Executive summary

Overview

The NSW Government has committed to building a significant piece of transport infrastructure by constructing Sydney Metro, a new standalone rail network identified in *Sydney's Rail Future*, providing 66 kilometres of metro rail line and 31 metro stations.

The NSW Government is currently delivering two stages of Sydney Metro – Sydney Metro Northwest (between Rouse Hill and Chatswood), and Sydney Metro City & Southwest (between Chatswood and Bankstown). The Sydney Metro Northwest project is currently under construction and will be operational in 2019.

Sydney Metro City & Southwest will extend Sydney Metro beyond Chatswood to Bankstown. Sydney Metro City & Southwest comprises two core components – the Chatswood to Sydenham project, and the Sydenham to Bankstown upgrade. Planning approval for the Chatswood to Sydenham project was granted in January 2017, with construction activities commencing in 2017.

Figure ES.1 shows the components of the Sydney Metro network.

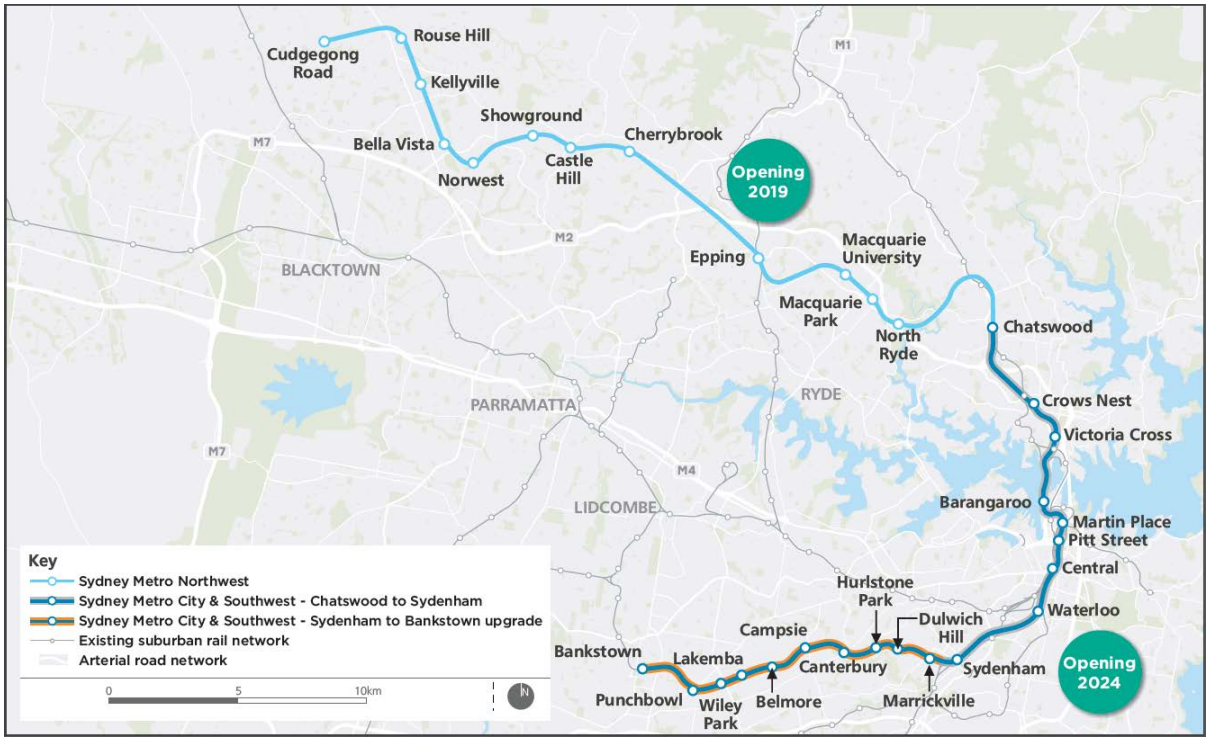

Figure ES.1 Sydney Metro

It is noted that the approved Chatswood to Sydenham project did not involve provision of additional stabling facilities, changes to the Sydney Trains tracks in the vicinity of Sydenham, or works to Sydenham Station prior to the Sydenham to Bankstown component of Sydney Metro City & Southwest being delivered. These works are currently the subject of an application to modify the Chatswood to Sydenham planning approval, to provide the opportunity for Sydney Metro City & Southwest to open in two phases. The first phase would involve services between Chatswood and Sydenham stations, while the second phase could extend Sydney Metro services to Bankstown.

Sydney Metro City & Southwest is planned to be completed by the end of 2024. This Environmental Impact Statement considers the potential impacts of the Sydenham to Bankstown

upgrade ('the project'). It has been prepared to support Transport for NSW's application for approval of the project in accordance with the requirements of Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Sydney Metro City & Southwest was declared to be critical State significant infrastructure in December 2015 due to its importance to the State, and is subject to approval by the NSW Minister for Planning. The Environmental Impact Statement addresses the environmental assessment requirements of the Secretary of the Department of Planning and Environment, dated 23 March 2017.

Sydney Metro

Sydney Metro is part of the NSW Government's infrastructure investment program to respond to the growth in transport demand in Sydney. Sydney Metro, together with other signalling and infrastructure upgrades across the Sydney rail network, will greatly increase the capacity of train services entering the Sydney CBD, from about 120 services an hour today, up to 200 services beyond 2024. This is an increase of up to 60 per cent capacity across the network to meet demand.

Sydney's existing suburban rail system can reliably carry 24,000 people an hour per line. Similar to other metro systems worldwide, Sydney Metro will have a long-term target capacity of about 40,000 customers per hour in each direction.

Sydney Metro will transform Sydney, cutting travel times, reducing congestion, and delivering economic and social benefits for generations to come. Sydney Metro will boost economic activity by more than $5 billion a year, supporting major jobs and business growth along its route, by:

- improving access to jobs
- changing the way people move about the city and reducing congestion
- allowing people to travel quickly and easily from one key centre to another
- enabling housing and employment growth along Sydney's Global Economic Corridor and west to Bankstown
- encouraging greater commercial development and jobs in key areas
- delivering huge flow-on benefits across productivity, wages, and the state's overall economic performance.

Need for the project

Key challenges

Sydney is experiencing sustained population and economic growth. The need for Sydney Metro is driven by the challenges being experienced in responding to this growth, including the existing and future capacity of Sydney's transport infrastructure.

Over the next 15 years, Sydney will require transport infrastructure to support 40 per cent more train trips, 30 per cent more car trips, and 31 per cent more households.

The rail network is heavily congested, with customers on most rail lines regularly experiencing significant crowding on trains and station platforms during the morning and evening peaks.

As population and employment continue to grow, rail is forecast to experience the highest growth in travel demand, with an additional 100,000 trips expected during the morning peak by 2036.

It is forecast that without further investment, Sydney's rail network will reach capacity in the Sydney CBD and on critical suburban rail lines by the mid to late 2020s (Transport for NSW, 2012a).

The T3 Bankstown Line creates a significant bottleneck for the existing rail network. The line effectively slows down the network because of the way it merges with other railway lines close to the Sydney CBD, including the T2 Airport, Inner West & South Line.

In addition, parts of the T3 Bankstown Line are over 120 years old, with existing infrastructure in varying conditions. A key challenge for this line is customer accessibility, with five of the stations not having lifts. A number of the stations between Marrickville and Bankstown also have very large gaps between the platforms and trains, which makes access difficult for some customers, particularly the disabled, elderly, and those travelling with young children and prams.

Project need

The NSW Government's strategy for accommodating Sydney's future population growth over the next 20 years aims to ensure that a competitive economy is fostered with world-class services and transport. The Sydney Metro system would improve infrastructure and remove existing bottlenecks, providing faster and more reliable connections to jobs, education facilities, health services, and sports and recreation facilities.

