Part B

Westmead metro station

7

7.0 Westmead metro station

This chapter provides a description of Westmead metro station and its precinct during operation and construction of this proposal. This chapter also provides an assessment of potential impacts during operation and construction that relate to Westmead and identifies mitigation measures to address these impacts.

7.1 Overview

Westmead metro station would be located to the east of Hawkesbury Road, between Railway Parade in the north, Bailey Street in the south and Hassall Street in the east to provide a direct interchange with the T1 Western Line and the T5 Cumberland Line. The existing Westmead Station is located immediately to the north. The metro station would provide increased accessibility and connectivity to the Westmead health and education precinct (which includes Westmead Hospital and Western Sydney University) for pedestrians and through interchange with the future Parramatta Light Rail Stage 1, as well as surrounding residential areas experiencing growth and renewal.

The locality around Westmead metro station generally contains a mix of land uses, including the Westmead town centre, and medium- and low-density residential buildings, as well as specialised health, education and recreational areas. Immediately to the north, the Westmead health and education precinct and its redevelopment is planned to transform Westmead into a world-class innovation district.

7.1.1 Operation

The vision for Westmead metro station and its surrounds is for a well-connected and accessible health and education precinct, and a revitalised, high amenity living and employment centre as an extension of Parramatta's CBD.

The station entry would be from a new aerial concourse on Hawkesbury Road, providing a consolidated entry to Sydney Metro and Sydney Trains platforms. A paid underground concourse beneath Alexandra Avenue and the existing rail corridor would also connect the aerial concourse to Sydney Metro and Sydney Trains services. Sydney Metro is continuing to investigate the opportunity for an additional southern station entrance.

When operational, Westmead metro station would provide substantial transport, placemaking and amenity benefits. This includes the provision of a direct interchange between Sydney Metro and Sydney Trains services, as well as safe and equitable connections with active transport. It would provide a gateway to the Westmead health and education precinct, support greater activation along Hawkesbury Road connecting north and south Westmead, providing high amenity and accessible public spaces and supporting growth and renewal opportunities.

A number of improvements would be made to the local transport network to facilitate integration of the metro station including new bicycle routes within the station precinct (to connect to the existing network), bus stops, kiss and ride zones and pedestrian crossing improvements. Sydney Metro is continuing to investigate options for the layout and use of Alexandra Avenue between Hawkesbury Road and Hassall Street. These options include the potential for this section of road to be narrowed and used for bus and emergency services only, to support safe pedestrian movement within the precinct.

This proposal would improve the character and visual amenity of the area due to the new metro station and the associated accessibility and placemaking outcomes. These improvements would also result in social benefits associated with increased accessibility to jobs, education and services and improved amenity, and some opportunities for local businesses such as increased passing trade and improved accessibility.

The key potential impact anticipated during operation of Westmead metro station is that Hawkesbury Road / Alexandra Avenue and Alexandra Avenue / Hassall Street intersections are forecast to see (with and without this proposal scenarios) a decline in performance once the metro station is operational, mainly associated with the increased pedestrian movements in the area. Sydney Metro is continuing to work with stakeholders to manage this issue which includes exploring options to change the layout and use of Alexandra Avenue between Hawkesbury Road and Hassall Street.

Potential impacts associated with other environmental matters such as operational noise and vibration, non-Aboriginal heritage, groundwater, flooding, social and business would comply with the relevant criteria and/or be minor to negligible.

7.1.2 Construction

Major civil construction including station excavation and tunnelling work at Westmead was assessed and approved under a previous Sydney Metro West planning application and does not form part of this proposal. This proposal includes the construction activities required to complete Westmead metro station, and associated precinct work required for the operation of Sydney Metro West.

Construction of Westmead metro station would require the continued use of the construction site established under the previous Sydney Metro West planning application. Some additional areas would be required within the existing rail corridor for interchange work and on roads surrounding the site for transport network improvements. The proposed work is expected to have a total duration of about four years.

For majority of the construction period, there would be little change to the surrounding transport network. To carry out construction of the underground concourse as part of this proposal, Alexandra Avenue would be temporarily closed between Hawkesbury Road and Hassall Street for about 12-18 months. The temporary closure of Alexandra Avenue would result in some additional detours affecting private trips and bus travel times. There would also be some temporary loss of parking, which would have a minor impact on the current availability of parking given the availability of parking on other local roads nearby, and this would generally occur periodically during rail possession works and during the temporary closure of Alexandra Avenue. Consultation would be undertaken with Cumberland Council and City of Parramatta Council to investigate opportunities to provide alternative parking facilities. These temporary construction traffic impacts would be managed through the Sydney Metro Construction Traffic Management Framework (CTMF).

The performance of some intersections around the site would temporarily decline due to construction works and vehicles, particularly during the 12-18 month closure of Alexandra Avenue. Sydney Metro is continuing to work with other parts of Transport for NSW and other relevant stakeholders to identify and implement measures to minimise potential impacts to network performance.

There would be temporary noise and vibration impacts associated with aboveground construction activities. During the daytime, the highest noise impact work would occur for around four days when a rail tamper is being used and for around 12 weeks during excavation (including excavation of the underground concourse) using a rockbreaker. Other temporary high noise impact work may also occur intermittently during activities that require a concrete saw. During the night-time, temporary ‘moderate’ to ‘high’ sleep disturbance impacts are predicted for receivers which are directly adjacent to the rail corridor along Alexandra Avenue and Railway Parade. These predicted impacts would be associated with the need to carry out some work during Sydney Trains rail possessions. Work would be coordinated with scheduled Sydney Trains rail possessions where possible. Rail replacement bus services, which currently operate during rail possessions, would be provided.

There would also be a temporary increase in traffic noise during the 12-18 month period that Alexandra Avenue is closed along roads where traffic is diverted. The Sydney Metro Construction Noise and Vibration Standard (CNVS) would be implemented to manage these potential impacts.

Other key potential impacts during construction would include:

- temporary minor to moderate impacts to landscape character and visual amenity due to the scale and extent of the construction work
- temporary medium social impacts due to construction-related disruptions and potential amenity impacts
- temporary slight negative impacts to local businesses, mainly associated with changed traffic conditions and potential amenity impacts.

Potential impacts associated with other environmental matters such as non-Aboriginal heritage, Aboriginal heritage, contamination, groundwater, flooding and biodiversity would be minor to negligible.

These impacts would be managed through the implementation of the Sydney Metro management frameworks and standard mitigation measures including the Construction Environmental Management Framework (CEMF), Overarching Community Communications Strategy (OCCS), CTMF and CNVS.

7.2 Station and precinct description

7.2.1 Design development

Development of the design has involved ongoing consultation with stakeholders and the Design Advisory Panel. This has included:

- feedback as part of submissions and consultation associated with the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a)
- ongoing meetings and design workshops held with Cumberland Council and City of Parramatta Council since exhibition of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a)
- meetings and advice from the Design Advisory Panel
- meetings and advice from the Parramatta Light Rail Stage 1 project
- ongoing meetings with Sydney Trains
- ongoing meetings with other relevant parts of Transport for NSW.

Key features or changes to the design to avoid or minimise impacts, and respond to feedback from stakeholders and the Design Advisory Panel, include:

- underground and aerial concourses – the underground concourse would provide efficient interchange for customers transferring between Sydney Metro and Sydney Trains services compared to an aerial concourse only, while the aerial concourse would provide efficient customer entry from the surrounding catchment and interchange with light rail and bus services
- retention of the existing Alexandra Avenue alignment– further design development and stakeholder feedback (including from the Design Advisory Panel, Transport for NSW and Schools Infrastructure NSW) since the approval of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a), has resulted in a decision to retain Alexandra Avenue (between Hawkesbury Road and Hassall Street) in its existing alignment following construction. This would enable efficient operation of the road network, including maintaining the existing route for T-way bus services, and minimising operational traffic impacts
- upgrade of Hawkesbury Road overbridge – the upgrade of Hawkesbury Road overbridge would enhance connections between north and south Westmead, support activation opportunities and interchange between transport modes. This responds to feedback from the City of Parramatta Council.

7.2.2 Station design

The indicative layout and key design elements of Westmead metro station are shown in Figure 7-1, with a long-section and cross-section shown in Figure 7-2 and Figure 7-3. The design of the metro station is subject to further detailed design development.

The key features of Westmead metro station are provided in Table 7-1.

Table 7-1 Key features - Westmead metro station

Key features	Description
Proposed station entry	Entry on Hawkesbury Road. Sydney Metro is continuing to investigate the opportunity for an additional southern station entrance.
Customers	• residents within walking and cycling distance • employees and visitors to and from the Westmead health and education precinct • university students, employees and visitors to the education precinct • customers transferring to and from other transport modes.
Primary station function	Origin, destination and interchange.
Catchment	Employment, residential, health and education.

Key features	Description
Transport interchange	• walk • cycle • suburban and intercity rail • bus • light rail (future) • point-to-point transport • kiss and ride.

Westmead metro station would consist of an underground station with an island platform in an east–west orientation.

An aerial concourse located on Hawkesbury Road would provide customers with access to the Sydney Trains and Sydney Metro platforms via an entrance along Hawkesbury Road, from the west. The entrance would be connected via an unpaid pedestrian concourse located adjacent to the existing Hawkesbury Road overbridge. Escalators and/or stairs and lifts would provide access to the Sydney Trains and Sydney Metro platforms. A paid underground concourse would be provided in a north-south orientation beneath Alexandra Avenue and the existing rail corridor, connecting the aerial concourse, Sydney Metro and Sydney Trains services via lifts and escalators. Customers transferring between the Sydney Metro network and the Sydney Trains network would do so within the paid area of the concourse.

New public domain areas would be located to the south of the existing Westmead Station. Areas for station services and utilities would be provided underground and in consolidated services buildings located above the metro station. The new concourse would also provide for Sydney Trains station facilities.

The aboveground station infrastructure (station concourse building with canopy) would be approximately two to three storeys above street level north of Alexandra Avenue, and five to six storeys above street level south of Alexandra Avenue for station services and utility buildings.

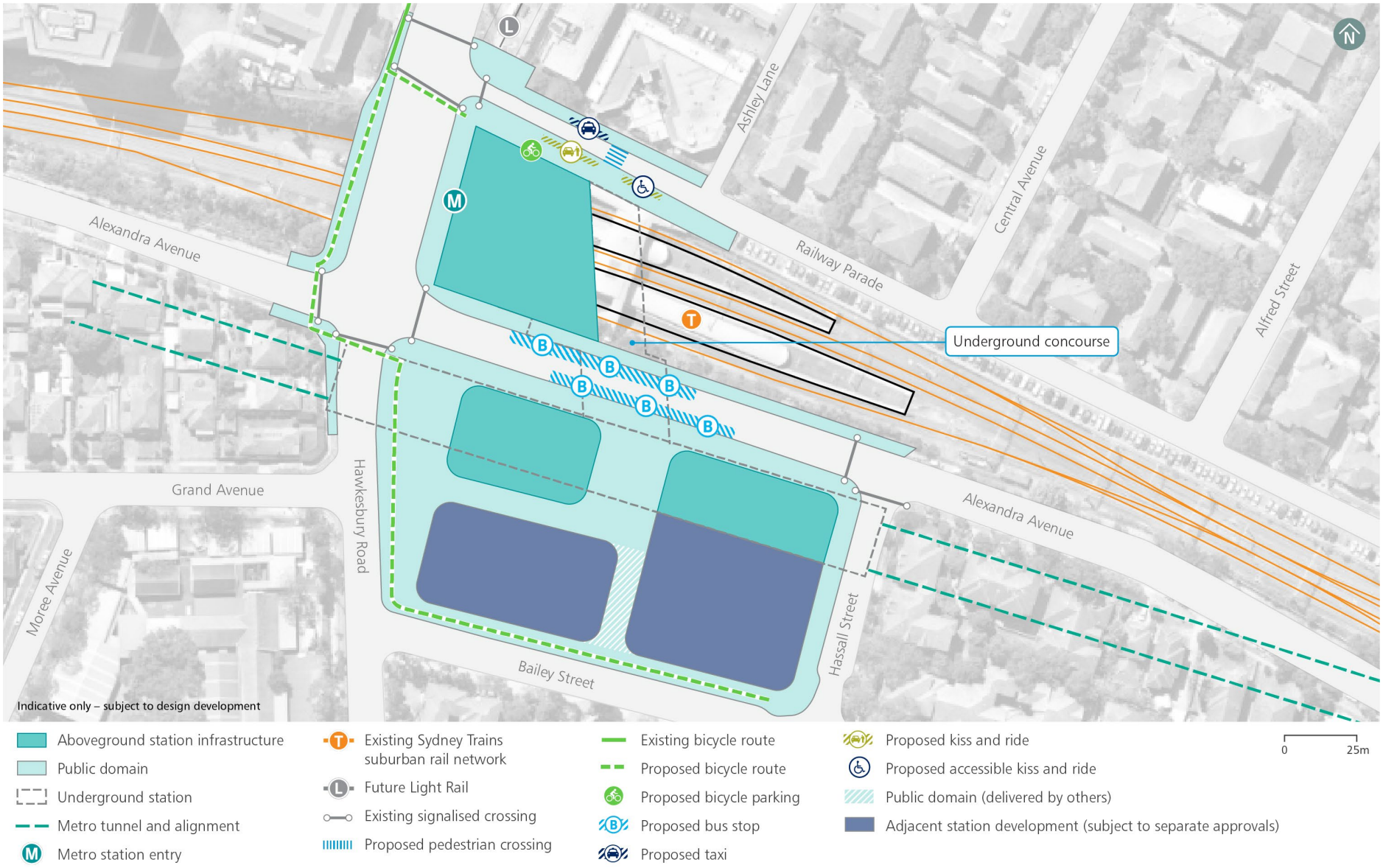

Figure 7-1 Indicative layout and key design elements – Westmead metro station

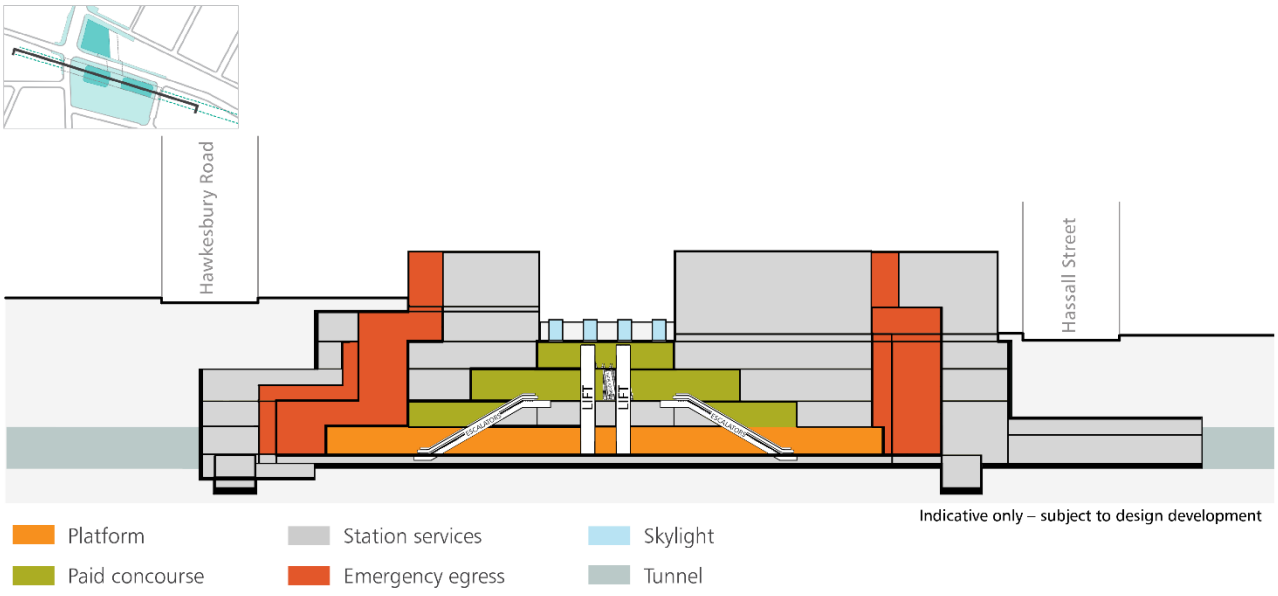

Figure 7-2 Indicative long-section – Westmead metro station

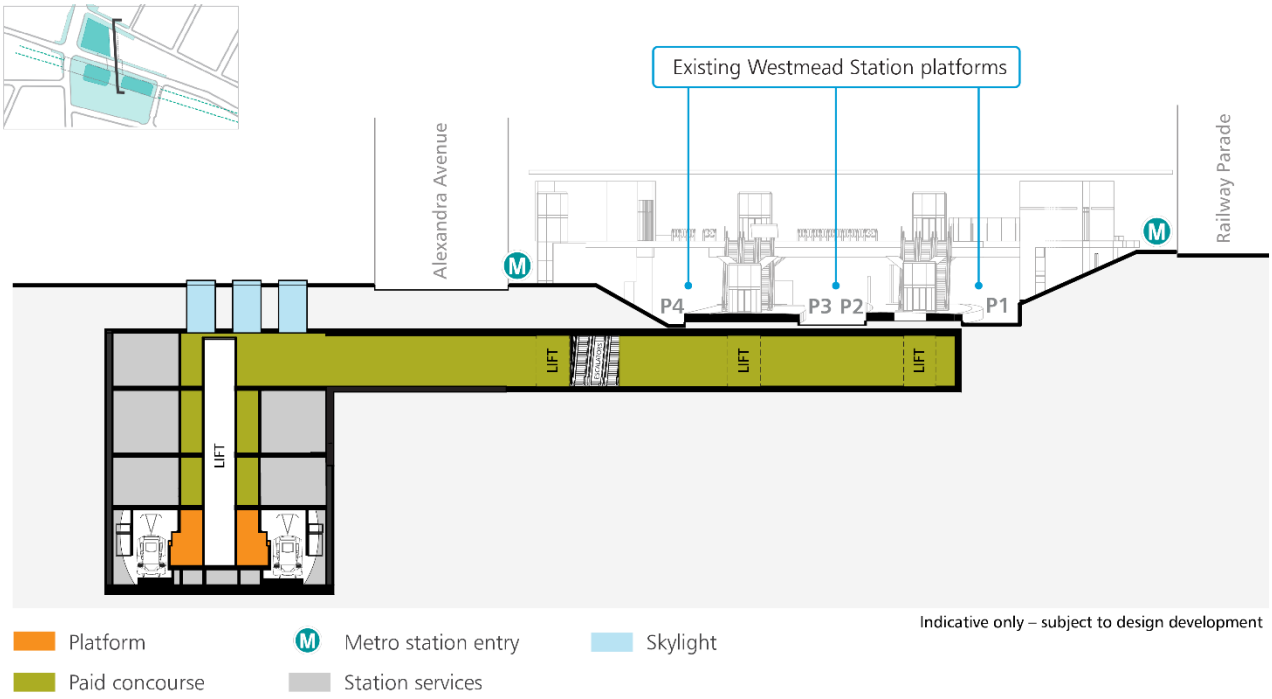

Figure 7-3 Indicative cross-section – Westmead metro station

7.2.3 Station precinct and interchange facilities

Westmead metro station would include a series of precinct and interchange elements such as:

- improvements to the existing Hawkesbury Road overbridge, to allow improved amenity and pedestrian accessibility across the rail corridor and between the existing Westmead Station, Sydney Metro station and Parramatta Light Rail stop
- bicycle parking and new bicycle path connections providing access throughout the station precinct
- consolidated Sydney Trains / Sydney Metro transfers via a new aerial concourse and a new underground concourse
- reinstatement of Alexandra Avenue between Hawkesbury Road and Hassall Street following the completion of construction
- a bus interchange and shelters located on both sides of Alexandra Avenue

- combined kiss and ride and point-to-point vehicle facilities
- upgrades to the surrounding road network, new pedestrian crossings and the creation of a new public plaza adjacent to the metro station (south of Alexandra Avenue)
- structural elements for the space for non-station uses within the aboveground station infrastructure (e.g. retail, commercial and/or community facilities). Fit-out and use of these spaces would be subject to separate approval, where required. Refer to Section 5.4.3 (Structures and spaces for non-station uses) for further detail.

Sydney Metro is continuing to investigate options for the layout and use of Alexandra Avenue between Hawkesbury Road and Hassall Street, including the potential for this section of road to be regraded and narrowed and used for bus and emergency services only. In this scenario, generally traffic would be redirected via Hassall Street, Bailey Street and/or Priddle Street which may result in additional traffic and traffic noise impacts along these roads.

7.2.4 Provisioning for adjacent station development

As shown in Figure 7-1, adjacent station development is proposed on the residual land required for construction of this proposal, to the south of the metro station.

This proposal would include and has assessed the following to support the future adjacent station development:

- a shared public domain area south of the metro station
- utility connections, where required
- subdivision.

Delivery of the adjacent station development does not form part of this proposal and would be subject to separate assessment and approval (with the exception of the provisioning elements listed above). Access to the metro station would be maintained around these spaces and may be temporarily activated to provide public spaces and local community facilities. Adjacent station development is discussed further in Section 5.4.5 (Related development) of this Environmental Impact Statement.

7.3 Placemaking

The vision for Westmead metro station and its surrounds is for:

A well connected and accessible health and education precinct, and a revitalised, high amenity living and employment centre, as an extension of Parramatta's CBD.

7.3.1 Integration with strategic planning

As identified in the *Central City District Plan* (Greater Sydney Commission, 2018c), the Westmead health and education precinct is a major attribute to Westmead, and its redevelopment has the potential to transform the precinct into a world-class innovation district. A number of plans and strategies support this plan, which have informed the development of Westmead metro station, particularly raising the awareness of Westmead health and education precinct, and these would guide future design.

This proposal has considered the objectives of *Better Placed* (Government Architect NSW, 2017) as outlined in Section 5.2 (Placemaking and design) of this Environmental Impact Statement. An overview of how this proposal meets the relevant transport and connectivity outcomes of the *Healthy Built Environment Checklist* (NSW Government, 2020a) is also provided in Appendix I (Healthy Built Environment Checklist).

Local Strategic Planning Statements

The relationship of Sydney Metro West to the *Cumberland 2030: Our Local Strategic Planning Statement* (Cumberland City Council, 2020) and the *City of Parramatta Local Strategic Planning Statement City Plan 2036* (City of Parramatta, 2020) are discussed in Section 7.10.1 of the Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD (Sydney Metro, 2020a).

The *Cumberland 2030: Our Local Strategic Planning Statement* reinforces the future role of the specialised health and education precinct at Westmead. It identifies that the land south of the existing rail corridor comprises an existing low-density residential area with potential to facilitate housing opportunities for key workers and students from the Westmead health and education precinct. It also identifies opportunities to reinforce and improve connectivity between the areas north and south of the existing rail line through the revitalisation of Hawkesbury Road.

Sydney Metro West would support the potential urban renewal of south Westmead by improving transport accessibility to and from Westmead; and would support activation and enhanced pedestrian amenity along Hawkesbury Road.

The *City of Parramatta Local Strategic Planning Statement* includes a priority to increase commercial floor space in strategic centres, including Westmead. The Statement also identifies a need to encourage growth of the night-time economy at Westmead; and to limit residential development in the Westmead health and education precinct in order to encourage commercial, entertainment, health and education development. The increase in transport amenity provided by Sydney Metro West would support these outcomes.

Westmead Draft Place Strategy

Since preparation of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a), the *Westmead 2036 Draft Place Strategy* (NSW Department of Planning, Industry and Environment, 2020a) was placed on public exhibition between December 2020 and March 2021. This document provides a framework to capitalise on opportunities created by new transport infrastructure, including Sydney Metro West and Parramatta Light Rail Stage 1, and major development to transform Westmead into a health and innovation district. Westmead Station is identified as a 'gateway site' and 'major transport interchange', including the Sydney Trains suburban rail network, T-way, Parramatta Light Rail network and the future metro station.

Westmead metro station would provide a major investment in transport infrastructure and realises the development of a new transport interchange at Westmead, improving transfer opportunities between all transport modes. A metro station at Westmead would also support the objectives, priorities and actions of the Strategy by providing an activated public plaza and creating a new activity centre, with improvements to Hawkesbury Road reinforcing connections between north and south Westmead.

7.3.2 Place and design principles

Place and design principles for Westmead metro station were identified in Section 7.10.1 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a). The principles build on the five Sydney Metro-wide design objectives and have considered relevant local council strategies and *Better Placed* design objectives (refer to Section 5.2 (Placemaking and design) of this Environmental Impact Statement). Table 7-2 outlines how these principles have been achieved in the Westmead metro station design.

Table 7-2 Design responses to Westmead metro station place and design principles

Place and design principle	Design response
Facilitate an integrated transport hub with direct interchange between Sydney Metro and Sydney Trains services, and safe, equitable and legible connections with active transport, buses and Parramatta Light Rail.	• direct and efficient transfer between Sydney Metro and Sydney Trains services via direct underground pedestrian connection, separated from other interchange movements • proposed accessible bus interchange on Alexandra Avenue • intuitive station design providing direct line of sight for transfer between Sydney Metro aerial concourse and the proposed bus interchange and Parramatta Light Rail.
Provide a gateway to the Westmead health and education precinct in recognition of its status.	• introduction of a new public plaza on Hawkesbury Road, designed as a focal point for the community • the design reinforces Hawkesbury Road's role as a major activity and mobility spine connecting north and south Westmead • widening the eastern and western sides of the existing Hawkesbury Road overbridge to create expansive shared path connections and intuitive interchange with the future Parramatta Light Rail.
Support greater activation along Hawkesbury Road connecting North and South Westmead.	• upgrades to the existing Hawkesbury Road overbridge to create expansive pedestrian zones enabling both north-south movement and transfer between buses, Sydney Trains, Sydney Metro and Parramatta Light Rail • the proposed pedestrian network would allow for good connectivity within the station precinct and would respond to all pedestrian desire lines.

Place and design principle	Design response
Support growth and renewal opportunities by enhancing connections across the existing railway line with the station as a focal point.	• new streetscape amenity with upgrades to Hawkesbury Road to support improved north south connectivity at the station interchange plaza • new public plaza that would be a focal point along the Hawkesbury Road corridor in Westmead south.
Create an inviting public place at the station with high amenity and landscaped spaces that will encourage activation.	• new public plaza to the south of Alexandra Avenue with large shade trees, and the sleeving of station services building with space for non-station uses such as retail facilities to support activation • enhanced street verge amenity to Hawkesbury Road and Alexandra Avenue • lower speed, pedestrian friendly environment on Railway Parade • station plaza canopy over the aerial concourse to provide shade and weather protection to interchange plaza.

The key urban design strategies to support the implementation of the place and design principles are illustrated in Figure 7-5, Figure 7-6 and Figure 7-7.

