

Redfern Station Upgrade – New Southern Concourse

Environmental Impact Statement



Artist's impression of the proposed Redfern Station Upgrade - New Southern Concourse. Indicative only, subject to detailed design.

Certification

Submission of Environmental Impact Statement

This Environmental Impact Statement has been prepared under Part 5.1 of the (NSW) *Environmental Planning and Assessment Act 1979* and in accordance with Part 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

Environmental Impact Statement prepared by:

Role	Project manager	Lead author	Independent reviewer
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Position	Principal Environmental Scientist	Senior Environmental Scientist	Technical Director - Environment
Qualifications	Bachelor of Environmental Science; CEnvP	Bachelor of Science (Environmental Science); Certificate of Environmental Management Systems	Bachelor of Arts (Hons) Geography and Economics Master of Regional and Urban Planning
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In respect of	Environmental Impact Statement Redfern Station Upgrade – New Southern Concourse		
Applicant Name	Transport for NSW		
Applicant Address	18 Lee Street Chippendale NSW 2008		
Proposed development	Redfern Station Upgrade – New Southern Concourse involves the construction and operation of a pedestrian concourse to the south of the existing Lawson Street concourse providing both lift and stair access to Platforms 1-10. The new pedestrian concourse would provide a new connection across the railway corridor, extending between Little Eveleigh Street and Marian Street in the suburbs of Redfern and Eveleigh and include associated interchange upgrades.		
Land to be developed	Located on land that forms part of the existing rail corridor and adjacent land owned by the NSW Government or Council owned land.		
Environmental Impact Statement	An Environmental Impact Statement is attached that assesses all matters specified in the Secretary's Environmental Assessment Requirements dated 20 December 2019, in accordance with Division 5.2 of the (NSW) Environmental Planning and Assessment Act 1979 and other relevant legislation.		
Declaration	I certify that I have prepared the contents of the Environmental Impact Statement in accordance with Schedule 2 of the Environmental Planning and Assessment Regulation 2000 and the Secretary's Environmental Assessment Requirements dated 20 December 2019, and that, to the best of my knowledge the information contained in the Environmental Impact Statement is not false or misleading.		

Role	Project manager	Lead author	Independent reviewer
Signatures			
Name	Rachel O'Hara	Dylan Drysdale	Catherine Brady
Date	22/05/2020	22/05/2020	22/05/2020

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Executive summary

Redfern Station (Redfern Station Upgrade – New Southern Concourse) is part of the Transport Access Program and is the first step in renewing the Redfern North Eveleigh Precinct. With Redfern Station at its core, the Redfern North Eveleigh Precinct encompasses 10 hectares of Transport for NSW owned land along the rail corridor. The precinct is positioned to become a future destination for all, with a range of housing, workspaces, and new public spaces that will promote healthy and sustainable lifestyles.

Overview

Transport for NSW (TfNSW) is the lead agency for the integrated delivery of public transport services across all modes of transport in NSW and is responsible for the delivery of projects within the Transport Access Program (TAP). The TAP is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure across NSW.

TfNSW is the proponent for a proposal to construct and operate an upgrade of Redfern Station (Redfern Station Upgrade – New Southern Concourse) ('the Project') as part of the TAP.

The Project involves the construction of a pedestrian concourse to the south of the existing Lawson Street concourse providing both lift and stair access to Platforms 1-10. The new pedestrian concourse would provide a new connection across the railway corridor, extending between Little Eveleigh Street and Marian Street in the suburbs of Redfern and Eveleigh and include associated interchange upgrades.

The Project would provide safe and equitable access to Platforms 1 to 10, Little Eveleigh Street and Marian Street, along with generally improved customer facilities, amenity and safety. The improvements would in turn assist in supporting the growth in public transport use and would provide an improved customer experience for existing and future users of Redfern Station. The Project would support better connections for the community including access to employment, education and businesses.

This Environmental Impact Statement (EIS) has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for the Project that were issued on 20 December 2019. Approval from the Minister for Planning and Public Spaces is required before TfNSW can proceed with the Project.

Project need and benefits

Redfern Station does not currently meet key requirements of the *Disability Standards for Accessible Public Transport 2002* (DSAPT). Existing platforms are accessed by a single stairway at the northern end of the platforms (with the exception of Platforms 6/7 which are serviced by an existing lift, and Platforms 11/12 which are serviced by escalators). The stairways do not provide an accessible path of travel for several groups of people including those with a disability, limited mobility, parents/carers with prams or customers with luggage.

The Project also aims to address current demand for the Station, and significant forecast growth in the surrounding area associated with the Sydney Innovation and Technology Hub and subsequent increase in rail patronage. Redfern Station is currently the sixth busiest station in NSW with approximately 70,000 customers on an average weekday. It is already at capacity and has deficiencies that restrict capacity to meet future demands and present a risk to customer safety.

The proposed concourse would provide connectivity between platforms 1 – 10 at Redfern Station and access to both Marian Street and Little Eveleigh Street, and would also provide cross corridor connectivity. This would address one of the existing desire line constraints, by providing access to the Station's above ground platforms closer to South Eveleigh, Carriageworks and the University of Sydney.

Project objectives

The objectives for the Project include the following:

- improve customer experience and accessibility
- reduce platform clearance times (i.e. the time required for passengers to leave a platform after alighting)
- improve customer circulation and relieve congestion within Redfern Station
- cater for the forecast customer growth for Redfern Station up to 2036
- provide durable and sustainable infrastructure
- provide improved connectivity for pedestrians, including improved urban connectivity for South Eveleigh
- support interfacing and upcoming works in the area surrounding Redfern Station
- minimise disruption to customers, staff and neighbours throughout the planning and construction of the Project.

The Project

Key features

The key Project components include:

- a six metre wide concourse between Little Eveleigh Street and Marian Street
- new stair and lift access from the new concourse to Platforms 1 to 10
- an upgraded station entrance at Marian Street including station services and customer amenities
- a new station entrance at Little Eveleigh Street including station services and customer amenities
- formalisation of a shared zone on Little Eveleigh Street, including:
 - safety improvements to vehicle, cyclist and pedestrian interactions
 - improvements to streetscape such as landscaping, lighting, drainage and pavements
 - relocation of approximately 20 parking spaces (including 18 resident/restricted parking spaces, one accessible parking space and one car share scheme parking space) and bus zone
 - utility adjustments
- upgrade of Marian Street/Cornwallis Street/Rosehill Street area
 - extension of existing shared zone including part of Rosehill Street
 - safety improvements to vehicle, cyclist and pedestrian interactions including footpath widening
 - improvements to streetscape such as lighting, drainage, landscaping and pavements as well as utility adjustments
 - changes to street parking arrangements including removal of approximately 16 parking spaces (including relocation of one car share scheme parking space)
- operation of the Project.

Other components of the Project include:

- relocation of the shuttle bus zone from Little Eveleigh Street to Lawson Street
- kiss and ride on Lawson Street and associated footpath upgrade
- kiss and ride on Gibbons Street, and associated footpath upgrade

- footpath widening on Ivy Street
- relocation of a building on Platform 1 to accommodate the concourse
- repurposing, relocations and alterations to platform building features and other platform features, including privacy walls, doors, screens and roofing, platform seats and electrical equipment
- addition of platform canopies
- platform resurfacing on all platforms and associated drainage alterations
- installation of station operational components and infrastructure including:
 - wayfinding and signage
 - tactile ground surface indicators (TGSI)
 - rubbish bins
 - Closed-circuit television (CCTV)
 - passenger information system (e.g. passenger information display, public address and hearing loops)
 - emergency equipment (e.g. for fire and life safety)
- service relocations and upgrades including:
 - relocation of overhead wiring structures
 - installation of a new rail signal between Platforms 1 and 2.

Early works (such as alterations and relocations to utilities, power and signalling, communications systems, Hazmat removal works, addressing of existing safety issues/non-conformances and associated site offices/laydown areas) would not form part of the Project and would be subject to a separate environmental assessment and approval process in accordance with Part 5 Division 5.1 of the *Environmental Planning and Assessment Act 1979*.

The Project area and overview is shown in **Figure ES-1**, and the key features of the Project are shown in **Figure ES-2**.

Construction

Construction of the Project would broadly involve the following key stages:

1. site establishment and enabling works
2. building modification works
3. overhead wiring relocations/adjustments
4. main construction works, including platform preparation works, installation of the concourse and station entrances
5. Little Eveleigh Street/Ivy Street, Marian Street/Cornwallis Street/Rosehill Street, Lawson Street and Gibbons Street road works.

The construction of the Project would require key construction areas, including ancillary facilities (i.e. construction compounds) and haulage routes.

Construction of the Project is proposed to commence in late 2020/early 2021 once all necessary approvals are obtained and continue for approximately 18 months.



FIGURE ES-1: PROJECT AREA AND OVERVIEW OF KEY FEATURES

Indicative and subject to detailed design.



FIGURE ES-2: KEY FEATURES OF THE PROJECT

Indicative and subject to detailed design.

Source: Imagery © Nearmap, 2019.

Stakeholder and community engagement

The stakeholder and community consultation process for the Project has played an integral role in informing and scoping investigations for this EIS and will continue to do so through detailed design and construction. Following the 27 February 2019 announcement of the Project, consultation began with the local community and stakeholders.

Consultation activities on the options for the proposed concourse were undertaken with the local community across two consultation periods: May–June 2019, and July–August 2019. Consultation activities included:

- stakeholder meetings (including residents and community groups)
- doorknocking local residents
- sending letters to local home owners and residents
- placement of Project consultation signage around the Station
- distribution of newsletters to businesses and residents within one kilometre of Redfern Station
- distribution of newsletters to customers at the Station during peak periods (periodically throughout the consultation period and ahead of community information sessions)
- community drop-in information sessions at Redfern Station for community members to meet and speak with the Project team
- stakeholder forums
- online surveys of customers and the local community.

In May 2019, transport customers, key stakeholder groups and community members were initially asked to provide feedback on an early concept, then from July to August 2019, on four different options, including the original concept. More than 400 responses were received across the two engagement periods from a wide range of stakeholders, such as customers and community members, community groups, local organisations and Council.

The majority of issues raised were common to large construction projects in Sydney but overall the feedback received was highly supportive of improving accessibility and reducing congestion at Redfern Station. There were also some community members who were not supportive of the Project. The responses assisted the project team in selecting the preferred option.