As part of Sydney Metro, the project is a key component of *Sydney's Rail Future*, a plan to transform and modernise Sydney's rail network so that it can grow with the city's population and meet the needs of customers in the future.

The project is needed to further progress implementation of *Sydney's Rail Future* and Sydney Metro City & Southwest, enabling the provision of necessary public transport infrastructure to respond to the identified challenges and future demands. With at least 15 trains an hour or a train at least every four minutes in the peak when services start in 2024, the upgrade of the T3 Bankstown Line would deliver benefits across Sydney's rail network. These benefits would further increase when the number of trains increases to 20 per hour as part of the ultimate operations.

By converting the T3 Bankstown Line to metro and delivering greater efficiency and reliability along the line, the project would play a role in encouraging transit oriented urban development around stations between Sydenham and Bankstown. It would facilitate realisation of urban renewal priorities and objectives under the *Sydenham to Bankstown Urban Renewal Corridor Strategy* (Department of Planning and Environment, 2017).

A key element of the project is upgrading all stations along the corridor between Marrickville and Bankstown, to allow better and safer access for more people, by providing new concourses, level platforms, platform screen doors and lifts at all stations. Improvements would also be undertaken within the immediate area surrounding the stations to provide accessible interchange with other forms of transport.

Options considered

Option development has been an integral part of the overall design process for the project. The option selection process has formed part of each design stage, and has taken into account issues raised during consultation with key stakeholders, including government agencies and the community. Options were assessed against a range of criteria, including customer focus, constructability, operation, environmental impacts, accessibility, heritage and place-making considerations, risk and cost effectiveness.

Options were considered for station designs, constructability, track alignment, temporary transport arrangements, and construction programming. The station design process involved consideration of a range of options, in consultation with heritage stakeholders, to minimise the potential impacts

on heritage values. This included refinements to the design to allow the retention of heritage elements where practicable.

The design process also involved recognising the important place-making role of the stations, and consideration of a range of options for the design of key elements at each station, to respond to local place, the surrounding urban context, the functioning of local town centres and input from the community.

Transport for NSW will continue to develop the project to a greater level of detail in conjunction with the appointed design contractor. Transport for NSW will challenge the contractor to develop innovative solutions to detailed design and construction to achieve improved outcomes.

The detailed design and construction methodology proposed to deliver the project would be assessed for consistency with this Environmental Impact Statement and the terms of any approval granted by the Minister for Planning. If the detailed design or construction impacts are not considered to be consistent with any approval granted for the project, an application to modify the project would be lodged.

Place making and urban design

The design of the project has been informed by a detailed analysis of existing and future urban design, community, heritage, engineering, planning, constructability, financial, and environmental considerations. The design has been, and would continue to be, guided by the Sydney Metro City & Southwest Sydenham to Bankstown Design Guidelines (included as Appendix C to this EIS). The design guidelines emphasise the need to respond to place and context, acknowledge the existing conditions, and promote the need to improve the urban interfaces at each station. The overarching project design principle is to 'create welcoming, secure and well maintained public domain spaces and station buildings with an attractive sense of place that responds to the distinct cultures of each station precinct.'

Developing the project design involved a comprehensive urban design analysis. For each station, the design has taken local conditions and place-making opportunities into account, unified by an overall architectural style for Sydney Metro that supports each centre. An example of an artist's impression of a station is provided in Figure ES.2.

Council public domain plans for centres were considered, as well as the emerging character and likely built form of each centre, articulated by the NSW Government's urban renewal strategy for the Sydenham to Bankstown corridor (Department of Planning and Environment, 2015).

The urban design aspects would continue to be developed and refined during future design stages, taking into account considerations such as each station's place making role, future urban development opportunities, heritage, links to the surrounding town centres, and feedback from stakeholders and the community. To reflect local conditions and heritage values, heritage interpretation, public art, and landscaping would be incorporated into the design of each station, in accordance with the design guidelines, and based on consultation with local stakeholders.

Figure ES.2 Artist's impression of Punchbowl station

The project

The project involves upgrading 10 existing stations west of Sydenham (Marrickville to Bankstown inclusive), and a 13 kilometre long section of the Sydney Trains T3 Bankstown Line, between west of Sydenham Station and west of Bankstown Station, to improve accessibility for customers and meet the standards required for metro operations. The project would enable Sydney Metro to operate beyond Sydenham to Bankstown.

The location of the project is shown in Figure ES.3.

Project objectives

The primary objectives of the project are to:

- improve the quality of the transport experience
- provide a system that is able to satisfy long-term demand
- improve the resilience of the transport network

Secondary objectives are to:

- grow public transport patronage and mode share
- support the productivity of the Global Economic Corridor
- serve and stimulate urban development
- improve the efficiency and cost effectiveness of the public transport system
- implement a feasible solution recognising impacts, constraints and delivery risks.

The project also aims to

- deliver accessible, modern, secure and integrated transport infrastructure
- contribute to the accessibility and connectivity of existing and future communities.

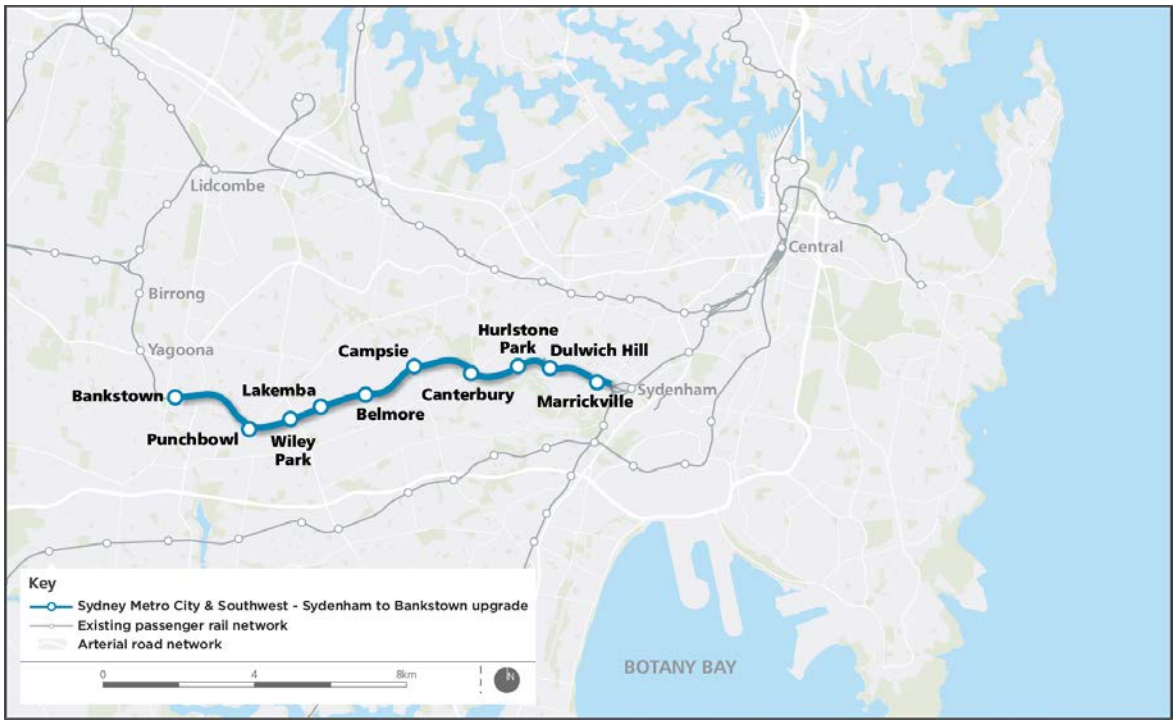

Figure ES.3 Location of the project

Works to upgrade access at stations

The project includes upgrading the 10 stations from Marrickville to Bankstown as required, to meet legislative requirements for accessible public transport, including the requirements of the *Disability Discrimination Act 1992* and the *Disability Standard for Accessible Public Transport 2002*. The proposed works include:

- works to platforms to address accessibility issues, including levelling and straightening platforms
- new station concourse and station entrance locations, including:
  - new stairs and ramps
  - new or relocated lifts
- provision of additional station facilities as required, including signage and canopies.