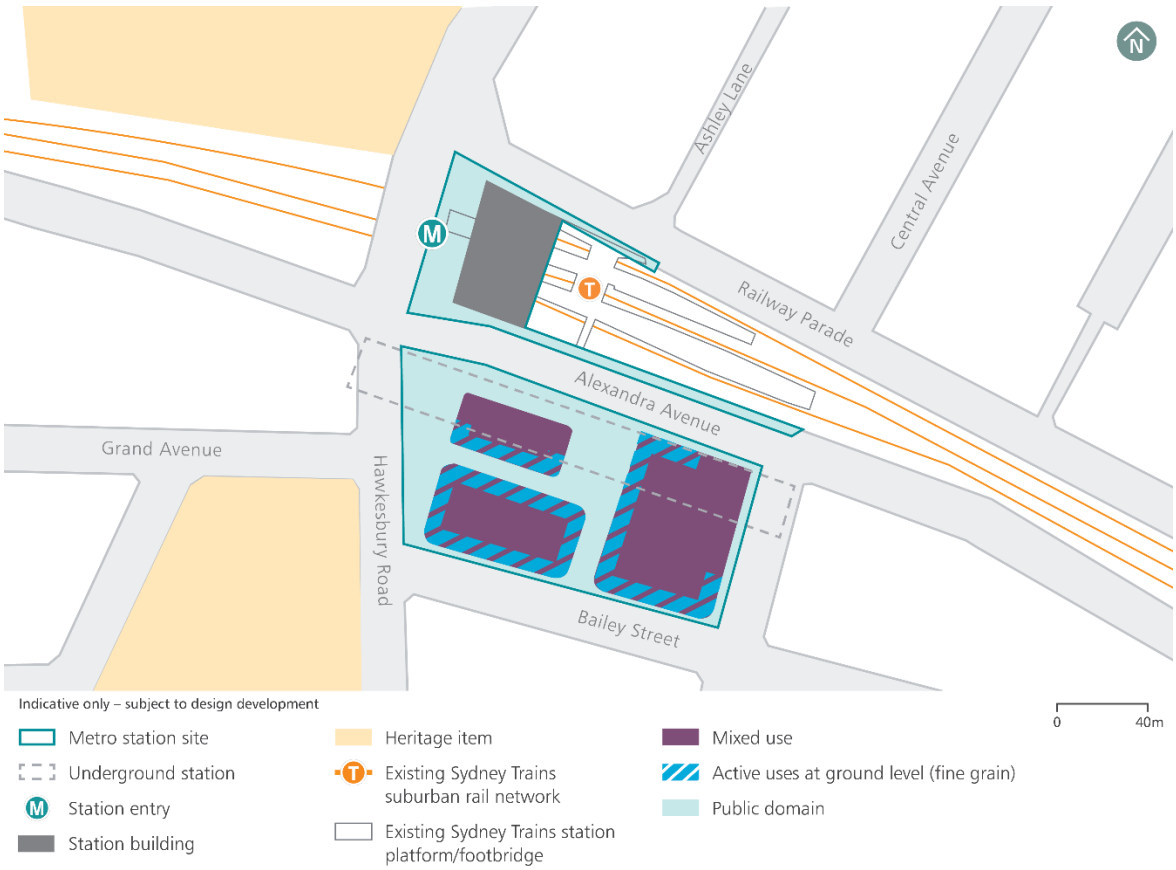

Figure 7-4 Land use and function urban design strategies – Westmead metro station

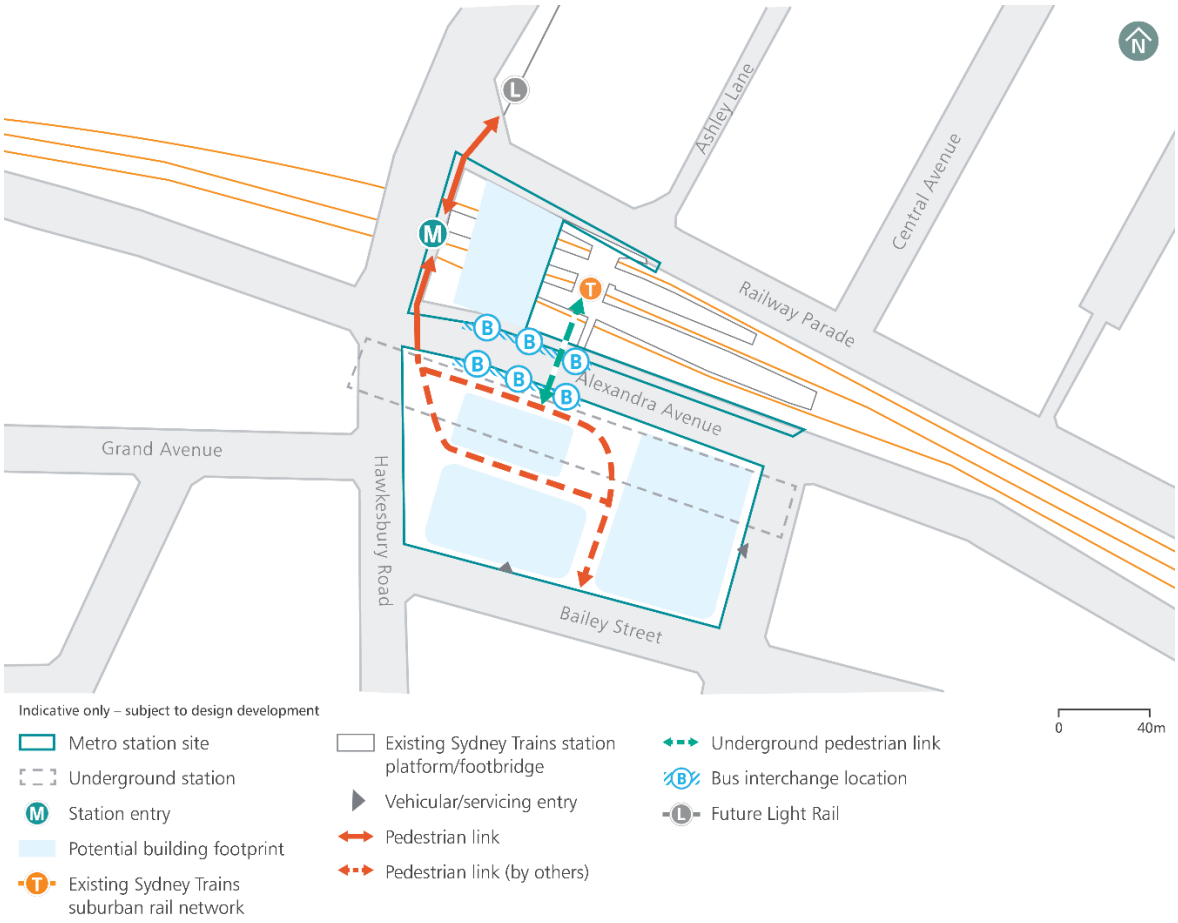

Figure 7-5 Access and connectivity urban design strategies – Westmead metro station

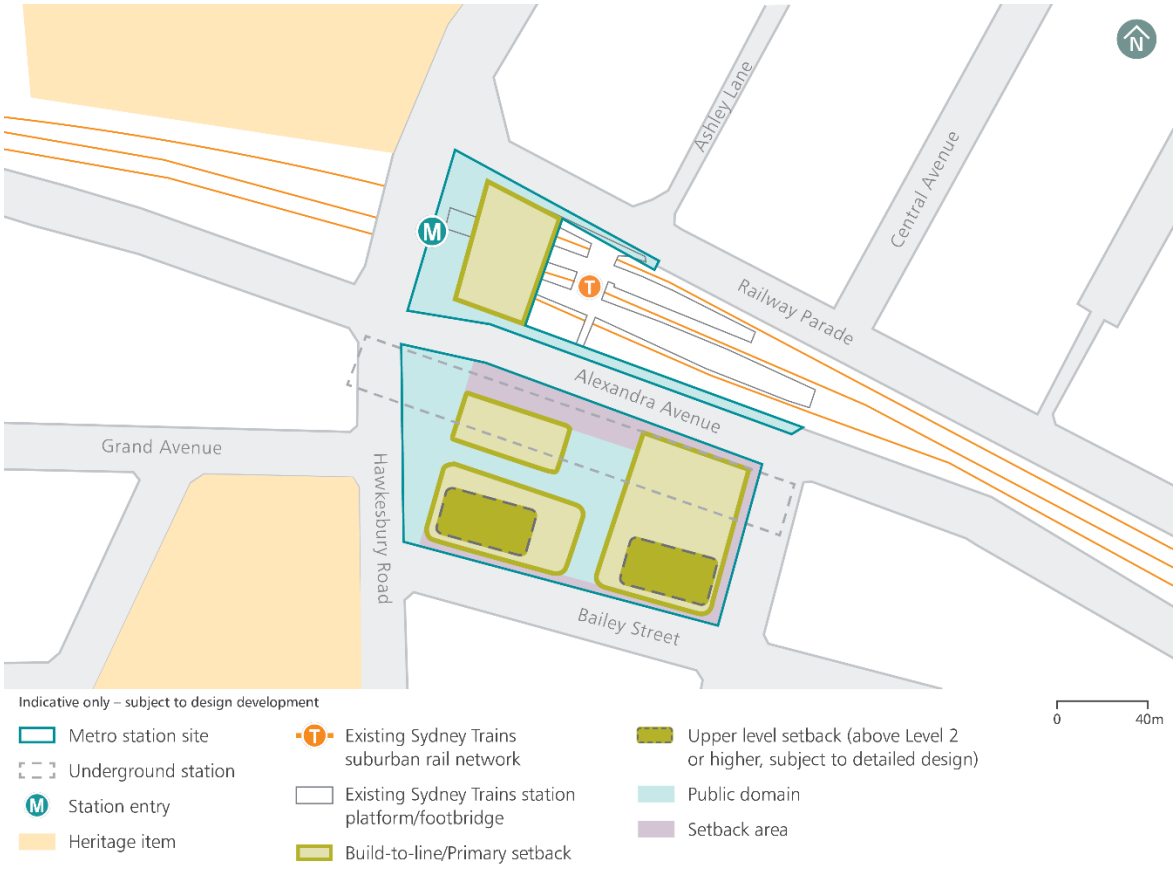

Figure 7-6 Built form urban design strategies – Westmead metro station

The Westmead metro station design includes the following key movement and place features:

- the creation of a new public plaza to the south of Alexandra Avenue, designed as a focal point for the community. The plaza would cater for large shade trees to create year-round amenity, and would support a range of informal passive recreation activities, providing the community with places to meet, rest and engage in urban life
- enhanced public domain and street improvements along Hawkesbury Road, Alexandra Avenue and Railway Parade, providing shade trees and improved amenity for pedestrians into and out of the station precinct
- a lower speed pedestrian friendly environment on Railway Parade, improving access and interchange with the Parramatta Light Rail
- an upgraded Hawkesbury Road overbridge to provide an expansive shared path environment (around seven metres wide) providing safe and easy north-south connection in front of the station concourse. When combined with retained bus and vehicle lanes, the design reinforces Hawkesbury Road's role as a major activity and mobility spine connecting north and south Westmead.

7.3.3 Transport interchange, access and connectivity

Integration with other transport modes, including active transport, is fundamental to improving access to the public spaces and local community facilities surrounding or delivered as part of the Westmead metro station design. Westmead Station is unique in that it would provide interchange between Sydney Metro, Sydney Trains, buses, and the future Parramatta Light Rail, making it an interchange hub. The delivery of a metro station at Westmead would provide a substantial improvement to regional access to the Westmead health and education precinct, either through a short walk from the metro station or through interchange with Parramatta Light Rail. This would be enhanced by improvements to the north-south connection across the existing rail line on the currently constrained Hawkesbury Road overbridge.

Examples of how the Westmead metro station design integrates with other transport modes and improves access for customers and the community include:

- an underground concourse to provide a direct customer transfer between Sydney Metro and Sydney Trains services
- an aerial station concourse above the existing T1 Western Line and existing Westmead Station (as an extension east of the existing Hawkesbury Road overbridge) to provide customer access and egress to the Sydney Metro and Sydney Trains services
- the proposed pedestrian network would allow for good connectivity within the station precinct and would respond to all pedestrian desire lines, creating safe and walkable streets that are designed for people and that provide easy access for all customers, including those with disabilities
- cycling paths (including shared paths) in the immediate vicinity of the station to enable cycle trips through the precinct and facilitate connections with the wider strategic cycle network. Bicycle parking facilities would be provided near the southern station plaza and on Railway Parade
- a new bus interchange on Alexandra Avenue to facilitate customer interchange between metro, suburban rail and light rail services, and would provide accessible paths between all modes.

For further information on transport interchange, access and connectivity features of Westmead metro station, see Section 7.5.

7.4 Construction description

This section provides a description of the construction activities required to complete Westmead metro station, and associated precinct work required for the operation of Sydney Metro West.

Major civil construction including station excavation and tunnelling work at Westmead was assessed and approved under *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a) and does not form part of this proposal.

7.4.1 Overview

Construction of Westmead metro station would require the continued use of the construction site established under the previous Sydney Metro West planning application. Additional areas are also required to support construction of this proposal. The Westmead metro station construction site would primarily be located in the block bound by the existing rail corridor, Hawkesbury Road, Bailey Street and Hassall Street.

The majority of the Westmead metro station construction site will be demolished and excavated (where required) as a result of activities associated with the work carried out under the previous Sydney Metro West planning application prior to the commencement of this proposal.

The Westmead metro station construction site for this proposal would comprise:

- the approved construction site that was established in *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a)
- additional areas within the existing rail corridor at the existing Westmead Station (bound by Railway Parade in the north and the Hawkesbury Road overbridge in the west, as well as to the west of the Hawkesbury Road overbridge) to support within-corridor construction activities. The location of these areas may vary during the construction period depending on specific activities being carried out. The construction boundary at this location includes the existing rail corridor between Bridge Road to the west and to the end of Railway Parade to the east
- additional areas within Alexandra Avenue to support construction activities.

This proposal would include some additional excavation to construct the underground concourse that will connect to the station which would require the removal of about 30,000 cubic metres of spoil.

The location and indicative layout of the Westmead metro station construction site are shown in Figure 7-7. Some activities would occur outside this construction footprint, such as delivery of construction equipment and station precinct and interchange work.

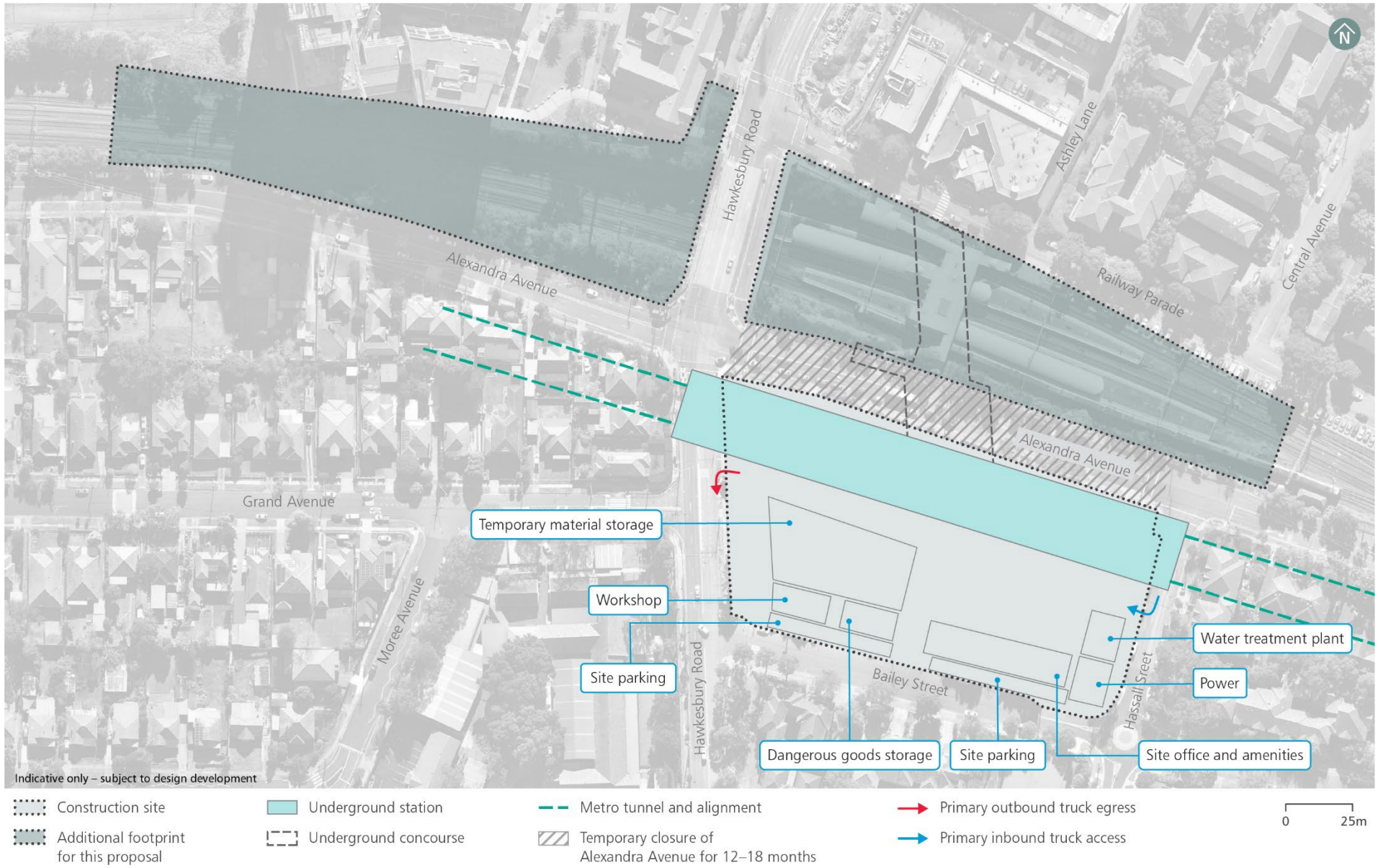

Figure 7-7 Indicative construction site layout – Westmead metro station

7.4.2 Construction work

Key construction work at the Westmead metro station construction site would include:

- enabling and site establishment work
- construction of the station and structures for non-station uses
- station fit-out
- construction of station precinct and interchange facilities, including provisioning for adjacent station development
- work within the existing rail corridor to enable integration of the proposal with the existing Sydney Trains suburban network, including:
  - construction and fit-out of a new aerial concourse above the existing rail corridor to the east of the existing Hawkesbury Road overbridge
  - upgrade work to the western side of the Hawkesbury Road overbridge
  - construction and fit-out of the new underground concourse which would connect to the existing Sydney Trains suburban network
  - demolition of the aerial concourse at the existing Westmead Station
  - track realignment in the vicinity of the existing Westmead Station
  - lengthening and widening of Platform 1 and Platform 4 of the existing Westmead Station
  - localised excavations of the existing platforms to allow for vertical transport (lifts and escalators) from the proposed underground concourse
  - adjusting the embankment (to the south of the rail tracks) within the existing rail corridor and west of the Hawkesbury Road overbridge to support track realignment
  - use of the existing rail corridor between Bridge Road in the west and Park Avenue in the east to support the above work
- finishing work, testing and commissioning.

Sydney Metro is continuing to investigate options for the layout and use of Alexandra Avenue between Hawkesbury Road and Hassall Street, including the potential for this section of road to be regraded (to provide an accessible connection from the bus stops to the station entry) and narrowed and used for bus and emergency services only.

The indicative construction program for Westmead metro station is shown in Figure 7-8.

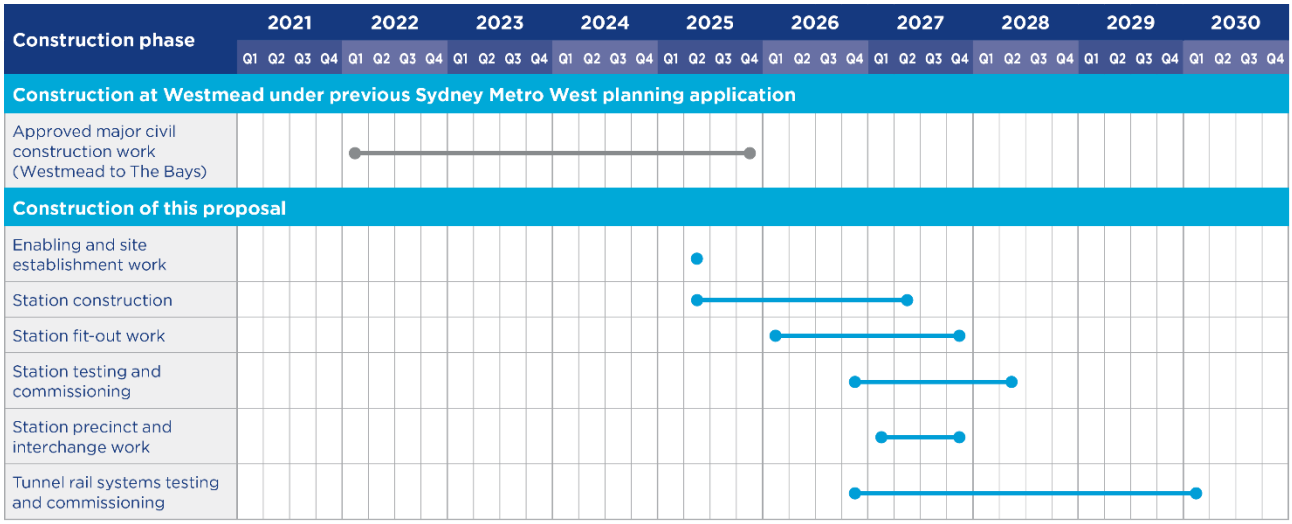

Figure 7-8 Indicative construction program – Westmead metro station

Other construction elements specific to Westmead metro station are shown in Table 7-3. Indicative construction hours, plant and equipment and workforce for Westmead metro station construction site are provided in Section 6.5 (Other construction elements) of this Environmental Impact Statement. Key elements specific to Westmead metro station as described in the table below, are also depicted on Figure 7-7.

Table 7-3 Other construction elements – Westmead metro station

Construction element	Description
Construction traffic access and egress	Continued access and egress arrangements established by the previous Sydney Metro West planning application that would likely be maintained during construction include: • access to the construction site during out of hours work via left-in from Bailey Street, with traffic control measures implemented • departure from the construction site via left-out to Hawkesbury Road.
	Additional and/or new access and egress arrangements likely to be required for construction of this proposal to minimise heavy vehicle movement travelling through school zones include: • access to the construction site during daytime construction hours via right-in from Hassall Street • potential secondary access to the construction site via left-in from Hassall Street • access to the existing rail corridor via existing and new Sydney Trains access gates on Alexandra Avenue, Railway Parade and Bridge Road.
Peak daily traffic movements	• about 320 daily heavy vehicle movements • about 360 daily light vehicle movements. Note: Movement refers to a one-way movement. A vehicle entering and then leaving a construction site represents two movements.
Transport network modifications	Continued temporary transport network modifications established by the previous Sydney Metro West planning application that would be maintained for the duration of construction of this proposal include: • removal of on-street parking spaces adjacent to the site along both Hassall Street and Bailey Street.
	Additional temporary transport network modifications that would be introduced as part of this proposal include: • temporary closure (around 12-18 months – length of closure subject to further design development) of Alexandra Avenue and temporary traffic detour via Hassall Street, Bailey Street / Priddle Street and Hawkesbury Road • during the temporary closure of Alexandra Avenue, modification of traffic signals at the Hawkesbury Road/Alexandra Avenue and Alexandra Avenue/Hassall Street intersections. This would involve: - signalisation of the Hawkesbury Road/Bailey Street intersection - removal of around four parking spaces at the Hawkesbury Road/Bailey Street intersection and about 10 parking spaces at the Hassall Street/Bailey Street intersection to accommodate signalisation - relocation of bus stops from Alexandra Avenue • temporary short-term removal of around 27 on-street parking spaces on Railway Parade (during rail possessions only) • temporary short-term removal of around 50 on-street parking spaces on Alexandra Avenue west of Hawkesbury Road (during rail possessions only).

7.5 Transport

Further details of the operational and construction transport assessment, including the approach and methodology, is provided in Technical Paper 1 (Operational transport) and Technical Paper 2 (Construction transport).

Potential impacts (including benefits) at a regional level or where impacts are common across precincts are assessed in Chapter 18 (Proposal-wide) of this Environmental Impact Statement. This includes strategic transport benefits during operation, and potential impacts in relation to road user safety, construction worker parking, emergency vehicles and road condition during construction.

7.5.1 Baseline environment

The baseline transport environment described for Westmead metro station includes the existing transport environment, as well as adjustments made by the previous Sydney Metro West planning application.

Active transport network

The pedestrian network surrounding Westmead metro station is well developed. Key pedestrian facilities include:

- footpaths along the majority of roads, including Hawkesbury Road and Alexandra Avenue
- controlled crossings on all approaches of the Hawkesbury Road / Priddle Street, Hawkesbury Road / Railway Parade and Hawkesbury Road / Darcy Road intersections; and on the majority of approaches of the Alexandra Avenue / Hassall Street and Hawkesbury Road / Alexandra Avenue intersections
- a staged pedestrian crossing at the Hawkesbury Road / Darcy Road intersection for T-way buses
- zebra crossings across Queens Road, Hawkesbury Road and Railway Parade, facilitating access to and from the existing Westmead Station
- a raised zebra crossing on Grand Avenue for access to and from Westmead Public School, as well as pedestrian refuge islands and traffic calming devices throughout the area.

There are high levels of pedestrian activity around the existing Westmead Station and the health and education precinct located to the north.

There are currently temporary alterations to the active transport network, particularly along Hawkesbury Road, including road closures, minor pedestrian detours and reduced footpath widths as a result of construction of Parramatta Light Rail Stage 1.

The cycle network surrounding Westmead metro station includes:

- on-road cycle routes along Queens Road and within Parramatta Park
- off-road shared paths on Mons Road, Darcy Road and Hawkesbury Road
- a separated on-road cycle lane on the north side of Queens Road
- a marked cycle crossing on the zebra crossing at Hawkesbury Road north of Queens Road
- bicycle racks at the existing Westmead Station north entrance on Railway Parade and the south entrance on Alexandra Avenue. Bicycle lockers are also provided on Alexandra Avenue near Hassall Street.

Public transport network

A summary of the public transport services around Westmead metro station is provided in Table 7-4.

Table 7-4 Public transport services – Westmead metro station

Mode	Description
Rail	• T1 Western Line and T5 Cumberland Line on the Sydney Trains network via the existing Westmead Station • future light rail services along Hawkesbury Road with the terminus located on the corner of Hawkesbury Road and Railway Parade as part of Parramatta Light Rail Stage 1.
Bus	• 18 bus routes including two NightRide bus routes • 22 school bus routes • as part of construction for Parramatta Light Rail Stage 1, bus stops located on Hawkesbury Road have been temporarily removed.

Parking, loading, servicing and pick-up arrangements

The parking environment around Westmead metro station includes:

- on-street parking on both sides of most local roads, generally restricted to two hours on weekdays and Saturdays
- on-street parking on the eastern side of Hawkesbury Road south of Alexandra Avenue and along the southern side of Alexandra Avenue east of Hassall Street
- unrestricted 90-degree parking along the southern side of Railway Parade
- a taxi zone on the northern side of Railway Parade between Hawkesbury Road and Ashley Lane
- a no-parking zone (excluding Australia Post vehicles) on the southern side of Railway Parade that operates as an informal kiss and ride zone.

As part of the work carried out under the previous Sydney Metro West planning application, parking spaces adjacent to the construction site along Hassall Street and Bailey Street will be temporarily removed.

Traffic volumes and patterns

Approximate peak-hour mid-block volumes on key access roads surrounding Westmead metro station are shown in Table 7-5. The key access roads carry traffic volumes generally commensurate with their function.

