallel routes.
- Support forecast growth in Sydney's south-west and key destinations such as inner Sydney, Port Botany and Sydney Airport.
- Improve communications between road users and motorway traffic controllers with a new control centre in Hammondville.
- Improve safety and provide early warning alerts for drivers on the motorway and arterial networks by providing additional variable message signs.
- Improve incident response times with the installation of a new CCTV system.

3.7.2 NorthConnex

Roads and Maritime, Transurban and Westlink M7 shareholders are proposing to construct and operate a tolled motorway, NorthConnex, linking the M1 Pacific Motorway (previously the F3 Freeway) at Wahroonga to the Hills M2 Motorway at West Pennant Hills. The preferred route is shown in **Figure 3-15**.

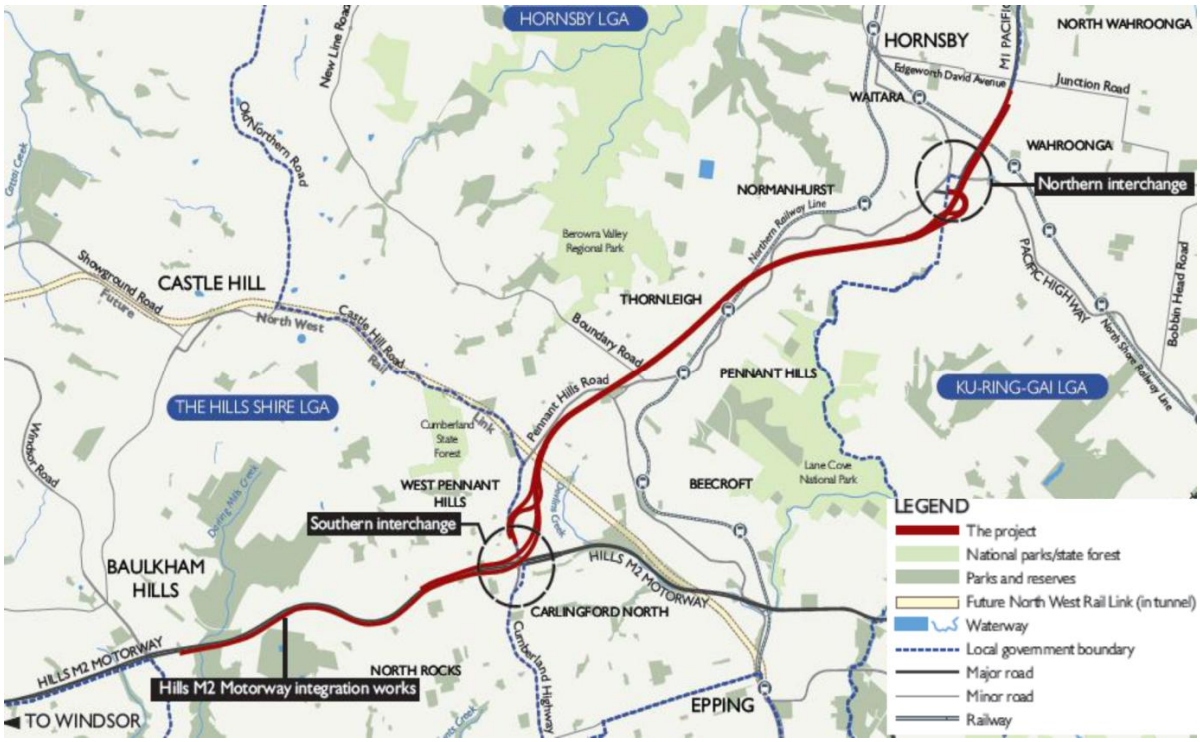

Figure 3-9: NorthConnex preferred route

Source: Transurban, *Community Presentation,* March 2014

The new link will feature:

- Twin motorway tunnels with two lanes in each direction and provision for future widening to three lanes.
- The twin motorway tunnels would be about eight kilometres in length and have a minimum posted speed limit of 80 kilometres per hour.
- Northern interchanges connecting with the M1 Pacific Motorway, the Pacific Highway and Pennant Hills Road.
- Southern interchange connecting with the Hills M2 Motorway and Pennant Hills Road.