Works would also be undertaken in the areas around the stations to better integrate with other modes of transport, improve travel paths, and meet statutory accessibility requirements. This would include provision of pedestrian, cyclist, and other transport interchange facilities; as well as works to the public domain, including landscaping.

Works to convert stations and the rail line to Sydney Metro standards

Station works

In addition to the station upgrades to improve accessibility, works to meet the standards required for metro services would be carried out, including:

- installation of platform screen doors
- provision of operational facilities, such as station services buildings.

Track and rail system facility works

Upgrading the track and rail systems to enable operation of metro services would include:

- track works where required along the rail corridor, including upgrading tracks and adjusting alignments, between west of Sydenham Station and west of Bankstown Station
- new turn back facilities and track crossovers
- installing Sydney Metro rail systems and adjusting existing Sydney Trains rail systems
- overhead wiring adjustments.

Other works

Other works proposed to support Sydney Metro operations include:

- upgrading existing bridges and underpasses across the rail corridor
- installation of security measures, including fencing
- installation of noise barriers where required
- modifications to corridor access gates and tracks
- augmenting the existing power supply, including new traction substations and provision of new feeder cables
- utility and rail system protection and relocation works
- drainage works to reduce flooding and manage stormwater.

Active transport corridor and future rail corridor development

The project would also deliver:

- sections of an active transport corridor located around the station areas, to facilitate walking and cycling connections to each station and between Marrickville and Bankstown
- enabling works to support future rail corridor development at Campsie Station.

Construction of the project

Stages and timing

Construction of the project would commence once all necessary approvals are obtained (anticipated to be in early 2018) and would include the following stages of work:

- enabling works, including site establishment and building removal
- main construction works, including the station, track, and other works described above
- finishing works, including demobilisation, rehabilitation, landscaping and testing and commissioning.

Upgraded stations would be progressively delivered from 2019 until 2024. During this period, works to upgrade other infrastructure, such as bridges, embankments and drainage, would also be undertaken. An indicative construction program is provided in Figure ES.4.

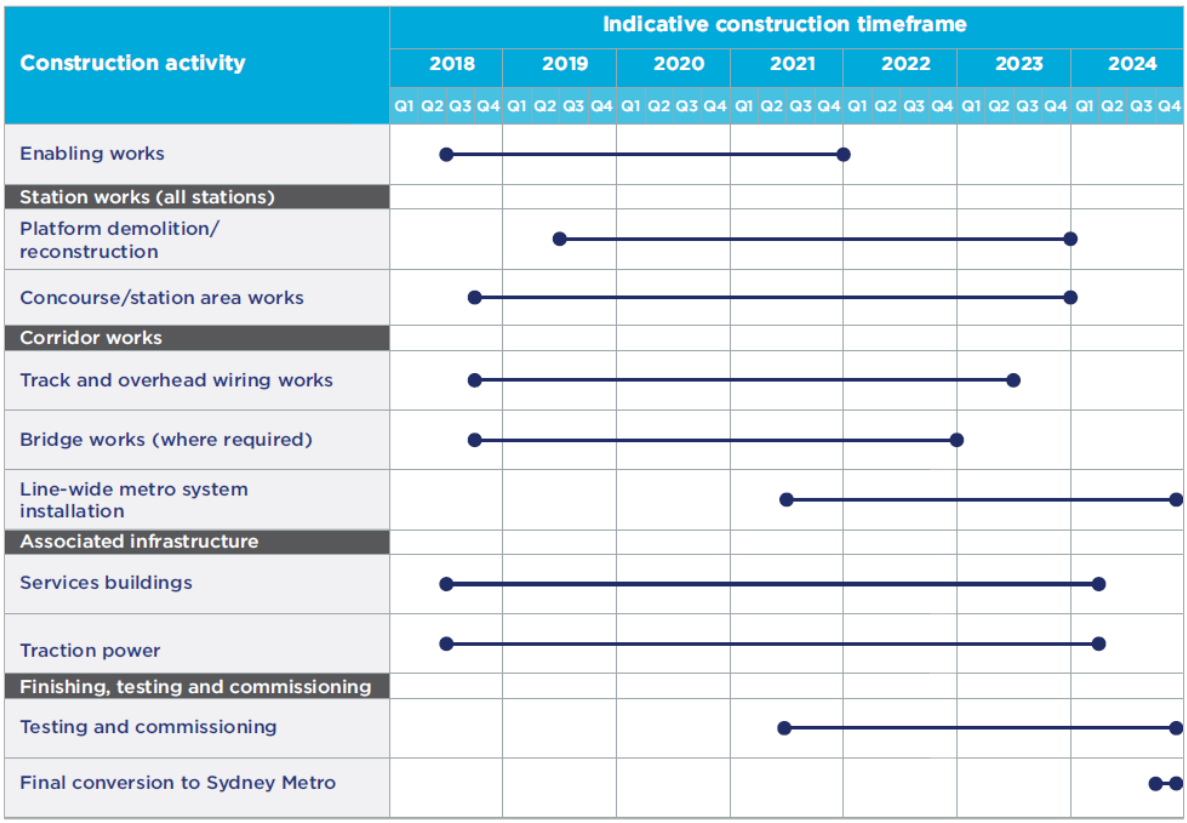

Figure ES.4 Indicative construction program

Possession periods

The T3 Bankstown Line would remain operational during the majority of the construction period. However, to ensure that works are completed as efficiently and safely as possible, and to accommodate works that cannot be undertaken when trains are operating, it is proposed to undertake some work during rail possession periods (i.e. periods where trains are not operating on the line). These works would include major station works, track works, and bridge works. It is anticipated that these rail possession periods would comprise the normal weekend maintenance possession periods (four each year), together with some longer possession periods during school holidays when rail patronage is lower.

A final, longer possession of about three to six months would also be required. This would involve full closure of the line to enable it to be converted to metro operations. This final possession period is to enable works that can only be completed once Sydney Trains services are not operating. It would include works such as the installation of new signalling, communication systems, and platform screen doors.

The indicative possession program would be reviewed during tendering, detailed design, and construction planning to ensure the available possessions are sufficient to complete the works and that the overall impacts to the community are reduced as far as possible.

During each possession period, a temporary transport management plan would be implemented, in accordance with the Temporary Transport Strategy (described below), to provide alternative public transport arrangements, and ensure that rail customers can still reach their destinations.

Prior to the final possession period, Transport for NSW would seek to have the first phase of Sydney Metro City & Southwest in operation, with metro services provided between Cudgegong Road Station in Rouse Hill and Sydenham Station.

Temporary Transport Strategy

A Temporary Transport Strategy (provided in Appendix G) has been developed to guide alternative public transport arrangements during construction, to minimise impacts on rail customers during possession periods and station closures. These arrangements would be detailed within a temporary transport management plan developed for each temporary closure of the rail line. The strategy includes:

- objectives for customers and replacement transport services
- customer markets to be served by the temporary transport management plans
- potential options to maintain public transport connections to and from all affected rail stations
- potential impacts associated with temporary transport options
- temporary transport facilities and measures required
- the process for developing temporary transport management plans, including stakeholder and community consultation
- performance outcomes for the temporary transport management plans.

The strategy would continue to be informed by stakeholder and community input, with the approach refined based on understanding customer needs and ongoing development of alternatives to deliver improved customer outcomes.

The components of the Temporary Transport Strategy are shown in Figure ES.5. The components include:

- buses that stop at all stations along the corridor
- buses that only stop at a limited number of stations before continuing as an express service to the end of the journey
- buses that move passengers to another rail line, such as the T2 Airport, Inner West & South Line, and the T1 North Shore, Northern & Western Line
- an increase in the frequency of existing bus services at specific locations, acknowledging that some customers may prefer to use those instead of the rail replacement bus service.