Table 7-5 Existing peak hour traffic volumes (mid-block) by direction – Westmead metro station (2021)

Road	Direction	AM peak hour volume (vehicles per hour)	PM peak hour volume (vehicles per hour)
Alexandra Avenue east of Hawkesbury Road	Eastbound	570	360
	Westbound	470	430
Great Western Highway west of Hawkesbury Road	Eastbound	1,280	1,080
	Westbound	1,490	2,220
Bailey Street east of Hawkesbury Road	Eastbound	50	50
	Westbound	60	170
Priddle Street east of Hawkesbury Road	Eastbound	80	30
	Westbound	120	150
Hawkesbury Road south of Alexandra Avenue	Northbound	630	360
	Southbound	420	660
Hassall Street south of Alexandra Avenue	Northbound	420	110
	Southbound	150	360

Intersection performance

Modelled intersection performance during the AM and PM peak hours for key intersections in the vicinity of Westmead metro station is shown in Table 7-6.

Modelled intersection performance indicates that the Hawkesbury Road / Great Western Highway / Coleman Street intersection currently performs at level of service E and F during the AM and PM peak hours, respectively. This is due to high traffic volumes on the majority of approaches.

All other intersections currently perform at level of service D or better.

Table 7-6 Modelled peak hour baseline intersection performance – Westmead metro station (2021)

Intersection and peak hour	Demand flow (vehicles per hour)	Average delay (seconds per vehicle)	Level of service	Maximum queue length by directional approaches (metres)	
Hawkesbury Road / Great Western Highway / Coleman Street (signalised)					
AM peak	4,034	63	E	NB	435
				EB	250
				SB	235
				WB	165
PM peak	4,162	81	F	NB	345
				EB	195
				SB	235
				WB	440
Hawkesbury Road / Amos Street (signalised)					
AM peak	1,191	13	A	NB	15
				EB	<5
				SB	<5
				WB	<5
PM peak	1,395	14	A	NB	5
				EB	<5
				SB	15
				WB	<5
Bailey Street / Hassall Street (roundabout)					
AM peak	694	10	A	NB	15
				EB	<5
				SB	<5
				WB	<5
PM peak	617	10	A	NB	5
				EB	<5
				SB	15
				WB	<5
Hawkesbury Road / Alexandra Avenue (signalised)					
AM peak	2,361	52	D	NB	195
				EB	140
				SB	100
				WB	140
PM peak	2,014	37	C	NB	90
				EB	85
				SB	100
				WB	110

Intersection and peak hour	Demand flow (vehicles per hour)	Average delay (seconds per vehicle)	Level of service	Maximum queue length by directional approaches (metres)	
Hawkesbury Road / Priddle Street (signalised)					
AM peak	1,218	14	A	NB	40
				EB	-
				SB	40
				WB	10
PM peak	1,385	19	B	NB	25
				EB	-
				SB	75
				WB	15
Alexandra Avenue / Hassall Street (signalised)					
AM peak	1,470	16	B	NB	40
				EB	45
				SB	-
				WB	65
PM peak	1,252	17	B	NB	10
				EB	25
				SB	-
				WB	90
Hawkesbury Road / Bailey Street (priority controlled)					
AM peak	1,193	20	B	NB	5
				EB	-
				SB	<5
				WB	<5
PM peak	1,266	25	B	NB	<5
				EB	-
				SB	<5
				WB	10
Hassall Street / Priddle Street (priority controlled)					
AM peak	578	6	A	NB	15
				EB	<5
				SB	<5
				WB	<5
PM peak	363	7	A	NB	<5
				EB	<5
				SB	<5
				WB	<5

Freight transport

Freight trains use the existing Main Suburban Line where they pass through the existing Westmead Station.

7.5.2 Operational impact assessment

This section outlines the transport interchange provisions proposed at Westmead metro station as shown in Figure 7-1.

The transport interchange provisions have been designed to maximise the seamless travel experience for all customer groups transferring between this proposal and other transport modes. Stations have been designed for ease of interchange from the different modes, including pedestrian and bicycle facilities, and to minimise disruptions to public transport users and the surrounding road network.

This section also discusses the potential impact of the transport interchange provisions on the transport network during operation.

Passenger demand

Station passenger demand forecast for the 2036 AM peak hour (8am to 9am) indicates about 3,000 customers accessing Westmead metro station and 3,300 customers egressing Westmead metro station, with nearly 3,000 customers transferring between Sydney Trains and Sydney Metro services during the AM peak hour. This indicates this station would be used as an origin and destination station, as well as serving a substantial interchange function.

The 2036 modal breakdown of forecast access and egress during the AM peak hour is presented in Table 7-7.

The key observations from this analysis indicate that the majority of access and egress trips are forecast to be by walking; however, bus transfers would also be substantial. Egress direction is heavily weighted towards the health and education precinct to the north, whereas access direction is more evenly distributed from all directions.

Table 7-7 2036 forecast mode of access and egress – Westmead metro station

Mode	Walk	Cycle	Bus	Kiss and ride	Light rail	Park and ride
Access	45%	1%	37%	6%	6%	6%
Egress	89%	0%	9%	0%	2%	0%

Integration with other transport modes

A description of how Westmead metro station would integrate with existing transport modes during operation is provided in Table 7-8. Appropriate signage and wayfinding would be provided within the precinct to provide easy customer transfer and access to the station and surrounds.

Table 7-8 Network integration – Westmead metro station

Network	Description
Pedestrian network	A consolidated station entry from the new aerial concourse on Hawkesbury Road would be provided to Westmead metro station. Sydney Metro is continuing to investigate the potential for additional station entrances. The existing and proposed pedestrian network around Westmead metro station would allow for good connectivity and would create safe, walkable streets, designed for people. New pedestrian facilities surrounding the station would include: • an underground concourse beneath Alexandra Avenue and the existing rail corridor, connecting the aerial concourse, Sydney Metro and Sydney Trains services via lifts and escalators • additional public space to the east of Hawkesbury Road overbridge, which would provide a generous pedestrian access connection between the north and south of the bridge as well as access to the station • an upgrade on the western side of Hawkesbury Road overbridge • footpath widening or upgrades in the following locations: - southern side of Railway Parade - both sides of Alexandra Avenue between Hassall Street and Hawkesbury Road - footpaths in the block bound by Hawkesbury Road, Alexandra Avenue, Bailey Street and Hassall Street

Network	Description
	• widening of all crossings at the Hawkesbury Road / Alexandra Avenue intersection • relocation and widening of all crossings at Hawkesbury Road / Railway Parade intersection • appropriate modifications to Railway Parade, between Hawkesbury Road and Ashley Lane, to provide a low-speed environment that prioritises pedestrian movements across both sides of the street, and to facilitate the connection between Parramatta Light Rail and Westmead metro station • a new public space / station plaza south of the station accessible to all. 2036 pedestrian modelling indicates that surrounding footpaths in the area would continue to operate satisfactorily at a level of service A in both the AM and PM peak periods.
Cycle network	New cycling facilities to be provided would include: • an active transport link on the western side of Hawkesbury Road overbridge. This would connect with the existing shared path on the western side of Hawkesbury Road to the north and through to the existing cycle network on Darcy Road and Queens Road • a dedicated cycle path on the eastern wide of Hawkesbury Road between Alexandra Avenue and Bailey Street, and on the northern side of Bailey Street between Hawkesbury Road and Hassall Street • bicycle parking facilities near the station entry.
Public transport network	Public transport integration at Westmead metro station would include: • a new bus interchange on Alexandra Avenue • direct interchange between Sydney Trains and Sydney Metro services via the new underground concourse • customers would be able to transfer between bus, light rail and Sydney Metro, using widened footpaths and new plazas along Hawkesbury Road, and the pedestrian prioritised low-speed environment on Railway Parade.
Road network	A number of changes are anticipated to be made to the surrounding road network as a result of Parramatta Light Rail Stage 1. The functionality of the road network at Westmead would remain largely unchanged, apart from: • a low speed environment on Railway Parade that prioritises pedestrian movements across both sides of the street and links Parramatta Light Rail and Westmead metro station • removal of the right turn movement out of Railway Parade at the intersection with Hawkesbury Road. Sydney Metro is continuing to investigate options for the layout of Alexandra Avenue between Hawkesbury Road and Hassall Street, including the potential for this section of road to be narrowed and used for bus and emergency services only. In this scenario, generally traffic would be redirected via Hassall Street, Bailey Street and/or Priddle Street which may result in additional traffic and traffic noise impacts along these roads. This may also include localised regrading of Alexandra Avenue to provide an accessible pathway between the bus stops and the station entry. Based on the low volumes of customers expected to access the station by car, these trips would not impact road network and intersection performance. Kiss and ride (including accessible spaces) and point-to-point zones would be provided for these customers on Railway Parade. No park-and-ride provisions are proposed and therefore these users would need to utilise the existing parking facilities available. Parking strategies to address potential parking impacts in residential streets in the vicinity of the station would be developed in consultation with Cumberland and City of Parramatta Councils.

Road network performance

Intersection performance results for the ‘2036 without proposal’ and ‘2036 with proposal’ scenarios during the AM and PM peak hours for key intersections in the vicinity of Westmead metro station are shown in Figure 7-9.

A number of intersections across the local network are expected to perform at level of service F in the AM peak without the proposed station and are forecast to decline further with the proposed station in both AM and PM peaks. This is most apparent at the intersection of Hawkesbury Road / Alexandra Avenue, reaching level of service F and more than 300 seconds of average delay during the AM peak. Increased delays are caused by the forecast increase in pedestrian volumes crossing the intersection to reach the station and the slightly higher growth factor applied to the 'with Sydney Metro West' scenario. To improve this intersection performance, Sydney Metro is continuing to investigate options for the layout of Alexandra Avenue between Hawkesbury Road and Hassall Street, including the potential for this section of road to be narrowed and used for bus and emergency services only.

Other intersections where performance reaches level of service F include the intersections of Alexandra Avenue / Hassall Street in the AM peak both with and without this proposal.

Figure 7-9 Westmead metro station operational intersection performance (2036)

Parking and property access

Around four parking spaces would be removed as part of this proposal on Railway Parade to accommodate the new kiss and ride bays and point-to-point zones.

Access to all properties would be maintained.

Freight transport

Operation of Westmead metro station would not impact on rail freight operations on the existing Main Suburban Line.

7.5.3 Construction impact assessment

Construction haul routes

The primary construction haul routes for Westmead metro station are shown in Figure 7-10. The primary inbound haul route has been changed from the previous Sydney Metro West planning application as a result on ongoing consultation with Schools Infrastructure and other parts of Transport for NSW. The proposed inbound route via Pitt Street and Park Parade would reduce passing heavy vehicle movements and associated potential traffic safety and traffic noise impacts to Westmead Public School.

Construction site access and egress locations, as well as the number of daily traffic movements anticipated at Westmead metro station construction site, are outlined in Technical Paper 2 (Construction transport). Occasional access and egress would also be required to existing and new rail corridor access gates. This would include existing access gates on Alexandra Avenue (near Hassall Street) and from Bridge Road, and new access gates from Railway Parade and Alexandra Avenue (west of Hawkesbury Road). These access gates would be used infrequently, associated with works during rail possessions.

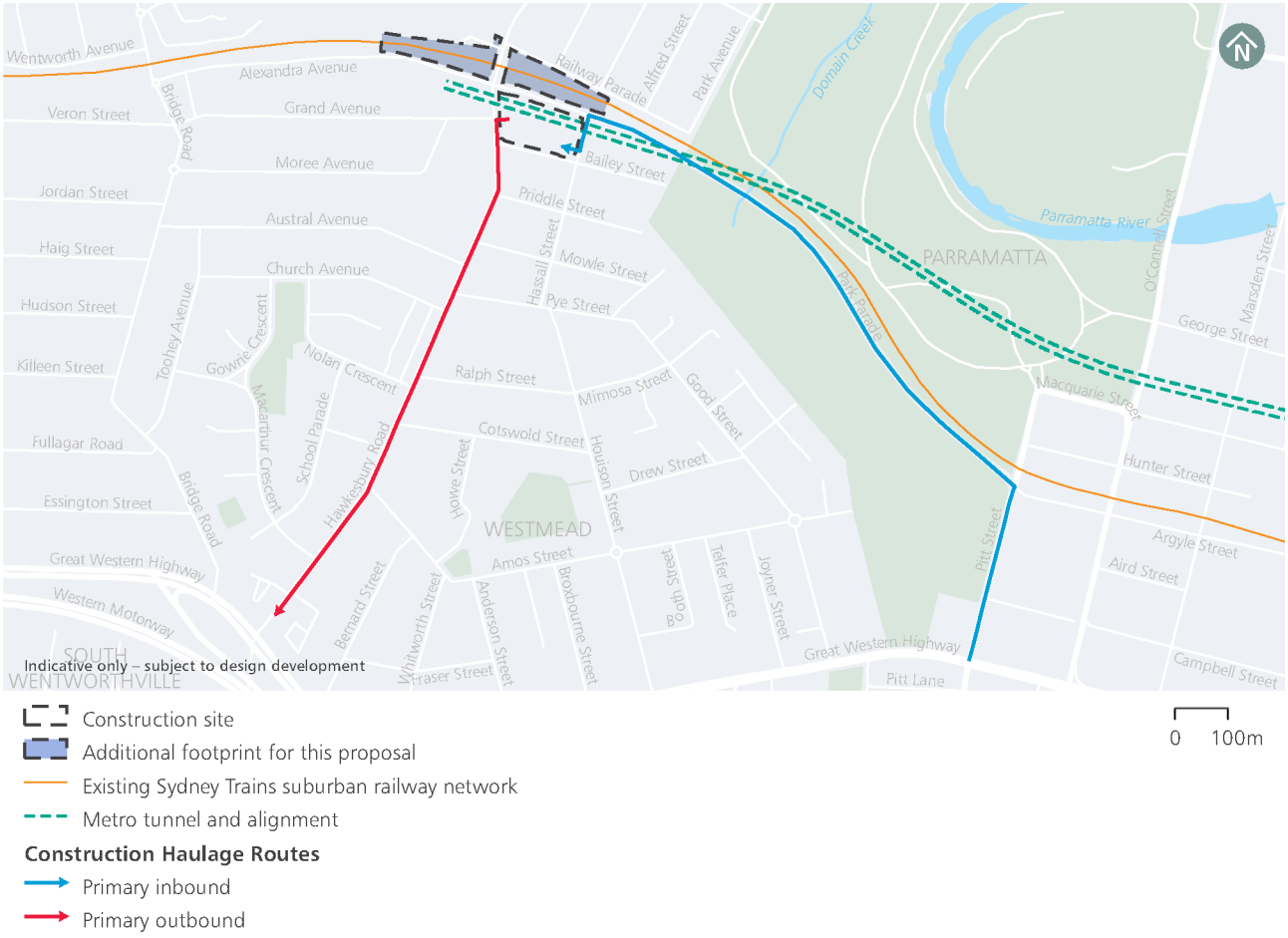

Figure 7-10 Primary construction haul routes – Westmead metro station

Active transport network

For the majority of construction for this proposal, there would be no changes to the existing pedestrian and cycle network and facilities.

To carry out the excavation of the underground concourse connecting from the metro station beneath the existing station platforms, Alexandra Avenue would be closed for a period of around 12 to 18 months. During the temporary closure of Alexandra Avenue, pedestrian access to the existing Westmead Station from the south, and connectivity between Hawkesbury Road and Hassall Street, would be maintained, although some short-term adjustments (for around a few months) may be required.

Construction for new bus stops, the new low-speed zone and other new kerbside uses may require short-term closures of sections of footpaths (for around a few months), which may result in some minor additional travel times for pedestrians. Appropriate diversions would be established to safely guide pedestrians around work zones.

Hawkesbury Road is designated as an on-road cycle route and would be used by construction vehicles travelling from the Westmead metro station construction site. Impacts on cyclists on this road would be minor given that cyclists would be interacting with a low number of additional heavy vehicles. Mitigation measures outlined in the CTMF would manage this impact during construction.

Public transport network

For the majority of construction for this proposal, there would be no changes to the operation of bus routes or bus stops near the construction site.

During the temporary closure of Alexandra Avenue:

- buses that currently travel along Alexandra Avenue east of Hawkesbury Road would be temporarily redirected via Hassall Street, Bailey Street or Priddle Street, and Hawkesbury Road, resulting in a minor increase in additional travel distance of around 150 metres
- the bus stops located on this section of Alexandra Avenue would be temporarily relocated to east of Hassall Street or onto Hassall Street, resulting in a minor increased travel distance for bus customers of around an additional 200 metres. The location of the relocated bus stops would be determined in consultation with Transport for NSW, Cumberland City Council and relevant bus operators.

Roads forming part of the construction haul route that are also used by buses include the Great Western Highway, Hawkesbury Road and Hassall Street. Impacts on these buses would be limited to a potential minor increase in travel time due to the additional construction vehicles on the road network.

Three light rail stops will be provided along Hawkesbury Road as part of Parramatta Light Rail Stage 1 and service the existing Westmead Station, Westmead Hospital and the Children's Hospital at Westmead. Construction vehicles are generally not proposed to (but on occasion may be required to) travel on Hawkesbury Road north of Alexandra Avenue and therefore no impacts on the light rail network are anticipated.

Works would be required within the rail corridor at and around the existing Westmead Station and would primarily be carried out during scheduled Sydney Trains rail possessions. Rail replacement bus services would be provided during these possessions. In addition, there may be a need for works to be carried out outside of scheduled Sydney Trains rail possessions. Sydney Trains would be consulted with during detailed construction planning of the proposal, with works coordinated with scheduled Sydney Trains rail possessions where possible, to minimise impacts on the operation of the rail network, and to provide advanced notification to customers of the proposed works and information on alternative travel options.

Parking and property access

In addition to the continued removal of parking spaces removed as part of the work carried out under the previous Sydney Metro West planning application, construction of this proposal would require:

- the short-term periodic removal of about 27 spaces on Railway Parade during rail possessions only
- the short-term periodic removal of about 50 spaces on Alexandra Avenue (west of Hawkesbury Road) during rail possessions only
- the removal of about four on-street parking spaces near the Hawkesbury Road / Bailey Street intersection and about 10 spaces near the Hassall Street / Bailey Street intersection to allow for the temporary detour during the temporary closure of Alexandra Avenue
- the short-term closure (for around a few months) of some on-street parking spaces on Railway Parade to create the low-speed zone.

The combined removal of on-street parking spaces would continue to have minor impacts, given the availability of parking on other local roads nearby. The additional parking loss associated with construction of this proposal would be minor, considering it would occur periodically during rail possession works and during the temporary closure of Alexandra Avenue.

Where existing parking is removed to facilitate construction activities, a parking management plan would be developed in accordance with the requirements of the CTMF. This would include consultation with Cumberland Council to investigate opportunities to provide alternative parking facilities.

No property impacts are anticipated during construction of this proposal at Westmead.

Road network performance

Intersection performance results were modelled for the three following scenarios, as shown in Figure 7-11:

- '2026 without proposal' (without construction vehicles and Alexandra Avenue open)
- '2026 with proposal' (with construction vehicles and Alexandra Avenue open)
- '2026 with proposal' (with construction vehicles and Alexandra Avenue closed).

During the AM peak hour (7.45am to 8.45am) and PM peak hour (4.45pm to 5.45pm), it is anticipated that the Westmead metro station construction site would generate a total of 58 light vehicle movements and 38 heavy vehicle movements during the peak construction activity.

These vehicle movement forecasts were assumed for the intersection performance modelling. Peak hours were selected to represent the times when background traffic demand is at its greatest.

For the majority of the construction period when Alexandra Avenue is open, modelled intersection performance during construction indicates the following intersections would experience a deterioration in level of service:

- Hawkesbury Road / Amos Street during the AM peak hour from level of service A to B. The intersection would still operate with spare capacity with the addition of construction traffic
- Hawkesbury Road / Priddle Street during the PM peak hour from level of service D to F. This is due to the additional construction vehicles travelling on Hawkesbury Road in the southbound direction, resulting in a redistribution of green traffic signal times and increased average delays on the Hawkesbury Road north approach
- Hawkesbury Road / Bailey Street during the PM peak hour from level of service D to F. This is due to additional construction vehicles traveling on Hawkesbury Road in the southbound direction, in conjunction with the intersection being unsignalised where the worst movement is reported (vehicles turning right out of Bailey Street onto Hawkesbury Road). The increase in traffic on Hawkesbury Road in the southbound direction would result in fewer gaps for vehicles to turn right out of Bailey Street.

For the period when Alexandra Avenue is closed between Hassall Street and Hawkesbury Road, traffic would be predicted via Hassall Street, Bailey Street / Priddle Street and Hawkesbury Road. This traffic diversion would result in an additional travel distance of around 150 metres. Modelled intersection performance during this construction period indicates the following intersections would experience a deterioration in level of service:

- Hawkesbury Road / Amos Street during the AM peak hour from level of service A to B. The intersection would still operate with spare capacity with the addition of construction traffic
- Bailey Street / Hassall Street during the AM and PM peak hours from level of service A to F and A to C, respectively. This is due to the substantial increase in traffic as a result of the detour route, in conjunction with the introduction of traffic signals, the presence of parking lanes and limited storage space for vehicles turning right on all approaches
- Hawkesbury Road / Priddle Street during the AM peak hour from level of service B to F. This is due to the substantial increase in traffic as a result of the detour route, particularly on the Priddle Street approach and Hawkesbury Road north approach, resulting in increased average delays and queues
- Hawkesbury Road / Bailey Street during the AM and PM peak hours from level of service C to F and D to F, respectively. Similar to the Hawkesbury Road / Priddle Street intersection, this is due to the substantial increase in traffic as a result of the detour route, particularly on the Bailey Street approach and Hawkesbury Road north approach, resulting in increased average delays and queues
- Hawkesbury Road / Priddle Street during the PM peak hour from level of service A to B. The intersection would still operate with spare capacity with the addition of construction traffic.

Sydney Metro is continuing to work with other parts of Transport for NSW and other relevant stakeholders to identify and implement measures to improve network performance during the temporary closure of Alexandra Avenue.

In some locations, the analysis shows that there would be in an improvement in intersection performance, such as at Hawkesbury Road / Alexandra Avenue in the PM peak hour and Alexandra Avenue / Hassall Street in both the AM and PM peak hours. The improvement in performance at these intersections is due to fewer conflicting movements, as these intersections would be modified with the removal of one or two approaches to accommodate the temporary closure of Alexandra Avenue.

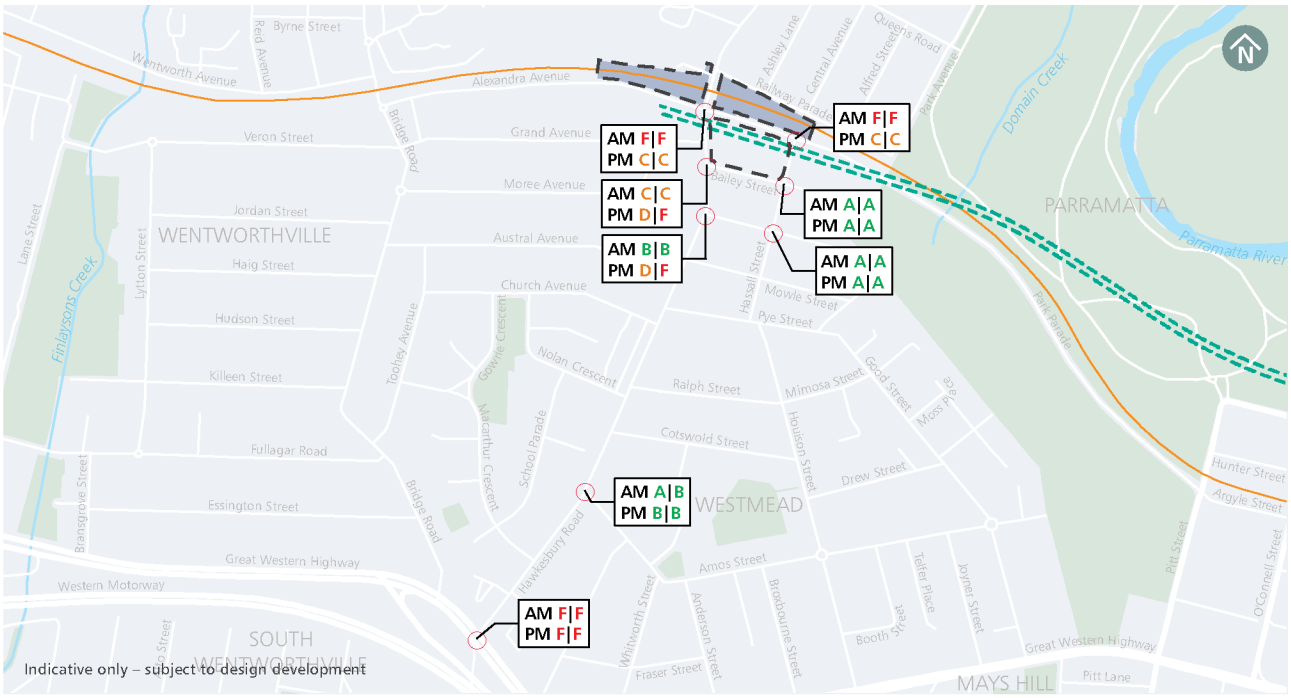

Figure 7-11 Intersection performance – Westmead metro station construction site Alexandra Avenue open (2026)

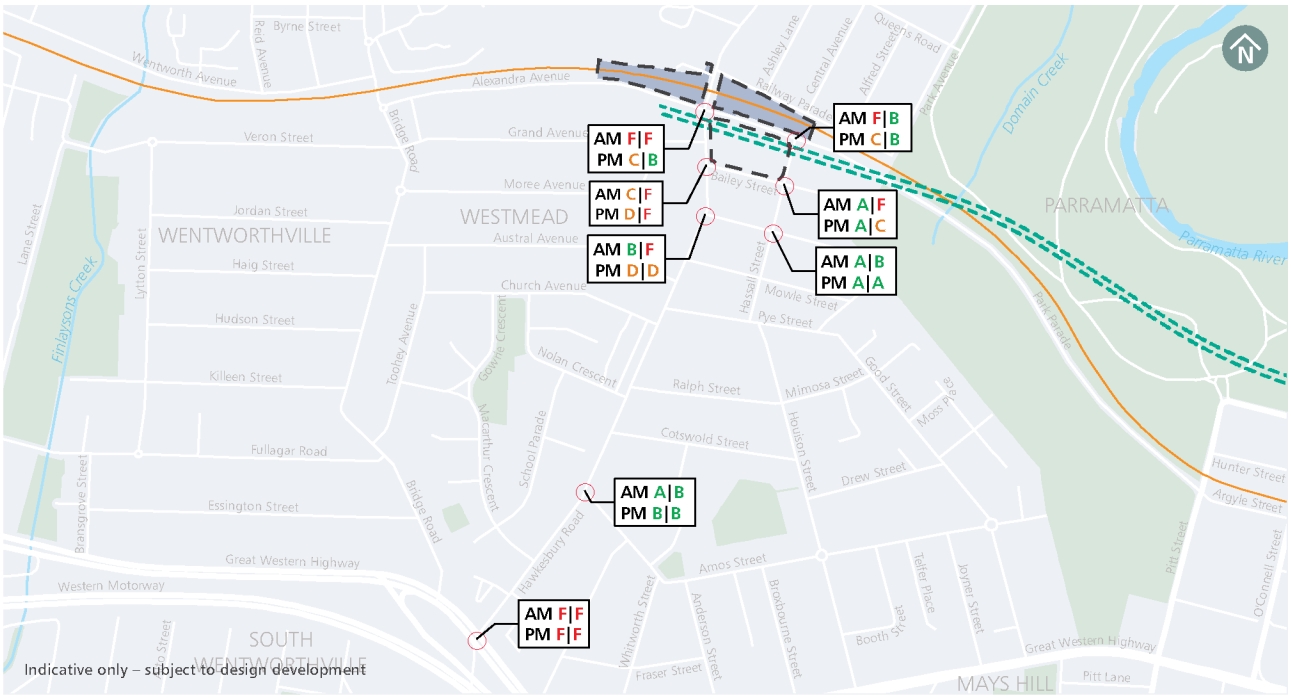

Figure 7-12 Intersection performance – Westmead metro station construction site Alexandra Avenue closed (2026)

Emergency vehicles

For the majority of construction of this proposal, there would be no changes to emergency vehicle access to the Westmead health precinct.