A Project webpage has also been established with Project information and materials such as newsletters, presentations and Frequently Asked Questions. The website also included a link to an online survey for the two consultation periods. Three community drop-in information sessions were also held at Redfern Station for community members to meet and speak with the Project team, as well as two stakeholder forums.

A Community Stakeholder Engagement Plan has been developed for ongoing engagement in the design phase. Should the Project be approved, a Community Liaison Management Plan would be developed for engagement during the construction of the Project.

Options considered

Development of the preferred option for the Project has been a result of the ongoing planning and design process, including consultation with customers, the community and key stakeholders. Four out of 12 designs were shortlisted through a multi criteria analysis (MCA) and then presented to the public for consultation, to inform the ongoing design development. Two community proposed options were also considered.

As a result of this process, Option 1 was selected as the preferred option for the Project as it provided efficiency and safety for customers, whilst also allowing integration into future developments.

Environmental assessment

This EIS has been prepared in accordance with the provisions of Part 5.2 of the *Environmental Planning and Assessment Act 1979*. It addresses the SEARs issued on 20 December 2020 (refer to **Appendix A**).

It is inevitable that a project at this location in a heavily urbanised environment would have some adverse impacts, particularly during construction. These impacts need to be considered within the context of the overall objectives of the Project and the significant transportation and other benefits it would provide over the medium to long term, particularly for future generations.

Key environmental issues have been examined throughout the design and development process. Consultation has been carried out with affected stakeholders to identify key potential impacts at an early stage. Where possible, these would be avoided or appropriate mitigation measures developed and implemented to minimise these impacts. Despite these efforts, a number of adverse impacts would remain. These impacts would be largely temporary and confined to the construction period. The main impacts identified in the environmental assessment are described in the following sections.

The Project would also result in benefits, such as improved accessibility and amenity, and would provide positive sustainability outcomes. The Project, through the creation of a new connection across the rail corridor, would support connections to employment, education and businesses.

Urban design

The Project has been developed based on the NSW Government's '*Better Placed*' guidelines and TfNSW's policy document '*Around the Tracks – urban design for heavy and light rail*'. Upon operation, the Project would improve the accessibility of the Station, and improve pedestrian and cyclist access around the Station. Trees removed during construction would also be offset so that a net positive balance in tree planting is achieved. The Project provides clear wayfinding and shortest pedestrian distances between key destinations while using crime prevention through environmental design techniques in its design both within the concourse and externally of the Station. The Project would provide a design that is inviting, engaging, and visually attractive. It would integrate views, vistas, and heritage interpretation to engage users. It is visually interesting on its own while providing a backdrop to the existing station precinct to the north. Positive public space outcomes would also be realised through the design of the shared zones on Marian Street and Little Eveleigh Street.

Construction of the Project would require the temporary use of barriers, hoardings and fences which have the potential to impact upon urban design features such as existing pedestrian and cyclist connectivity in the broader area. This could potentially increase the walking distances of customers while also potentially adding extra obstacles on already narrow footpaths.

The design of the Project has been informed by a detailed analysis of existing and future urban design, community, heritage, engineering, planning, constructability, financial, and environmental considerations.

Landscape character and visual

The existing visual environment is characterised by a highly developed urban nature, which includes existing rail and road infrastructure, and a range of built forms. Landscape character surrounding Redfern Station has been divided into several different landscape character Zones (LCZs). These LCZs have been defined by a number of qualities which contribute to overall character, including urban form, topography, vegetation and land use.

During operation, the impact of the Project on landscape character would be largely positive. The Project elements are similar in character to the LCZs in which they lie (e.g. rail infrastructure built within a working rail corridor), and the architectural design of the Project would be highly refined. The proposed new/upgraded station entrances would be integrated into the surrounding setting with landscaping and would include the adaptive reuse of an existing building, resulting in a development that is sympathetic to the surrounding landscape character.

The visual impact of the Project during construction on the surrounding area was broadly assessed. During the construction period, temporary visual impacts would be experienced at Redfern Station and its surrounds, mainly within the rail corridor, reducing in intensity with distance from the Station. Visible construction elements would include site sheds, site hoarding and fencing, parking areas, mobile

construction equipment and lighting, equipment and plant. Construction activity would also generate traffic, including heavy vehicles, which would utilise access routes to and from construction ancillary facilities. Vegetation removal would also be required to facilitate construction work. Visual impacts during construction would be temporary (limited to the construction period) and mostly occur within the rail corridor.

The visual impact of the Project at operation on the surrounding area was also assessed from a series of carefully selected viewpoints, some of which were found to have highly sensitive receptors, such as residential and recreational areas. The effect of the Project on key views and visual amenity was considered to be largely positive. The two new station entries and road upgrades to the east and west of the rail corridor would bring additional pedestrian movement into residential streets, but the design of these upgraded streets would include shared zones and substantial landscaping, resulting in a positive visual impact. The higher pedestrian numbers in Little Eveleigh Street and Marian Street would be somewhat mitigated by urban design and landscaping within these streetscapes, providing separation between residences and pedestrian movement at ground level, visually softening the hardscape within these road corridors, and providing visual amenity.

The pedestrian concourse and upgrades to station infrastructure would lie within the active rail corridor, and while these would be a substantial visual change, they would be of a high quality and therefore a positive addition to the otherwise utilitarian rail corridor.

Land use and property

The area within which the Project would be constructed and operated is located within the rail corridor, road reserves or other government owned land adjacent to the rail corridor.

During construction, the impact on land use is generally considered minor as the operation of the rail corridor and Redfern Station would continue throughout construction works. However, the use of Gibbons Street Reserve as a construction ancillary facility would result in a temporary loss of passive recreational space. Other potential land use impacts during construction relate to possible disruptions to services, utilities and other transport assets/infrastructure.

During the operation of the Project, there would be minimal direct impacts to land use. Gibbons Street Reserve would be restored as a passive recreational space following construction. Little Eveleigh Street would be reconfigured as a shared zone, and the Marian Street shared zone would be extended and reconfigured, which would allow for shared use by pedestrians, cyclists and vehicles during operation.

The Project would lead to improvements in accessibility to Redfern Station and better integration of the rail network with existing and improved pedestrian, cyclist and public transport networks. The Project would play a part in facilitating the future development envisaged by the broader urban renewal program.

Social

The social impacts associated with construction include amenity impacts particularly noise and vibration, impacts on the heritage elements and buildings near and within Redfern Station, property impacts associated with discontinuation of the lease at 125-127 Little Eveleigh Street, and impacts to access and connectivity. Some social impacts would be permanent such as the removal of parking, the relocation of the Platform 1 Office Building, and changes to 125-127 Little Eveleigh Street. Local residents, particularly those on Little Eveleigh Street and Marian Street would also experience changes to local amenity.

During operation, potential social impacts relate to amenity impacts on local streets from increased pedestrian traffic from the introduction on station entrances and shared zones and parking relocation. These potential impacts have been a key consideration during design development, including designing the Project in accordance with the principles of Crime Prevention through Environmental Design (CPTED). Upon opening of the Project, TfNSW would undertake a review of the operation of the shared zones, in consultation with residents and relevant stakeholders, to consider any additional mitigation that may be required.

Redfern Station is located within an area containing significant social, health and education infrastructure and institutions. During operation, some impacts to amenity, access and connectivity,

social infrastructure and heritage and character would be beneficial. The Project, which includes the provision of an additional station entrance, an upgraded station entrance, shared zones and lifts to one of Sydney's busiest stations, would allow for greater accessibility and equal access to public transport, connectivity with the wider area and more easy access to these facilities. Changes would benefit the community, particularly those people who currently experience transport or mobility difficulties, non-drivers and people without access to private vehicles.

Overall the urban design of the station precinct would facilitate benefits to the community, visitors to the area and businesses (e.g. connectivity and access, safety, etc.). It would also enhance access to, understanding and conservation of the fabric/values of the historical character of the area. The new concourse would also allow improved access to areas designated for urban renewal.

Traffic, transport and access

The greatest potential impacts during construction are likely to include temporary relocation of bus stops, footpath diversions, alternative on-street parking and an increase in traffic volumes. Alternative access arrangements and footpath diversions would be required for pedestrians/cyclists along Marian Street, Little Eveleigh Street, Ivy Street, Lawson Street and Gibbons Street during the construction of the Project. Additionally, road works at Marian Street, Rosehill Street, Little Eveleigh Street, Gibbons Street and Lawson Street would result in a loss of on-street parking. However, there is existing on-street parking available in the surrounding area (within 400 metres of these streets).

A new 20-space car park at the western end of Little Eveleigh Street would be constructed prior to the construction of the shared zone on Little Eveleigh Street. This would replace 18 residential on-street parking spaces, one disabled parking space and one car-share space that would be removed for the new shared zone along Little Eveleigh Street.

Changes to the transport network would also include temporary periodic closure of the railway as although construction works within the railway would largely be undertaken during scheduled rail possessions, approximately two additional non-scheduled rail possessions would be required. Temporary bus services to replace trains would be provided during the rail possessions.

The expected peak volume of construction vehicles of 20 heavy vehicles and 40 light vehicles per day would create negligible traffic impacts on the key regional access routes, given that this traffic from the Project would result in a small percentage increase in traffic volumes for these key routes. There are likely to be partial road closures at Little Eveleigh Street and Marian Street to construct the shared zones, however as these roads mainly provide local access (which would be maintained throughout the construction phase), it is not likely that network performance would deteriorate as a result of these closures.

During operation, the new station entrance at Little Eveleigh Street, the upgrade of the station entrance at Marian Street and the establishment of new shared zones at these locations would enhance the customer experience, specifically for pedestrians and cyclists and encourage walking and cycling as an alternative mode of transport. The formalisation and provision of new kiss and ride facilities at Lawson Street and Gibbons Street and the relocation of the shuttle bus zone would optimise the Station's operation, through integrating multiple modes of transport, with footpath and pavement upgrades proposed linking these modes to the Station.

Noise and vibration

Noise generated by the construction of the Project has been a key consideration through the development of the Project's construction methodology. Despite this, the Project would result in construction noise impacts. The greatest construction noise impacts would be experienced by residents located on the western side of Redfern Station, including Little Eveleigh Street, Lawson Street and Wilson Street.