The project aims to:

- Reduce traffic congestion, particularly along Pennant Hills Road, providing reduced travel times for road users.
- Reduce the number of heavy vehicles along Pennant Hills Road, and as a result improve safety, local air quality and noise amenity along the corridor.
- Provide opportunities for improved public transport in the area around Pennant Hills Road.
- Improve the efficient movement of state and national freight.
- Provide a high standard access-controlled motorway that integrates with the regional transport network.

3.7.3 South West Rail Link

The South West Rail Link is a NSW Government initiative to respond to issues of reliability and passenger growth on the metropolitan rail network and population growth in south-west Sydney.

The South West Rail Link, refer to **Figure 3-16**, includes a major upgrade of Glenfield Station and bus/rail interchange and a new twin track passenger rail line from Glenfield to Leppington via Edmondson Park. Construction of the South West Rail Link commenced at Glenfield in August 2009.

The South West Rail Link includes:

- a new 11.4-kilometre rail line from Glenfield to Leppington
- two new stations located at Edmondson Park and Leppington, including commuter car parking
- a train stabling facility at Rossmore
- an upgrade of the existing Glenfield Station and bus/rail interchange, including new commuter car parking construction of Glenfield North and Glenfield South rail flyovers

The South West Rail Link will:

- provide essential infrastructure for the predicted future increases in population in Sydney's south-west, including the South West Growth Centre
- improve access to public transport for the people of south-west Sydney, providing a link to major employment centres including Liverpool, Parramatta and the Sydney CBD
- allow increased and more reliable train services
- provide increased commuter car parking spaces
- provide modern, safe and accessible stations and interchange facilities for rail commuters.