Emergency response services, in particular those travelling to and from the Westmead health precinct, would potentially be impacted by the temporary 12 to 18 month closure of Alexandra Avenue. Emergency vehicles that currently use Alexandra Avenue to travel between the Westmead health precinct and Parramatta CBD would be diverted onto Bailey Street or Priddle Street, and Hassall Street. The Ambulance Service of NSW would be consulted about the proposed road network changes during construction, and mitigation strategies would be detailed in the Construction Traffic Management Plan for the site. The potential for ambulance services to travel through the site in specific circumstances would be further investigated as this proposal progresses.

Freight transport

Possession of the freight line at Westmead may also be required during construction. Australian Rail Track Corporation and Sydney Trains would be consulted prior to any possession works, with works coordinated to minimise impacts to the operation of the freight rail network.

7.5.4 Management and mitigation measures

Environmental management for this proposal would be undertaken through the environmental management approach as detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. This includes operational mitigation measures (where relevant) and performance outcomes for the operation and construction of this proposal.

The approach to transport and traffic management during the construction phase, including the process for the development of all construction traffic management plans is outlined in the CTMF (Appendix G (Construction Traffic Management Framework)).

The CTMF provides the overall strategy and approach for construction traffic management for Sydney Metro West, and an outline of the traffic management requirements, mitigation measures and processes that would be common to each of the proposed construction sites. It establishes the traffic management processes and acceptable criteria to be considered and followed in managing roads and footpaths adjacent to construction sites.

Mitigation measures that are specific to the operation and construction of Westmead metro station are listed in Table 7-9.

Table 7-9 Transport mitigation measures – Westmead metro station

Ref	Impact/issue	Mitigation measure	Timing
Transport			
EIS-TT4	Traffic congestion	Measures to manage congestion issues in the area and improve bus service reliability along the T-way would be investigated including the potential for Alexandra Avenue, between Hawkesbury Road and Hassall Street, to be restricted to buses, taxis and emergency vehicles only.	Operation
EIS-TT14	Impacts to rail services	Where works are required within the rail corridor, Sydney Trains and Australian Rail Track Corporation would be consulted to minimise potential disruptions to rail services. Works would be carried out during scheduled Sydney Trains rail possessions where possible, and customers would receive advanced notification of proposed works and information on alternative travel options.	Construction
EIS-TT15	Bus movement impacts	Opportunities to improve bus priority along the temporary detour route at Westmead metro station construction site would be investigated during detailed design.	Construction
EIS-TT16	Pedestrian and cyclist access at Alexandra Avenue	Pedestrian and cyclist access would be maintained during the temporary closure of Alexandra Avenue. Wayfinding and customer information would be provided to guide pedestrians and cyclists to alternative routes.	Construction

Ref	Impact/issue	Mitigation measure	Timing
EIS-TT17	Temporary traffic arrangements at Alexandra Avenue	The design of the temporary traffic arrangements at the Westmead metro station construction site during closure of Alexandra Avenue would consider construction traffic, alternate bus routes and bus stops, local vehicular traffic and pedestrian safety. The design of the temporary traffic arrangements would be undertaken in consultation with Transport for NSW, Schools Infrastructure, Health Infrastructure, relevant local councils and bus operators.	Construction

7.6 Noise and vibration

Further details on the operational and construction noise and vibration assessment, including the approach and methodology, are provided in Technical Paper 3 (Operational noise and vibration) and Technical Paper 4 (Construction noise and vibration).

7.6.1 Baseline environment

Existing noise levels around Westmead metro station are controlled by traffic noise from the surrounding road network, rail movements along the existing rail line and general background noise in an urban location. The area surrounding Westmead metro station is mainly residential, generally comprising two- to four-storey apartment buildings. The Westmead health and education precinct is located to the north of the site and educational facilities are also located relatively close by.

This precinct has been divided into two noise catchment areas (NCAs) for the construction noise assessment – NCA01 and NCA02. The site and NCAs are shown in Figure 7-13.

Figure 7-13 Location of sensitive receivers near Westmead metro station and NCAs

Unattended noise monitoring was carried out at sensitive receiver locations near Westmead metro station between March and July 2019 as part of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a). This data represents the noise environment prior to the commencement of the work carried out under the previous Sydney Metro West planning application and was used to inform this assessment.

The results of the unattended noise monitoring are summarised in Table 7-10 and indicate that background noise levels generally reflect the residential nature of the area.

Short-term attended noise monitoring was also carried out at Westmead metro station between March and July 2019. The results were generally found to be consistent with the unattended noise monitoring. Detailed observations from the attended monitoring are provided in Technical Paper 4 (Construction noise and vibration).

Table 7-10 Summary of unattended noise monitoring – Westmead metro station

Location ID	Noise logger location	Noise level (dBA)[1,2]					
		Background noise (RBL)			Average noise level (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
B.01	8-12 Alexandra Avenue, Westmead	49	47	37	67	67	62
B.02	14A Central Avenue, Westmead	48	46	41	58	53	51

Notes:

1. The RBL and L_{Aeq} noise levels have been determined with reference to the procedures in the Noise Policy for Industry (NSW Environment Protection Authority, 2017)
2. Daytime is 7am to 6pm, evening is 6pm to 10pm, and night-time is 10pm to 7am

7.6.2 Operational impact assessment

The operational noise associated with Westmead metro station has been assessed for the nearest and most noise-affected residential sensitive receivers for each source type, as presented in Table 7-11.

The results indicate that the predicted noise levels would be compliant with the applicable noise criteria. Noise attenuation has been incorporated into the design to determine the predicted noise levels and includes consideration of the use of large fan attenuators, vent orientation, acoustic louvres and appropriate plant selection. These measures would be further developed throughout the detailed design phase so that compliance with the environmental noise criteria is achieved.

At Westmead metro station the sleep disturbance noise criteria is L_{AFmax} 52 dB(A). At Hassall Street the draught relief shaft could exceed this noise criteria by up to 8 dB(A). This location is directly adjacent to an existing rail network which, has a noise criteria of L_{AFmax} 85 dB(A). Sensitive receivers are currently exposed to high L_{AFmax} noise levels from the existing railway, and it is considered unreasonable to design the draught relief shaft to a noise criteria over 30 dB higher than the noise criteria for the above ground rail line. The draught relief shaft noise criteria of 65 dB(A) is considered appropriate for Westmead metro station.

In the event that the option to restrict Alexandra Avenue between Hawkesbury Avenue and Hassall Street to buses, taxis and emergency vehicles is progressed, a detailed traffic noise assessment would be required to determine the traffic noise impacts. This option would change the functional class of the road which would reduce the applicable noise criteria and may therefore require some form of noise attenuation. The nature of this noise mitigation would be dependent on the location of the impacted sensitive receivers, and the magnitude of the impacts.

There would be no sources of vibration as part of operation of the station that would impact nearby receivers. Potential operational vibration impacts from trains operating in the tunnels are addressed in Chapter 16 (Tunnels) of this Environmental Impact Statement.

Table 7-11 Operational noise levels – Westmead metro station

Period / source	Criteria[1], dB(A)	Predicted noise level ($L_{Aeq,15min}$)
Railway Parade – residential		
Daytime	54	43
Evening	48	43
Night-time	42	41
Emergency mode	47	42
Draught relief noise impacts	65 L_{Amax}	50
Hassall Street – residential		
Daytime	54	45
Evening	48	45
Night-time	42	41
Emergency mode	47	48
Draught relief noise impacts	65 L_{Amax}	58
Bailey Street – residential		
Daytime	54	42
Evening	48	42
Night-time	42	38
Emergency mode	47	43
Draught relief noise impacts	65 L_{Amax}	52
Hawkesbury Road – residential		
Daytime	54	45
Evening	48 (52[2])	45
Night-time	42	41
Emergency mode	47	47
Draught relief noise impacts	65 L_{Amax}	56

Notes:

1. Criteria differs between operational noise source type (refer Technical Paper 3 (Operational noise and vibration))

7.6.3 Construction impact assessment

The construction scenarios and anticipated working hours at the Westmead metro station construction site are shown in Table 7-12.

The estimated duration of each activity is also provided, noting that most activities would be intermittent and would not occur on a continual basis during every day of the activity.

The proposed work is anticipated to have a total duration of about four years. Refer to Figure 7-8 for the indicative construction program at Westmead metro station.

The majority of piling, aboveground rail, brownfield work (work within the existing rail corridor) and excavation would be completed during about 16 individual short-term rail possessions. Work would also likely occur during five-day shutdowns between 26-30 December in 2024, 2025 and 2026. Station / facility construction – internal construction and fit-out would also occur during the night-time, however, the majority of this work would occur inside the built station structure and does not require noise intensive equipment. Mined tunnel work would also be completed on a 24 hours per day, seven days per week basis.

Temporary construction noise and vibration impacts would be managed through the implementation of standard and additional mitigation measures in accordance with the Sydney Metro CNVS.

Table 7-12 Construction activities and working hours - Westmead metro station

Scenario	Activity		Indicative duration (months)	Hours of work[1]			
				Std. day	Out of hours works		
					Day OOH	Evening	Night
Station construction							
Site establishment and public domain work	Typical	Deliveries and general work	15	✓	✓	-	-
	Peak	Construction / decommissioning of facilities and hoarding		✓	✓	-	-
Piling	Typical	Supporting work	1	✓	✓	✓	✓
	Peak	Bored piling with support plant		✓	✓	✓	✓
Station/facility construction	Typical	Internal construction and fit-out	24	✓	✓	✓	✓
	Peak 1	Installation of framing and structure		✓	✓	✓	-
	Peak 2	Concrete work		✓	✓	✓	-
Mined tunnel	Typical	Spoil removal	6	✓	✓	✓	✓
	Peak	Mining with support		✓	✓	✓	✓
Brownfield/other off-site work							
Piling	Typical	Supporting work	Rail possession[2]	✓	✓	✓	✓
	Peak	Bored piling with support plant		✓	✓	✓	✓
Aboveground rail	Typical	Track installation	Rail possession[2]	✓	✓	✓	✓
	Peak	Track subgrade, capping and tamping		✓	✓	✓	✓
Brownfield work	Typical	Deliveries and supporting work	Rail possession[2]	✓	✓	✓	✓
	Peak 1	Installation of framing and structure		✓	✓	✓	✓
	Peak 2	Removal of existing structures		✓	✓	✓	✓
Excavation	Typical	Mucking out	Rail possession[2]	✓	✓	-	-
	Peak 1	Through soft soil/rock		✓	✓	-	-
	Peak 2	Through rock using a rockbreaker		✓	✓	-	-

Notes:
1. OOH = out-of-hours
2. Work would be completed during short-term rail possessions. Two-day rail possessions would likely occur about four times per year, plus an additional five-day shutdown between 26-30 December in 2024, 2025 and 2026

Airborne construction noise

The predicted airborne NML exceedances from the Westmead metro station construction site are summarised in Table 7-13 for all residential receivers and in Table 7-14 for commercial and other sensitive receivers. The predictions are representative of the highest noise levels that would be experienced when the works are nearest to the sensitive receiver.

The number of receivers predicted to experience exceedances of the NMLs are summarised in bands of 10 dB and are separated into day, evening and night-time periods, as appropriate.

During the daytime, the highest construction noise impacts are predicted during aboveground rail, excavation and station / facility construction work when noise intensive equipment such as a rail tamper, rockbreaker or concrete saw would be in use. The highest impact work is expected to last for about four days while using a rail tamper during aboveground rail work, and for about 12 weeks while using a rockbreaker for excavation.

During the night-time, the highest construction noise impacts are predicted during mined tunnelling work, when noise intensive equipment such as roadheaders are in use. The highest impact work is expected to last for around six months; however, worst-case impacts would be limited to when work is being launched and close to the surface.

Table 7-13 Overview of NML exceedances (residential receivers) – Westmead metro station

Scenario	Activity	Indicative duration (months)	Number of receivers exceeding NML														
			Standard hours daytime			Out of hours											
						Daytime out of hours			Evening			Night time			Sleep disturbance		
			1 10 dB	10 20 dB	>20 dB	1 10 dB	10 20 dB	>20 dB	1 10 dB	10 20 dB	>20 dB	1 10 dB	10 20 dB	>20 dB	1 10 dB	10 20 dB	>20 dB
Station construction																	
Site establishment and public domain work	Typical	15	10	-	-	20	4	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Peak		22	4	-	43	10	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Piling	Typical	1	4	-	-	19	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Peak		19	-	-	45	4	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Station/facility construction	Typical	24	-	-	-	4	-	-	11	-	-	40	8	-	11	-	-
	Peak 1		7	-	-	24	1	-	34	1	-	n/a	n/a	n/a	n/a	n/a	n/a
	Peak 2		51	11	-	106	29	1	144	41	2	n/a	n/a	n/a	n/a	n/a	n/a
Mined tunnel	Typical	6	-	-	-	2	-	-	4	-	-	26	4	-	8	-	-
	Peak		8	-	-	27	2	-	32	3	-	119	21	3	27	4	-
Brownfield – other off-site work																	
Piling	Typical	Rail possession	-	-	-	4	-	-	7	-	-	32	5	-	14	-	-
	Peak		4	-	-	11	-	-	13	2	-	78	14	1	32	5	-
Aboveground rail	Typical	Rail possession	11	-	-	19	5	-	21	7	-	80	21	4	38	13	-
	Peak		65	19	5	179	33	11	245	44	14	388	218	48	371	103	29
Brownfield work	Typical	Rail possession	2	-	-	9	1	-	11	2	-	45	7	-	42	9	2
	Peak 1		16	2	-	36	7	-	42	11	1	217	36	7	49	12	2
	Peak 2		7	1	-	14	4	-	24	5	-	160	18	3	64	15	2
Excavation	Typical	Rail possession	2	-	-	6	-	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Peak 1		5	-	-	10	1	-	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Peak 2		28	5	-	76	10	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 7-14 Overview of NML exceedances (other sensitive receivers) – Westmead metro station

Scenario	Activity	Indictive duration (months)	Number of receivers exceeding NML								
			Commercial			Child care			Educational		
			1 10 dB	10 20 dB	>20 dB	1 10 dB	10 20 dB	>20 dB	1 10 dB	10 20 dB	>20 dB
Station construction											
Site establishment and public domain work	Typical	15	-	-	-	1	-	-	1	-	-
	Peak		-	-	-	1	-	-	3	1	-
Piling	Typical	1	-	-	-	1	-	-	1	-	-
	Peak		-	-	-	1	-	-	4	-	-
Station/facility construction	Typical	24	-	-	-	-	-	-	-	-	-
	Peak 1		-	-	-	1	-	-	2	-	-
	Peak 2		-	-	-	-	1	-	1	4	-
Mined tunnel	Typical	6	-	-	-	-	-	-	-	-	-
	Peak		-	-	-	1	-	-	3	-	-
Brownfield – other off-site work											
Piling	Typical	Rail possession	-	-	-	-	1	-	1	-	-
	Peak		-	-	-	-	1	-	1	-	-
Aboveground rail	Typical	Rail possession	-	-	-	1	-	-	1	-	-
	Peak		1	-	-	-	1	-	11	-	1
Brownfield work	Typical	Rail possession	-	-	-	1	-	-	1	-	-
	Peak 1		-	-	-	-	1	-	1	1	-
	Peak 2		1	-	-	-	1	-	2	-	-
Excavation	Typical	Rail possession	-	-	-	-	1	-	1	-	-
	Peak 1		-	-	-	-	1	-	2	-	-
	Peak 2		2	-	-	-	-	1	4	2	-

The findings of the worst-case construction noise impact assessment at the Westmead metro station construction site during the daytime indicate:

- receivers are located relatively close to the construction site and impacts are predicted to be ‘moderate’ to ‘high’ during outdoor work activities, particularly when noise-intensive equipment, such as ballast tampers or concrete saws, is being used as part of aboveground rail and station / facility construction work. The total duration of ballast tamping is expected to be about four days, while rockbreakers could be used during excavation for around 12 weeks. Concrete saws are expected to be infrequently used throughout a 24-month construction period. When work is inside the station, the daytime impacts are predicted to substantially reduce, with noise levels expected to comply with the management levels or result in ‘low’ impacts
- brownfield work is generally predicted to result in more impacts than work within the Westmead metro station construction site, being closer to the surrounding receivers; however, this work would be limited to short-term rail possessions
- the ‘peak’ scenarios would generate more noise and result in more exceedances than the ‘typical’ scenarios, which would result from the ‘peak’ scenarios using noise-intensive (or noisier) equipment
- the nearest commercial and ‘other sensitive’ receivers are predicted to be impacted during some of the noisier outdoor work activities. The highest impacts are predicted during the use of ballast tamping, rockbreakers or concrete saws as part of aboveground rail, excavation and station / facility work respectively. Some of this work would be completed during rail possessions when ‘other sensitive’ receivers such as child care centres and educational facilities are unlikely to be in use. ‘High’ or ‘moderate’ worst-case impacts are predicted at:
  - ‘high’ at Western Sydney University – Westmead Precinct and Mounika’s Family Day Care
  - ‘moderate’ at Westmead Public School.

The findings of the worst-case construction noise impact assessment at Westmead metro station construction site during the evening and night-time indicate:

- outdoor work during rail possessions is predicted to result in 'moderate’ to ‘high’ impacts at the nearest residential receivers during the noisiest work, when ballast tampers or concrete saws are being used. The total duration of ballast tamping is expected to be about four days over 16 individual rail possessions and an extended five-day possession between 26-30 December in 2024, 2025 and 2026. The impacts are generally reduced to ‘low’ or ‘moderate’ at the nearest residential receivers when noise intensive equipment is not in being used during these activities, and fewer residential receivers are predicted to be impacted
- ‘moderate’ to ‘high’ impacts are predicted during the mined tunnel work when work is near the surface
- ‘low’ impacts are generally predicted during internal station / facility construction work
- a small number of the nearest residential receivers are predicted to have ‘moderate’ impacts during the noisiest activities.

Based on current construction planning, access points for tunnel fit-out and rail systems work would likely be via the Parramatta metro station, Clyde stabling and maintenance facility (including Rosehill services facility), Burwood North Station and The Bays Station construction sites. However, depending on construction staging, other construction sites would be used to access the tunnels to carry out tunnel fit-out and rail systems work. If Westmead metro station is used to support rail systems fit-out work, this would likely result in the following potential impacts:

- moderate exceedances of the noise management level at the nearest residential receivers during the daytime, which could be reduced to negligible with the use of an acoustic shed or other acoustic measures
- high exceedances of the noise management level at the nearest residential receivers during the night-time, which could be reduced to low with the use of an acoustic shed or other acoustic measures
- negligible exceedances of the noise management level at the nearest commercial receivers.

The impacts presented above are based on all equipment working simultaneously in each assessed scenario. There would be periods when construction noise levels are much lower than the worst-case levels predicted and there would be times when no equipment is in use and no impacts occur.

Highly affected residential receivers

Several residential receivers on Alexandra Avenue and Railway Parade are expected to be highly noise affected during peak station / facility construction, aboveground rail and excavation work in the daytime, evening and night-time when ballast tampers, rockbreakers or concrete saws are being used outside. The total duration of ballast tamping is expected to be about four days during rail possessions.

Sleep disturbance

A sleep disturbance screening assessment has been completed for the construction work and is summarised in Table 7-13.

'Moderate' to 'high' sleep disturbance impacts are predicted at the nearest residential receivers when noise intensive equipment is being used during rail possessions. The 'high' impacts are generally limited to receivers on Alexandra Avenue and Railway Parade that are directly adjacent to the rail corridor.

The number of potential instances of sleep disturbance would depend on several factors, including the type of equipment being used and the duration of the noisy work. The requirement for night-time rail possessions would be relatively minimal and the possessions would generally only occur over isolated weekend periods.

During detailed construction planning, sleep disturbance would continue to be investigated to identify opportunities to minimise sleep disturbance impacts.

Vibration impacts

Vibration from excavation and tunnelling work is predicted to comply with the management levels at all receivers except for the existing Westmead Station, where the cosmetic damage and human comfort criteria are predicted to be exceeded. Where vibration levels are predicted to exceed the cosmetic damage screening criteria, a more detailed assessment of the structure and attended vibration monitoring would be carried out so that vibration levels remain below appropriate limits for that structure.

Ground-borne noise

Vibration intensive work at the Westmead metro station construction site would include mined tunnelling and excavation work. The existing Westmead Station is the only receiver predicted to be impacted by ground-borne noise from the excavation and tunnelling work. 'Moderate' worst-case exceedances are predicted at commercial spaces within the station due to their close proximity to the work.

Construction traffic noise

Construction-related traffic has the potential to temporarily increase road traffic noise levels at receivers that are adjacent to the construction site and haul routes. The forecast construction traffic volumes outlined in Technical Paper 2 (Construction transport) have been used to determine where potentially noticeable increases in road traffic noise (i.e. a greater than 2 dB increase above the existing noise level) is likely. Roads anticipated to have a greater than 2 dB increase would include:

- Hassall Street south of Alexandra Avenue –5 dB increase during the night
- Hassall Street south of Bailey Street – 5 dB increase during the day
- Bailey Street east of Hawkesbury Road – 9 dB increase during the day
- Priddle Street east of Hawkesbury Road – 8 dB increase during the day
- Hawkesbury Road south of Alexandra Avenue – 5 dB increase during the day
- Hawkesbury Road south of Bailey Street – 3 dB increase during the night.

This increase is associated with the diversion of traffic from Alexandra Avenue during the period it would be closed to traffic. The increase represents the worst-case predicted increase in any period.

Further assessment of construction traffic would be completed during detailed design for this proposal, including consideration of the potential for exceedances of the NSW Road Noise Policy base criteria (where greater than 2 dB increases are predicted). Measures outlined in the Sydney Metro CEMF (Appendix F (Construction Environmental Management Framework)) would be implemented to manage potential impacts.

Utilities

The majority of utility adjustments would be carried out as part of the previous Sydney Metro West planning application; however, there may be some utility adjustments required as part of this proposal, including work along the existing rail corridor at Westmead for routing station or rail services.

An assessment of the potential noise levels from utility work has been carried out to determine predicted noise levels at various offset distances from typical items of equipment. The results show that where the closest receivers are around 10 to 15 metres from the proposed utility work, worst-case noise levels of between 80 to 90 dBA are possible for short periods during noisy phases of the work.

During the night-time, worst-case residential NML exceedances of greater than 30 dB above the NML are possible if noise-intensive equipment is used during the night-time. The potential noise impacts from utility work would be temporary, and the duration of impacts would be limited.

7.6.4 Management and mitigation measures

Environmental management for this proposal would be undertaken through the environmental management approach as detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. This includes operational mitigation measures (where relevant) and performance outcomes for the operation and construction of this proposal.

The approach to noise and vibration management during the construction phase, including the process for the development of all construction noise and vibration statements is outlined in the CNVS (Appendix H (Construction Noise and Vibration Standard)). The CNVS provides the overall strategy and approach for construction noise and vibration management for Sydney Metro West, and an outline of the noise and vibration management requirements and processes that would be common to each of the proposed construction sites.

In addition, Sydney Metro's CEMF outlines the construction noise and vibration mitigation measures to minimise impacts as relevant to this proposal as a whole.

The CNVS and CEMF are discussed further in Chapter 20 (Synthesis) of this Environmental Impact Statement.

7.7 Non-Aboriginal heritage

Further details on the non-Aboriginal heritage assessment, including the approach and methodology, are provided in Technical Paper 5 (Non-Aboriginal heritage).

7.7.1 Baseline environment

The assessment of non-Aboriginal heritage impacts in Chapter 12 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a) included a description of the existing environment. The non-Aboriginal heritage assessment for this proposal has predominantly used the baseline environment that will be established following the completion of the work carried out under the previous Sydney Metro West planning application.

Areas within the Westmead metro station construction site for work carried out under the previous Sydney Metro West planning application will have been cleared of existing structures and vegetation, with the station box excavated.

As part of the work carried out under the previous Sydney Metro West planning application, all archaeological investigations will have been carried out within the approved Westmead metro station construction site (not including areas of additional land required for this proposal). Additional land would be required for this proposal within the rail corridor to the east and west of Hawkesbury Road and on the existing roads surrounding the site.

For the purpose of this heritage assessment, the study area for Westmead metro station has been defined as a 50-metre buffer around the full extent of the site.

Existing setting

The existing setting around the study area is predominantly suburban, comprising low-density inter-war residential dwellings and low- to medium-density modern apartments. The existing Westmead Station forms part of the proposed construction site. The Westmead metro station study area and existing heritage items within the study area are shown in Figure 7-14.

Site history

The Westmead metro station site is located within the original curtilage of the Government Farm and Government Domain, developed from 1788. However, there is no clear evidence of cultivation at the study area during this period. The Main Western Line from Sydney was constructed through Westmead in 1861, however, a station was not constructed until 1914 when a new ticket office was built. Further development including the introduction and extension of the platforms and additional station upgrades took place in the 1930s, 1960s, 1990s and the early 2000s, resulting in the demolition of earlier structures.

Figure 7-14 Heritage items within the study area – Westmead metro station

7.7.2 Impact assessment

Built heritage impact assessment

Table 7-15 summarises the potential impacts of construction and operation of this proposal on built heritage items within the study area at Westmead metro station.

Potential impacts to built heritage items in the Westmead metro station study area would generally be neutral or negligible. Management of potential impacts is outlined in Section 7.7.3.