The noise level would vary throughout the construction period, with as much of the Project construction as possible to be undertaken during the day, however some out of hours works would be required for the Project (to minimise disruptions to traffic, pedestrians, nearby residents and businesses, and also for constructability, safety, continuity of rail services reasons and/or to meet approval requirements (e.g. Road Occupancy Licence)).

Vibration would also be generated by the Project construction. This vibration has the potential to affect heritage-listed items within the Project area if these items fall within the minimum work distances identified for vibration intensive works. Where the screening criteria for vibration are predicted to be exceeded, a more detailed assessment would be undertaken including a condition assessment in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.

If these minimum working distances are complied with, no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage. A construction noise and vibration management plan would be in place to minimise the construction noise and vibration, including specific mitigation measures for sensitive receivers closest to the works (e.g. scheduling construction works to minimise the noise impact on sensitive receivers).

During operation, the Project is not anticipated to generate significant additional vehicular traffic, and therefore negligible impacts to traffic noise around Redfern Station are expected during operation. As a new car park is proposed at the end of Little Eveleigh Street, to offset parking lost on Little Eveleigh Street from the construction of the shared zone, most receivers on this street would experience a reduction in the current noise levels associated with parking cars. However, noise from car parking activities during night-time may cause sleep disturbance for some residents on Little Eveleigh Street living in proximity to the new car park. The car park would be used infrequently during the night-time (as there are only 20 spaces), therefore it is unlikely that the acoustic environment would change significantly from the current frequency of cars parking along Little Eveleigh Street.

The investigations undertaken to inform the design of the Project estimated that approximately 3,300 and 6,770 people would be walking down Little Eveleigh Street and Marian Street respectively during a typical AM peak hour. Noise from additional pedestrians walking along Little Eveleigh Street and Marian Street would be noticeable. The noise generated by commuters would likely comprise footfall noise and conversations and would not be considered atypical for an urban area. The Project would investigate further opportunities to minimise noise impacts to residents through the ongoing design development of the Little Eveleigh Street and Marian Street shared zones.

Non-Aboriginal heritage

Non-Aboriginal heritage impacts have been assessed against the three State heritage listed items potentially affected by the Project – the Redfern Railway Station Group, the Eveleigh Railway Workshops and the Eveleigh Chief and Mechanical Engineers Office, as well as several locally listed heritage items and conservation areas within the City of Sydney Local Government Area (Darlington Heritage Conservation Area and Golden Grove Heritage Conservation Area).

The Redfern Railway Station Group is a significant heritage item associated with the growth and development of Redfern as a place, as well as being an important element and transportation hub associated with the NSW Railways. The Eveleigh Railway Workshops are one of the finest historic railway engineering workshops in the world, containing intact late 19th century and early 20th century forge installations and a collection of cranes and power systems. The Eveleigh Chief Mechanical Engineers Office is a fine Victorian railway office building and reflects the importance of the railway engineers in the development of the State's rail network and its close association with Eveleigh Railway Workshops.

Darlington Heritage Conservation Area is representative of mid-nineteenth century residential subdivisions and mid to late-nineteenth-century working-class housing. Golden Grove Heritage Conservation Area is representative of the late nineteenth-century residential subdivision and was developed with the influence of the Eveleigh Railway Workshops.

The Project would result in impacts to the aesthetic, historic, and rarity values of the Redfern Station Railway Group. A major adverse impact to the aesthetic significance of Redfern Station Railway Group is expected from the construction concourse, station entrance, stairs and lifts. Further, moderate adverse impacts to the aesthetic, historic, and rarity values of the Redfern Station Railway Group are expected from the relocation of the Platform 1 Office Building.

Design decisions and mitigation measures identified to minimise these impacts have included positioning the proposed concourse, platform canopies, stairs and lifts, at the southern end of the Redfern Station and away from significant historic structures, allowing for the majority of heritage

elements at the Station to be retained. Further, the proposed concourse has been designed to achieve transparency using glazed and perforated metal panels and minimising the bulk and scale of the concourse.

The concourse would also provide an opportunity to reference former historic pedestrian routes and views. The relocation of the Platform 1 Office Building is necessary to construct the new concourse. Options for retention of the Platform 1 Office Building were considered and relocation was determined as the sole practical means of ensuring its survival, avoiding demolition. Adverse impacts of the relocation have been mitigated by relocating the building on the same platform and providing an equally appropriate setting in association with the Eveleigh Railway Workshops.

The Project also has the potential to have a minor adverse impact on both the aesthetic and technical values of the Eveleigh Railway Workshops. Although the proposed concourse is outside the heritage boundary of Eveleigh Railway Workshops, a minor adverse impact to the industrial character and significant views has been identified. However, this industrial character is less relevant outside the Eveleigh Railway Workshops Precinct and significant views are already obscured by existing railway infrastructure. Nevertheless, impacts would be mitigated by ensuring a maximum level of transparency is achieved through the glazed and perforated metal panels on the concourse, as well as ongoing consideration of design refinements to minimise bulk and scale. The concourse would have a beneficial impact to the social value of Eveleigh Railway Workshops by reinstating former historic pedestrian routes.

The Project would have a neutral impact to the Eveleigh Chief Mechanical Engineers Office and Golden Grove Heritage Conservation Area.

The proposed works to 125-127 Little Eveleigh Street have the potential for a minor adverse impact on the Darlington Heritage Conservation Area. Impacts would be mitigated by conservation works to the building which would improve the building's presentation and have a positive impact on the aesthetic significance of the Conservation Area.

The Project has evolved following extensive optioneering, continued consultation with industry professionals, the community and independent review by the TfNSW Design Review Panel. The Project area has complex issues including heritage constraints and urban design challenges, as well as physical limitations which include existing underground tunnels. The Project is necessary to respond to accessibility issues, and is also required to address emerging and future pedestrian traffic requirements from adjacent developments, providing cross corridor connections to access major hubs and celebrating the cultural and built history of the area by implementing heritage interpretation.

Aboriginal heritage

A previously recorded Aboriginal site is listed as being located within the Project area, however evidence of the site was not found as part of this assessment. Past historical activities have resulted in bulk excavation of the area which have more than likely destroyed this site. The Metropolitan Local Aboriginal Land Council and Heritage NSW, Department of Premier and Cabinet would be further consulted with the view to amend the recorded status of the site. No additional Aboriginal sites or areas of Aboriginal archaeological sensitivity are located within the Project area, therefore there would be no impacts to Aboriginal sites during construction or operation.

Other issues

Other issues assessed include:

- biodiversity
- soils, groundwater and contamination
- flooding, hydrology and water quality
- air quality
- hazard and risk
- waste and resources
- climate change and sustainability.

This EIS has identified that the Project would result in only minor impacts to the issues identified above. Notwithstanding, management and mitigation measures have been identified to minimise potential impacts identified.

Cumulative impacts

There are a number of projects proposed in the area surrounding the Project that were considered to have potential to result in cumulative impacts with the Project. Given the potential overlap of construction with these projects, the key potential cumulative impacts were determined to be construction traffic and transport, noise and vibration, social and property and land use impacts.

Cumulative impacts would be dynamic and time/activity specific and are therefore difficult to define in detail at this stage of the assessment process. TfNSW would continue to work closely with relevant stakeholders and other project proponents to manage and co-ordinate the interface with other projects under construction at the same time, and would consult with a range of State and local government agencies.

During operation, there is anticipated to be a net cumulative benefit for the community. Considered together with these other projects, the Project would provide:

- improved accessibility and safety at the Station and connectivity with the public transport network overall
- improved access to employment areas and housing in the surrounding area
- a potential increase in economic activity, businesses and employment opportunities, particularly around Redfern Station.

Environmental management

The primary document that would drive the environmental management approach during construction of the Project is the Construction Environmental Management Framework. The framework provides a whole of project life-cycle approach to construction environmental management and includes a range of requirements including the preparation of specific environmental management plans and sub-plans to implement the framework. Performance outcomes have been developed for each key issue for the Project, which TfNSW have committed to achieving. Mitigation measures designed to manage the potential impacts include measures to achieve the performance outcomes.

Project justification and conclusion

The Project forms part of the TAP, a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure. The Project has been designed to comply with the DSAPT, which Redfern Station does not currently meet.

In addition, the Station is located within the Sydney Innovation and Technology Precinct, (NSW Government, 2018), which is a commitment by the NSW Government to create a globally competitive innovation and technology hub located in the Central to Eveleigh corridor creating 25,000 new innovation jobs. This precinct contributes to the high forecast demand for the Station.

The Project has been designed to meet the DSAPT, and would support the objectives of relevant NSW government policies and plans. The Project would provide safe and equitable access to Platforms 1-10 and the surrounding pedestrian network, along with generally improved customer facilities, amenity and safety. The proposed pedestrian concourse also provides cross corridor connectivity, enabling access between major destination precincts on either side of the railway. The improvements would in turn facilitate existing demand, ease congestion and assist in supporting the growth in public transport use, providing an improved customer experience for existing and future users of Redfern Station.

The Project has been developed with the objective of minimising potential impacts on the local and regional environment and community. The design and construction methodology would continue to be developed with this overriding objective in mind, taking into account the input of stakeholders and the local community.

The Project's environmental performance would be demonstrated by implementing the Construction Environmental Management Framework, Construction Environmental Management Plan (and its' sub-plans) and Construction Noise and Vibration Strategy. They would include a range of environmental mitigation measures developed following the environmental assessment documented in this EIS. With the implementation of the proposed management and mitigation measures, the potential environmental impacts of the Project are considered manageable.

Next steps

This EIS will be placed on public display by Department of Planning, Industry and Environment (DPIE) for a minimum statutory period of 28 days, in accordance with Schedule 1 of the *Environmental Planning and Assessment Act 1979*. This EIS will be made available on the DPIE website at <https://www.planningportal.nsw.gov.au/mlajor-projects>.

During the public exhibition period, stakeholders and the community are encouraged to make written submissions to the DPIE in relation to the Project. Submissions can be made online at <https://www.planningportal.nsw.gov.au/major-projects> or in writing (citing development application number SSI-10041) and addressed to the planning officer listed below:

Department of Planning, Industry and Environment
Attention: Director – Transport Assessments
GPO Box 39
Sydney NSW 2001

Consultation activities proposed to be undertaken during the public exhibition of this EIS includes:

- release of an EIS summary document
- media releases
- online community information video sessions
- newsletter letterbox drop
- Project webpage updates
- newspaper advertising
- offer of online stakeholder meetings (including Aboriginal and Torres Strait Islander engagement, local businesses, government agencies).
- emails and phone calls to community members and stakeholder groups who have registered to be on the project contact list
- social media.