Operation of the project

Sydney Metro City & Southwest is expected to be fully operational by 2024. Once operational, metro trains would run between Chatswood and Bankstown stations in each direction, at least every four minutes in peak periods, averaging around 15 trains per hour. Customers would be able to interchange with Sydney Trains services at Sydenham and Bankstown stations as required to reach other destinations.

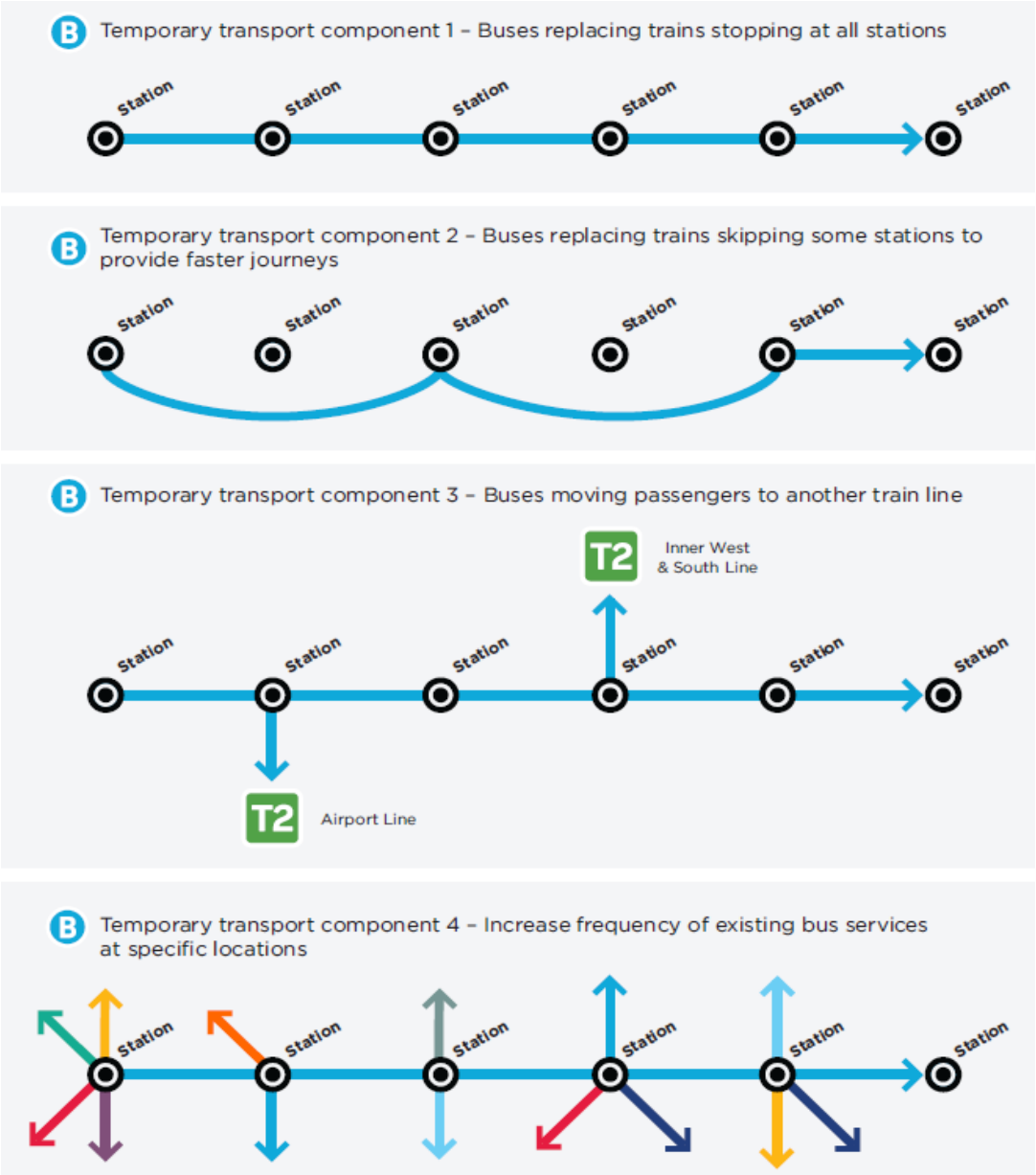

Figure ES.5 Components of the Temporary Transport Strategy

Stakeholder and community consultation

Stakeholder and community consultation for Sydney Metro is an ongoing process that commenced with the release of *Sydney's Rail Future* in 2012. Consultation with stakeholders and the community has occurred during the development of the project and preparation of this Environmental Impact Statement. The consultation strategy has been designed to inform the community and key stakeholders about the project, and encourage participation.

The following consultation activities were undertaken during preparation of the Environmental Impact Statement:

- a project update distributed in February 2017
- community information displays between January 2017 and May 2017
- a planning focus meeting in February 2017
- a community survey seeking feedback on alternative transport arrangements during the construction period

- meetings with relevant government agencies and key stakeholders
- engagement with customer focus groups to inform the designs of stations.

Transport for NSW will continue to work closely with key stakeholders and the community to minimise impacts or issues of concern. Consultation activities will continue as the project progresses to detailed design and construction.

During public exhibition of the Environmental Impact Statement, the community and other stakeholders will be invited to make written submissions about the project. Following exhibition, issues raised in these submissions will be summarised in a submissions report. Transport for NSW will consider the issues raised, and may make changes to the project as a result of submissions or to reduce impacts on the environment. The Minister for Planning will then make a decision about whether to approve the project.

If the project proceeds, Transport for NSW will continue to liaise with key stakeholders and the community during the detailed design and construction. This ongoing engagement process will play an important role in reducing the potential impacts and enhancing the benefits of the project for all stakeholders.

Summary of the key findings

The following sections provide a summary of the key findings of the environmental assessment. The environmental assessment considers the potential for impacts to the project area (defined as the area that would be directly impacted by construction of the project, and including the location of operational infrastructure), as well as the broader study area, where relevant. The environmental assessment was informed by specialist technical assessments of the key environmental issues defined by the Secretary's environmental assessment requirements, and an assessment of other potential issues identified in the State Significant Infrastructure Application Report. The potential impacts of construction and operation were assessed.

Traffic, transport and access

The project area is located within a highly urbanised environment, comprising a number of main roads, and a range of other transport facilities and infrastructure, including the T3 Bankstown Line, train stations, bus stops, light rail, freight rail, pedestrian, and cycle facilities.

Key potential construction impacts

During construction, there would be some impacts to the road network and intersections within and/or connected to the project area. The impact assessment for road traffic during construction considered:

- the use of the road network by construction vehicles, including worker transport
- the combined effects of the construction vehicles with road diversions and lane closures resulting from the proposed works to bridges that cross the corridor
- the potential impacts on the road network of alternative transport arrangements during possessions and/or station closures, guided by the Temporary Transport Strategy.

The assessment concluded that only one intersection, near Lakemba Station, has the potential to experience major delays during construction as a result of construction vehicles. Despite this prediction, it is expected that traffic would redistribute to other intersections, without the need for modification.

The project includes works to bridges located along the rail corridor, which would require partial or full closures at certain times to undertake the works. To minimise congestion and potential delays, these works would generally need to be undertaken outside of peak periods, and potentially at night.

Construction works and the final conversion of the T3 Bankstown Line to support a metro system would require temporary closures of the train line, involving a range of weekend and school holiday possession periods, and a final longer possession period of about three to six months. During these possession periods, about 100,000 customer journeys would be affected each day.

The proposed Temporary Transport Strategy (provided in Appendix G) would guide the provision of alternative public transport arrangements during construction, to minimise impacts on customers during possession periods and station closures. Each temporary transport management plan would be developed to guide the provision of alternative transport arrangements during a specific possession period, in consultation with relevant stakeholders and the community.