Table 7-15 Impacts on significance of built heritage items – Westmead metro station

Item, listing and significance	Potential impact	Magnitude
Westmead Public School, c1917 Cumberland LEP Item No. I295 Local	**Direct impact** The heritage item is located south-west of the intersection of Grand Avenue and Hawkesbury Road and directly opposite the proposed Westmead metro station precinct, with the existing Westmead Station about 90 metres north-east of the item. This proposal includes construction and operation of the station and station services, as well as public domain work and roadworks at Hawkesbury Road. These works would result in neutral direct (physical) impacts to the item.	**Neutral**
	Settlement and vibration impacts Construction vibration levels are predicted to be below the cosmetic damage screening criteria. Potential direct impacts associated with vibration are not anticipated.	**Neutral**

Item, listing and significance	Potential impact	Magnitude
	Temporary indirect (visual) impact Construction activities for this proposal would be present within the vicinity of this item; however, the removal of the acoustic shed established for work under the previous Sydney Metro West planning application may reduce visual obstructions toward the heritage item and minimise visual impacts (compared to the previous Sydney Metro West planning application). Temporary indirect (visual) impacts are considered negligible in the context of this heritage item and its setting.	**Negligible**
	Permanent indirect (visual) impact This proposal would include the introduction of a new aerial concourse over the existing railway line; however, the aerial concourse would be located some distance from this item. The station services building would be about five to six storeys in height, located on the north-western corner of Hawkesbury Road and Alexandra Avenue. The height of this new structure would be sufficiently offset from the public school that it would not overshadow the heritage significant buildings of the item – which are located in the southern portion of the curtilage of the item. As such, the infrastructure introduced for this proposal would not obstruct or overshadow existing views to the item or alter its visual setting.	**Neutral**
Western Sydney University Parramatta LEP Item No. I628 Local	**Direct impact** The main façade of the heritage item is located along the western side of Hawkesbury Road, about 40 metres north-west of the existing Westmead Station. The upgrade of the western side of the Hawkesbury Road overbridge would require tie-in work within the heritage curtilage of this item. The significance of the item is associated with the Western Sydney University building to the north-east of the work for this proposal, which would be protected during construction. No inadvertent impacts are anticipated to the fabric of the item during construction of this proposal. Road work and construction of precinct and interchange facilities would include the introduction of a lower speed environment along Railway Parade (to the east of the item), an aerial concourse on the eastern side of the Hawkesbury Road overbridge and upgrade work to the western side of the overbridge immediately south of the item. This work would be sited partly inside of the heritage curtilage of the item however would not result in any adverse direct (physical) impacts.	**Negligible**
	Settlement and vibration impacts Construction vibration levels are predicted to be below the cosmetic damage screening criteria. Potential direct impacts associated with vibration are not anticipated.	**Neutral**
	Temporary indirect (visual) impact Construction activity for this proposal would extend north and across the rail corridor, as well as requiring localised roadwork along Hawkesbury Road and Railway Parade. Work would also be required within the existing rail corridor and to the existing Westmead Station to the south of this item. Temporary indirect (visual) impacts are considered negligible in the context of this heritage item and its setting.	**Negligible**
	Permanent indirect (visual) impact The proposed station services building would be located on the opposite side of the existing rail corridor from this heritage item. While this structure would be about five to six storeys in height, it would be located about 90 metres away from the heritage item, and as such would not overshadow or obstruct views of the heritage item or compete with the item's visual prominence on the street.	**Negligible**

Item, listing and significance	Potential impact	Magnitude
	The proposed station concourse and plaza would be low level and open plan. This would not obstruct views towards the item from the surrounding Hawkesbury Road streetscape. Additionally, due to the siting of the work, this proposal would not alter the visual setting and context of the item overall. The proposed bus stops and canopies on Alexandra Avenue would be located over 100 metres to the south-east of the street frontage of the item. This would not obstruct significant views of the heritage significant street frontage and would not alter the context or setting of the item. The proposed lower speed environment is consistent with the existing roadway of Railway Parade.	
Victorian residence (in University of Western Sydney grounds) Parramatta LEP Item No. I629 Local	**Direct impact** The heritage item is located over 100 metres north-west of the proposed Westmead metro station construction site, and road works would not intrude into the curtilage of the item. As such, this proposal would not result in any adverse direct (physical) impacts to the item.	**Neutral**
	Settlement and vibration impact Given the distance of the heritage item from the construction site, construction vibration levels are predicted to be below the cosmetic damage screening criteria.	**Neutral**
	Temporary indirect (visual) impact Site hoarding, facilities and heavy machinery would be located within the construction site. Due to the siting of these structures, their temporary installation would not alter the existing view lines, setting and context of the item. Due to the set back of this item from Hawkesbury Road by about 50 metres, there would be no views between this item and the area of proposed work.	**Neutral**
	Permanent indirect (visual) impact There are no existing view lines to the item from Westmead metro station or road works due to the siting of the heritage item 'Western Sydney University, LEP No. I628', located to the south and south-east of the item, which blocks views. No views would be obstructed, and the existing visual setting would be retained.	**Neutral**

Archaeological impact assessment

This section considers the potential archaeological impacts at Westmead metro station within areas of additional footprint for the construction of this proposal (shown in Figure 7-14). The area within the approved Westmead metro station construction site has been previously assessed in Technical Paper 3 (Non – Aboriginal Heritage) of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a), and all archaeological investigations will be completed prior to the construction of this proposal.

Table 7-16 identifies the type of archaeological remains that may be present, the potential for those archaeological remains to occur within the study area, their likely heritage significance, and the potential for those remains to be impacted by this proposal. Land use phasing information presented in Table 7-16 has been developed from original archaeological phasing outlined in Chapter 12 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a). A summary of the land use and previous impacts at Westmead metro station is considered in Technical Paper 5 (Non-Aboriginal heritage).

Table 7-16 Potential archaeological impacts – Westmead metro station

Phase and potential archaeological feature	Potential for occurrence	Heritage significance	Potential archaeological remains
Phase 2 (1860 – 1943) Late nineteenth and early twentieth century road developments	High	Local	Road formalisation occurred when subdivision of the estate was developed throughout the late nineteenth and early twentieth centuries. Sandstone ballast for former Telford road surfaces from the 1920s previously identified in the road corridors around the Westmead construction sites. Service and road surfacing works on the streets around the Westmead metro station construction sites would have the potential to impact locally significant remains associated with 1920s-era Telford road subsurfaces. Impacts would be localised to specific areas of road works and would not result in the total removal of the resource. This work would result in a minor impact to the archaeological resource. Archaeological remains of the former Telford road surfaces and ballast substrate within the approved Westmead metro station construction site would be managed under the previous Sydney Metro West planning application. Localised road work for this proposal would be managed in accordance with Sydney Metro's Unexpected Heritage Finds Procedure.

7.7.3 Management and mitigation measures

Environmental management for this proposal would be undertaken through the environmental management approach as detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. This includes operational mitigation measures (where relevant) and performance outcomes for the operation and construction of this proposal.

During construction of this proposal, non-Aboriginal heritage would be managed in accordance with Sydney Metro's CEMF (refer to Appendix F). The CEMF includes heritage management objectives and mitigation measures to minimise impacts as relevant to this proposal as a whole.

7.8 Aboriginal heritage

The approach and methodology for the Aboriginal heritage assessment are provided in Chapter 4 (Methodology) of this Environmental Impact Statement. The legislative context for the assessment is provided in Appendix B (Legislative and policy context).

7.8.1 Baseline environment

The previous Sydney Metro West planning application assessed the potential impacts of the establishment of the Westmead metro station construction site.

This section summarises the existing environment presented in the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a) including providing context of the additional footprint required for this proposal.

Landscape and archaeological context

The Westmead metro station construction site is located within the Cumberland Lowlands physiographic region of the Cumberland Plain. Consistent with the description of Chapman & Murphy (1989), the immediate environs of the Westmead metro station construction site lie towards the upper portion of a broad, low-lying ridge crest, west of the Parramatta River (refer to Section 8.2 of Technical Paper 4 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a)).

Reference to contemporary aerial photography indicates that areas of ground disturbance associated with the construction of Westmead Station, surrounding road network and underground services are present. The archaeological implication is the potential disturbance or destruction of pre-existing Aboriginal sites and archaeological deposits in these areas.

The closest permanent watercourse is Domain Creek, approximately 450 metres east of the Westmead metro station construction site. The Parramatta River is approximately one kilometre north of the Westmead metro station construction site. These would have been important resource areas for Aboriginal people. Reference to the 1:100,000 Geological Map Sheet for Sydney (9130) indicates that the surface geology is dominated by Wianamatta Group units, comprising of Ashfield Shale, Minchinbury Sandstone and Bringelly Shale, which would have provided raw materials suitable for artefact manufacture.

Previous Aboriginal cultural heritage assessments

The following summarises key investigations undertaken in the local environs that are relevant to this proposal:

- RPS Australia Pty Ltd (2015) undertook an Aboriginal heritage assessment comprising archaeological survey for the redevelopment of Westmead Hospital, located approximately 200 metres north of the Westmead metro station construction site. The survey did not identify any Aboriginal sites but did conclude that areas of high archaeological potential were present in the project's study area. On the basis that those areas were not proposed to be impacted, no further investigation was undertaken
- Artefact Heritage Services Pty Ltd (2016) undertook an Aboriginal heritage assessment, including test excavation, for proposed upgrades to park amenities, paths, and landscaping within Parramatta Park. Works were undertaken approximately 200 metres east of the Westmead metro station construction site. Excavation activities identified subsurface cultural materials (i.e., lithic artefacts) in both alluvial and residual soils
- Artefact Heritage Services Pty Ltd undertook an Aboriginal heritage assessment for the Sydney Metro West metro station locations and tunnel (refer to Technical Paper 4 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a)). The assessment did not identify any Aboriginal heritage constraints or site-specific cultural values within the Westmead metro station construction site.

Recorded Aboriginal sites

The *Sydney Metro West Environmental Impact Statement – Westmead to the Bays and Sydney CBD* (Sydney Metro, 2020a) did not identify any previously recorded Aboriginal sites within 100 metres of the Westmead metro station construction site. The closest recorded Aboriginal site identified was AHIMS 45-5-4537, located about 500 metres east of the construction site in Parramatta Park. No surface sites were identified during the 2020 survey and subsurface archaeological potential was assessed as low (Sydney Metro, 2020a).

An updated search of the AHIMS database was undertaken for this assessment on 21 August 2021 (Search ID 609567), including for the additional footprint area required for construction of this proposal. There were no additional entries identified within 100 metres of the Westmead metro station construction site in the search results, consistent with the results in *Sydney Metro West Environmental Impact Statement – Westmead to the Bays and Sydney CBD* (Sydney Metro, 2020a).

Aboriginal community consultation and cultural values

Consultation undertaken with Registered Aboriginal Parties for the *Sydney Metro West Environmental Impact Statement – Westmead to the Bays and Sydney CBD* (Sydney Metro, 2020a) did not identify any site-specific cultural values within the Westmead metro station construction site. Registered Aboriginal Party field representatives did note that the area is part of a wider cultural landscape of high cultural significance to the local Aboriginal community. In particular, major water sources including the Parramatta River were of particular cultural significance. Parramatta Park, located to the east of the Westmead metro station construction site, is known to contain several scarred trees and is believed to be a major camping place for the Burramatta peoples.

Ongoing consultation with Aboriginal heritage knowledge holders is underway as part of design development for this proposal, including for the purposes of better understanding cultural values and addressing the Connecting with Country framework.

Field investigation results

The *Sydney Metro West Environmental Impact Statement – Westmead to the Bays and Sydney CBD* (Sydney Metro, 2020a) included a survey of the Westmead metro station construction site undertaken with participation from a Registered Aboriginal Party representative from Deerubbin Local Aboriginal Land Council. A field investigation was undertaken on 12 January 2022 for the additional footprint required for this proposal at Westmead metro construction site with participation from a Registered Aboriginal Party representative from Deerubbin Local Aboriginal Land Council. No site-specific cultural values were identified during the field investigation.

7.8.2 Operational impact assessment

Direct impacts

No identified Aboriginal sites, objects and/or site-specific cultural heritage values would be directly impacted during operation of this proposal at Westmead metro station.

Indirect impacts

No identified Aboriginal sites, objects and/or site-specific cultural heritage values would be indirectly impacted during operation of this proposal at Westmead metro station.

During development of Sydney Metro West, consultation was undertaken with knowledge holders to inform the project development as part of the Connecting with Country Pilot program. This consultation will continue during further development of the project. In accordance with Concept conditions of approval C-B4 and C-B5, a draft Heritage Interpretation Strategy has been prepared for this proposal (refer to Appendix K (Draft Heritage Interpretation Strategy)) which details how Aboriginal heritage values would be interpreted and reflected within the design of this proposal.

Further details regarding Sydney Metro's approach to Connecting with Country, and heritage and archaeology design guidelines are provided in the station and precinct design guidelines in Appendix E (Design Guidelines).

7.8.3 Construction impact assessment

Direct impacts

There were no recorded Aboriginal sites, objects or site-specific cultural values identified within the Westmead metro station construction site, including within the additional footprint areas required for this proposal. Therefore, there would be no direct impacts on identified Aboriginal heritage sites or objects or site-specific cultural heritage values during construction of this proposal.

Indirect impacts

No identified Aboriginal sites, objects and/or site-specific cultural heritage values would be indirectly impacted during construction of Westmead metro station.

7.8.4 Management and mitigation measures

Environmental management for this proposal would be undertaken through the environmental management approach as detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. This includes operational mitigation measures (where relevant) and performance outcomes for the operation and construction of this proposal.

During construction of this proposal, Aboriginal heritage would be managed in accordance with Sydney Metro's CEMF (refer to Appendix F). The CEMF management objectives and mitigation measures to minimise impacts as relevant to this proposal as a whole.

7.9 Landscape and visual amenity

Further details on the landscape and visual amenity assessment, including the approach and methodology, are provided in Technical Paper 6 (Landscape and visual amenity).

7.9.1 Baseline environment

Westmead metro station would be located to the east of Hawkesbury Road, between Railway Parade in the north, Bailey Street in the south and east to Hassall Street.

On the southern side of the existing station, the approved Westmead metro station construction site extends south to Bailey Street and east to Hassall Street. All buildings and vegetation within this area will be removed and the station excavation will have occurred as a part of work carried out under the previous Sydney Metro West planning application, including excavation for the future station. Vegetation to the north of Alexandra Avenue, within the rail corridor, will also have been removed, to accommodate pedestrian access to the station.

Construction hoarding will remain in place around the perimeter of the construction site as established by work carried out under the previous Sydney Metro West planning application.

The existing Westmead Station includes two island platforms, accessed via an aerial concourse that extends from Railway Parade in the north to Alexandra Avenue in the south. The northern side of the existing rail corridor includes more intensive retail and office development opposite the existing station and along Hawkesbury Road and Railway Parade. There are some medium-rise residential apartment buildings between this commercial area and Parramatta Park in the east.

To the north-west of the existing station, on Hawkesbury Road, there are several major institutions, including the Western Sydney University Westmead campus (a local heritage item which includes the former Westmead Boys Home) and the Westmead health and medical research precinct. As part of the future Parramatta Light Rail Stage 1 project, a new terminus stop (the Westmead Station stop) is currently under construction at the northern corner of Hawkesbury Road and Railway Parade, opposite the existing Westmead Station. The light rail alignment will extend north along Hawkesbury Road and is expected to be operational in 2023. Westmead Public School is located to the south-west of the existing Westmead Station, along Hawkesbury Road.

Mays Hill Precinct (formerly occupied by the Parramatta Golf Club) is located to the east of the site and forms part of the visual setting and green space buffer of Parramatta Park. There are no views between Westmead metro station and the Mays Hill Precinct.

Section 7.3.1 provides further discussion of the local strategic plans relevant to Westmead. A detailed review of local planning guidance relevant to landscape and visual context is provided in Technical Paper 6 (Landscape and visual amenity).

Landscapes and public realm areas

The landscapes and public realm areas potentially impacted by this proposal, and the landscape sensitivity level for these areas, are outlined in Table 7-17.

Table 7-17 Landscapes and public realm areas – Westmead metro station

Location	Baseline environment	Landscape sensitivity level
Westmead Station, Railway Parade, Hawkesbury Road and Alexandra Avenue	Hawkesbury Road is a four-lane heavily trafficked roadway providing access to a mix of uses. At the overbridge and Westmead Public School, the footpaths are separated from the Hawkesbury Road by fencing, creating a constrained pedestrian environment. The Western Sydney University Westmead campus (a local heritage listed item) is a prominent visual feature on Hawkesbury Road. Westmead Station is located to the east of Hawkesbury Road and spans the rail corridor with an aerial concourse. Railway Parade is aligned parallel to the north of the rail corridor. The road slopes down from near the rail overbridge, with a commuter car park beside the rail corridor. There is a pedestrian crossing between the station entry and commercial properties to the north. Alexandra Avenue is located parallel to the south of the existing rail corridor and provides access to the existing Westmead Station. Street trees along Alexandra Avenue will have been removed as part of work under the previous Sydney Metro West planning application.	Local

Location	Baseline environment	Landscape sensitivity level
Alexandra Avenue, Hassall Street and Bailey Street streetscapes	Alexandra Avenue (east of Bailey Street and west of Hawkesbury Road), Hassall Street and Bailey Street are residential character streets with footpaths, grassed verges, powerlines and scattered street trees. The trees within the adjacent private properties provide some amenity to these streetscapes. To the south of Alexandra Avenue there is a mix of low- and medium-density residential properties and a few retail uses. All buildings and vegetation within the approved Westmead metro station construction site will have been removed as a part of work under the previous Sydney Metro West planning application.	Neighbourhood
The site and Hawkesbury Road	Hawkesbury Road, as it passes the Westmead metro station construction site, is a four-lane roadway providing access to a mix of uses. Trees within adjacent private properties along Hawkesbury Road contribute to a somewhat leafy streetscape character. The existing pedestrian environment along Hawkesbury Road comprises narrow pavements and mixed surfaces.	Local

Representative viewpoints

Representative viewpoints that have been selected to inform the visual impact assessment are shown on Figure 7-15. Viewpoints 1 to 5 are of local sensitivity, and viewpoints 6 and 7 are of neighbourhood sensitivity.

While the impact ratings for all seven viewpoints are provided, the following two have been selected as the most representative for this station to be discussed in this section. These take into account the degree of sensitivity, and potential operational and construction elements that would be visible:

- **viewpoint 2: view north-east from the corner of Hawkesbury Road and Alexandra Avenue** – presents potential impacts visible from the residential area to the west of Westmead metro station, and the interface of this proposal with the Western Sydney University Westmead campus (a local heritage item, left of view)
- **viewpoint 3: view south-east from the corner of Hawkesbury Road and Railway Parade** – includes the existing Westmead Station in cutting and would be experienced by users of nearby commercial properties and visitors to the area.

These viewpoints are assessed in further detail in this section. A detailed assessment of all viewpoints is provided in Technical Paper 6 (Landscape and visual amenity).

Figure 7-15 Representative viewpoints – Westmead metro station

Night-time visual sensitivity

Areas around and to the north of Westmead metro station are of high district brightness (A4) and have a very low visual sensitivity at night. This is due in part to the brightly lit concourse and platforms at the existing Westmead Station and the nearby intensive retail and office development north of the station. The headlights from traffic along Hawkesbury Road and bus movements along Alexandra Avenue, together with traffic lights at signalised intersections also contribute to the night-time brightness of this environment.

To the south of the station, the predominantly residential area has medium district brightness (A3) and a low sensitivity. In this area there is a lower level of lighting associated with the predominantly low-density and medium-rise residential apartment buildings. This area includes the Westmead Public School on Hawkesbury Road, opposite the site.

There will be some remaining security lighting at the Westmead metro station construction site established by works carried out under the previous Sydney Metro West planning application.

7.9.2 Operational impact assessment

Operation of this proposal at Westmead metro station would comprise underground and surface elements. The key elements and of this proposal that would be visible are described in Section 7.2.

Landscape impact

Landscape impacts anticipated as a result of the operation of this proposal are summarised in Table 7-18. Management of potential impacts is discussed in Section 7.9.4.

During operation, the character and amenity of Hawkesbury Road would be considerably improved with the introduction of a new station entry facing Hawkesbury Road and Railway Parade. The location of the metro station entry would improve legibility within the surrounding area, improving visibility of the station along Hawkesbury Road, and from the future Parramatta Light Rail Stage 1 terminus stop on Hawkesbury Road. Bus stops would be provided along Alexandra Avenue with direct access to the station. The unpaid pedestrian concourse located adjacent to the existing Hawkesbury Road overbridge would also improve accessibility and permeability within the precinct.

There would be new footpaths and public domain provided along the western side of Hassall Street and northern side of Bailey Street, adjacent to the site. The completion of construction activity along these streets would improve the amenity and accessibility for local residents. Residual areas of the Westmead metro station construction site would be subject to future adjacent station development (subject to separate approvals).

There would be a new area of public domain to the east of Hawkesbury Road, between Bailey Street and Alexandra Avenue, improving the function and amenity of this area for pedestrians. Beyond this public domain, set back from the road and downhill from Hawkesbury Road, there would be a services building and areas for future adjacent station development (subject to separate approvals).

Table 7-18 Landscape impacts during operation – Westmead metro station

Location	Landscape sensitivity level	Magnitude of change	Impact rating
Westmead Station, Railway Parade, Hawkesbury Road and Alexandra Avenue	Local	Considerable improvement	Moderate beneficial
Alexandra Avenue, Hassall Street and Bailey Street streetscapes	Neighbourhood	Noticeable improvement	Negligible
The site and Hawkesbury Road	Local	Considerable improvement	Moderate beneficial

Daytime visual amenity impact

Visual amenity impacts anticipated as a result of the operation of this proposal are summarised in Table 7-19. Management of potential impacts is discussed in Section 7.9.4. An artist's impression of Westmead metro station during operation is shown in Figure 7-16. Potential station finishes would be identified as part of further design development and would be consistent with the principles and outcomes presented in the Design Guidelines (see Appendix E).

Table 7-19 Daytime visual impacts during operation – Westmead metro station

Location	Sensitivity rating	Magnitude of change	Impact rating
Viewpoint 1: view north-east along Hawkesbury Road	Local	Noticeable improvement	Minor beneficial
Viewpoint 2: view north-east from corner of Hawkesbury Road and Alexandra Avenue	Local	Considerable improvement	Moderate beneficial
Viewpoint 3: view south-east from corner of Hawkesbury Road and Railway Avenue	Local	Considerable improvement	Moderate beneficial
Viewpoint 4: view south-west from Railway Parade near Ashley Lane	Local	Considerable improvement	Moderate beneficial
Viewpoint 5: view west from Alexandra Avenue and Hassall Street	Local	Noticeable improvement	Minor beneficial
Viewpoint 6: view west from Bailey Street and Hassall Street	Neighbourhood	Noticeable improvement	Negligible
Viewpoint 7: view east along Alexandra Avenue	Neighbourhood	No perceived change	Negligible

As noted in Section 7.9.1, the most representative viewpoints have been described in detail in this section. Potential impacts from those viewpoints would include the following:

- **viewpoint 2: view north-east from the corner of Hawkesbury Road and Alexandra Avenue** – there would be a moderate beneficial impact to this view during operation. A new station entry would be visible at the Hawkesbury Road overbridge, creating a new focal point in this view. The station concourse would be set back from the road, rising about two storeys, with a wide footpath and area of public domain. The Hawkesbury Road rail overbridge would be upgraded, with new a public domain area to the east. Views to the Western Sydney University Westmead campus and future Parramatta Light Rail Stage 1 terminus stop would remain, unobstructed, in the background of this view
- **viewpoint 3: view south-east from the corner of Hawkesbury Road and Railway Parade** – there would be a moderate beneficial impact to this view during operation due to improvements in the amenity of this view. A new metro station entry would be visible rising above the Hawkesbury Road overbridge, creating a new focal point in this view. There would be new public domain areas along the southern side of Railway Parade, improving the amenity of this view. Views to the skyline of Parramatta CBD and vegetation within Parramatta Park would remain, in the background of view.

Indicative only – subject to design development

Figure 7-16 Artist's impression of Westmead metro station during operation

Night-time visual impact

The anticipated night-time visual impacts during operation are summarised in Table 7-20.

The proposed station, interchange and public domain areas would be brightly lit to provide for customer safety. There would also be headlights from vehicles using interchange facilities. The existing rail corridor cutting would contain some lighting from the metro station, east and west of Hawkesbury Road, and all lighting would be designed to minimise light spill and skyglow.

This proposal would increase the lighting levels around the station and within the existing rail corridor, including in views from the commercial and residential properties along Railway Parade, Hawkesbury Road, Alexandra Avenue (east and west of Hawkesbury Road), Grand Avenue, Hassall Street and Bailey Street. However, these additional light sources would be seen from within areas of high district brightness (A4), including the existing Westmead Station, Hawkesbury Road and Railway Parade adjacent to the station. This lighting would be consistent with and largely absorbed into the surrounding brightly lit night scene.

Within the areas of medium district brightness (A3), including in views from surrounding residential properties, new lighting associated with this proposal would contrast with the lower light levels of this precinct. However, views would be somewhat filtered through garden and street trees.

Table 7-20 Night-time visual amenity impacts during operation – Westmead metro station

Location	Sensitivity rating	Magnitude of change	Impact rating
Westmead Station and Alexandra Avenue	A4: High district brightness	No perceived change	Negligible
Bailey Street, Hawkesbury Road and Hassall Street residential areas	A3: Medium district brightness	Noticeable reduction	Minor adverse

7.9.3 Construction impact assessment

The Westmead metro station construction site for this proposal would include the approved construction site established under the previous Sydney Metro West planning application, as well as additional footprint shown on Figure 7-7. During construction of this proposal, there would also be some precinct work carried out to the west of Hawkesbury Road, and to the north on Railway Parade. The construction work within the additional footprint that would be visible would include construction of a new aerial concourse, and work to the existing Westmead Station and within the rail corridor (for example, track slewing). The proposed work, construction site features, equipment and vehicle access routes which would be visible are described in Chapter 6 (Proposal description – construction) of this Environmental Impact Statement and Section 7.4.

Landscape impact

The landscape impact of the construction of this proposal on the key landscapes and public realm areas is provided in Table 7-17. Construction of this proposal would generally result in minor to moderate adverse temporary landscape impacts. Management of potential impacts is outlined in Section 7.9.4.

During construction at the existing Westmead Station, the existing station concourse building would be removed, with work extending west into Hawkesbury Road. There would be work to the west of the Hawkesbury Road overbridge to upgrade the overbridge and construct a new public domain area to the east of the overbridge. Construction of a new station building and subsurface pedestrian connection would include work within the rail corridor and work extending north to the southern verge of Railway Parade, and south to the northern verge of Alexandra Avenue, where public domain upgrades would be undertaken.

Alexandra Avenue would be temporarily closed for a period of around 12-18 months during construction. During this period, pedestrian access to the existing Westmead Station from the south, and connectivity between Hawkesbury Road and Hassall Street, would be generally maintained, although some short-term adjustments may be required (refer to Section 7.5 for further detail). Some vegetation around the station would also be removed, reducing the level of amenity for pedestrians approaching the station (refer to Section 7.14 for further detail).

There would also continue to be construction activity, behind site hoarding, to the south of Alexandra Avenue (east of Hawkesbury Road), west of Hassall Street and north of Bailey Street. Construction vehicles would be seen travelling along these streets and accessing the site via Hassall Street.

The overall size of the construction site, extending across a whole block, would temporarily reduce the accessibility of the station for residences to the west of Hawkesbury Road and south of the rail corridor. Construction vehicles would be seen travelling along Hawkesbury Road and accessing the site.

Overall, the scale and extent of construction work would temporarily impact on the accessibility and legibility of the surrounding area.

Table 7-21 Landscape impacts during construction – Westmead metro station

Location	Sensitivity rating	Magnitude of change	Impact rating
Westmead Station, Railway Parade, Hawkesbury Road and Alexandra Avenue	Local	Considerable reduction	Moderate adverse
Alexandra Avenue, Hassall Street and Bailey Street streetscapes	Neighbourhood	Considerable reduction	Minor adverse
The site and Hawkesbury Road	Local	Considerable reduction	Moderate adverse

Daytime visual amenity impact

The anticipated daytime visual impacts on representative viewpoints as a result of the construction of this proposal are summarised in Table 7-22. Generally, there would be minor and moderate adverse temporary visual impacts due to the proposed construction activities. Management of potential impacts is discussed in Section 7.9.4.