During exhibition of this EIS, government agencies and key stakeholders would also be offered Project briefings.

Following the exhibition period, TfNSW will consider the issues raised in submissions and will respond to community feedback in a submissions report. The report will also document the outcomes of any ongoing investigations and design work identified following the exhibition of this EIS.

If the Project is approved, it would be undertaken in accordance with the mitigation measures proposed in this EIS, the submissions report, and the conditions of approval.

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Assessment Requirements

Appendix B

Stakeholder and Community Engagement

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Urban Design and Public Domain Plan

Appendix D

Construction Environmental Management Framework

Appendix E

Construction Noise and Vibration Strategy

Appendix F

BDAR Waiver

Appendix G

Geotechnical and Contamination Investigation Reports

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Glossary and abbreviations

Table 1 Glossary

Term	Meaning
A-weighted decibels (dB(A))	The A-weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Acid sulfate soils	Naturally occurring soils, sediments or organic substrates (e.g. peat) that are formed under waterlogged conditions. These soils contain iron sulfide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, acid sulfate soils are benign. However, if the soils are drained, excavated or exposed to air by a lowering of the water table, the sulfides react with oxygen to form sulfuric acid.
Airborne noise	Airborne noise is sound transmitted through the air/atmosphere, e.g. conversation between people.
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.
Ancillary facility area	Areas required for temporarily storing materials, plant and equipment and providing space for other ancillary facilities, such as site offices, during construction.
Annual Exceedance Probability (AEP)	The probability or likelihood of an event occurring or being exceeded within any given year.
Assessment background level (ABL)	The overall background level for each day, evening and night period for each day of the noise monitoring.
Australian Height Datum	The standard reference level used to express the relative height of various features. A height given in metres AHD is the height above mean sea level.
Average Recurrence Interval	The likelihood of occurrence, expressed in terms of the long-term average number of years, between flood events as large as or larger than the design flood event. For example, floods with a discharge as large as or larger than the 100-year ARI flood will occur on average once every 100 years.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L ₉₀ sound pressure level is used to quantify background noise.
Blue Book	Landcom, 2004, Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom, 2004) and Volume 2D (DECCW, 2008)
Community	A group of people living in a specific geographical area or with mutual interests that could be affected by the Project.
Construction	Includes all physical work required to construct the Project and also includes construction planning such as the development of construction management plans.
Day	The period from 7:00 am to 6:00 pm Monday to Saturday and 8:00 am to 6:00 pm Sundays and public holidays.
Decibel (dB)	The measurement unit of sound.

Term	Meaning
Detailed design	Detailed design broadly refers to the process that the Construction Contractor undertakes (should the Proposal proceed) to refine the concept design to a design suitable for construction (subject to Transport for New South Wales acceptance).
Down-side	Down-side refers to the direction of travel away from Central Station.
Disability Standards for Accessible Public Transport	The Commonwealth <i>Disability Standards for Accessible Public Transport 2002</i> ("DSAPT") (as amended) are a set of legally enforceable standards, authorised under the Commonwealth <i>Disability Discrimination Act 1992</i> (DDA) for the purpose of removing discrimination 'as far as possible' against people with disabilities. The Transport Standards cover premises, infrastructure and conveyances, and apply to public transport operators and premises providers.
Ecologically Sustainable Development	As defined by clause 7(4) Schedule 2 of the EP&A Regulation. Development that uses, conserves and enhances the resources of the community so that ecological processes on which life depends are maintained, and the total quality of life, now and in the future, can be increased.
Evening	The period from 6:00 pm to 10:00 pm Monday to Sunday and public holidays.
Feasible	A work practice or mitigation measure is feasible if it can be engineered and is practical to build and/or implement, given Project constraints such as safety, maintenance and reliability requirements.
Flow width	Flow width represents with width of water flow for a given rainfall event. Flow width limits are applied for the safety of vehicular traffic.
Frequency (noise)	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Ground-borne noise	Ground-borne noise is noise generated by vibration transmitted through the ground into a structure, e.g. tunnelling works affected residential building above.
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment.
Interchange	Transport interchange refers to the area/s where passengers transit between vehicles or between transport modes. It includes the pedestrian pathways and cycle facilities in and around an interchange.
L₁₀	The sound pressure level exceeded for 10 per cent of the measurement period. For 10 per cent of the measurement period it was louder than the L ₁₀ .
L₉₀	The sound pressure level exceeded for 90 per cent of the measurement period. For 90 per cent of the measurement period it was louder than the L ₉₀ .
L_{max}	The maximum sound pressure level measured over the measurement period.
L_{min}	The minimum sound pressure level measured over the measurement period.
Maximum depth velocity	The product of depth of flow and velocity which typically represents a safety criteria for floodway safety.
Night	The period from 10:00 pm to 7:00 am Monday to Saturday and 10:00 pm to 8:00 am Sundays and public holidays.
Opal card	The integrated ticketing smartcard introduced by Transport for New South Wales. Opal is now the only way to travel via train, bus, ferry and light rail in NSW.
Out of hours works	Defined as works <i>outside</i> standard construction hours (i.e. outside of 7am to 6pm Monday to Friday, 8am to 1pm Saturday and no work on Sundays/public holidays).
Project area	The Project area comprises the overall potential area of direct disturbance by the Project, which may be temporary (for construction) or permanent (for operational infrastructure) and extend below the ground surface.

Term	Meaning
Proponent	A person or body proposing to carry out an activity under Division 5.1 of the EP&A Act - in this instance, Transport for New South Wales.
Rating background level (RBL)	The overall background level for each day, evening and night period for the entire length of noise monitoring.
Reasonable	Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.
REDWatch	An active community group that covers the suburbs of Redfern, Eveleigh, Darlington and Waterloo.
SA2	As defined by the Australian Bureau of Statistics (ABS), are geographical regions that reflect functional areas and represent how communities interact socially and economically.
Secretary's Environmental Assessment Requirements (SEARs)	Requirements and specifications for an environmental assessment prepared by the Secretary of the Department of Planning, Industry and Environment under section 5.16 of the EP&A Act.
SEIFA	The socio-economic indices for areas (SEIFA) are scores and ratings used to broadly define the relative socio-economic advantage and/or disadvantage of an area in terms of a person's access to material and social resources, and the ability to participate in society (ABS, 2016).
Sensitive receivers	Persons, facilities, structures or organisms that are sensitive to potential noise, vibration, air and visual impacts, such as residents, schools, heritage structures and medical facilities.
Sound power level	The total sound emitted by a source.
Sound pressure level	The amount of sound at a specified point.
Special audible characteristics	Noise with characteristics that can cause annoyance and disturbance, containing noticeable factors such as tonality, low frequency noise, impulsive or intermittent noise events
Sydney Trains	From 1 July 2013, Sydney Trains replaced CityRail as the provider of metropolitan train services for Sydney.
The Project	The construction and operation of the Redfern Station Upgrade – New Southern Concourse.
Track possession	Track possession means the temporary closure of part of the railway network for a specified period of time for the purposes of carrying out repair, maintenance or upgrading work on or adjacent to the railway network, during which no trains operate.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Up-side	Up-side refers to the direction of travel towards Central Station.
Urban design	The process and product of designing human settlements, and their supporting infrastructure, in urban and rural environments.
Vibration intensive works	Works which use vibration intensive equipment such as jack hammers, piling rigs and rock breakers.

Table 2 Abbreviations

Term	Meaning
ABL	Assessment background level
ABS	Australian Bureau of Statistics
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ANZEC	Australian and New Zealand Environment Council
ASS	Acid Sulfate Soils
ATAC	Accessible Transport Advisory Committee
AVATG	<i>Assessing Vibration: A Technical Guideline</i>
BC Act	<i>Biodiversity Conservation Act 2016 (NSW).</i>
BDAR	Biodiversity development assessment report
BEP	Built Environment Plan
BoM	Bureau of Meteorology
C2E	Central to Eveleigh
CBD	Central Business District
CCTV	Closed Circuit Television
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CLM Act	<i>Contaminated Land Management Act 1997</i>
CLMP	Community Liaison Management Plan
CMP	Conservation Management Plan
CNVMP	Construction Noise and Vibration Management Plan
CNVS	<i>Construction Noise and Vibration Strategy</i>
CPTED	Crime Prevention through Environmental Design
CSEP	Community Stakeholder Engagement Plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTMP	Construction Traffic Management Plan
DA	Development application
dB	Decibel
dB(A)	A-weighted decibels
DBH	Diameter Breast Height
DBYD	Dial Before You Dig
DDA	<i>Disability Discrimination Act 1992 (Cwlth)</i>
DECC	Department of Environment Climate Change
DECCW	Department of Environment, Climate Change and Water

Term	Meaning
DP	Deposited plans
DPC	Department of Premier and Cabinet
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
DSAPT	<i>Disability Standards for Accessible Public Transport (2002)</i>
DRP	Design Review Panel
EIA	Environmental Impact Assessment
EILs	Ecological investigation levels
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000 (NSW)</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)</i>
EPI	Environmental Planning Instrument
ESD	Ecologically sustainable development
ESLs	Ecological screening levels
GDEs	Groundwater Dependent Ecosystems
GLVIA	<i>Guidelines for Landscape and Visual Impact Assessment</i>
GREP	<i>Government Resource Efficiency Policy</i>
GSC	Greater Sydney Commission
HARD	Historical Archaeological Research Design
Heritage Act	<i>Heritage Act 1977 (NSW)</i>
HILs	Health investigation levels
HMP	Heritage Management Plan
HV	High Voltage
Hz	Hertz
ICNG	<i>Interim Construction Noise Guideline</i>
ICOMOS	International Council on Monuments and Sites
IHO	Interim Heritage Orders
IS	Infrastructure Sustainability
ISCA	Infrastructure Sustainability Council of Australia
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i>
L _{Amax}	Maximum A-weighted sound pressure level
LCZs	Landscape Character Zones
LEP	Local Environmental Plan
LGA	Local Government Area