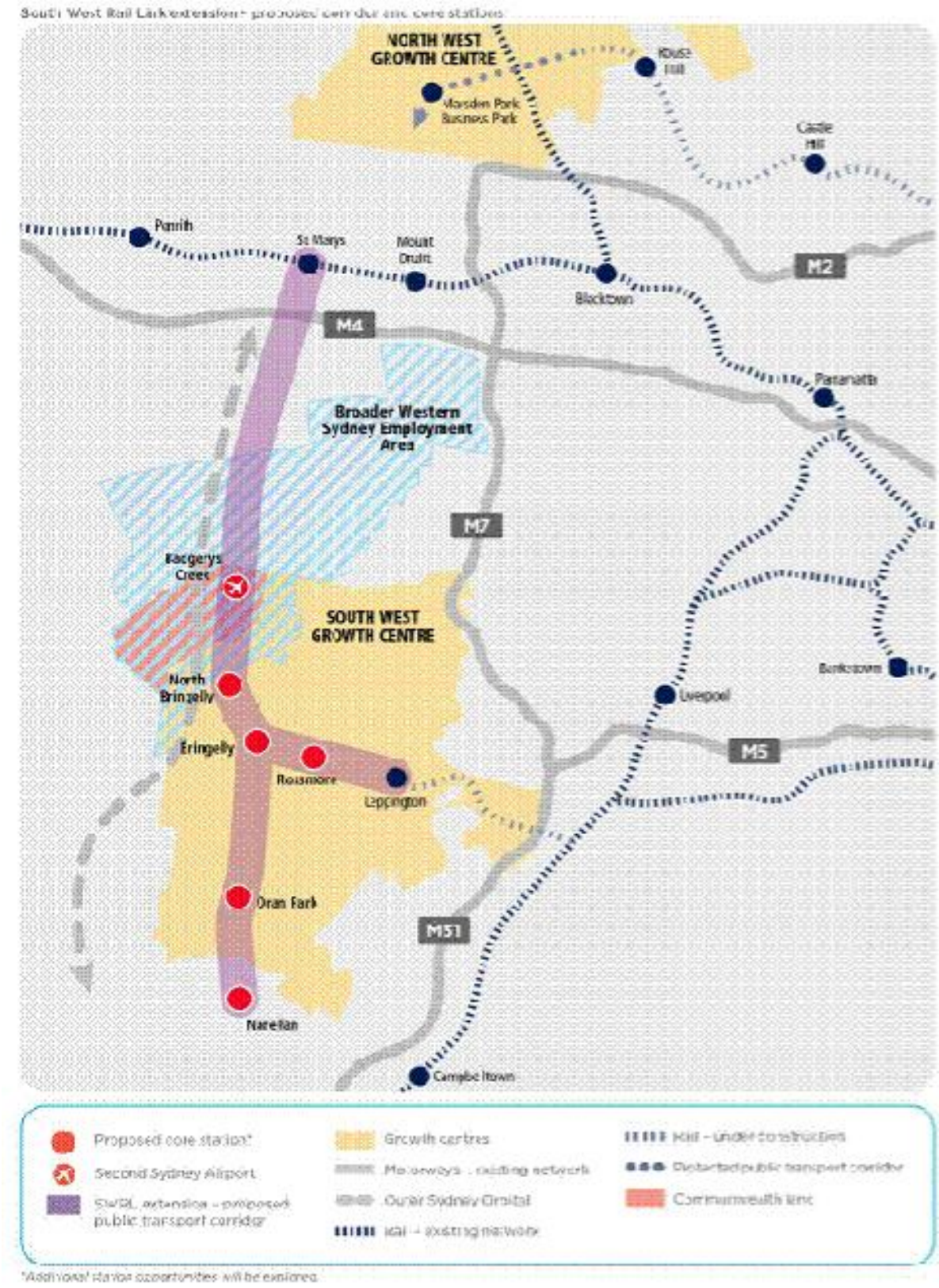

Figure 3-10: South West Rail and planned extension

Source: TfNSW, *South West Rail Link Project Overview,* 2012d

The NSW Government is future proofing public transport options in Western Sydney by protecting an additional public transport corridor in Sydney's West – helping people to access jobs and services.

The proposed public transport corridor will connect with the South West Rail Link and into the existing rail network (refer to **Figure 3-10**).

The long-term extension of the South West Rail Link will support jobs and population growth in Western Sydney, including the new airport at Badgerys Creek.

The NSW Long Term Transport Master Plan identifies 19 major transport corridors across Sydney that need to be protected to meet future transport requirements. This includes a north-south corridor through the South West Growth Centre and the Broader Western Sydney Employment Area, including the site for the second Sydney airport at Badgerys Creek announced by the Australian Government.

The extension corridor is proposed to connect Leppington Station to Bringelly and then head in two directions: north to the Western Line near St Marys; and south to Narellan.

A number of core stations are proposed in the existing and planned centres of Rossmore, Bringelly, North Bringelly, Oran Park and Narellan. A station is also proposed at Badgerys Creek to service the second Sydney airport. The corridor allows for additional stations if required.

3.7.4 North West Rail Link

The North West Rail Link is a 23 kilometre rail link between Epping and Rouse Hill. Construction is proposed to commence in 2014 and the line is expected to be operational in 2019. Its features include:

- A direct underground link to the existing Epping to Chatswood rail tunnels.
- Eight new stations at Cherrybrook, Castle Hill, Hills Centre, Norwest, Bella Vista, Kellyville, Rouse Hill and Cudgegong Road.
- A train stabling facility at Tallawong Road, Rouse Hill.
- 4,000 commuter car parking spaces at Cherrybrook, Hills Centre, Bella Vista, Kellyville and Cudgegong Road stations.
- Twin tunnels 15 kilometres in length between Epping and Bella Vista.
- A viaduct four kilometres in length between Bella Vista and Rouse Hill.
- Bus, taxi, kiss and ride, pedestrian and cycling facilities at all stations.

The alignment is shown in **Figure 3-17**.