Table 7-22 Daytime visual amenity impacts during construction – Westmead metro station

Location	Sensitivity rating	Magnitude of change	Impact rating
Viewpoint 1: view north-east along Hawkesbury Road	Local	Noticeable reduction	Minor adverse
Viewpoint 2: view north-east from corner of Hawkesbury Road and Alexandra Avenue	Local	Considerable reduction	Moderate adverse
Viewpoint 3: view south-east from corner of Hawkesbury Road and Railway Avenue	Local	Considerable reduction	Moderate adverse
Viewpoint 4: view south-west from Railway Parade near Ashley Lane	Local	Considerable reduction	Moderate adverse
Viewpoint 5: view west from Alexandra Avenue and Hassall Street	Local	Considerable reduction	Moderate adverse
Viewpoint 6: view west from Bailey Street and Hassall Street	Neighbourhood	Considerable reduction	Minor adverse
Viewpoint 7: view east along Alexandra Avenue	Neighbourhood	Considerable reduction	Minor adverse

As noted in Section 7.9.1, the most representative viewpoints have been discussed in detail in this section. Potential temporary impacts for the duration of construction from those viewpoints would include the following:

- **viewpoint 2: view north-east from the corner of Hawkesbury Road and Alexandra Avenue** – there would be a temporary moderate adverse impact to this view during construction due to the scale and extent of construction work visible. Construction work would be required at the existing Westmead Station and extending east from Hawkesbury Road and west along Alexandra Avenue. Elements of the existing station would be demolished and some vegetation along the rail corridor would be removed. Work to upgrade the Hawkesbury Road overbridge would be visible to the west. There would be hoarding established along the perimeter of the site, facing Hawkesbury Road, with construction work and equipment seen rising above the hoarding
- **viewpoint 3: view south-east from the corner of Hawkesbury Road and Railway Parade** – there would be a temporary moderate adverse impact to this view during construction due to the scale and extent of construction work. Construction work at the existing Westmead Station would be seen in this view, extending from the corner of Railway Parade and Hawkesbury Road south and east along the rail line. Elements of the existing station would be demolished and some vegetation along the rail corridor would be removed. There would be perimeter site hoarding along Railway Parade and Hawkesbury Road and construction equipment would be seen rising above the hoarding. This work would temporarily obstruct the views to Parramatta CBD and vegetation within Parramatta Park. There would also be construction activity seen from this view along the southern verge of Railway Parade.

To manage these potential impacts, management and mitigation measures are provided in Section 7.9.4 and Chapter 20 (Synthesis) of this Environmental Impact Statement. These sections include measures to locate elements of construction sites to minimise visual impact, where feasible and reasonable.

Night-time visual impact

The anticipated night-time visual impacts during construction of this proposal are summarised in Table 7-20.

Night work would be required at this location during station construction and for road and rail possessions. This work would include brightly lit task lighting, lighting at key areas of the construction sites, and additional headlights from heavy vehicles entering and leaving the site. The existing rail corridor cutting would contain some of this lighting and all lighting would be designed to minimise light spill and skyglow. However, this lighting would temporarily increase the lighting levels around the existing station and within the rail corridor, at Railway Parade, Hawkesbury Road, Hassall and Bailey streets.

In areas of high district brightness (A4), including the existing Westmead Station, this lighting would generally be absorbed into the surrounding night scene.

Night work seen within the areas of medium district brightness (A3), including near residential properties, would contrast with the lower light levels of this area. However, the majority of night work is expected to be located around the existing Westmead Station and rail corridor, which is set back from the residential areas. Views to night work would also be partly filtered through street trees.

Table 7-23 Night-time visual amenity impacts during construction – Westmead metro station

Location	Sensitivity rating	Magnitude of change	Impact rating
Westmead Station and Alexandra Avenue	A4: High district brightness	No perceived change	Negligible
Bailey Street, Hawkesbury Road and Hassall Street residential areas	A3: Medium district brightness	Noticeable reduction	Minor adverse

7.9.4 Management and mitigation measures

Environmental management for this proposal would be undertaken through the environmental management approach as detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. This includes operational mitigation measures (where relevant) and performance outcomes for the operation and construction of this proposal.

During construction of this proposal, landscape and visual amenity impacts would be managed in accordance with Sydney Metro's CEMF (refer to Appendix F). The CEMF includes landscape and visual amenity management objectives and mitigation measures to minimise impacts as relevant to this proposal as a whole.

The design of this proposal would also be consistent with the principles and outcomes presented in the Design Guidelines (refer to Appendix E).

Mitigation measures that are specific to the operation and construction of Westmead metro station to address potential impacts are listed in Table 7-24.

Table 7-24 Landscape and visual amenity mitigation measures – Westmead metro station

Ref	Impact/issue	Mitigation measure	Timing
Landscape and visual amenity			
EIS-LV5	Visual impacts	Revegetate the embankments of the rail corridor where possible to minimise views from residences on Alexandra Avenue.	Operation
EIS-LV6	Activation of streetscapes	Opportunities to provide temporary activation would be explored in areas of future adjacent station development (that would be delivered by others).	Operation
EIS-LV7	Visual impacts	Engineered batters and water management measures would be designed to have a natural shape and low profile as far as is reasonable and feasible and would be designed to support vegetation that would allow for their visual integration and screening over time.	Operation

7.10 Soils, contamination and groundwater

Further details on the contamination assessment, including the approach and methodology, are provided in Technical Paper 7 (Contamination). The approach and methodology for the soils and groundwater assessments are provided in Chapter 4 (Methodology) of this Environmental Impact Statement and Appendix D (Detailed assessment methodologies). The legislative context for the assessment is provided in Appendix B.

7.10.1 Baseline environment

The baseline environment as relevant to soils, contamination and groundwater is discussed in the following sections.

The Westmead metro station construction site and its surrounds currently comprise the existing station and rail corridor, and low-, medium- and high-density residential properties along with a mechanical workshop on the corner of Hassall Street and businesses along Railway Parade. Western Sydney University Westmead campus is also located to the north of the railway station along Hawkesbury Road.

Prior to the commencement of this proposal, buildings and other infrastructure located on the land required for the Westmead metro station construction site will be demolished (not including areas of additional footprint for this proposal), and bulk excavation work for the station will have occurred as part of the work carried out under the previous Sydney Metro West planning application.

Areas of additional construction footprint are required for construction of this proposal at Westmead, including for railway integration works and road works. This proposal would also include additional excavation to construct an underground concourse that would connect to the existing station platforms and introduce a station entry from Railway Parade.

Soils

The existing soils environment is described in detail in Chapter 19 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a) and is summarised in the following sections, including in the context of the minor areas of additional construction footprint required.

Soil and geology types

The geological units expected to be encountered at the Westmead metro station construction site include Quaternary deposits (zero – two metres below ground level, Ashfield Shale and Mittagong Formation (two to 35 metres below ground level), Mittagong Formation (35 to 45 metres below ground level) and Hawkesbury Sandstone (greater than 45 metres below ground level).

The Soil Landscapes of Sydney 1:100,000 Sheet (Chapman et al., 2009) and Soil Landscapes of Penrith 1:100,000 Sheet (Bannerman et al., 2010) identifies 'Blacktown' soil units at Westmead metro station and surrounds, which typically comprise strongly acidic and hard setting soils.

Soil salinity

The NSW Natural Resources Atlas sourcing information from the Salinity Hazard Map of NSW (DIPNR, 2018) does not indicate a soil salinity hazard at the Westmead metro station construction site. The hydrogeology modelling undertaken in the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a) also assessed there was no risk of saline water intrusion.

Acid sulfate soils

Potential acid sulfate soils risk maps obtained from the former Office of Environment and Heritage (now part of NSW Department of Planning and Environment) were reviewed to assess the probability of potential acid sulfate soils being present in proximity to Westmead metro station. No potential acid sulfate soils were identified within the construction site and immediate vicinity.

Contamination

Work carried out under the previous Sydney Metro West planning application would include the investigation and remediation of soil and/or groundwater contamination where required in accordance with the applicable mitigation measures and conditions of approval for that application.

Areas of environmental interest (AEI) identified in Chapter 20 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a) at Westmead metro station construction site, as well as those identified for this proposal in the areas of additional footprint, are described (as relevant to this proposal) as follows:

- AEI 1 – Railway activities north of the construction site – Moderate risk of soil contamination from use of hazardous building materials and railway activities including lead, asbestos, polychlorinated biphenyl's (PCBs), petroleum hydrocarbons and pesticides
- AEI 1(a) – Roads surrounding the construction site (Hawkesbury Road, Grand Avenue, Bailey Street, Hassall Street, Alexandra Avenue and Railway Parade) (new area of environmental interest identified for this proposal) – Low risk of soil and groundwater contamination from use of uncontrolled and potentially contaminated fill for shallow earthworks required for this proposal
- AEI 2 – Mechanical workshop/service station within the footprint of the construction site (corner of Alexandra Avenue and Hassall Street) – Low risk of groundwater contamination from petroleum hydrocarbons, volatile halogenated compounds (degreasers) and heavy metals

- AEI 3, 4 and 5 – Hazardous building materials and dumping of construction waste/former demolition within the footprint of the construction site east of Hawkesbury Road – Low risk of contamination because dumped construction waste or impacted shallow soils are expected to be remediated or managed prior to construction of this proposal.

AEIs rated as moderate risk or above following the completion of the work carried out under the previous Sydney Metro West planning application are shown on Figure 7-17.

Overall, the risk of shallow soil contamination or encountering previously dumped construction waste within the existing construction site is expected to be low as it would have been removed or managed prior to construction of this proposal. Residual groundwater contamination could be present following remediation that may potentially require ongoing management during construction of this proposal.

The additional footprint for this proposal includes rail integration work within AEI 1 (moderate risk of soil contamination) and road works within AEI 1(a) (low risk of soil and groundwater contamination). The additional excavation required for this proposal within the existing construction site would be located within AEI 2, 3, 4 and 5; however, as noted above, potential contamination in relation to AEIs 3, 4 and 5 will have been managed as part of work carried out under the previous Sydney Metro West planning application.

The conceptual site model and risk ranking for the areas of environmental interest at Westmead metro station are detailed in Appendix C of Technical Paper 7 (Contamination).

Figure 7-17 Areas of environmental interest (moderate risk or above) – Westmead metro station

Groundwater

Work carried out under the previous Sydney Metro West planning application will include the excavation of an untanked station box (excavation that allows groundwater to flow into the structure) and a tanked crossover cavern (mined cavern constructed with an impermeable casing/membrane that minimises groundwater inflows to negligible rates) to the east of the station box. The underground concourse excavated as part of this proposal would be about 16-17 metres wide, about 80 metres long and would be untanked.

The baseline groundwater environment for this proposal is described in Table 7-25 and shown in Figure 7-18.

Table 7-25 Groundwater baseline environment – Westmead metro station

Aspect	Description
Groundwater levels and flow	As a result of the work under the previous Sydney Metro West planning application, the groundwater level within the immediate area is predicted to reduce to about 30 metres below ground level (Sydney Metro, 2020a) (see Figure 7-18 for groundwater drawdown extent). This groundwater level is assumed to remain at the commencement of construction for this proposal. The predicted groundwater inflows to the station box of around 1.5 litres per second is expected to continue at the commencement of construction for this proposal. Localised groundwater flow is expected to be towards the untanked station box.
Groundwater quality	The baseline groundwater quality may be impacted by a change in the groundwater flow direction towards the untanked station box, (and has the potential to induce contaminated groundwater seepage). Potential contaminants of concern include hydrocarbons and volatile organic compounds. The potential contamination risk was assessed to be low to moderate for groundwater (as described above and in Chapter 20 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CB*D (Sydney Metro, 2020a)). The Westmead metro station construction site lies upgradient of the Charles Street and Marsden Street weirs on the Parramatta River. The waters of Parramatta River in the vicinity of the station are not expected to be saline, and groundwater in the vicinity of the Westmead metro station construction site is therefore not likely to be impacted by saline water intrusion (Sydney Metro, 2020a).
Groundwater users	One registered bore, GW108378, is reportedly used for industrial purposes and is located about 280 metres north-west of the Westmead metro station construction site. This bore is expected to have a reduced groundwater level of about six metres, as a result of work under the previous Sydney Metro West planning application (refer to Figure 7-18).
Groundwater dependent ecosystems	Figure 7-18 depicts groundwater dependent ecosystems in proximity to this proposal and the potential groundwater drawdown impacts to these ecosystems (associated with work under the previous Sydney Metro West planning application), which includes: • about 30 metres drawdown to a community of *Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain* located around 200 metres to 650 metres east of the construction site • about 23 metres drawdown to a community of *Forest Red Gum –Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain* located around 350 to 650 metres east of the construction site • about nine metres drawdown to a community of *Swamp Oak – open forest on riverflats of the Cumberland Plain and Hunter Valley* located around 500 metres to one kilometre north-west of the construction site.
Surface water and groundwater interaction	The interaction between surface water and groundwater in proximity to the Westmead metro station construction site is considered limited due to the altered nature of the area. The primary interactions include: • surface water acting as recharge to underlying groundwater units, where hydraulic gradients and modified environments (e.g. concrete-lined waterways/channels) allow • groundwater discharging to surface water as baseflow, especially in areas of low elevation (where hydraulic gradients and modified environments allow) • induced flow of surface water into groundwater due to the predicted groundwater drawdown resultant from work under the previous Sydney Metro West planning application • the surrounding area is highly urbanised with predominantly impervious surfaces across the catchments prior to the commencement of work for this proposal, which reduces possible surface water infiltration into soils and underlying groundwater. Groundwater drawdown is expected in proximity to Domain Creek, Toongabbie Creek, Finlaysons Creek and the Parramatta River (see Figure 7-18) as a result of the work under the previous Sydney Metro West planning application.

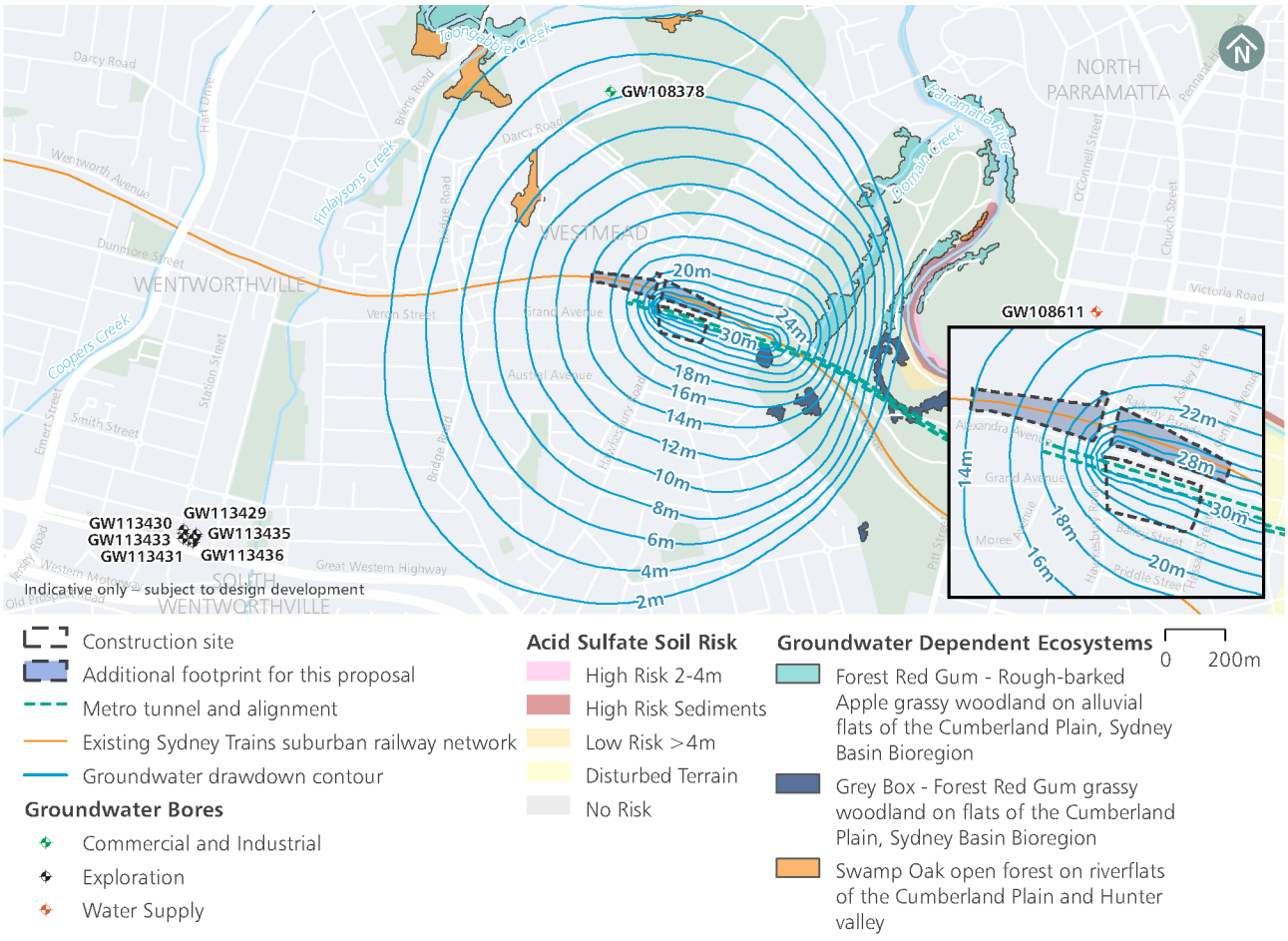

Figure 7-18 Groundwater baseline environment – Westmead metro station

7.10.2 Operational impact assessment

Soils

The operation of Westmead metro station is not expected to have any further impact on soils, including from acid sulfate soils and saline soils, as there would be no excavation after completion of construction of this proposal.

Contamination

Soil and/or groundwater contamination within the construction footprint, if present, is expected to be investigated and remediated during work carried out under the previous Sydney Metro West planning application or this proposal, in accordance with the relevant mitigation measures and conditions of approval. There are therefore not expected to be impacts from existing contamination during operation, except for potential drawdown of contaminated groundwater from outside of the construction footprint that requires management and treatment during operation as the Westmead metro station box is untanked. All groundwater extracted from dewatering of the station box would be captured, pumped to the operational water treatment plant at the Clyde stabling and maintenance facility and treated prior to discharge, in accordance with the water quality requirements outlined in Section 18.9 (Hydrology and water quality) of this Environmental Impact Statement.

Operation of Westmead metro station would require limited use and storage of chemicals, oils or fuels. There are no significant sources of contamination or impacts anticipated from the operation of the station, roads or public domain. Management measures associated with the use and storage of chemicals during operation would be implemented (refer to Chapter 20 (Synthesis) of this Environmental Impact Statement).

Groundwater

Potential impacts to groundwater during operation at Westmead metro station are described in Table 7-26.

Table 7-26 Potential impacts to groundwater during operation – Westmead metro station

Potential impact	Discussion
Groundwater recharge	Groundwater within the station area is predominantly recharged by rainfall runoff and infiltration through the soil profile. The surface area of impervious surfaces at Westmead metro station is not expected to substantially increase due to the operational elements for this proposal, as the construction site prior to commencement of work for this proposal would comprise predominately paved (impervious) surfaces.
Groundwater levels, inflows, and flow patterns	During the operation of this proposal, the predicted groundwater inflows to the untanked station box and underground concourse anticipated during the construction of this proposal are expected to continue (refer to Table 7-27). Tanking the crossover cavern would promote a partial recovery of groundwater level and associated inflows (compared with construction phase drawdown) until a new long-term groundwater level is achieved around Westmead metro station. The overall regional flow pattern is expected to be consistent with that identified for the previous Sydney Metro West planning application due to the untanked station box and underground concourse. Further groundwater modelling to confirm the impacts and flow patterns would be carried out for the work under the previous Sydney Metro West planning application in accordance with Concept condition of approval D122. This groundwater modelling report would be further reviewed and updated to incorporate the scope of this proposal.
Groundwater quality	Groundwater quality is expected to remain consistent with the baseline conditions (refer to Table 7-25), where there is a continued risk of encountering localised contaminated groundwater during operation (through the untanked station box and underground concourse). However, the volume of potentially contaminated groundwater to be managed during the operation of this proposal would be less than for the construction under the previous Sydney Metro West planning application. This is due to the cavern excavation being tanked at commencement of construction of this proposal, which would reduce the groundwater drawdown and associated inflow volumes. Any long-term groundwater inflows would be collected, treated at the operational water treatment plant at the Clyde stabling and maintenance facility, and discharged in accordance with the water quality requirements outlined in Section 18.9 (Hydrology and water quality) of this Environmental Impact Statement.
Groundwater users	One registered groundwater bore reported to be used for industrial purposes is expected to improve from the baseline condition and the bore's yield (groundwater supply capability) is unlikely to be markedly impacted by groundwater level drawdown associated with station operation.
Groundwater dependent ecosystems	Potential impacts on identified groundwater dependent ecosystems (terrestrial vegetation) are expected to be enhanced from their baseline conditions during station operation, as groundwater levels are expected to partially recover during operation compared to construction phase of this proposal due to the tanked cavern.

Potential impact	Discussion
Surface water – groundwater interaction	Groundwater acting as baseflow to surface water features is considered to be a minor component of recharge in the area surrounding Westmead metro station. During work under the previous Sydney Metro West planning application, the potential for impacts on the groundwater recharge to surface water is expected to be minimal. The operational phase of this proposal is considered to maintain or reduce this minimal impact. Mitigation measures GW2 and GW3 for the previous Sydney Metro West planning application identified that further investigations during design development may confirm the existing baseflow contribution by groundwater resources to Domain Creek and Toongabbie Creek, and the likelihood and significance of potential impacts of predicted groundwater drawdown on baseflow. A review of these further investigations and potential treatments implemented as part of work under the previous Sydney Metro West planning application would be carried out to identify whether further measures may need to be implemented to manage potential impacts of this proposal.
Policy compliance	The minimal harm criteria in the NSW Aquifer Interference Policy (NSW Department of Primary Industries, 2012) and Water Sharing Plan rules (NSW Department of Industry, 2011) adopted for the previous Sydney Metro West planning application are expected to be carried through and complied with during operation of this proposal. Impacts from the alteration of groundwater levels and flow regime are likely to be reduced, due to the tanked crossover cavern that would reduce the groundwater drawdown and associated inflow until a new groundwater level is achieved around the station.

7.10.3 Construction impact assessment

Soils

There is the potential for temporary minor soil erosion from the exposure of soil to water runoff and wind during excavation works required for this proposal. This would be adequately managed with the implementation of standard erosion and sediment controls.

There are no impacts anticipated related to soil or groundwater salinity related to the construction of the proposed Westmead metro station, due to the lack of salinity risk identified within the construction site. If unexpected saline soils are encountered, salinity impacts would be managed in accordance with *Book 4 Dryland Salinity: Productive Use of Saline Land and Water* (NSW Department of Environment and Climate Change, 2008b).

The exposure of acid sulfate soils during construction is not expected to occur at Westmead metro station. If unexpected acid sulfate soils are encountered, any potential acid sulfate soil impacts would be managed in accordance with the *Acid Sulfate Soil Manual* (NSW Acid Sulfate Soil Management Advisory Committee, 1998). The extent of groundwater drawdown during construction (discussed further below) is also not expected to extend into areas of potential acid sulfate soils.

Contamination

Existing contamination

Soil contamination within the Westmead metro station construction site is likely to be predominantly remediated or managed in accordance with the mitigation measures and conditions of approval for the previous Sydney Metro West planning application prior to construction commencing for this proposal. Residual contamination, if present, is likely to be minor and isolated.

The additional footprint for this proposal includes rail integration works within AEI 1 (moderate risk of soil contamination) and road works within AEI 1(a) (low risk of soil and groundwater contamination). Potential contamination risks in these locations include potential exposure to, and disturbance of, contamination from earthworks for the subsurface pedestrian connection and shallow earthworks required within the rail corridor or road corridor for this proposal. Potential contamination impacts would be managed in accordance with the mitigation measures (refer to Section 7.10.4).

There is the potential for residual localised groundwater contamination to require management and be collected, treated, and discharged during construction of this proposal in accordance with the water quality requirements if collected from the station box. In accordance with Concept condition of approval D122, a revised Groundwater Modelling Report is required to assess impacts from groundwater drawdown. Specific mitigation and monitoring recommended in this report, including where required for groundwater contamination, would be reviewed and updated as required for this proposal.

New contamination

With the exception of the use and storage of chemicals associated with construction activities (e.g. fuels and oils associated with the operation of plant and equipment), the construction activities associated with this proposal are unlikely to represent a significant source of contamination. Management measures associated with the use and storage of chemicals during construction activities would be implemented (refer to Chapter 21 (Synthesis) of this Environmental Impact Statement).

Groundwater

Potential impacts to groundwater during construction of this proposal at the Westmead metro station construction site are outlined in Table 7-27.

Table 7-27 Potential impacts to groundwater during construction – Westmead metro station

Potential impact	Discussion
Groundwater recharge	Groundwater within the station area is predominantly recharged by rainfall runoff and infiltration through the soil profile. The impervious surface area within the construction site is expected to increase marginally. However, this area is small relative to the overall aquifer, such that the net impact on regional recharge due to construction of this proposal is considered negligible.
Groundwater levels, inflows, and flow patterns	The extent of groundwater drawdown in the immediate station area is expected to be similar to, or reduced, in comparison to those identified for the previous Sydney Metro West planning application. This is due to the excavation work required for the underground concourse being lesser in extent compared to the previous excavations. The untanked station box would maintain the groundwater inflows modelled for the previous Sydney Metro West planning application (identified in Table 7-25) throughout construction of this proposal. The untanked underground concourse would likely have similar inflow rates maintained through the construction phase of this proposal. The tanked crossover cavern would reduce the groundwater inflows and would promote recovery of groundwater levels around the cavern over time (recovery continued through construction of this proposal). The groundwater flow direction would be towards the untanked underground concourse and the ongoing untanked station box, as discussed in Table 7-26. The groundwater flow pattern may be varied from that shown in Figure 7-18 due to the orientation of the underground concourse to the station box. Overall, the potential impacts from construction of this proposal to groundwater levels, inflows and groundwater flow regime at Westmead metro station are expected to be similar to, or reduced, compared to the baseline groundwater environment. Potential groundwater impacts from this proposal would be managed through the implementation of mitigation measures outlined in the CEMF, relevant sub-plans and in Table 7-28 below. Further groundwater modelling to confirm the extent of groundwater drawdown, flow patterns, and seepage rates would be carried out in accordance with Concept condition of approval D122. This would be further reviewed and updated to consider the potential groundwater impacts associated with this proposal at Westmead metro station.