Term	Meaning
LiDAR	Light Detection and Ranging
LV	Low voltage
Mirvac	Mirvac Group
MCA	Multi criteria analysis
MLALC	Metropolitan Local Aboriginal Land Council
MNES	Matters of National Environmental Significance
NARCIiM	NSW and ACT Regional Climate Modelling
NCA	Noise catchment areas
NCIE	National Centre of Indigenous Excellence
NEPC	National Environment Protection Council
NML	Noise management levels
NSW	New South Wales
NPW Act	<i>National Parks and Wildlife Act 1974</i>
OEH	NSW Office of the Environment and Heritage
OEMP	Operational Environmental Management Plan
OHW	Overhead wiring
OOHW	Out-of-Hours Works
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PDP	Public Domain Plan
PM	Particulate matter
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
RailCorp	(former) Rail Corporation of NSW
RBL	Rating background level
RCP	Representative Concentration Pathways
RNP	<i>NSW Road Noise Policy</i>
Roads and Maritime	NSW Roads and Maritime Services
ROLs	Road Occupancy Licences
ROTAP	Rare or Threatened Australian Plants
RPA	Royal Prince Alfred Hospital
SA2	Statistical Area Level 2
SDG	Sustainable Design Guidelines
SEARs	Secretary's environmental assessment requirements
SEIFA	Socio-economic indices for areas
SEPP	State Environmental Planning Policy
SHI	State Heritage Inventory
SHR	State Heritage Register

Term	Meaning
SIA	Social impact assessment
SIS	Building Momentum: State Infrastructure Strategy 2018-2038
SMP	Sustainability Management Plan
SSD	State significant development
SSI	State significant infrastructure
SSP	State Significant Precinct
STAR	Sydney Terminal Area Reconfiguration
TAP	Transport Access Program
TfNSW	Transport for New South Wales
TGSI	Tactile ground surface indicators
The Region Plan	The Greater Sydney Region Plan
TPZs	Tree Protection Zones
TSP	Total suspended particulates
UDP	Urban Design Plan
UNESCO	United Nations Educational, Scientific and Cultural Organization
UrbanGrowth (UGDC) (now Infrastructure NSW)	UrbanGrowth NSW Development Cooperation (now Infrastructure NSW)
VDV	Vibration dose values
VENM	Virgin excavated natural material
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2007</i>
WSUD	Water sensitive urban design

1 Introduction

This chapter provides a brief overview of the Project, including its key features, need and objectives, and identifies the structure of this EIS.

1.1 Project overview

Transport for NSW (TfNSW) is the lead agency for the integrated delivery of public transport services across all modes of transport in NSW, and is responsible for the delivery of projects within the Transport Access Program (TAP). The TAP is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure across NSW.

TfNSW is seeking approval to construct and operate an upgrade of Redfern Station (Redfern Station Upgrade – New Southern Concourse) ('the Project') as part of the TAP. The Project involves the construction of a pedestrian concourse to the south of the existing Lawson Street concourse providing both lift and stair access to Platforms 1-10. The new pedestrian concourse would provide a new connection across the railway corridor, extending between Little Eveleigh Street and Marian Street in the suburbs of Redfern and Eveleigh and include associated interchange upgrades.

The Project's context and location is provided on **Figure 1-1**. The key Project features are shown on **Figure 5-2**, and include the following:

- a six metre wide concourse between Little Eveleigh Street and Marian Street
- new stair and lift access from the new concourse to Platforms 1 to 10
- an upgraded station entrance at Marian Street including station services and customer amenities
- a new station entrance at Little Eveleigh Street including station services and customer amenities
- formalisation of a shared zone on Little Eveleigh Street
- upgrade of Marian Street/Corwallis Street/Rosehill Street area including an extension to the existing shared zone
- relocation of the bus zone from Little Eveleigh Street to Lawson Street
- kiss and ride on Lawson Street and Gibbons Street, and associated footpath upgrades
- footpath widening on Ivy Street
- relocation of a building on Platform 1 to accommodate the concourse
- platform works (including re-surfacing, repurposing/relocating/altering platform features, installation of canopies, drainage works, and installation of operational infrastructure such as wayfinding and signage and passenger information systems)
- service relocations and upgrades including relocation of overhead wiring structure and installation of a new rail signal between Platforms 1 and 2.

Redfern Station is an important destination and the sixth busiest on the rail network, servicing the community, an innovation and technology hub, education and health centres and businesses. The Project is the first step in renewing the Redfern North Eveleigh Precinct. It would provide easy access to Platforms 1 to 10 with six new lifts and stairs, and better connectivity with the surrounding areas including key destinations such as South Eveleigh (formerly known as Australian Technology Park), Carriageworks and educational and health centres.

The Project is subject to assessment and approval by the Minister for Planning and Public Spaces under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This document addresses the environmental assessment requirements of the Secretary of the Department of Planning, Industry and Environment (DPIE) (the 'Secretary's environmental assessment requirements', or SEARs), dated 20 December 2019, which incorporates the requirements of Part 3 of

Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) (refer to **Appendix A**).

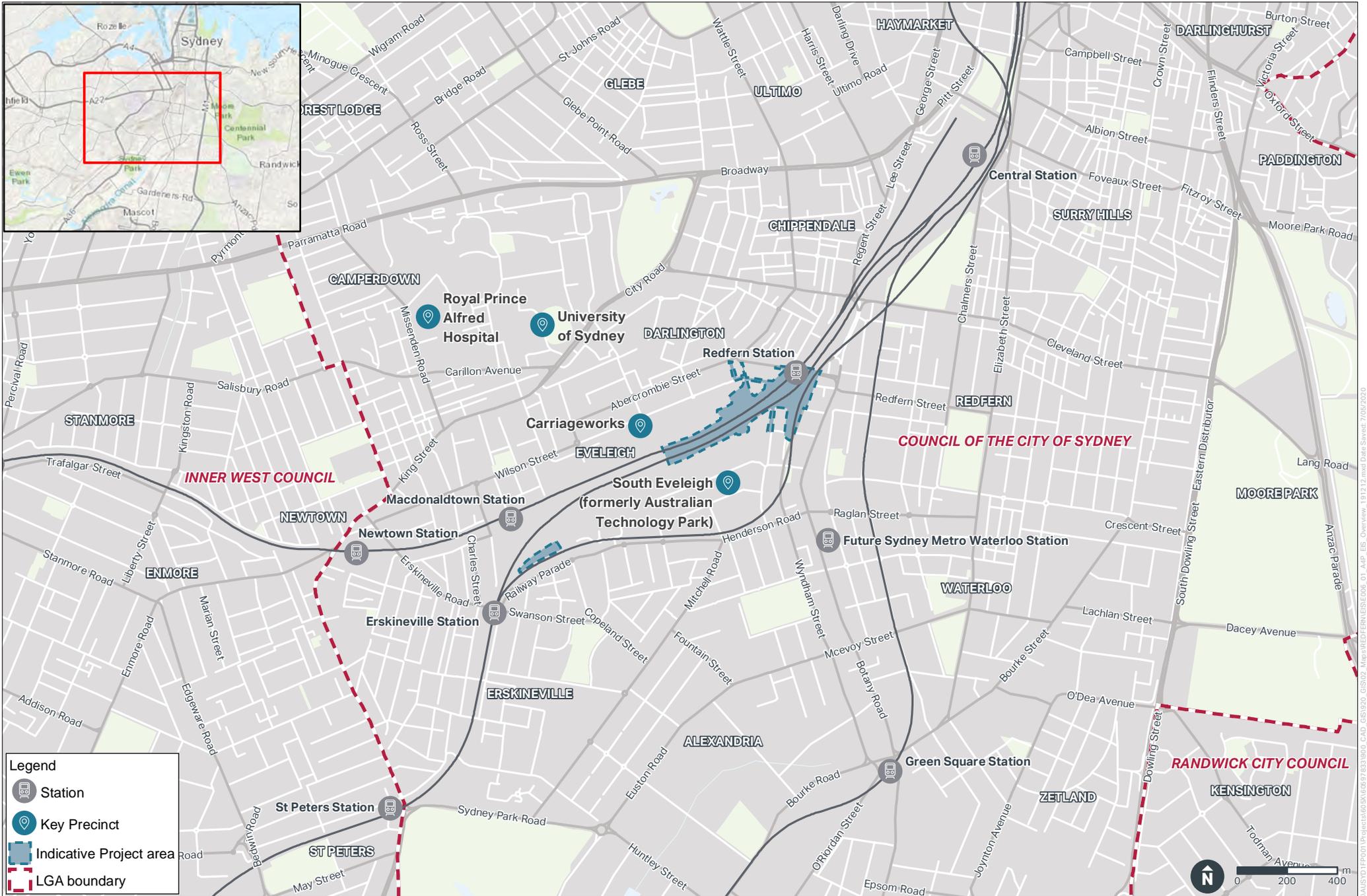


FIGURE 1-1: PROJECT OVERVIEW AND LOCATION

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeBCo, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community. Imagery © Nemap, 2019.

1.2 Background

1.2.1 Transport Access Program

The NSW Government is committed to facilitating and encouraging the use of public transport, such as trains, by upgrading railway stations to make them more accessible, and improving interchanges around stations with other modes of transport such as bicycles, buses and cars. As outlined in **Section 1.1**, the TAP is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

The TAP aims to provide:

- stations that are accessible to people who have disabilities, are less mobile, parents/carers with prams and customers with luggage
- modern buildings and facilities for all modes that meet the needs of a growing population
- modern interchanges that support an integrated transport network and allow seamless transfers between all modes of transport for all customers
- safety improvements including extra lighting, lift alarms, fences and security measures for car parks and interchanges, including stations, bus stops and wharves
- signage improvements so customers can more easily use public transport and transfer between transport modes at interchanges
- other improvements and maintenance such as painting, new fencing and roof replacements.

Redfern Station does not currently meet key requirements of the *Disability Standards for Accessible Public Transport 2002* (DSAPT). Existing platforms are accessed by a single stairway at the northern end of the platforms (with the exception of Platforms 6/7 which are serviced by an existing lift and Platforms 11/12 which are serviced by escalators). The stairways do not provide an accessible path of travel for several groups of people, including those with a disability, limited mobility, parents/carers with prams or customers with luggage.

The Project would provide safe and equitable access to Platforms 1 to 10 and Little Eveleigh Street and Marian Street along with generally improving customer facilities, amenity and safety. The improvements would in turn assist in supporting the growth in public transport use and would provide an improved customer experience for existing and future users of Redfern Station.