Specific initiatives and detailed alternative transport arrangements would be defined by the temporary transport management plans. These initiatives may include:

- increasing train services on other lines
- improving cycle facilities at stations on other lines, for customers who want to continue cycling as part of their journey
- potential road network enhancements and/or bus interchange improvements to support replacement bus operations and reduce their impact on the road network.

Transport for NSW would continue to work to ensure that construction traffic, transport, and access impacts, including disruptions to customers' travel plans and delays to road users, are minimised.

Key potential operation benefits

Once operational, the project would provide more than twice as many trains per hour in peak periods, reducing the waiting time for customers, and significantly improving the capacity and reliability of the rail network. The travel time savings resulting from the project are one of the factors that would encourage people to use Sydney Metro, reducing travel times and providing customers better access to job opportunities and housing choices across Sydney, with fast, more frequent, and direct connections.

The other significant benefit of the project is the accessibility improvements that would be provided along paths to, and within, stations which will provide safe and accessible public transport for all users. The station access hierarchy, shown in Figure ES.6, was used as the basis for the design to ensure that the design of stations, and their integration with other transport modes, gives the highest priority to walking and cycling, followed by public transport. Active transport to stations would continue to be prioritised, with upgrades to pedestrian and cycle facilities to make paths safer and more accessible. The station and train carriage design would also cater for vision and mobility impaired customers.

Figure ES.6 Station access hierarchy

Transport for NSW will work with the Department of Planning and Environment to support the development of an active transport corridor, including walking and cycling infrastructure. As part of the project, Transport for NSW would deliver sections of the active transport corridor around stations. This would facilitate walking and cycling connections to important destinations in the local area and region. When complete, the active transport corridor will link public transport interchanges between Marrickville and Bankstown, and encourage more active, healthier lifestyles.

The project would also benefit bus customers by enhancing connections between bus and rail services, and providing bus stops as close as practicable and with accessible paths to station entries.

Other accessibility benefits of the project include:

- improving the interchange with bus, light rail, pedestrian, and cycling networks, and provision of additional and more convenient taxi, kiss and ride, and bike parking facilities at all stations
- enhancing the accessibility of each station precinct with regard to walking and cycling
- providing infrastructure to ensure that the travel paths between different transport modes meet statutory accessibility requirements.

Noise and vibration

The project area is located in an established urban environment already subject to various sources of noise, including noise generated by the movement of trains along the rail corridor (both passenger and freight trains where relevant), and traffic on the road network. Numerous noise sensitive receivers, including residences and commercial premises, are located close to the project area.

Key potential construction impacts

Potential noise emissions from construction activities were predicted by the noise and vibration assessment in accordance with the *Interim Construction Noise Guideline* (DECC, 2009), by

assuming that the loudest plant for each activity operates at the edge of the work site closest to the receiver, which represents a conservative assessment approach.

The project includes works which cannot be safely undertaken while the rail network is operational. While works would be undertaken during the recommended standard hours defined by the *Interim Construction Noise Guideline*, there would also be a need to undertake works during evenings, at night, and on weekends and public holidays, particularly during rail possession periods.

The noise and vibration assessment concluded that construction activities have the potential to impact surrounding noise sensitive receivers. Exceedances were predicted at most sites for the majority of construction scenarios modelled, with a number of exceedances at residential receivers being greater than 20 decibels above the relevant criteria during the day and night. However, these predictions identify noise levels at the most exposed receiver, which may not be reached, or only infrequently reached, during the construction period. The use of noise intensive construction equipment was found to broadly correlate with construction activities resulting in exceedances of the noise criteria. It is noted that noise intensive construction equipment would not be used for the majority of the construction period. Construction planning would endeavour to minimise the use of this equipment during more sensitive periods.

Road traffic noise was assessed using the preliminary estimate of construction traffic volumes and implementation of alternative transport arrangements during a rail possession period. This assessment found that construction vehicles, rail replacement buses, or a combination of both would result in an increase of greater than two decibels above existing noise conditions along 10 roads. These roads are located in the vicinity of stations east of and around Campsie Station.

A large number of buildings adjacent to the project area are predicted to be located within the recommended offset distance for potential amenity and cosmetic damage resulting from vibration. These impacts are predicted in the event that large hydraulic rock breakers are used at the edge of the work site closest to the receiver. In practice, this may not be necessary and vibration impacts would be intermittent over the duration of construction.

For structures where the vibration levels are predicted to exceed the criteria, a more detailed assessment of the structure and vibration monitoring would be undertaken during detailed design and construction, to ensure that vibration levels remain within appropriate limits.

Given the proximity of construction to a number of heritage items, particularly at stations, there is the potential for vibration impacts if appropriate mitigation measures are not implemented. For heritage items, a more detailed assessment would be undertaken to identify necessary mitigation and monitoring requirements, taking into account the heritage values of the item.

A Construction Noise and Vibration Strategy (provided in Appendix E) has been developed for the Sydney Metro program to provide a framework for implementing appropriate mitigation measures. The strategy provides for the preparation of detailed construction noise impact statements once construction methods are defined at each location, and more detailed assessments of the potential for vibration impacts. Further measures to minimise and manage construction noise and vibration impacts would be identified during detailed design and construction planning in close consultation affected receivers.

Key potential operation impacts

Predictions of future rail noise levels without the project indicate that noise levels would be generally close to, or exceed, the trigger levels identified by the *Rail Infrastructure Noise Guideline* (EPA, 2013) (‘the RING’). It is predicted that future noise levels would exceed the RING trigger levels in eight of the twelve noise catchment areas in the study area. Overall, the addition of the project is not predicted to result in significant increases in rail noise – in most instances, the

increase in noise as a result of the project would be less than two decibels which would be barely perceptible.

The majority of exceedances are predicted to occur in the Punchbowl and Bankstown noise catchment areas. These exceedances would be minimised by implementing noise mitigation measures. Feasible and reasonable mitigation measures, such as noise barriers and at-property treatments, would be considered where exceedances have been identified. The final form and location of mitigation measures would be determined during detailed design.

While exceedances of groundborne noise criteria are predicted, airborne noise levels would be more substantial and therefore no mitigation is required. No exceedances of vibration criteria are predicted.

Non-Aboriginal heritage

The project area contains substantial historical resources of significance. All 10 railway stations in the project area are heritage listed. Three stations (Marrickville, Canterbury and Belmore stations) are listed on the State Heritage Register, and the others are subject to listings on local environmental plans and/or a State agency Section 170 heritage register.

Two items listed on the State Heritage Register (Sewage Pumping Station 271 in Marrickville and the Old Sugarmill in Canterbury) are located adjacent to the project area. A number of other locally listed items are located adjacent to, or within 25 metres of the project area. In addition, the project area passes through or adjacent to two heritage conservation areas.

The approach to the design has been to retain as many significant heritage items and/or elements as possible, with particular focus given to items listed on the State Heritage Register. Potential adaptive reuse for the retained items would be determined during detailed design. The design process for the project involved significant work to minimise direct impacts to heritage items as far as possible. However in some instances, to meet accessibility standards and Sydney Metro operational requirements, there has been no alternative to the changes proposed. For example, platforms need to be reconstructed along the alignment to provide safer and easier access to trains.

The main potential for impacts to non-Aboriginal heritage would occur during the construction phase. The project would result in the removal of one or more heritage elements at each station, which would directly impact on heritage listed items as follows:

- a major direct and visual impact to the State Heritage Register listed Marrickville Railway Station Group, mainly as a result of upgrading the Illawarra Road overbridge
- moderate direct and visual impacts to the State Heritage Register listed Canterbury and Belmore railway station groups as a result of the removal some heritage elements associated with these items
- major direct and visual impacts to four locally listed heritage items (Dulwich Hill, Hurlstone Park, Wiley Park, and Punchbowl railway station groups) as a result of the removal of heritage elements associated with these items
- moderate direct and visual impacts to three locally listed heritage items (Campsie, Lakemba, and Bankstown railway station groups) as a result of the removal of some heritage elements associated with these items.