Potential impact	Discussion
Groundwater quality	There is a risk of encountering localised contaminated groundwater as part of this proposal (groundwater quality is expected to remain consistent with the baseline conditions). The volume of potentially contaminated groundwater to be managed during construction of this proposal would be similar to or less than the previous Sydney Metro West planning application as the crossover cavern would be tanked prior to the commencement of construction of this proposal. Groundwater inflows would be collected, treated, and discharged in accordance with the water quality requirements outlined in Section 18.9 (Hydrology and water quality) of this Environmental Impact Statement. Potential migration of contaminated groundwater into localised road, services and footing excavations, poses an overall low exposure risk to construction workers and ecological receptors (Domain Creek and Paramatta River) as groundwater contamination within the area is expected to be localised. Further groundwater monitoring to confirm groundwater quality and predictive groundwater modelling to confirm potential groundwater flow patterns would be carried out for work under the previous Sydney Metro West planning application. This would be further reviewed and updated as required for this proposal (refer to mitigation measures in Chapter 20 (Synthesis) of this Environmental Impact Statement).
Groundwater users	This proposal would likely continue to impact groundwater levels in one registered groundwater bore (GW108378, identified in Table 7-25). Further groundwater modelling would be carried out to identify potential impacts on this groundwater bore. Groundwater monitoring of the water level at this bore would be undertaken should further predictive modelling identify the potential for substantial impacts to this groundwater resource. Based on the distance of other registered bores within the vicinity of Westmead metro station, as shown on Figure 7-18, it is unlikely that groundwater drawdown associated with this proposal would impact these bores.
Groundwater dependent ecosystems	Potential impacts on identified groundwater dependent ecosystems in proximity of Westmead metro station, if realised, are predicted to be similar or reduced compared to those identified as part of the previous Sydney Metro West planning application. Additional investigations and assessment completed as part of the previous Sydney Metro West planning application (in accordance with mitigation measure B3 for those works) would be reviewed and updated for this proposal, to confirm the potential for impacts, and to identify any required mitigation through design (see mitigation measure EIS-GW3 in Section 7.10.4).
Surface water – groundwater interaction	Groundwater acting as baseflow to surface water features is considered to be a minor component of recharge in the area. There is potential for groundwater drawdown to impact on recharge to surface water features as a result of work under the previous Sydney Metro West planning application, with these impacts to surface water features in proximity to the station expected to remain during construction of this proposal due to construction of the untanked subsurface pedestrian connection. Further investigations during design development for work under the previous Sydney Metro West planning application to confirm the existing baseflow contribution by groundwater resources to Domain Creek and Toongabbie Creek, and the likelihood and significance of potential impacts of predicted drawdown on baseflow, would be reviewed and updated for this proposal. The mitigation measures identified would be maintained throughout construction of this proposal (see mitigation measure EIS-GW1 and EIS-GW2 in Section 7.10.4).
Policy compliance	The minimal harm criteria in the NSW Aquifer Interference Policy (NSW Department of Primary Industries, 2012) and Water Sharing Plan rules (NSW Department of Industry, 2011) adopted for the previous Sydney Metro West planning application are expected to be carried through and complied with during construction of this proposal. Impacts from the alteration of groundwater levels and flow regime are predicted to be reduced for this proposal compared to the baseline.

Potential impact	Discussion
Ground movement	There is the potential for ground movement during construction of this proposal including due to excavation of the subsurface pedestrian connection and associated groundwater drawdown. If not adequately managed, ground movement has the potential to cause damage to infrastructure, nearby buildings and other structures. A preliminary assessment considering the Rankin 1988 risk classification identified that the risk to buildings and structures associated with this proposal, in the vicinity of the Westmead metro station construction site due to ground movement, would be limited to the existing Westmead Station and would be slight (possible superficial damage which is unlikely to have structural significance) to negligible (superficial damage unlikely). In accordance with the measures in the CEMF, the detailed geotechnical and hydrogeological model developed prior to construction under the previous Sydney Metro West planning application would be adopted, as relevant, for this proposal and progressively updated during design and construction, including to determine potential ground movement. Condition surveys of buildings and structures in the vicinity of excavations would also be carried out prior to the commencement of excavation. During detailed assessment, if ground movement impacts are predicted to exceed acceptable criteria for buildings and/or heritage items, a range of potential options are available to reduce impacts to acceptable levels including: • changes to elements of the construction methodology • consideration of ground improvement options • provision of structural support to the tunnels/excavations and/or to the structures potentially impacted • ground movement monitoring for identified sensitive areas of this proposal. These options have been successfully implemented to manage ground movement impacts on a number of other rail and road tunnelling projects in NSW.

7.10.4 Management and mitigation measures

Environmental management for this proposal would be undertaken through the environmental management approach as detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. This includes operational mitigation measures (where relevant) and performance outcomes for the operation and construction of this proposal.

During construction of this proposal, soils, contamination and groundwater would be managed in accordance with Sydney Metro's CEMF (refer to Appendix F). The CEMF includes soil, contamination and groundwater management objectives and mitigation measures to minimise impacts as relevant to this proposal as a whole.

Mitigation measures that are specific to the operation and construction of Westmead metro station to address potential impacts are listed in Table 7-28.

Table 7-28 Soils, contamination and groundwater mitigation measures – Westmead metro station

Ref	Impact/issue	Mitigation measure	Timing
Soils, contamination and groundwater			
EIS-GW1	Potential reduced baseflow to Toongabbie Creek and Domain Creek	A review of additional geotechnical and hydrogeological data from ongoing investigations would be carried out to inform the hydraulic connectivity between groundwater and surface water and whether predicted groundwater drawdown from this proposal is likely to occur in the vicinity of these creeks.	Construction

Ref	Impact/issue	Mitigation measure	Timing
EIS-GW2	Potential reduced baseflow to Toongabbie Creek and Domain Creek. Requirements for baseline monitoring of hydrological attributes	Additional site investigations would be carried out at creeks or surface water bodies where the additional data review in EIS-GW1 shows there is a likely surface water/groundwater interaction. This would involve baseline monitoring of creek flows (streamflow gauging) prior to construction, and baseflow streamflow analysis to confirm the existing groundwater baseflow contribution to streamflow for each creek. Where a significant reduction in baseflow is predicted due to this proposal, design responses would be implemented at station and shaft excavations to reduce potential baseflow loss.	Construction
EIS-GW3	Groundwater dependent ecosystems	Additional investigations and assessment completed as part of the previous Sydney Metro West planning application (mitigation measure B3) would be reviewed and updated for this proposal, to confirm the potential for impacts to groundwater dependent ecosystems due to groundwater drawdown, and to identify any required mitigation through design.	Construction

7.11 Flooding

Further details on the flooding assessment, including the approach and methodology, are provided in Technical Paper 8 (Hydrology, flooding and water quality). The legislative context for the assessment is provided in Appendix B.

7.11.1 Baseline environment

Westmead metro station is located on a local ridge and there is no significant catchment upstream of the site. The local area is on sloping land which drains to the east, primarily through an underground stormwater system, into Domain Creek and then onto Parramatta River. The site ranges from around 32 to 40.5 metres Australian Height Datum (AHD).

Flood study mapping and the previous Sydney Metro West planning application identified that the construction site and immediate surrounds are outside of flooding extents, flood hazard, floodway and flood storage areas in both the one per cent Annual Exceedance Probability (AEP) event and Probable Maximum Flood (PMF) event. Flooding is generally expected to be contained within the adjacent roadways, with some areas of ponding within the site. Alexandra Avenue currently acts as a flow path to convey stormwater to the kerb and drainage system, and stormwater extends south into the existing residential areas during rare flood events.

The area is primarily classified as a low flood hazard in the one per cent AEP flood event and is considered safe for people, vehicles, and buildings. Small, localised areas show higher depths that are within a high flood hazard category. The PMF event is similar, with slightly larger areas above the low hazard category, including high flood hazard areas along Alexandra Avenue and other streets adjacent to the site.

There are no mainstream flooding or coastal inundation risks relevant to the site and immediate surrounds.

Private property bounded by Priddle Street, Bailey Street, Hassall Street, Alexandra Avenue, Park Parade and parkland (previously known as the Parramatta Golf Course) are likely to be impacted during the PMF event.

The additional footprint for this proposal in the rail corridor also contains areas that are classified up to moderate flood hazard during the PMF event. Evacuation from the site can be accessed via Hawkesbury Road in all flood events.

The station box and crossover cavern at Westmead metro station will have been excavated as part of work carried out under the previous Sydney Metro West planning application. The previous Sydney Metro West planning application identified that impacts to existing flooding behaviour at the Westmead construction site and immediate surrounds are unlikely.

7.11.2 Operational impact assessment

The flood protection levels for Westmead metro station are driven by the one per cent AEP (with climate change) flood event (plus 0.3 metres of freeboard), which is 38.03 metres AHD on Alexandra Avenue and 30.32 metres AHD on Hassall Street. The proposed surface levels at the station entry on Hawkesbury Road is around 38 metres AHD and the design level of the station is at or above the flood protection level.

Operational flood impact criteria established for this proposal are described in Section 3.1.4 of Technical Paper 8 (Hydrology, flooding and water quality). An assessment of potential flooding impacts at Westmead metro station is provided in Table 7-29 and shown in Figure 7-19. The operational flooding assessment considers the flooding extent for the one per cent AEP (with climate change) and PMF events. The five per cent AEP (with climate change) is also considered in Technical Paper 8 (Hydrology, flooding and water quality). Figures showing the modelling for a range of flooding events are provided in Appendix B and C of Technical Paper 8 (Hydrology, flooding and water quality).

Potential impacts during operation of this proposal at Westmead metro station are expected to be minor and localised in all flooding events. Mitigation measures to manage potential impacts are outlined in Section 7.11.4.

Table 7-29 Potential flooding impacts for the modelled one per cent AEP and PMF flood events – Westmead metro station

Potential impact	Description
Change in peak flooding levels	• flood modelling undertaken for the one per cent AEP and PMF events indicate this proposal would have limited localised impacts on flood levels, including increases in flood levels for the adjacent Alexandra Avenue • a potential increase in flood depths of about 0.2 metres at the verge of the intersection of Alexandra Avenue and Hassall Street is predicted during the one per cent AEP and PMF events • as set out in the mitigation measures (refer to Section 7.11.4), further design refinement would occur to manage potential local flooding impacts.
Change in flood extent	• a slight increase in potential flood extent around the aboveground station infrastructure (located south of the existing rail corridor) is anticipated in both the one per cent AEP and PMF events. The increase in flood extent around the structures is anticipated as there would be open areas between the structures. This is shown in Figure 7-19 for the one per cent AEP event. Impacts to private properties due to the change in flood extent are not anticipated.
Compatibility with the flood hazard of the land	• flood risk and potential impacts during operation of this proposal would remain unchanged from the baseline environment conditions and therefore are considered compatible with the flood hazard of the site • access and evacuation routes would be readily available via the adjacent streets for the events considered in this assessment with Hawkesbury Road a safer choice during the PMF flood event.
Change in duration of inundation	• change in duration of inundation in all flood events would be negligible.
Potential property impacts	• there would be no newly flood-affected private properties as a result of this proposal.
Consistency with floodplain risk management	• Cumberland City Council has no floodplain risk management plan applicable to this area. Flood control mapping under the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 identifies that some sections of Alexandra Avenue are flood ways with flow conveyance largely within the road corridor. This is consistent with the mapping shown in Appendix A of Technical Paper 8 (Hydrology, flooding and water quality).
Potential impacts to critical infrastructure and emergency management arrangements for flooding	• no potential flooding impacts to the major road or rail transport routes identified in the *South West Regional Emergency Management Plan* (South West Metropolitan Regional Emergency Management Committee, 2017) would occur as a result of this proposal given the distance of the routes from the site.

Potential impact	Description
Potential social and economic costs from flooding impacts	• given the generally low flood affectation at Westmead metro station and the expected low impact on flood behaviour on surrounding properties and infrastructure as a result of this proposal, the potential social and economic costs from flooding impacts are considered low.

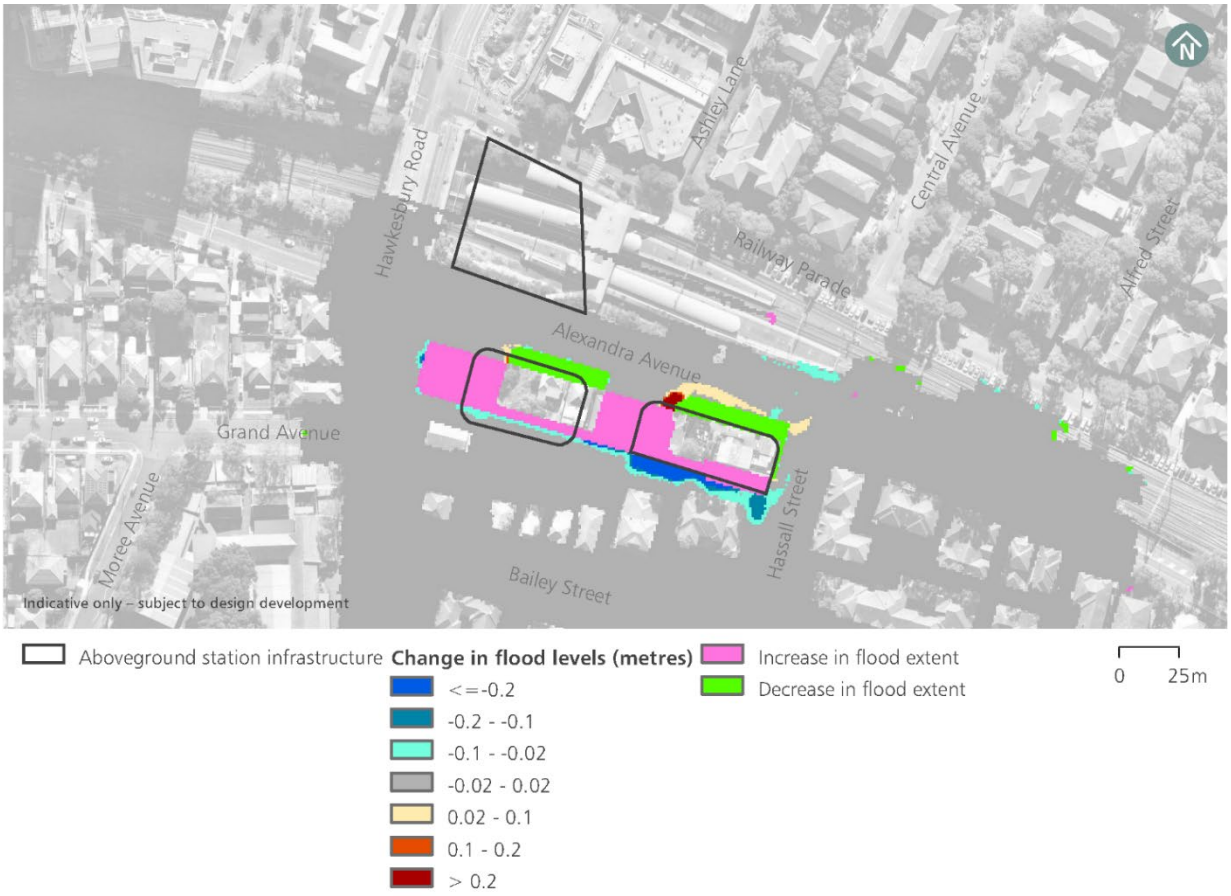

Figure 7-19 Potential change in flood levels (one per cent AEP event) - Westmead metro station

7.11.3 Construction impact assessment

The duration of construction at the Westmead metro station construction site would be about four years (see Figure 7-8). In general, the potential construction phase flood risks would be a continuation of the potential flooding risks associated with the previous Sydney Metro West planning application. That is, impacts to existing flooding behaviour at the Westmead metro station construction site and immediate surrounds are unlikely because the majority of the site is located outside of flooding extents, flood hazard, floodway and flood storage areas in both the five per cent AEP and one per cent AEP (both with climate change) events. The potential impacts on flood behaviour from the previous Sydney Metro West planning application would continue during construction of this proposal, including:

- direct intense rainfall onto the site may cause nuisance flooding and drainage issues
- continued potential interruption of overland flow paths from temporary construction site infrastructure and modifications to landforms
- the potential interruption or diversion of existing flood routes away from the location of bunding or spoil within construction sites, resulting in a reduction of flood storage and an increased flood risk to adjacent sites
- disruption of street kerb and gutter at construction site vehicle entry locations which may result in localised ponding
- potential blocking of drainage networks through increased sedimentation of surface water.

This proposal includes temporary construction activities within Alexandra Avenue for about 12 to 18 months to support construction, and temporary works within adjacent roadways for station precinct and interchange work. There are some minor localised areas of moderate to high flood hazard in adjacent roadways during the five per cent AEP and one per cent AEP (both with climate change) events. Therefore this proposal has the potential to result in new impacts on existing flooding behaviour through the temporary interruption of the overland flow path along Alexandra Avenue as a result of installation of temporary construction site infrastructure or modification to landforms (i.e. placement of fill materials in roadways for station precinct infrastructure). The CEMF (refer to Appendix F) requires the preparation of a Soil and Water Management Plan that would include consideration of surface water and flooding measures and progressive erosion and sediment control plans to management potential impacts, including in relation to managing and staging work to manage overland flow paths on Alexandra Avenue.

The additional construction footprint for this proposal also includes some locations within the existing rail corridor which are affected by both the five per cent AEP and one per cent AEP (both with climate change) events. Construction work within the rail corridor would generally be carried out during multiple short term rail possessions. As such, potential impacts to flood behaviour associated with this work would be negligible.

Localised changes to overland flows would be limited in their scale to the immediate vicinity of the construction works, and due to the temporary nature of the impacts are considered minor. The overall risk of flooding impacts during construction from this proposal is considered low and the magnitude of impacts negligible.

Potential hazard to people and vehicles accessing the site would need to be managed through the CEMF in rare and extreme flood events due to the high hazard in surrounding streets and the existing rail corridor.

Compatibility of construction sites with flood conditions

The majority of the Westmead metro station construction site is considered to be compatible with flood conditions due to the majority of the construction site not being flood prone and having low flood hazard during all flood events.

Cumberland City Council flood control mapping under the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 indicates that the section of Alexandra Avenue east of around Hassall Street to the parkland previously known as the Parramatta Golf Course is considered a flood way. This proposal involves temporary construction activities within Alexandra Avenue at, and west of, Hassall Street.

With the implementation of mitigation measures, it is expected that these hydraulic functions would be compatible with this proposal.

Consistency with floodplain risk management plans

Cumberland City Council has no floodplain risk management plan applicable to this area. Flood control mapping under the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 indicates that several lots within and adjacent to this proposal have ponding hazard which would be managed as part of future re-development. A review of this mapping did not identify any conflicts or inconsistencies with proposed floodplain risk management measures.

Potential impacts to emergency management arrangements for flooding

No major road or rail transport routes identified in the *South West Regional Emergency Management Plan* (South West Metropolitan Regional Emergency Management Committee, 2017) are close enough to be impacted by flood flows from this site. The temporary closure of Alexandra Avenue for around 12 to 18 months would result in ambulances travelling to the Westmead health precinct being diverted via Hassall Street, Bailey Street and/or Priddle Street to Hawkesbury Road. Existing flood conditions along this diversion are similar to or less than existing flood conditions on the current route. As a result, there would be no impacts from this proposal on the ability for ambulances to access Westmead health precinct during flood events.

Potential social and economic costs from flooding impacts

Similar to the operations phase, potential social and economic costs from flooding impacts at Westmead as a result of this proposal are considered low given the generally low flood affectation of Westmead metro station construction site and the expected low impact on flood behaviour on surrounding properties and infrastructure.

7.11.4 Management and mitigation measures

Environmental management for this proposal would be undertaken through the environmental management approach as detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. This includes operational mitigation measures (where relevant) and performance outcomes for the operation and construction of this proposal.

Potential flood risks during construction of this proposal would be managed in accordance with Sydney Metro's CEMF (refer to Appendix F). The CEMF includes flooding objectives and mitigation measures to minimise impacts as relevant to this proposal as a whole.

Mitigation measures that are specific to the operation and construction of Westmead metro station to address potential impacts are listed in Table 7-30.

Table 7-30 Flooding mitigation measures – Westmead metro station

Ref	Impact/issue	Mitigation measure	Timing
Flooding			
EIS-HF3	Impacts during operation	Ongoing consultation would occur with State Emergency Services and relevant councils in relation to potential impacts to existing community emergency management arrangements for flooding.	Operation

7.12 Social impacts

Further details on the social impact assessment, including the approach and methodology, are provided in Technical Paper 9 (Social impacts). A discussion of potential broader proposal-wide and regional social impacts (both benefits and disbenefits) are provided in Chapter 18 (Proposal-wide) of this Environmental Impact Statement.

7.12.1 Baseline environment

The characteristics of the communities within the social locality is described as the social baseline. The social baseline has been analysed by considering the human, social, economic, physical, and natural capital present around Westmead metro station. Statistical analysis of the social baseline has been carried out by considering the primary geographical areas of interest as defined by the Australian Bureau of Statistics (ABS). These areas of interest have been termed as:

- **the proximal area:** Statistical Area level 1 (SA1s) have been chosen as the closest approximation of each of the localities along the corridor
- **suburb:** Statistical Area level 2 (SA2s) have been chosen to prepare community profiles for the proposal corridor
- **region:** The Greater Sydney area has been chosen to assist with the assessment of the broader social impacts. It has also been used for comparative purposes.

A summary of the community capitals related to Westmead metro station is discussed in Table 7-31. This summary considers the proximal area of analysis only. A discussion of potential broader corridor-wide and regional social impacts (both benefits and disbenefits) is provided in Chapter 18 (Proposal-wide) of this Environmental Impact Statement.

Table 7-31 Community capitals summary – Westmead metro station

Capital	Summary
Human	As of 2016, the population was about 6,642 residents with a quarter of the population under the age of 19 – this is the youngest locality across the corridor and is comparable to Greater Sydney. In 2016, 23.7 per cent of the population were attending an educational facility, including two-thirds of which were at preschool, or infants/primary or secondary school, which is reflective of the younger population of the locality.
Social	Some 23.1 per cent of households spoke English only at home. This was the lowest share of all localities across the corridor and reflective of the percentage of residents in this locality that were born overseas (71.8 per cent). Almost 40 per cent of the population were born in India, and Tamil and Hindi were the second and third most common language spoken at home (9.9 per cent and 9.4 per cent respectively).

Capital	Summary
	In terms of stability of residence, this has been increasing in Westmead relative to other localities, with the share of residents living at the same address one year ago increasing to 79.1 per cent compared to 41.7 per cent living at the same address five years ago. Westmead also had a slightly higher percentage of the population needing help or assistance in one or more of the three core activity areas of self-care, mobility and communication, attributable to long-term health conditions (lasting six months or more), a disability (lasting six months or more) or old age.
Economic	Overall, households were slightly less financially advantaged compared to other localities, as they have a lower median household annual income, with only one in four households earning above $2,500 per week, which is considered a high income. A high proportion of households were rented (63.5 per cent) compared to 35.1 per cent in Greater Sydney, while 11.5 per cent were owned outright, the smallest across all localities. Westmead had the highest percentage of households paying weekly rent in the medium highest quartile (55.1 per cent paying between $340 to $442 per week). They also had the highest percentage in the lowest group (17.3 per cent paying between $0 to $234 per week), indicating that the locality has more affordable housing when compared to others in the corridor. Westmead also had one of the highest levels of unemployment in 2016 at 9.6 per cent of the eligible working age population. Unemployment levels are calculated based on those of eligible age (between the ages of 16 and 65), who are not engaged in secondary education and who are able to work. Of those that were employed, the dominant industry was professional, scientific and technical services.
Physical	Most dwellings were flats, units or apartments (74.5 per cent) and one in five houses were separate houses. The average household size was 3, which was the highest across all the localities, with the average household size being 2.4 across the entire corridor. Residents reported one of the highest uses of public transport compared to other localities, with 40.3 per cent of residents travelling to work via train or bus. This was one of the highest across all localities, indicating that the existing station and bus networks within the Westmead locality mean that residents have fairly good access to public transport and are less car dependent compared to other localities. 78.9 per cent of households had one or more cars, and 32.4 per cent of residents drove to work. Key community infrastructure (tangible community assets) around Westmead metro station includes various heritage, cultural or built-form landmarks. These include, but are not limited to, Westmead Hospital and Westmead Children's Hospital, Western Sydney University Parramatta campus and Parramatta Park.
Natural	Natural capital includes watercourses such as the Parramatta River, as well as many small creeks and tributaries. Additionally, Parramatta Park has a UNESCO World Heritage listing.

7.12.2 Operational impact assessment

Social impacts would be experienced at different geographies or spatial extents. A large proportion of operational social impacts associated with Westmead metro station would be felt at a regional and a suburb level; however, some would be experienced at a proximal level. This section focuses on the operational impacts at the proximal level, while a region- and suburb-based analysis, including potential beneficial social impacts, is provided in Chapter 18 (Proposal-wide) of this Environmental Impact Statement.

An assessment of the potential social impacts, both positive (benefits) and negative (disbenefits), of the operation of Westmead metro station is outlined in Table 7-32. These potential social impacts are unmitigated and would be appropriately managed through the mitigation measures outlined in Section 7.12.4 and through the performance outcomes detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. Sydney Metro would also develop a Community Benefit Plan to guide the development of community benefit initiatives (by Principal Contractors).

A residual impact rating has been assigned to each unmitigated impact in Table 7-32 to quantify the impacts after mitigation measures have been applied.

Table 7-32 Summary of operational social impacts – Westmead metro station

Pre mitigation impact	Social impact category	Impact type	Residual impact rating
Increased access to jobs, businesses, education, services, and social facilities improving social cohesion and social health for the whole community, including vulnerable persons.	Health and wellbeing Way of life Accessibility Livelihoods	Positive	High
Social amenity and placemaking benefits, including improvements to the aesthetic value of the area by creating attractive and active public spaces that reflect the existing or desired future scale and character of local areas. In terms of social amenity and placemaking, the operation of Sydney Metro West would help enhance the sense of community character within the Westmead town centre and would possibly change the way the community functions, by providing a focal point for the community to meet, pause and engage in urban life.	Surroundings	Positive	High
Change in community character due to permanent changes to improve local visual character. In terms of visual amenity, Technical Paper 6 (Landscape and visual amenity) found that overall, the new station upgrades would considerably improve the landscape quality and functioning of the precinct.	Community	Positive	High
Potential decline in social amenity and ability to experience surroundings in the way the community have done in the past to due to ongoing operational noise. During operation, localised impacts on amenity may be experienced at properties near Westmead metro station due to: • increased noise and light spill from station operations • changes to the visual environment and views from new surface infrastructure • changes to local road access and through routes • potential increased traffic and parking in local streets around station precincts.	Way of life	Negative	Low
Potential decline in how people experience their living environments due to light spill, visual amenity and/or extended opening hours of services at individual precincts.	Way of life	Negative	Low

Overall, the assessment found that the operation of Westmead metro station would provide increased accessibility to and from the area for a large group of people, including for those with vulnerabilities. A greater level of access would be experienced in comparison to the existing T1 Western Line and T5 Cumberland Line, which would open up additional opportunities for employment, education and recreational pursuits by reducing the travel time between larger metro areas such as Parramatta and the Sydney CBD.

There would be some potential residual negative social impacts with respect to noise and vibration and visual impact; however, these would be managed to an acceptable level through the mitigation measures as identified in Chapter 20 (Synthesis) of this Environmental Impact Statement.

7.12.3 Construction impact assessment

Construction activities would predominantly be carried out within the same construction site required for the previous Sydney Metro West planning application. However, additional land within the rail corridor to the east and west of Hawkesbury Road and within local roads surrounding the construction site would be required for the purposes of construction activities. It is expected that the people impacted by this proposal would already be experiencing impacts from similar activities and that construction impacts would be continued. Anticipated construction impacts are expected to be similar and would be a continuation of those from the work carried out under the previous Sydney Metro West planning application. During this proposal, local amenity impacts such as noise, vibration, and air quality would reduce compared to the work carried out under the previous Sydney Metro West planning application due to the nature of the construction activities for this proposal.

An assessment of the potential social impacts of constructing this proposal at Westmead metro station are outlined in Table 7-33. These potential impacts are unmitigated and would be appropriately managed through the implementation of the mitigation measures outlined in Section 7.12.4 and through the performance outcomes detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. Sydney Metro would also develop a Community Benefit Plan to guide the development of community benefit initiatives (by Principal Contractors).

A residual impact rating has been assigned to each unmitigated impact to quantify the impacts after these mitigation measures have been applied.