1.2.2 Local Redfern precinct

Redfern Station is located within the Sydney Innovation and Technology Precinct (NSW Government, 2018), which is a commitment by the NSW Government to create a globally competitive innovation and technology precinct located in the Central to Eveleigh corridor. The vision for the Sydney Innovation and Technology Precinct includes the development of approximately 250,000 square metres of dedicated floorspace for technology companies with a focus on enabling the growth of new companies. The development of this Precinct aims to create 25,000 new innovation jobs, 100 new scale-up companies and triple NSW's technology exports. The Project has been identified as a key infrastructure project which will be crucial to supporting the development of the Precinct.

Redfern is also the subject of various local urban renewal initiatives such as streetscape and cycleway improvements by City of Sydney Council and private developments, which are transforming the urban village of Redfern.

Several housing projects within the vicinity of the Project have also been proposed or are currently being completed including The Pemulwuy Project to redevelop land known as "the Block" in Redfern in the area north of the Project. The mixed-use site will ultimately include affordable housing for 62 Aboriginal and Torres Strait Islander families, a gymnasium, commercial and retail space, a gallery, student accommodation for 154 students, and a childcare centre.

The Project footprint sits within the Redfern-Waterloo Authority Sites State Significant Precinct which includes the North Eveleigh West site, the South Eveleigh site (formerly Australian Technology Park) and Carriageworks, which continues to experience growth in visitor numbers.

In addition to the predicted growth trend in public transport customers, patronage at Redfern Station is increasing as a result of a large-scale commercial development underway at South Eveleigh, where Commonwealth Bank of Australia has partnered with Mirvac Group (Mircac) to redevelop the former Australian Technology Park as an innovation and technology hub. This development alone gave rise to an increase of approximately 4,500 commuters at Redfern Station by early to mid-2019, with approximately another 5,500 workers expected by mid-2020.

The University of Sydney's Camperdown-Darlington campus is a significant employment hub and destination which has delivered four transformational projects as part of a substantial capital works program over the past five years. A further five major developments are proposed, including its Engineering and Technology Precinct, which has been declared to be State Significant Development (SSD).

Redfern Station is located in the vicinity of two major Sydney hospitals. It is about 1.3 kilometres east of Royal Prince Alfred Hospital (RPA) and two kilometres south west of St Vincent's Hospital. Both hospitals operate within the Public and Private system and are teaching hospitals affiliated with Universities. RPA is the largest hospital in the Sydney Local Health District and has the largest volume of medical research undertaken within NSW.

1.3 Project need and benefits

The Project aims to address current demand for the station and significant forecast growth in the surrounding area associated with the Sydney Innovation and Technology Precinct and subsequent increase in rail patronage. Redfern Station is currently the sixth busiest station in NSW with approximately 70,000 customers on an average weekday. It is already at capacity and has deficiencies that restrict capacity to meet future demands and present a risk to customer safety.

Access to the station platforms does not currently comply with DSAPT requirements, as only a single point of access (consisting of a stairway) is available to the majority of platforms. Currently only Platforms 6 and 7 are accessible via a lift, greatly restricting the availability of services for disabled customers and other people with mobility issues.

The Project would enable access to Redfern Station and platforms from both Little Eveleigh and Marian Streets through the inclusion of lifts to Platforms 1-10. New stairs to platforms would provide a secondary entry/exit point which would serve to improve customer movements and capacity within the station. The Project would support better connections for the community including access to employment, education and businesses.

The proposed concourse would provide connectivity between the platforms at Redfern Station and Marian Street and Little Eveleigh Street and would also provide cross corridor connectivity. This would address one of the existing pedestrian desire lines, by providing access to the station's above ground platforms closer to South Eveleigh, Carriageworks and the University of Sydney.

1.4 Project objectives

The objectives of the Project include:

- improve customer experience and accessibility
- reduce platform clearance times (i.e. the time required for passengers to leave a platform after alighting from a train)
- improve customer circulation and relieve congestion within Redfern Station
- cater for the forecast customer growth for Redfern Station up to 2036
- provide durable and sustainable infrastructure
- provide improved connectivity for pedestrians, including improved urban connectivity for South Eveleigh
- support interfacing and upcoming works in the area surrounding Redfern Station

- minimise disruption to customers, staff and neighbours throughout the planning and construction of the Project.

1.5 Proponent details

The proponent for the Project is Transport for NSW (TfNSW). TfNSW engages in transport planning, strategy, policy, procurement and other non-service delivery functions across many modes of transport including roads, rail, ferries, light rail and point to point transport such as taxis, hire cars and rideshare services.

1.6 Purpose and structure of this environmental impact statement

This EIS supports an application for approval of the Project as State Significant Infrastructure (SSI) under Part 5.2 of the EP&A Act. It addresses the SEARs issued on 20 December 2020 (refer to **Appendix A**).

The EIS is structured as follows:

- Chapter 1: Introduction to the EIS
- Chapter 2: A description of the location of the Project and surrounding area, and strategic context of the Project
- Chapter 3: Information on the statutory planning and assessment process
- Chapter 4: A description of the Project development process including options considered and justification for the preferred option
- Chapter 5: A description of the Project
- Chapter 6: A summary of the community and stakeholder engagement for the Project
- Chapter 7: A description of the environmental scoping assessment undertaken for the EIS
- Chapters 8 to 23: Assessment of specific environmental issues including:
 - Urban design
 - Landscape and visual
 - Land use and property
 - Social
 - Transport and traffic
 - Noise and vibration
 - Non-Aboriginal heritage
 - Aboriginal heritage
 - Biodiversity
 - Soil, groundwater and contamination
 - Flooding, hydrology and water quality
 - Air quality
 - Hazard and risk
 - Waste and resources
 - Climate change and sustainability
 - Cumulative impacts.
- Chapter 24: An outline of the proposed environmental management framework, performance outcomes and mitigation measures proposed for the Project

- Chapter 25: A synthesis of the EIS, including an overall evaluation of the Project with regard to social, economic and environmental considerations and the results of the EIS
- Chapter 26: EIS References.

The appendices of the EIS (Appendix A to Appendix G) include the SEARs as well as a table of where the SEARs are addressed, the Stakeholder and Community Engagement documents, the Urban Design and Public Domain Plan for the Project, the Construction Environmental Management Framework, Construction Noise and Vibration Strategy, biodiversity development assessment report (BDAR) waiver and supporting geotechnical and contamination assessment reports.

The specialist technical reports prepared as an input to the EIS are provided as Technical report 1 to Technical report 7.

2 Location and strategic context

This chapter describes the location and strategic context of the Project. It defines the Project area for the purpose of the EIS, and provides a description of the surrounding area in which it is located. A description of relevant strategic plans and the need for the Project is also provided.

2.1 Project area and study area

The term 'Project area' refers to the area where the Project would be undertaken, including both construction and operational areas. The Project area includes land within the rail corridor and surrounding streets where new station entrances, shared zones and other elements of the Project would be located. The Project area also includes construction areas and ancillary facility areas. The Project area is shown on **Figure 5-1**.

The 'study area' is the wider area that may be directly or indirectly affected by the Project, and varies for each technical assessment within this EIS according to the nature and requirements of the assessment and potential impacts (e.g. noise and vibration impacts, visual impacts, heritage impacts). A description of the study area for each technical assessment is provided in each assessment.

2.2 Project Location

2.2.1 Project setting and local area

The Project is located at Redfern Station on the Main Suburban railway line, approximately 1.3 kilometres from Central Station. Redfern Station is located within the suburbs of Redfern and Eveleigh in the City of Sydney Local Government Area (LGA) and in 2018 was the sixth busiest station on the Sydney Trains networks with approximately 70,000 entries and exits on an average weekday. The station is served by all Sydney Trains lines except the Cumberland Line, Carlingford Line and the airport branch of the Airport and South Line. Redfern Station contains 12 platforms, of which Platforms 1 to 10 are above ground platforms, and Platforms 11 and 12 are underground platforms (serving the Eastern Suburbs Railway).

The station is bounded by Lawson Street to the north, Little Eveleigh Street to the west, Gibbons Street to the east and Marian Street to the south. The railway corridor itself is located within a cutting with the surrounding areas to both the east and west being elevated above the station platforms. The majority of the Project area has been heavily modified by past and ongoing disturbances associated with urban development and the active rail corridor. These activities have resulted in the full removal of all remnant vegetation communities.

The Project area is surrounded by a mix of residential properties and commercial land uses. Surrounding land uses include:

- East – Redfern town centre
- South – South Eveleigh (formerly Australian Technology Park)
- West – Residential areas, Carriageworks, the University of Sydney and RPA
- North – Residential areas and the Redfern Community Centre.

At present there are three entrances to Redfern Station:

- the Lawson Street overbridge located to the north of the station
- Gibbons Street entrance, located to the south-east of the station, adjacent to the Gibbons Street/Redfern Street intersection
- Marian Street entrance, located to the south of the station, which provides access directly to Platform 10.

Bus services surrounding Redfern Station include two bus stops (Stand A and Stand B) located along Gibbons Street, within walking distance to the station, a bus stop on Regent Street after Redfern Street (southbound) and designated shuttle bus zones on Little Eveleigh and Lawson Streets. No

commuter parking facilities are available around Redfern Station. On-street parking is provided in surrounding streets, including Gibbons Street, Cornwallis Street, Marian Street, Lawson Street, Rosehill Street, and Little Eveleigh Street.

The Redfern area holds great significance for Aboriginal people and other communities who identify with its political symbolism and history of the area as a focus for activism and civil and land rights for Aboriginal people. Within the Project area, the Aboriginal heritage assessment undertaken for the Project showed that no existing Aboriginal heritage records are present within the Project area (noting that an existing record identified within the Project area was found unlikely to be of cultural origin).

Several non-Aboriginal heritage items are located within and surrounding the Project area including:

- Redfern Railway Station Group
- Eveleigh Railway Workshops
- Eveleigh Chief Mechanical Engineer's Office
- Darlington Heritage Conservation Area
- Golden Grove Heritage Conservation Area.

2.2.2 Property ownership

The Project would predominantly be located on land that forms part of the existing rail corridor and adjacent land owned by the NSW Government or City of Sydney Council. The design of the Project has avoided the need to permanently acquire land and properties. Construction of the Project would require the temporary use of NSW Government and Council owned land. Land ownership is described further in **Chapter 5**, and land use and property is further described in **Chapter 10** of this EIS.