Despite these impacts, the assessment concluded that the T3 Bankstown Line would continue to retain some of its heritage values and demonstrate the historical phases of development of the line. The most significant stations (Marrickville, Canterbury, and Belmore), dating from the first

development period, would retain their significant, near-identical brick buildings of exceptional significance.

Stations representing the second period of development of the line would be conserved largely in their existing states. Lakemba and Bankstown's island platform configurations and platform buildings would be retained. Punchbowl Station would be subject to greater impacts as it would be fully redeveloped.

Stations representing the inter-war development period would be impacted, with Wiley Park Station being fully redeveloped. The inter-war phase of redevelopment of Dulwich Hill Station would also be altered, with the loss of the overhead booking office and major visual impacts on the station building, although the building and the island platform configuration would be conserved.

Examples of each significant platform building type between Marrickville and Bankstown would be conserved.

The project would also have a moderate direct impact on the locally listed Canterbury (Cooks River) Underbridge, as a result of the proposed removal and replacement of the parapets during bridge maintenance and protection works.

The assessment concluded that all State heritage listed items would continue to meet the threshold for State significance following completion of the project. However, two locally listed items (Wiley Park and Punchbowl railway station groups) would no longer meet the threshold for local significance and would likely be de-listed.

In addition to archival recording, additional management and mitigation measures would be implemented to minimise heritage impacts. Measures include considering opportunities for the retention, conservation, and/or reuse of original and significant heritage fabric where impacts are unavoidable. Appropriate landscape treatments, architectural design, and heritage interpretation would be incorporated into the detailed design. A conservation management plan would be prepared for all State Heritage Register listed stations, in accordance with NSW Heritage Council guidelines.

Aboriginal heritage

No listed Aboriginal sites are located within the project area. The closest previously recorded Aboriginal heritage site is a potential archaeological deposit (PAD) (the Fraser Park PAD) located about 650 metres north-east of the project area boundary. Two areas of potential archaeological deposits were identified during field surveys near Belmore and Punchbowl stations (S2B PAD 01 and S2B PAD 02 respectively).

The archaeological significance of the project area within the existing rail corridor is considered to be low as a result of the high levels of ground disturbance. S2B PAD 01, which is located outside the project area is considered to have low to moderate significance, while S2B PAD 02 is considered to have moderate significance, and low to moderate potential for intact archaeological deposits to be identified.

The main potential for impacts to Aboriginal heritage would occur during the construction phase. Construction of the project would not impact any previously recorded Aboriginal heritage sites, however S2B PAD 02 would be impacted by the proposed new access way from Punchbowl Road to Punchbowl Station, and proposed landscaping works. S2B PAD 01 would not be impacted.

Appropriate mitigation measures have been recommended to manage this impact, including preparation of an Aboriginal Cultural Heritage Assessment Report, and archaeological test excavation where impacts cannot be avoided.

Land use and property

The study area consists of a varied and relatively dense mix of land uses, including residential, commercial, industrial, transport infrastructure, community, health, education, and recreation. The majority of the project area is used for transport purposes (rail and road) and is public land managed by State Government agencies.

The design of the project has had regard to relevant strategic planning policies and strategies, and proposed future land uses provided by these strategies, including *A Plan for Growing Sydney* (NSW Government, 2014), the draft *Sydenham to Bankstown Urban Renewal Corridor Strategy*, and relevant district plans prepared by the Greater Sydney Commission.

Key potential construction impacts

Property acquisition would occur during the project planning and pre-construction phases.

A direct impact on property and land use is expected where land would be acquired at Marrickville and Punchbowl stations for the provision of station entrances, plazas, and shared zones. To enable development of the proposed western entrance, concourse, and shared zone at Marrickville Station, three privately owned lots (one residential and two commercial lots) would need to be acquired, and a portion of publicly owned land (in Station Street) would also need to be acquired. All acquisitions would be managed in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*.

Similarly, a portion of publicly owned land in Station Street, Marrickville and two parcels of public land at Warren Reserve at Punchbowl Station would be required to enable development of the new station entrances and concourse areas.

The majority of construction sites would be located within the existing rail corridor to minimise direct impacts on land use and property. However, direct impacts on land use during construction would include temporary land take and the short term presence of construction equipment, plant, vehicles, and fenced work sites along the proposal site. During construction, the use of the land would change from a transport corridor (the main land use of the majority of the project area) to a construction site. Land subject to acquisition would change from its existing use (commercial, residential, public road, and reserve) to a construction site. Public access would be restricted. The impacts to Warren Reserve would be limited to a small portion of the overall reserve, located adjacent the existing rail corridor.

Other temporary land use impacts during construction would include construction of an underground detention basin in the north-western portion of McNeilly Park in Marrickville, which would restrict the use of this land during construction of the basin. The area above the basin would be restored and returned to public use when construction of the basin is complete.

Key potential operation impacts

Direct operational impacts on land use would be limited to the change in use for those areas of land and properties that would be acquired for the location of permanent operational infrastructure. Land acquired near Marrickville Station would change use, from commercial, road, and residential, to transport. Land acquired near Punchbowl station would change use from reserve/open space to transport.

Although the project would have no major direct operational impacts on land use or properties, it could act as a catalyst for urban renewal and future development. This could stimulate population growth, increase the demand for higher density living along the corridor, and positively affect future property values. In most cases, the project would lead to improvements in accessibility to stations and better integration of the rail network with existing and improved pedestrian, cycle and bus

networks. The project would play a part in facilitating the future development envisaged by the broader urban renewal program.

In terms of future land uses, the project presents opportunities for positive change within the vicinity of the stations, supporting urban renewal, and creating attractive, vibrant and highly accessible places. The relationship between the project and surrounding land uses is mainly being addressed through the planning and land use integration process that commenced with the draft *Sydenham to Bankstown Urban Renewal Corridor Strategy.* Overall, the project is anticipated to integrate positively with the initiatives proposed by the urban renewal corridor strategy, by providing a public transport facility that can meet future needs.

Socio-economic and business impacts

The project area extends through a highly urbanised, densely populated, and ethnically diverse area. It is located within 11 suburbs in the Inner West and the Canterbury-Bankstown local government areas. In 2011, the Sydenham to Bankstown corridor provided about 19,700 jobs. Each station is located within/close to a commercial/retail centre. Businesses of varying types are located close to each station. A small retail business is located at six stations (Dulwich Hill, Belmore, Lakemba, Wiley Park, Canterbury, and Punchbowl). Campsie station is directly adjoined by a number of buildings (located on land owned by RailCorp), which are used for a variety of retail/commercial purposes.

Key potential construction impacts

Both socio-economic benefits and impacts are expected to result from construction of the project. Construction would result in substantial economic benefits by way of job generation and construction multipliers. Some local businesses would expect to receive a direct stimulus from construction workers requiring food and beverage supplies and other goods and services.

There would also be adverse impacts on a number of businesses where acquisition and lease cessation is required. Land requirements to undertake the project would include business interests, as follows:

- full acquisition of two commercial lots near Marrickville Station
- cessation of one existing commercial retail lease at each of six stations (Dulwich Hill, Belmore, Lakemba, Wiley Park, Canterbury, and Punchbowl stations)
- cessation of 31 commercial leases in the building adjacent to Campsie Station.

The project would have the potential to impact community infrastructure located near the project area mainly as a result of impacts to amenity and access arrangements. The former Canterbury Bowling and Community Club would be directly impacted. The majority of the club building and all the surrounding open space is proposed for use as a construction compound and site office. This would mean that the majority of the facility would not be available for community use for the duration of the construction period.

Closure of the rail line and/or stations during possession periods has the potential to impact on the community, which has higher levels of public transport use compared to the Sydney average. It would also have the potential to affect businesses dependent on passing trade generated by rail customers. Implementation of a small business owners support program would assist in mitigating this impact.