Table 7-33 Summary of construction social impacts – Westmead metro station

Pre mitigation impact	Social impact category	Impact type	Residual impact rating
Continued impact to how people experience the local area, reduced social cohesion or a decline in community interactions due to continued construction impacts and changes to the streetscape, particularly considering the linguistic diversity in the community.	Community Culture Way of life	Negative	Medium
Potential wellbeing impacts associated with ongoing construction activity for vulnerable people including those people sensitive to noise and vibration, needing assistance with mobility or communication, or experiencing mental ill health.	Health and wellbeing	Negative	Low
Continued reduction to social amenity in local area and how people experience local social infrastructure (such as schools) due to the presence of a slightly larger construction site and associated impacts on noise, air quality and vibration.	Surroundings Way of life	Negative	Medium
Disruption to business trade due to the demolition of the existing concourse.	Livelihood	Negative	Low

The assessment indicates that the social impacts of this proposal would effectively represent a continuation of the impacts identified for the previous Sydney Metro West planning application, though generally at a lower level of intensity and extent. Key negative impacts would be largely related to community, culture, surroundings and way of life, and would be temporary and short term in nature. These impacts would be managed to an acceptable level through proven mitigation measures as identified in Chapter 20 (Synthesis) of this Environmental Impact Statement.

7.12.4 Management and mitigation measures

Environmental management for this proposal would be undertaken through the environmental management approach as detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. This includes operational mitigation measures (where relevant) and performance outcomes for the operation and construction of this proposal.

During construction of this proposal, social impacts would be managed in accordance with Sydney Metro's CEMF (refer to Appendix F). The CEMF includes social impact management objectives and mitigation measures to minimise impacts as relevant to this proposal as a whole.

The OCCS (Appendix C (Overarching Community Communications Strategy)) also specifies that a Community Communication Strategy would be prepared and implemented during construction which would define the location specific measures to be implemented to minimise impacts on people during construction.

Design refinements that have occurred to avoid or minimise social impacts, and to respond to stakeholder feedback are provided in Technical Paper 9 (Social impacts). Monitoring commitments during the operation and construction of this proposal, including adaptive management measures, are provided in Technical Paper 9 (Social impacts).

Mitigation measures that are specific to the operation and construction of Westmead metro station to address potential impacts are listed in Table 7-34.

Table 7-34 Social impacts mitigation measures – Westmead metro station

Ref	Impact/issue	Mitigation measure	Timing
Social impacts			
EIS-S2	Potential impacts on school infrastructure	Ongoing engagement would be undertaken with NSW Department of Education to continue to investigate feasible and reasonable mitigation measures related to construction traffic, pedestrian safety, construction noise and vibration, and air quality.	Construction

7.13 Local business impacts

The approach and methodology for the local business assessment are provided in Chapter 4 (Methodology) of this Environmental Impact Statement. The legislative context for the assessment is provided in Appendix B (Legislative and policy context).

7.13.1 Baseline environment

The Westmead metro station construction site will be established under the previous Sydney Metro West planning application. This included a description of the existing environment as it relates to this local business impacts assessment, based on ABS Census 2016 data. As updated census data is not yet available, the broad existing environment described in Chapter 16 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CB*D (Sydney Metro, 2020a) is considered to remain largely relevant to this assessment.

To verify this, a desktop gap analysis was carried out with respect to any new data available and the specific scope of this proposal. The baseline environment is summarised in the sections below and more detail is provided in Chapter 16 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a).

Local business profile

The Westmead metro station local business study area is largely consistent with that considered in Chapter 16 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a). Due to the minor additional footprint areas at Westmead metro station for this proposal, the 400-metre zone for consideration of local businesses has been expanded accordingly (refer Figure 7-20).

Figure 7-20 Local business impacts study area – Westmead metro station

Businesses in this area have a strong focus on health and medical services. These businesses are part of the broader Westmead Health and Education Precinct, centred around Westmead Hospital. This precinct is one of the largest health, education, research, and training locations in Australia and is a key provider of jobs for the local area and region.

The Westmead metro station local business impacts study area also includes a range of commercial premises. This includes those within the Westmead shopping village to the immediate north of the existing Westmead Station, as well as others to the north and south of the station (e.g. the Oakes Centre).

Broadly speaking the medical and retail businesses differ in their mode of interaction with customers, suppliers and the community. Most medical-related businesses in this area would be expected to interact with customers by appointment only (such as a doctor or a physiotherapist). Conversely, retail businesses would be expected to have a greater reliance on visibility and passing trade, particularly from foot traffic. Interactions with suppliers and other businesses would be highly business-specific and dependent on other factors such as location or accessibility (or need) for deliveries.

Table 7-35 identifies the types of existing businesses within the local business impacts study area.

Table 7-35 Businesses within the local business impacts study area – Westmead metro station

Impact area	Types of businesses	Approximate number of businesses
Within 100 metres of the site	Healthcare services; commercial – service industries	20 to 30
Between 100 and 400 metres of the site	Healthcare services, banks, cafes and restaurants	40 to 60

Employment

At the 2016 Census, about 13,450 people were employed within the 'destination zones' relevant to the Westmead local business impacts study area. Destination zones are the spatial unit used to code 'place of work' by the Australian Bureau of Statistics. In most cases, more than one destination zone was relevant to a local business study area.

Employment within the local business study area was highly concentrated in household services, indicating the local economy is specialised in providing services for local and regional populations such as education and health care services. Business in the household services sector are primarily destination businesses and less reliant on passing trade.

At an industry level, employment within the Westmead local business impacts study area and surrounds is highly concentrated in the health care and social assistance industry, reflecting the strong association of the area with Westmead Hospital and its related medical facilities. The second most common industry for employment was education and training.

Most businesses in the study area are concentrated north of the existing Westmead Station, within and around Westmead Hospital (about 400 metres from the construction site).

Travel patterns

Australian Bureau of Statistics 2016 Census data indicates that workers within the area are highly dependent on cars to get to and from work, with 71.2 per cent of residents using a car (as driver). Compared to other locations, this proportion is relatively high, suggesting that businesses are dependent on good access to the road network to access labour markets within the region. Despite there being an existing Sydney Trains station within the precinct, only 15.2 per cent workers used this method of travel.

Since the 2016 Census, it is likely that the share of workers working from home in the local business impacts study area has increased, with this trend likely to be accelerated in a post-COVID-19 environment.

7.13.2 Operational impact assessment

A qualitative assessment of the potential indirect operational impacts to local businesses at Westmead metro station is provided in Table 7-36. There are no direct impacts anticipated for local businesses during operation. Potential opportunities for local businesses during operation are also provided in Table 7-36.

Overall, the specialised nature of the Westmead area (primarily focussed on medical and health facilities) suggests that most of the local businesses would have a degree of resilience to potential operational impacts and would benefit from the accessibility provided by a metro station.

Westmead metro station would contribute to and support the health, education and research precinct by increasing its accessibility for patients, customers and employees supporting the precinct in expanding its role, function and ability to serve the community. Additionally, Westmead metro station would contribute to the creation of new retail and commercial opportunities, supporting the creation of new jobs and businesses in the area. The operation of Westmead metro station would help enhance the sense of community character and possibly change the way the community functions, by providing a focal point for the community to meet, pause and engage in urban life. This could be beneficial for local businesses that rely on passing trade.

Table 7-36 Local business impacts during operation – Westmead metro station

Potential impact operation	Risk assessment	
	Likelihood	Significance
Potential opportunities		
Increased passing trade for businesses Some businesses (i.e. non-medical businesses) located around Westmead metro station (both north and south) may benefit from an increase in passing trade from customers accessing Westmead metro station.	Likely	Moderate positive
Improved accessibility Some businesses may experience increased accessibility (both those reliant on passing trade and destination businesses, e.g. those that are visited by appointment) bringing in new customers who previously could not easily access the area.	Likely	Moderate positive

Potential impact operation	Risk assessment	
	Likelihood	Significance
Opportunity for new retail/commercial uses While this proposal does not assess or provide for any future over and/or adjacent station development, the opportunities for new retail and/or commercial uses in the future would afford new businesses and jobs to the area. This proposal would include the following to support the future adjacent development: • a shared public domain area south of the metro station • utility connections, where required • subdivision.	Likely	Moderate positive
Improved amenity Improved amenity (e.g. visual impacts and urban design, air quality) around Westmead metro station would make the area a more attractive place. This could contribute to improved customer experiences (for a range of business types) throughout the area and increased foot traffic for those businesses reliant on passing trade.	Likely	Moderate positive

7.13.3 Construction impact assessment

A qualitative assessment of potential direct and indirect construction impacts to local businesses at Westmead metro station is provided in Table 7-37. Potential opportunities for local businesses during construction are also provided in Table 7-37.

Similar to the potential operational impacts, the specialised nature of the Westmead area (primarily focussed on medical and health facilities) suggests that most of the local businesses would have a degree of resilience to potential construction impacts as demand for health-related services is more inelastic and less affected by local changes (Chapter 16 of the *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a)). This would not however, be as applicable to the businesses in closest proximity to the Westmead metro construction site on Railway Parade which tend to be local businesses that rely on passing trade.

Additionally, anticipated construction impacts are expected to be similar and would be a continuation of those from the work carried out under the previous Sydney Metro West planning application. During this proposal, local amenity impacts such as noise, vibration, and air quality would reduce compared to the work carried out under the previous Sydney Metro West planning application due to the nature of the construction activities for this proposal.

Table 7-37 Local business impacts during construction – Westmead metro station

Potential impact construction	Risk assessment	
	Likelihood	Significance
Potential opportunities		
Continuation of passing trade from construction workforce Businesses located immediately north of the existing rail corridor and south along Hawkesbury Road (e.g. the Oakes Centre) may continue to benefit from an increase in the number of customers (construction workers), buying goods and services from retail, cafes and restaurants, in comparison to pre-construction numbers.	Possible	Slight positive
Continuation of redistribution of trade As a result of work carried out under the previous Sydney Metro West planning application, some local customers could have redistributed their trade towards similar locally serving businesses within other parts of the study area or the surrounding area. This redistribution of trade could continue during construction of this proposal.	Possible	Slight positive

Potential impact construction	Risk assessment	
	Likelihood	Significance
Potential indirect impacts		
Continuation of redistribution of trade As a result of the work carried out under the previous Sydney Metro West planning application, some local customers could have redistributed their trade towards similar locally serving businesses within other parts of the study area or the surrounding area which would be a negative impact for those businesses that potentially experience a reduction in trade. This redistribution of trade could continue during construction of this proposal.	Possible	Slight negative
Continuation of temporary traffic congestion and increased travel times Some businesses surrounding the Westmead metro station construction site may have experienced impacts associated with traffic congestion and increased travel times during the work carried out under the previous Sydney Metro West planning application. It is possible that these impacts may continue for some local businesses during construction of this proposal. Impacts may be increased (when compared to the work carried out under the previous Sydney Metro West planning application) for short durations for road upgrade work as part of this proposal. Workers within the precinct are highly car dependent. The extent to which they would be affected by construction traffic would largely depend on which direction they drive from. Workers driving from the north and the west would be less affected by construction traffic than workers driving from a southerly direction towards the construction site (along Hawkesbury Road) or easterly towards the construction site (Park Parade), which are the main construction site haul routes for inbound and outbound, respectively. Similarly, temporary traffic and travel time impacts for business servicing deliveries would be minimal for businesses north of the site in the Westmead town centre. About 10-20 businesses are located along the construction haul route on Hawkesbury Road, including businesses within the Oakes Centre which is situated about 400 metres south of the Westmead metro station construction site. This is a neighbourhood centre generally servicing the local population and does not require direct access to and from Hawkesbury Road. Impacts are expected to be minor in nature due to the small amount of road diversions and traffic control measures required around these businesses. These diversions and traffic control measures would mostly be limited to the intersections of Hawkesbury Road and Railway Parade, as well as Hawkesbury Road and Alexandra Avenue.	Possible	Slight negative
Continued impacts on parking Some businesses surrounding the construction site may have experienced impacts associated with temporary loss of 10 car parking spaces at Hassall Street and Bailey Street, respectively, during the work carried out under the previous Sydney Metro West planning application. The potential temporary impact to parking availability for local businesses from the presence of a construction workforce is expected to continue to be minimal. Construction workers would be encouraged to access the site using nearby public transport options.	Unlikely	Neutral

Potential impact construction	Risk assessment	
	Likelihood	Significance
Temporary parking loss during construction of this proposal would be similar to the work carried out under the previous Sydney Metro West planning application, although there would be some additional short-term parking loss at Railway Parade (about 27 spaces) and Alexandra Avenue (about 50 spaces) associated with rail possession works. The location of the temporary parking loss is unlikely to impact nearby businesses.		
Temporary loss of power and utilities Unplanned power and utility interruptions could result in business impacts during interruptions. Given the physical separation between the construction site and the businesses within study area, and that most utility works would be completed as part of the work carried out under the previous Sydney Metro West planning application, any substantial impact from unplanned power and utility interruptions is very unlikely.	Almost unprecedented	Slight negative
Continuation of temporarily reduced local amenity Some businesses surrounding the construction site may have experienced reduced local amenity during the work carried out under the previous Sydney Metro West planning application, although these impacts were anticipated to be minor. These impacts may continue during construction of this proposal. Overall, businesses in the general vicinity are generally sufficiently separated from the main construction site thereby minimising any potential temporary amenity and visibility related impacts caused by work within the construction site. There are no businesses immediately surrounding the Westmead metro station construction site which would be affected by temporary amenity impacts. This notwithstanding, some nearby businesses (such as those north of the existing rail line in the Westmead shopping village) may experience increased impacts for short periods of time during local road works. Additionally, local businesses about 400 metres south of the site (the Oakes Centre), fronting a service road parallel to Hawkesbury Road may experience some temporary reduced amenity from construction heavy vehicles along Hawkesbury Road. This notwithstanding, the division of the inbound and outbound haulage routes (Pitt Street and Park Parade, and Hawkesbury Road, respectively) would minimise this impact for any given business, effectively halving the amount of passing construction vehicles.	Possible	Slight negative
Continuation of safety and security impacts There is potential for businesses to experience a temporary reduction in patronage due to perceptions related to safety and security when travelling through the local business study area. Safety and security could relate to the perception of potentially becoming a victim of crime. These perceived impacts are likely to be limited to retail and cafes and restaurants located near the Westmead metro station construction site that would normally continue trading into the evening. This is because safety and security impacts tend to become more prevalent outside of daylight hours when any reduction in visibility decreases surveillance and the ability to see and navigate hazards.	Rare	Neutral

Potential impact construction	Risk assessment	
	Likelihood	Significance
Potential direct impacts		
Property The demolition of the existing aerial concourse at Westmead (owned by the Transport Asset Holding Entity of NSW) would directly impact the single occupying business. This tenant would be required to relocate.	Almost certain	Slight negative

7.13.4 Management and mitigation measures

Environmental management for this proposal would be undertaken through the environmental management approach as detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. This includes operational mitigation measures (where relevant) and performance outcomes for the operation and construction of this proposal.

During construction of this proposal, local business impacts would be managed in accordance with Sydney Metro's CEMF (refer to Appendix F).

The OCCS (Appendix C) also specifies that a Community Communication Strategy would be prepared and implemented during construction and include requirements related to small business engagement. The Community Communication Strategy would define the location specific measures to be implemented to minimise impacts on individual businesses during construction, taking into account the commercial character of the locality, its general trading profile (daily and annually), and information gained from the business profiling.

7.14 Biodiversity

The approach and methodology for the biodiversity assessment are provided in Chapter 4 (Methodology) of this Environmental Impact Statement. The legislative context for the assessment is provided in Appendix B.

7.14.1 Baseline environment

Site context

The area immediately surrounding the proposed location of Westmead metro station is highly urbanised, with a history of clearing and development over the past 200 years. This includes the earlier use of the area for agriculture, with subsequent redevelopment for a variety of uses including residential, commercial and health. The area is relatively flat, with a landform generally draining towards Domain Creek 350 metres to the east. The nearest area of native vegetation is the riparian area of Domain Creek, the majority of which has been revegetated as part of the development of the surrounding public open space.

The Westmead metro station construction site includes the following (refer to Figure 7-21):

- the Westmead metro station construction site as assessed by the previous Sydney Metro West planning application, including the southern side of the rail corridor to the east of the Hawkesbury Road overbridge
- additional footprint area 1 within the rail corridor on the southern side of the rail line, to the west of Hawkesbury Road overbridge
- additional footprint area 2 within the rail corridor on the northern side of the rail line, to the west of the Hawkesbury Road overbridge
- additional footprint area 3 within the rail corridor on the northern side of the rail line, to the east of the Hawkesbury Road overbridge
- additional footprint area 4 within the landscaped area of Western Sydney University, north of the rail line and to the west of Hawkesbury Road.

Precinct and interchange work requiring minor vegetation removal is also proposed at the north-western corner of the intersection of Railway Parade and Ashley Lane.

Vegetation characteristics

The area immediately surrounding the proposed location of Westmead metro station is highly urbanised, with vegetation including street plantings, private landscape planting and planted and naturally propagated native and exotic vegetation within the rail corridor. This includes a number of common landscaping species such as Brush Box, Callistemon, Jacaranda, Cocos palm, Silky oak, Banksia and Conifer.

Vegetation within the Westmead metro station construction site as assessed by the previous Sydney Metro West planning application will be removed, including all vegetation within the southern side of the rail corridor adjacent to Westmead Station and between Hawkesbury Road and Hassall Street (east of the Hawkesbury Road overbridge).

Biodiversity assessment undertaken for the previous Sydney Metro West planning application identified 0.03 ha of poor condition Cumberland Plain Woodland on the southern side of the rail corridor to the east of Hawkesbury Road. The vegetation integrity score assigned to this patch was low, and as such offsetting of this vegetation was not required.

With respect to the additional footprint areas required for this proposal, the majority is naturally propagated or planted native and exotic species. Review of historical photography of this location indicates that some or all of this vegetation has been planted.

Vegetation within the northern side of the rail corridor (west of Hawkesbury Road) is made up of weed species only.

The small area of additional footprint on the northern side of Railway Parade is occupied by two planted mature Brush Box trees (*Lophostemon confertus*).

Figure 7-21 Vegetation – Westmead metro station

Native vegetation

The vegetation present within the Westmead metro station construction site assessed as part of the previous Sydney Metro West planning application consisted of native species present as small trees and garden plantings including *Corymbia citriodora, Corymbia maculata, and Lophostemon confertus*.

This assessment also considered native vegetation present within the rail corridor to the south of the existing Westmead Station (between Hawkesbury Road and Hassall Street), which consisted of several native canopy, mid-storey and ground stratum species including *Angophora floribunda, Eucalyptus tereticornis, Acacia falcata, Acacia parramattensis, Acacia floribunda, Melia azedarach, Bursaria spinosa, Dodonaea triquetra, Indigofera australis, Lomandra longifolia,* and *Themeda triandra*. This assemblage of species was assessed as plant community type 849 - *Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*. The plant community was identified as being in poor condition due to the vegetation being regrowth rather than a remnant patch, and the inclusion of landscape plantings and weed species within the vegetated area.

Under the previous Sydney Metro West planning application, the following vegetation has been approved for removal:

- vegetation present within the Westmead metro station construction site
- vegetation within the southern side of the rail corridor adjacent to Westmead Station and between Hawkesbury Road and Hassall Street.

Under this proposal the five additional discrete areas of vegetation noted above are proposed to be removed.

None of the vegetation present in the additional footprint areas for this proposal is considered to be remnant, with the majority being naturally propagated or planted native and exotic species. Within additional footprint area 1 (southern side of rail line to the west of the Hawkesbury Road overbridge) the vegetation assemblage is largely native. Dominant species in this area include Queensland silver wattle (*Acacia podalyriifolia)*, Tick Bush (*Kunzea ambigua*), Basket Grass (*Lomandra longifolia)*, Coastal or Native Rosemary (*Westringia fruticosa)*, Parramatta wattle (*Acacia parramattensis)*, Lantana (*Lantana camara)*, Sweet Bursaria (*Bursaria spinosa*) and Blue Flax Lily (*Dianella cerulea)*. Historical photography of this location indicates that most or all of the native vegetation present has been planted.

Within additional footprint area 2 (northern side of rail line to the west of the Hawkesbury Road overbridge) the vegetation assemblage is made up of weed species only, including African olive (*Olea europaea* subsp. *cuspidata*), Large-leaved privet (*Ligustrum lucidum*), Small-leaved privet (*Ligustrum sinense*), Cotoneaster (*Cotoneaster glaucophyllus*), Bougainvillea, Lantana (*Lantana camara*), Sweet briar (*Rosa rubiginosa*) and Bamboo (*Bambusa sp*).

Vegetation within additional footprint area 3 (northern side of rail line to the east of Hawkesbury Road overbridge) is comprised of a mix of native and exotic species.

Vegetation within additional footprint area 4 (landscaped area of Western Sydney University) is comprised exclusively of landscaping species including Jacaranda (*Jacaranda mimosifolia)*, Blue Lily Turf (*Liriope muscari*), white Feather Honeymyrtle (*Melaleuca decora*), Conebush (*Leucadendron sp*.) and Jasmine (*Jasminum spp.).*

The area at the north-western corner of Railway Parade and Ashley Lane is occupied by two planted mature Brush Box trees (*Lophostemon confertus*). These trees are isolated in the footpath area of Railway Parade and do not form any coherent plant community.

Threatened ecological communities

One threatened ecological community, *Cumberland Plain Woodland in the Sydney Basin Bioregion*, occurs within the Westmead metro station construction site established as part of the previous Sydney Metro West planning application. *Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD* (Sydney Metro, 2020a) assessed this community as being in poor condition due to the native vegetation being regrowth and the presence of landscape plantings and weed growth. This vegetation would be removed as part of the work carried out under the previous Sydney Metro West planning application.

The additional footprint areas required for construction at Westmead metro station were assessed for the presence of threatened species or ecological communities. Of these, additional footprint area 1 (southern side of rail line to the west of the Hawkesbury Road overbridge), was determined to comprise part of the critically endangered ecological community, *Cumberland Plain Woodland in the Sydney Basin Bioregion*. The condition of this occurrence was deemed to be poor due to the site being fully comprised of native species regrowth and exotic and planted species. In addition, field inspection undertaken for this proposal did not record this or other threatened ecological community in any of the additional footprint areas outlined above.

Groundwater dependent ecosystems

Figure 7-18 in Section 7.10.1 of this Environmental Impact Statement depicts groundwater dependent ecosystems in proximity to this proposal including:

- a community of *Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain* located around 200 metres to 650 metres east of the construction site
- a community of *Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain* located around 350 to 650 metres east of the construction site
- a community of *Swamp Oak – open forest on riverflats of the Cumberland Plain and Hunter Valley* located around 500 metres to one kilometre north-west of the construction site.

The vegetation within the Westmead metro station construction site was also identified as having a moderate to high likelihood of being a groundwater dependent ecosystem as part of the previous Sydney Metro West planning application. Based on the presence of a deep cutting immediately adjacent to the additional footprint for this proposal it is highly unlikely that groundwater is present near the surface. As such none of the additional footprint areas are considered to be groundwater dependent.

Threatened flora species

One threatened population was assessed as part of the previous Sydney Metro West planning application, being Native pear *(Marsdenia viridiflora* subsp*. Viridiflora)* - endangered population (BC Act). No individuals of this species were identified within the additional footprint areas for this proposal. No other threatened flora species were recorded within the additional footprint areas for this proposal.

Threatened fauna species

The Westmead metro station construction site will be cleared (including demolition of existing buildings and structures) by the previous Sydney Metro West planning application. As such, at the commencement of work associated with this proposal no roosting habitat would be present for microbats.

All additional footprint areas associated with this proposal were assessed for threatened fauna habitat, including microbat habitat within structures proposed to be removed. No habitat or any individuals were identified during the inspection undertaken for this assessment. As such, no potential impacts to microbats are anticipated and impacts have not been assessed further.

Migratory species

There is no habitat associated with migratory species present within the Westmead metro station construction site, including the additional footprint areas for this proposal.

Aquatic ecology

There is no aquatic habitat present within the Westmead metro station construction site, including the additional footprint areas for this proposal and immediately adjacent to the construction site.

7.14.2 Operational impact assessment

Direct impacts

Direct impacts related to the operation of Westmead metro station would be limited to the disruption of non-threatened fauna due to noise, light and human activity. As the majority of activity would be underground at this location, impacts would only include those associated with surface activities such as people moving in and out of the station, additional street-level lighting and the increased movement of private vehicles, buses and taxis. In the context of the urban locality, including substantial residential and retail development, as well as movements associated with the existing station, these impacts would be minor.

Indirect impacts

Indirect impacts associated with the operation of Westmead metro station would be limited to the management of stormwater runoff and its impacts to local waterways. This may include changes in the quantity and quality of stormwater runoff leaving the additional footprint areas for this proposal, resulting in subsequent impacts to nearby aquatic systems such as Domain Creek and Parramatta River. Potential biodiversity impacts associated with such changes include temporary or permanent inundation of wetland habitat, changes in water chemistry affecting sensitive breeding habitat (such as pH changes affecting amphibian breeding and foraging habitat) and changes in turbidity affecting the overall health and productivity of aquatic plants and animals.

This proposal is located within an area that is already highly urbanised and the existing stormwater systems are likely to already be contributing to the impacts described above. The additional impact of this proposal is likely to be minimal, given the site is already highly developed. This proposal would seek to manage operational stormwater effectively and manage the quantity and quality of water leaving the additional footprint for this proposal (refer to Chapter 18 (Proposal-wide) of this Environmental Impact Statement).

Potential impacts to groundwater dependent ecosystems are discussed in Section 7.10.2.

7.14.3 Construction impact assessment

Direct impacts

As described in Section 7.14.1, the vegetation to be removed within the additional footprint areas for this proposal would be generally restricted to naturally propagated or planted common native and exotic species occurring within the rail corridor adjacent to the existing Westmead Station. No threatened flora or fauna species were recorded in these areas or assessed as having a moderate or high likelihood of occurring. As such, the removal of this vegetation is anticipated to have a minor impact on the biodiversity of the locality and this potential impact would not be significant.

Further direct impacts would include the direct disturbance of fauna due to noise, light and human activity. Threatened species assessments undertaken during previous Sydney Metro West planning application found no threatened species likely to be present within the additional footprint areas for this proposal, nor were any threatened fauna species recorded during the site inspection. Given the context of the existing residential and commercial development of the Westmead Station, the impact of this direct disturbance is not anticipated to be significant.

Indirect impacts

Potential changes to the quantity and quality of stormwater runoff leaving the Westmead metro station construction site, sediment-laden runoff and spills could result in indirect adverse impacts to nearby aquatic systems such as the Parramatta River. Biodiversity impacts associated with this would include temporary or permanent inundation of wetland habitat, changes in water chemistry affecting breeding habitat (e.g. pH changes affecting amphibian breeding and foraging habitat) and changes in turbidity affecting the overall health and productivity of aquatic plants and animals.

The mobilisation of sediment and contaminants from the Westmead metro station construction site would be managed through the implementation of mitigation measures outlined in the CEMF (refer to Appendix F). Potential water quality and quantity impacts would be managed through the measures included in Chapter 18 (Proposal-wide) of this Environmental Impact Statement. As such the potential for indirect downstream biodiversity impacts is expected to be low.

Potential impacts to groundwater dependent ecosystems are discussed in Section 7.10.3.

7.14.4 Management and mitigation measures

Environmental management for this proposal would be undertaken through the environmental management approach as detailed in Chapter 20 (Synthesis) of this Environmental Impact Statement. This includes operational mitigation measures (where relevant) and performance outcomes for the operation and construction of this proposal.

During construction of this proposal, biodiversity impacts would be managed in accordance with Sydney Metro's CEMF (refer to Appendix F). The CEMF includes biodiversity management objectives and mitigation measures to minimise impacts as relevant to this proposal as a whole.