The Project area is situated over the following lot and deposited plans (DP):

- Lot 38 DP 98 (125-127 Little Eveleigh Street)
- Lot 39 DP 98 (125-127 Little Eveleigh Street)
- Lot 1 DP 4209 (Gibbons Street Reserve)
- Lot 2 DP 4209 (Gibbons Street Reserve)
- Lot 3 DP 4209 (Gibbons Street Reserve)
- Lot 4 DP 4209 (Gibbons Street Reserve)
- Lot 6 DP 4209 (Gibbons Street Reserve)
- Lot 7 DP 4209 (Gibbons Street Reserve)
- Lot 8 DP 4209 (Gibbons Street Reserve)
- Lot 9 DP 4209 (Gibbons Street Reserve)
- Lot 10 DP 4209 (Gibbons Street Reserve)
- Lot 4 DP 264605 (Gibbons Street Reserve)
- Lot 5 DP 264605 (Gibbons Street Reserve)
- Lot 6 DP 264605 (Gibbons Street Reserve)
- Lot 1 DP 431984 (Gibbons Street Reserve)
- Lot 1 DP 776019 (Gibbons Street Reserve)
- Lot 3 DP 862513 (railway corridor beneath the Lawson Street bridge)
- Lot 52 DP 1001467 (Eveleigh Maintenance Centre)
- Lot 2 DP 1011782 (railway corridor north of the Lawson Street bridge)
- Lot 5 DP 1175706 (the station and railway corridor south of the Lawson Street bridge)

- Lot 4007 DP 1194309 (South Eveleigh Precinct).

The Project area is also situated over road reserves for the following roads:

- Marian Street
- Railway Parade
- Cornwallis Street
- Rosehill Street
- Gibbons Street
- Lawson Street
- Little Eveleigh Street
- Ivy Lane
- Ivy Street.

The above roads are classified as local roads with the exception of Gibbons Street which is classified as a State road.



FIGURE 2-1: CADASTRAL BOUNDARIES

2.3 Strategic context

2.3.1 Overview

Improving transport customer experience and accessibility is the focus of the TAP. Transport interchanges and stations are recognised as important gateways to the transport system and as such play a critical role in shaping the customer's experience and perception of public transport. As outlined in **Chapter 1**, the TAP is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

Redfern Station is located within the Redfern-Waterloo Authority Sites - State Significant Precinct (SSP) as listed under Schedule 2 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) and prescribed under Appendix 4 of the *State Environmental Planning Policy (State Significant Precincts) 2005* (State Significant Precincts SEPP). However, neither Schedule 2 of the SRD SEPP nor Appendix 4 of the State Significant Precincts SEPP affect the SSI declaration for the Project (see the discussion in **Table 3-1**).

The NSW State Government is considering the future vision of the North Eveleigh site within the SSP with the upgrade of Redfern Station the first step towards its renewal.

There is significant strategic need for the Redfern Station Upgrade as Redfern Station performs an essential role in the wider Sydney CBD rail network. Its proximity to the Redfern Street retail strip plays an important socio-economic role and it is pivotal to the success and connectivity of key residential, commercial and educational/research sites in the precinct. It serves a broad patronage including local residents, the nearby South Eveleigh precinct, the University of Sydney, TAFE Eora, Royal Prince Alfred Hospital and Carriageworks.

The community are considered a key stakeholder in the delivery of the Project.

2.3.2 Greater Sydney Region Plan

The '*Greater Sydney Region Plan: A Metropolis of Three Cities – Connecting people*' (Greater Sydney Commission, 2018), sets the vision and strategy for the Greater Sydney Region. This vision is based on the concept of 'a metropolis of three cities' comprising the Eastern Harbour City (centred on the current Sydney CBD), the Central River City (centred on the emerging CBD of Parramatta), and a new Western Parkland City (centred on the Western Sydney Airport and the Western Sydney Aerotropolis).

The Greater Sydney Region Plan identifies that the provision of adequate infrastructure to support population growth is essential to creating strong communities. Of the 40 objectives set out in the Plan, objectives 1 to 4 are relevant to the Project, as follows:

- infrastructure supports the three cities
- infrastructure aligns with forecast growth – growth infrastructure compact
- infrastructure adapts to meet future needs
- infrastructure use is optimised.

Through its location at one of Sydney's key stations, the Project would help achieve the objectives of the Greater Sydney Region Plan by supporting the concept of a '30-minute city', whereby people can reach their nearest metropolitan and strategic centres within 30 minutes. The Project would also promote north-south and east-west connections. The Project would assist in providing for a forecast increase in the patronage of Redfern Station (associated with growth in the Redfern and North Eveleigh Precinct and the wider Sydney Innovation and Technology Precinct), along with maximising the utility of existing infrastructure, thereby further supporting the objectives of the Greater Sydney Region Plan.

2.3.3 NSW State Infrastructure Strategy 2018 – 2038

The '*Building Momentum: State Infrastructure Strategy 2018-2038*' (Infrastructure NSW, 2018) recommends reforms, policies and projects that respond to NSW's changing economic, social, technological and environmental outlook. It contains 122 recommendations spanning NSW's key infrastructure sectors of transport, energy, water, health, education, justice, social housing, culture,

sport and tourism. The key strategic objective for the transport sector is to '*ensure the transport system creates opportunities for people and businesses to access the services and support they need*'. Relevant recommendations for the Project outlined within the strategy include:

- support the development of a three-city metropolis for Greater Sydney by investing in transport infrastructure that provides high frequency and high-volume access to, and connectivity between, each of the three cities, while enhancing local amenity
- invest in transport infrastructure that is integrated with land use to create opportunities for agglomeration and enhance productivity, liveability and accessibility, in support of the policy goal of a '30-minute city'
- further develop the Sydney rail network with new rail links and system-wide upgrades
- improve the resilience of the system to reflect its critical operational role, including during periods of acute and sustained shock.

The Project would help realise the recommendations of the State Infrastructure Strategy by providing an accessible and high-volume connection to the Eastern Harbour City and Central River City outlined in the Greater Sydney Region Plan.

2.3.4 Future Transport Strategy 2056

The *Future Transport Strategy 2056* (TfNSW, 2018a) is a 40-year strategy, harnessing technology to improve customer and network outcomes, and aligning future planning of the transport network with land use, through collaboration with various government departments.

The *Future Transport Strategy 2056* identifies 12 customer outcomes to guide transport investment in Greater Sydney. These outcomes include transport providing convenient access, supporting attractive places and providing 30-minute access for customers to their nearest centre by public transport.

Customer outcomes relevant to the Project include:

- a safe transport system for every customer with the aim for zero deaths or serious injuries on the network by 2056
- moving people from private vehicles to more sustainable transport modes to reduce congestion and emissions
- fully accessible transport for all customers.

The Project would support the objectives of the *Future Transport Strategy 2056* by improving accessibility at a key station in Sydney and planning for all customers in the context of significant forecast growth in the area surrounding Redfern Station. By improving the accessibility of the Station and catering for the increased demand in customers, the Project aims to increase patronage on public transport thus improving air quality and supporting better health and wellbeing.

2.3.5 Disability Inclusion Action Plan 2018 – 2022

The *Disability Inclusion Action Plan 2018-2022* (TfNSW, 2017a) was developed by TfNSW in parallel with the development of *Future Transport Strategy 2056* and in consultation with the Accessible Transport Advisory Committee, which is made up of representatives from peak disability and ageing organisations within NSW. The *Disability Inclusion Action Plan 2018-2022* builds on the objectives of *Future Transport Strategy 2056* in relation to accessibility to transport. The TAP has been identified in this plan as a key action to ensure that the transport network in Sydney is accessible for all potential users.

The relevant strategic objectives of the *Disability Inclusion Action Plan 2018-2022* are as follows:

- to deliver barrier-free end to end journeys for all customers
- to provide accessible planning and cutting-edge assistive technology
- to ensure people with a disability influence the future of transport in NSW.

The Project would continue to be developed with consideration of the objectives outlined in this Plan and would seek to improve and provide equitable access to public transport facilities.

2.3.6 Central to Eveleigh Urban Transformation Strategy

The *Central to Eveleigh Urban Transformation Strategy*, which was released by the NSW Government in November 2016, guides renewal of 50 hectares of government-owned land in and around the rail corridor along five precincts being:

- North Eveleigh precinct
- South Eveleigh precinct
- Redfern Station precinct
- Central Station precinct
- Waterloo Estate precinct.

The Project would support the implementation of the vision and key moves identified within the strategy, specifically 'Key move 1' to renew Redfern Station, 'Key move 4' to connect the city with surrounding places and 'Key move 7' to create a centre for Sydney's growing economies. The Project would constitute a major upgrade to Redfern Station facilitating increased capacity and supporting the growth of economic and technological centres around the station. The Project would also provide a direct connection between Marian Street and Little Eveleigh Street, providing an accessible path across the railway corridor between Redfern and Eveleigh.

2.3.7 Camperdown - Ultimo Place Strategy

The *Camperdown - Ultimo Place Strategy* was released by the Greater Sydney Commission in February 2019. The vision set out in the Strategy is for the Camperdown–Ultimo Collaboration Area to be Australia's innovation and technology capital by 2036.

The Project would support the implementation of the vision identified within the strategy by addressing some of the challenges faced such as unequally distributed public transport, pedestrian and cycling links within the area and poor pedestrian amenity on high-traffic volume roads.

The Project would constitute a major upgrade to Redfern Station facilitating increased capacity and supporting the growth of economic and technological centres around the station. The Project would also provide a direct connection between Marian Street and Little Eveleigh Street, providing an accessible path across the railway corridor between Redfern and Eveleigh as well as a shared zone for pedestrians and cyclists on Little Eveleigh Street and Marian Street.

2.3.8 Australian Infrastructure Plan 2016

The *Australian Infrastructure Plan 2016* (Infrastructure Australia, 2016) sets out the infrastructure challenges and opportunities Australia faces over the 15 years between 2016 and 2031 and the solutions required to drive productivity growth.

Recommendation 1.7 of the *Australian Infrastructure Plan 2016* states that governments should increase funding for investments in projects and technologies that make better use of existing infrastructure. The Project would support recommendation 1.7 by providing an upgrade to Redfern Station that would both ensure it meets accessibility requirements but also would enable Redfern Station to safely cater for anticipated demand in the future, given planned growth in the surrounding precinct.