Impacts would also include temporary access restrictions; amenity issues, such as increased traffic congestion, noise, vibration and dust; and changes to parking availability.

Management measures would be implemented to minimise the potential impacts of construction on the community and businesses. These measures would include Place Managers tasked with

working with businesses and the wider community during the construction period; implementation of a workforce development plan to promote local employment and skills development; and implementation of business management plans for each locality, detailing location specific mitigation measures.

Key potential operation impacts

Operation of the project as part of Sydney Metro would generate significant local and regional benefits and opportunities, as a result of the enhanced capacity and frequency of transport services, and improved access to the Sydney CBD and the wider transport network. During operation, community access and connectivity are expected to greatly improve through the provision of new, efficient, high capacity public transport and accessible station designs.

In addition to these broader operational benefits, key local benefits would include:

- Marrickville – improved access to Schwebel Street and Illawarra Road resulting in better safety and accessibility outcomes, and a more inviting station entrance in Station Street.
- Dulwich Hill – new accessible, cross corridor access link to facilitate community cohesion, and a new entrance closer to the light rail stop to facilitate interchange between the different transport modes.
- Hurlstone Park – provision of an enlarged station forecourt for safer gathering and interaction, and new pedestrian crossings to facilitate access to surrounding areas.
- Canterbury – improved access to the potential new town centre via a new station entrance on Broughton Street, promoting accessibility, community interaction, and cohesion.
- Campsie – the new station entrance would be more open to Beamish Street, which would further consolidate the station as a focal point for the community.
- Belmore – new station plaza and accessible cross-corridor link to promote community cohesion and gathering, and the proposed improvements to the Tobruk Avenue station frontage would improve connectivity with surrounding streets, the Burwood Road shopping area, and the Belmore Sportsground.
- Lakemba – improved access, new station entrance forecourts, and upgrades to the existing courtyard and memorial space to promote community identify.
- Wiley Park – new station entrance and public domain improvements would provide a more comfortable and safe station access.
- Punchbowl – the new station entrance and forecourt to The Boulevarde would improve pedestrian access to the station, and improve safety by increasing visibility and opportunities for passive surveillance.
- Bankstown – new, at grade cross-corridor link to improve access, cohesion, and integration.

The project would enhance local amenity and character in the areas surrounding the stations as a result of the focus on place making and promotion of active transport in the design development process. The project also has the potential to stimulate growth, new development, and urban renewal around stations, including new housing, employment opportunities, public places, community facilities, and integration with other transport infrastructure. This would provide the opportunity to enhance the health and wellbeing of the broader community.

As one of the two components of Sydney Metro City & Southwest, the project would contribute to economic growth by providing direct benefits to customers through reduced travel time and better reliability. The project would also deliver wider economic benefits by facilitating access to education and employment opportunities, increased connectivity, land development opportunities, and business logistics improvements, particularly for knowledge-based businesses.

Impacts to businesses during operation would largely be positive at the local and regional level, as a result of the enhanced capacity and frequency of transport services. Adverse impacts for local businesses during operation would include the potential for increased commercial rents, increased levels of competition, and changes to customer access and parking. The project may facilitate increased retail investment in local business precincts, due to improved customer access and an enlarged customer base enabled by Sydney Metro. The potential for redevelopment within the local business precincts, would provide subsequent opportunities for businesses to leverage off a growing resident and worker population base.

Landscape character and visual amenity

The existing visual environment is characterised by its highly developed urban nature, which includes existing rail and road infrastructure, and a range of built forms. Landscape character varies along the project area, with a number of different landscape character areas identified by the landscape and visual impact assessment. The landscape character areas are influenced by the nature of the urban form (including residential and commercial areas, and a variety of different built forms), natural features (the Cooks River), and the presence of areas of open space and parks.

Key potential construction impacts

Temporary visual impacts would be experienced during construction in the vicinity of construction work areas, compounds, and work sites. Visible elements would include machinery and equipment, site hoardings, partially complete structures, and other works. However, these impacts would be temporary and limited to the construction period. In addition, the majority of the works would be viewed within the context of a highly developed and dynamic urban environment, where construction and associated works are frequent occurrences.

A number of trees of varying sizes would potentially need to be removed to facilitate the upgrades of stations and station areas. Removal of trees would also be required to occur in sections of the rail corridor. Some of these trees contribute to the amenity and character of the local area and/or screen views from properties surrounding the project area. The removal of these trees would have the potential to reduce some screening between residential dwellings and the rail corridor, and impact on existing amenity. The final number of trees to be removed would be confirmed during detailed design and final construction planning. Impacts to trees would be minimised where practicable in accordance with the tree management strategy. It is noted that minimising tree removal will be key requirement of the construction contract.

Where removal of trees is unavoidable, trees would be replaced in accordance with the proposed tree management strategy, which would be prepared in consultation with relevant stakeholders, including the Inner West and Canterbury-Bankstown councils. This strategy would ensure that any trees that need to be removed would be replaced, and where possible, increased in number. This would include preparation of comprehensive tree reports by a qualified arborist where trees around station areas require protection, or pruning to guide the approach to managing each tree during construction.

In addition, as described below, biodiversity offsets are proposed to mitigate the loss of ecological values as a result of clearing in the rail corridor.

Key potential operation impacts

With the introduction of upgraded stations and new infrastructure in the project area, the project has the potential to result in changes to landscape character and visual amenity. The project would result in changes to the appearance (to differing degrees) of stations, and the addition of new infrastructure along the rail corridor.

The design of the stations and associated facilities has been undertaken to reinforce their role. As new vibrant spaces and destinations, the stations would fit with the NSW Government's transformation and renewal vision for the Sydenham to Bankstown corridor. They could serve as a catalyst for regeneration in the surrounding neighbourhoods and along the road corridors connecting to the stations, reflecting a high level of land use and transport integration. The detailed design of the project would include measures to integrate the changes to the stations into the surrounding urban fabric.

Hydrology, flooding and water quality

The majority of the project area, between Marrickville and Punchbowl stations, is located in the Cooks River catchment. The project area crosses the Cooks River about 400 metres west of Canterbury Station. Between Punchbowl and Bankstown stations, the project area is located within the Georges River catchment.

Around Marrickville Station, the rail corridor and surrounding lands are subject to regular and extensive flooding. Other areas where flooding of the rail corridor may occur are located to the west of Campsie Station, between Campsie and Canterbury stations, and to the east of Canterbury Station, however the frequency and extent is less than at Marrickville. Flooding issues generally result from the limited capacity of existing drainage infrastructure, including infrastructure within and crossing the rail corridor.

As a consequence of the heavily urbanised nature of the drainage catchments, the water quality of major watercourses is generally considered relatively poor, with stormwater runoff fouling the river systems with litter, petroleum derivatives, excess nutrients, and other pollutants.

Key potential construction impacts

A number of construction compounds and worksites would be located in areas that are currently subject to hazardous flooding conditions. However, as a result of the size of these areas relative to the overall floodplain, and the nature of activities proposed, no noticeable changes in floodplain function or storage are predicted. Further investigation and modelling would be undertaken during detailed design to ensure that the function of the floodplain is not materially affected by construction of the project. As far as possible, to minimise potential impacts to existing flooding conditions, all new drainage infrastructure would be constructed and operational prior to disconnection of existing infrastructure. Contingency management plans would also be developed and would include consideration of flooding, ensuring that appropriate arrangements are in place to manage any contingency events should they occur.

During construction, the potential for water quality impacts would be managed by implementing standard erosion and sediment management measures, in accordance with *Managing Urban Stormwater: Soils and Construction*.

Key potential operation impacts

Flood modelling conducted for the study area in the vicinity of Marrickville Station indicated that during the one per cent annual exceedance probability event, flood depths and velocities would generally remain the same or reduce as a result of the upgraded drainage infrastructure to be provided by the project. This would include increasing the capacity of culverts and installing detention basins in key locations.