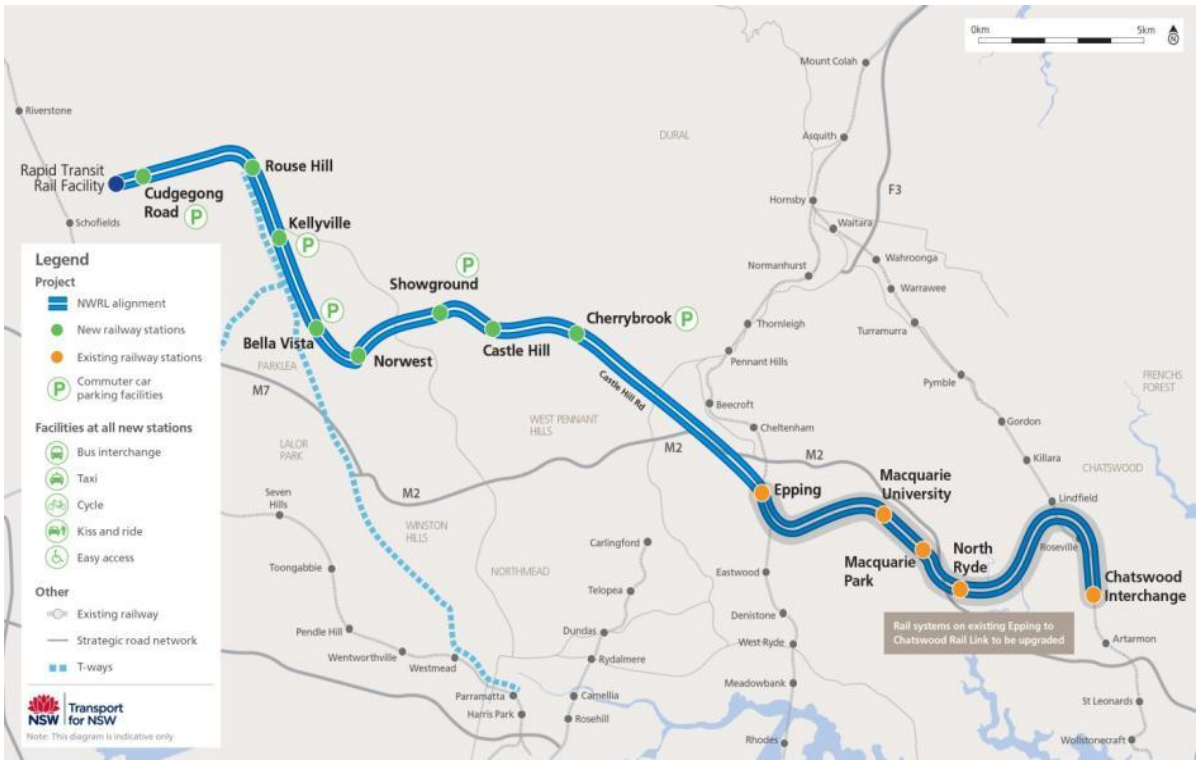

Figure 3-11: North West Rail Link alignment

Source: TfNSW, *North West Rail Link Project Overview,* 2012c

The new rail link will provide:

- Approximately 300,000 people living in Sydney's north-west with rail access to Epping, Macquarie Park, Chatswood, St Leonards, North Sydney and Sydney CBD.
- Increased service capacity to Sydney CBD.
- New rail services to existing suburbs in the Hills District as well as new areas that are planned for residential and commercial development.
- Frequent, regular rail services and improved travel time reliability compared with bus and private car.
- Travel time savings from many areas of the north-west region to Sydney CBD and Macquarie Park, and within the region, including to the Rouse Hill Town Centre.
- An increase in train services to Macquarie University and Macquarie Park.
- Reduced bus congestion in Sydney CBD in the longer term.

The North West Rail Link, when operational, will reduce the level of overcrowding on the Main Western Rail Line. In the longer term, the construction of a second Sydney Harbour rail crossing and a new CBD rail line, and improved operational use of the Main Western Rail Line tracks will increase service capacity to the CBD by 35 per cent. Improvements on the line will allow more express trains per hour from Blacktown and Penrith to the CBD, with all-day frequent and reliable Cumberland Line services, providing better connections from Parramatta to Liverpool and the south-west.

3.7.5 Bus network changes

The NSW Government's *Sydney's Bus Future* (TfNSW 2013b) is a long-term plan to redesign the bus network to cater for future growth. A three-tiered network is proposed with each level delivering a defined level of service consistency and reliability:

- 'Rapid' service routes would form the foundation of the new bus network, offering fast and reliable bus travel between major centres. Rapid routes would provide customers with mass transit level services between centres which are not linked by trains or light rail. Features would include frequent 'turn up and go' services without the need for consulting a timetable, stops every 800 metres to one kilometre, and investment in bus priority infrastructure.
- 'Suburban' service routes and 'Local' service routes would supplement the Rapid service routes to improve access to local, neighbourhood destinations. Features of Suburban service routes would include a mix of frequent 'turn up and go' and timetabled services, stops every 400 metres and bus priority targeted at key pinch points. Features of Local service routes would include timetabled services; local shopping services, CBD shuttles and peak expresses; stops every 400 metres; peak express services with variable stop spacing; the use of local streets and roads; and bus priority for peak express connections.

The current route 525 service between Parramatta and Burwood via the University of Western Sydney, Rydalmere, Ermington, Silverwater, Newington, Sydney Olympic Park and Strathfield would be converted to a Suburban service route.