Preliminary consultation was undertaken with the Inner West and Canterbury-Bankstown councils, and the NSW State Emergency Service, regarding existing flood evacuation routes and the potential impacts of the project. Some roads that currently provide emergency access near Marrickville Station are subject to flooding under existing conditions. Modelling predicted that the project would result in negligible changes to the flood level at the majority of these roads, and a

decrease in the flood level in the vicinity of Marrickville Road (including surrounding roads). Flood emergency management would be incorporated into the design of station infrastructure and the project's operational emergency management plans. Flood modelling of other areas along the rail corridor, including appropriate allowance for climate change, would be undertaken during detailed design.

The project would include installation of water quality treatment measures at stations to capture pollutants, including litter, sediments, phosphorous, hydrocarbons, and nitrogen, to meet water quality targets, which are in keeping with relevant guidelines. However, as a result of the small size of station catchments compared to the much larger overall drainage catchment, there is expected to be no noticeable effect on water quality in receiving waters.

Biodiversity

The majority of the study area has been heavily modified by past and ongoing disturbances associated with urban development and the active rail corridor. The majority of vegetation in the project area and surrounding study area comprises exotic or planted native species on highly modified landforms. There are small isolated patches of remnant or regrowth native vegetation in small portions of the study area associated with rail cuttings with less disturbed soil profiles.

About 0.6 hectares of the native vegetation in the project area matches two threatened ecological communities listed under the *Threatened Species Conservation Act 1995* (TSC Act). No listed threatened flora species were recorded in the project area. Around 650 stems of the endangered Downy Wattle*,* which is listed as a vulnerable species under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the TSC Act, are located near the project area. One threatened fauna species, the Grey-headed Flying-fox, was recorded during site surveys.

The main potential for biodiversity impacts would occur during construction. Potential impacts on biodiversity have been minimised by designing the project to minimise the potential for impacts outside the rail corridor. This included refining the location of project near Punchbowl and Bankstown stations to avoid impacts on Downy Wattle.

A biodiversity impact assessment was undertaken for the Environmental Impact Statement in accordance with the *Framework for Biodiversity Assessment* (OEH, 2014a). It was assumed for the purpose of the assessment that construction would require removal of all vegetation within the rail corridor in the project area. This would involve removal of 29.8 hectares of vegetation. The majority of this vegetation comprises exotic plants (about 21.5 hectares) or planted, often non-indigenous, native species on fill material (about 7.3 hectares). Removing all vegetation in the rail corridor would impact one hectare of native vegetation.

The project would also require the removal of street trees, mainly around station areas. This potential impact is considered above (under landscape character and visual amenity).

The assessment concluded that the project would not significantly impact any listed ecological community or species.

To mitigate potential impacts to biodiversity as a result of clearing of native vegetation in the rail corridor, the proposed Biodiversity Offset Strategy would be implemented in accordance with the *NSW Biodiversity Offsets Policy for Major Projects* (OEH, 2014b). The offset strategy requires the purchase and retirement of biodiversity credits calculated in accordance with the *Framework for Biodiversity Assessment*.

Sustainability and climate change

For infrastructure projects, 'infrastructure sustainability' is defined by the Infrastructure Sustainability Council of Australia as 'infrastructure that is designed, constructed and operated to optimise environmental, social and economic outcomes of the long term'.

The assessment undertaken for the Environmental Impact Statement considers the application of sustainability principles to the project, and opportunities to achieve sustainability targets and outcomes aligned with best practice infrastructure projects. Sustainability principles have been incorporated throughout the design process. A project-specific environment and sustainability strategy has been developed, and is provided in Appendix F.

Sydney Metro is targeting an 'Excellent' rating under the Infrastructure Sustainability Council of Australia's Infrastructure Sustainability framework. To assist in achieving this rating, a range of sustainability initiatives and targets would be implemented, including:

- provision of solar systems
- incorporating carbon and energy management into the project design
- reduction of greenhouse gas emissions by 20 per cent
- rainwater harvesting and water saving features
- waste reduction targets for different types of waste.

Project contractors would be required to clearly identify how they would achieve specific sustainability objectives, initiatives, and targets. This approach would encourage industry to develop innovative value-for-money sustainability solutions. Key sustainability themes would include governance, carbon and energy management, pollution control, climate change resilience, resources (water efficiency and waste and materials), biodiversity conservation, heritage conservation, liveability, community benefit, supply chain, workforce development, and economic factors.

A climate change risk assessment and a greenhouse gas assessment were also undertaken. The climate change risk assessment identified risk treatments that would be incorporated into the detailed design of the project, including ensuring that adequate flood modelling is carried out and integrated into the design.

The greenhouse gas assessment concluded that operation and maintenance of the project would result in increased emissions of greenhouse gas through increased electricity use. However, the project has the potential to reduce greenhouse gas emissions by providing a reliable and efficient alternative to private car travel. An iterative process of greenhouse gas assessments and design refinements would be carried out during detailed design and construction to identify opportunities to minimise greenhouse gas emissions.

Cumulative impacts

A number of major projects are proposed or are being undertaken in the vicinity of the project area, including the Sydney Metro City & Southwest Chatswood to Sydenham project, and two stages of WestConnex.

The Chatswood to Sydenham project would involve works close to the project area, as both projects are located adjacent to each other east of Marrickville Station. The main potential cumulative impacts associated with construction of the two projects include:

- traffic impacts, due to the movement of construction vehicles and the operation of buses to replace rail services during possession periods
- hydrology and flooding impacts, which are assessed as part of the hydrology assessment.

Both projects would provide cumulative transport-related benefits, including a major increase in the capacity of Sydney's rail network.

There is considered to be limited potential for cumulative impacts with the WestConnex projects, due to the distance between the surface works for these projects and the Sydenham to Bankstown upgrade.

Cumulative impacts would be highly dynamic and time/activity specific, so are difficult to define in detail at this stage of the assessment process. Transport for NSW would continue to work closely with relevant stakeholders to manage and co-ordinate the interface with other major projects under construction at the same time, and would consult with a range of state and local government agencies.

Other issues

In addition to the above, other environmental issues, including contamination, air quality; hazards, risk and safety; and waste management, were also considered to develop a comprehensive environmental management framework for the project. These and other impacts would be managed by the implementation of appropriate environmental management measures included in the construction environmental management plan for the project.

Environmental mitigation and management

The detailed design for the project would be undertaken with the objective of minimising potential impacts on the environment and the community. The design and construction methodology would continue to be developed with this objective in mind, taking into account the input of stakeholders.

To minimise and manage the potential impacts identified by the Environmental Impact Statement, the assessment chapters outline a range of mitigation and management measures, including those that have been successfully applied to other major infrastructure projects in Sydney. Chapter 28 summarises the environmental mitigation and management measures that would be implemented prior to and during construction and operation. These include implementation of the:

- Sydenham to Bankstown Design Guidelines (Appendix C)
- Construction Environmental Management Framework (Appendix D)
- Construction Noise and Vibration Strategy (Appendix E)
- Temporary Transport Strategy (Appendix G)
- Utilities Management Framework (Appendix H).

Next steps

During the public exhibition period, stakeholders and the community are encouraged to make written submissions to the Department of Planning and Environment in relation to the project. Following the exhibition period, Transport for NSW will consider the issues raised in submissions and will respond to community feedback in a submissions report. The report will also document the outcomes of any ongoing investigations and design work identified following the exhibition of in the Environmental Impact Statement.

Should changes to the project be proposed during the exhibition period, a preferred project report would be prepared to assess the impacts of any changes. The submissions report would be integrated into this report.

If the project is approved, it would be undertaken in accordance with the mitigation measures proposed in the Environmental Impact Statement, the submissions/preferred infrastructure report, and the conditions of approval.