2.3.9 Sydney's Rail Future 2012

Sydney's Rail Future 2012 (TfNSW, 2012) introduced the TAP as a means of improving amenities and efficiencies of train stations in Sydney by contributing to the delivery of accessible stations, modern efficient interchanges, improved customer safety and signage improvements. *Sydney's Rail Future 2012* is a long term plan to increase the capacity of Sydney's heavy rail network through investment in new services and upgrading of existing infrastructure. It is a plan to improve the customer's experience by modernising Sydney's rail network.

The Project would support the aims of the plan by upgrading existing infrastructure and improving customer experience at Redfern Station.

2.3.10 Sydney Innovation and Technology Precinct

As discussed in **Section 1.2.2** of the EIS, the NSW Government's vision for the Sydney Innovation and Technology hub (south of the Sydney Central Business District) (DPI, 2019) is to create 25,000 new innovation jobs and 100 new scaleup companies in the wider area. It envisages high level collaboration to achieve this with universities and research institutions, high tech companies and the community.

The Project would support the aims of the precinct by facilitating safe and accessible public transport to meet both current and future demands arising from increased volume of employment and educational opportunities within the precinct.

2.4 Why this Project

Currently Redfern Station is the sixth busiest station in NSW, experiencing approximately 70,000 users on a daily basis between 2016-2018 (TfNSW, 2018b) with an expected increase of over 15 per cent by 2036. This increase will place additional pressures on Redfern Station and the station has been identified as in need of an upgrade for several reasons, including:

- to cater for growth in commuter use at Redfern Station for both transfers between services and as a destination station
- to improve customer experience and accessibility by providing lift access to all platforms
- to develop a design that is flexible and can be integrated with any future station precinct upgrades
- to provide additional access to Redfern Station platforms.

Patronage at Redfern Station is set to increase due to large scale urban renewal and commercial developments in the surrounding area. This includes The Pemulwuy Project and projects associated with the Redfern and North Eveleigh Precinct, and the wider Sydney Innovation and Technology Precinct.

Additional station entrances, lifts and stairs are required to enable accessible and safe access to the station platforms and to provide for the predicted growth in public transport patronage and increasing visitor numbers to the surrounding area.

The proposed pedestrian concourse also provides cross corridor connectivity, enabling safe and easy access between major destination precincts on either side of the railway.

The Project would support the objectives of relevant NSW government policies and plans along with providing safe and accessible access to a key Sydney station, taking into account capacity needs and significant predicted future growth in the area surrounding Redfern Station.

3 Planning and assessment process

This section provides an overview of the planning and assessment process for the Project.

3.1 NSW environmental planning approvals

The EP&A Act and *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) provide the legislative framework for environmental planning in NSW. The Act and associated regulation include provisions to ensure that all development proposals that have the potential to have an impact on the environment are subject to an appropriate level of assessment, while also providing opportunity for community involvement. They are supported by a range of environmental planning instruments including State environmental planning policies (SEPPs) and local environmental plans (LEPs).

The Project is declared as SSI pursuant to Section 5.12(2) of the EP&A Act. It is a class of development defined by an environmental policy which may be carried out without consent by or on behalf of a public authority. It is subject to the assessment and approval provisions of Division 5.2 of the EP&A Act as discussed below.

3.1.1 Permissibility of the Project

Clause 79 of *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) provides that development for the purpose of a railway or rail infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land. The Project is characterised as development for the purpose of a railway or rail infrastructure facilities and would be carried out by or on behalf of TfNSW, a public authority. Accordingly, development consent under Part 4 of the EP&A Act is not required for the Project.

TfNSW has considered the likely nature and extent of potential environmental impacts of the Project and has formed the opinion that the Project is likely to significantly affect the environment, requiring the preparation of an EIS.

Given the Project represents infrastructure for which TfNSW would be the determining authority, and the activity is likely to significantly affect the environment, thus requiring an EIS, the Project is classified as SSI under the provisions of Schedule 3 (Clause 1(1)) of *State Environmental Planning Policy (State and Regional Development) 2011*. Approval for the Project would be sought from the Minister for Planning and Public Spaces, under Division 5.2 of the EP&A Act.

3.1.2 Planning and approval process under Division 5.2 of the EP&A Act

As required by Section 5.15 of the EP&A Act, TfNSW submitted a SSI application and supporting Scoping Report to the Secretary of the DPIE on 05 November 2019. The SEARs for the Project were issued (pursuant to Section 5.16 of the EP&A Act) on 20 December 2019. The SEARs are provided in full in **Appendix A** of this EIS.

The DPIE will place this EIS on public exhibition for a minimum of 28 days (as per Clause 12 of Schedule 1 of the EP&A Act). During the exhibition period, interested parties can review the EIS and make a written submission to the DPIE for consideration during the assessment process.

At the completion of the public exhibition period, the DPIE will collate and provide TfNSW a copy of all submissions received. After reviewing the submissions, TfNSW will prepare a submissions report that responds to relevant issues raised. If changes are required to the Project to respond to the issues raised or to further minimise environmental impacts, a preferred infrastructure report or an amendment report may also be required. These reports would be made available to the public.

Approval from the Minister for Planning and Public Spaces is required before TfNSW can proceed with the Project (as per Section 5.14 of the EP&A Act).

The planning approval process, and including where TfNSW are up to in the process, is shown on **Figure 3-1**.

STAGE 1 EARLY CONSULTATION

Early project consultation undertaken prior to the commencement of the formal assessment process.

Project refined on the basis of the early project consultation.

Initial scoping of EIS investigations undertaken on the basis of early project consultation.

STAGE 2 ENVIRONMENTAL IMPACT STATEMENT

Transport for NSW prepares and submits a State significant infrastructure application to the Secretary of the NSW Department of Planning, Industry and Environment (DPIE), which includes a supporting document outlining the project and its likely impacts.

Consultation undertaken with key government stakeholders and the community.

DPIE issues Secretary's environmental assessment requirements (SEARs) for EIS with focus on key issues.

EIS prepared addressing the matters outlined in the SEARs.

STAGE 3 EXHIBITION CONSULTATION AND REVIEW

DPIE exhibits the EIS for 28 days and invites public submissions.

Secretary may require proponent to respond to submissions and submit a preferred infrastructure report outlining proposed changes to minimise environmental impacts or address any other issues raised during assessment of the application.

STAGE 4 ASSESSMENT AND DETERMINATION

Assessment by DPIE, draft Secretary's environmental assessment report prepared with recommended conditions or refusal. Agencies and councils consulted by DPIE.

Secretary's environmental assessment report finalised with recommendations and submitted to Minister for Planning.

Determination by the Minister, including if approved, any conditions of approval.

Post approval implementation and compliance (if project approved).

Figure 3-1: The assessment and approval process for State Significant Infrastructure

3.1.3 State Environmental Planning Policies

Section 5.22 of the EP&A Act provides that environmental planning instruments do not apply to SSI projects (with some exceptions, including how they apply to the declaration of SSI). The environmental planning instruments that have been considered for consistency or are relevant to the Project are summarised in **Table 3-1**.

Table 3-1 Environmental planning instruments relevant to the Project

Environmental planning instrument	Relationship to the Project
<i>State Environmental Planning Policy (State and Regional Development) 2011</i>	This SEPP identifies development that is SSD, SSI and critical SSI. The Project is declared SSI by reason of clause 14(1) and clause 1 of Schedule 3 of this SEPP. Clause 1 of Schedule 3 is engaged through clause 79 of ISEPP and a determination that the proposed Project which is characterised as development for the purpose of " <i>railway or rail infrastructure facilities</i> ", is likely to significantly affect the environment.
<i>State Environmental Planning Policy (Infrastructure) 2007</i>	Clause 79 of the ISEPP provides that development for the purpose of a railway or rail infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land. The Project is characterised as development for the purpose of a railway or rail infrastructure facilities and would be carried out by or on behalf of TfNSW, a public authority. Accordingly, development consent under Part 4 of the EP&A Act is not required for the Project.
<i>State Environmental Planning Policy (State Significant Precincts) 2005</i>	<p>The Project is located within the Redfern-Waterloo Authority Sites listed in the State Significant Precincts SEPP. The SEPP identifies land zoning for the area and items of local heritage significance. The Project area covers the following zones within this precinct:</p> <ul style="list-style-type: none"> • Zone D – Business Zone – Mixed Use • Zone E – Business Zone – Commercial Core • Zone G: Special Purpose Zone – Infrastructure • Zone H – Recreation Zone – Public Recreation <p>Within Zones D, E and G, development may only be carried out with development consent. Within Zone H, development is prohibited unless it is car parks; environmental facilities; environmental protection works; kiosks; passenger transport facilities; recreation areas; recreation facilities (outdoor), at which time it can be carried out with consent. This provision is inconsistent with clause 79 of the ISEPP, which states that development for the purpose of "<i>railway or rail infrastructure facilities</i>", does not require consent. In the event of an inconsistency between the State Significant Precincts SEPP and the ISEPP, the State Significant Precincts SEPP prevails (clause 8(2)(b) of the ISEPP). However, clause 24A of Appendix 4 of the State Significant Precincts SEPP states that Appendix 4 does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without development consent under the ISEPP.</p> <p>The Project therefore does not require consent under the State Significant Precincts SEPP.</p>

Environmental planning instrument	Relationship to the Project
<p><i>State Environmental Planning Policy (Urban Renewal) 2010</i></p>	<p>Redfern Station is located within the Redfern-Waterloo precinct outlined within this SEPP. The SEPP applies to a development application to carry out development on land that comprises all or part of a potential precinct if the proposed development is or involves subdivision or has a capital investment value of more than \$5 million (clause 10). Development consent must not be granted unless the development is consistent with the objective of developing the potential precinct for the purposes of urban renewal. This includes ensuring the development does not restrict or prevent the following:</p> <ol style="list-style-type: none"> a. <i>development of the potential precinct for higher density housing or commercial or mixed development,</i> b. <i>the future amalgamation of sites for the purpose of any such development within the potential precinct,</i> c. <i>access to, or development of, infrastructure, other facilities and public domain areas associated with existing and future public transport in the potential precinct.</i> <p>The Project supports the future development of the precinct for urban renewal through providing improved access to public transport and public spaces within the Redfern-Waterloo precinct. This SEPP only applies to development that requires development consent and does not apply to the Project by reason of the ISEPP and the SRD SEPP.</p>

3.2 Other NSW legislation and approvals

3.2.1 Approvals or other authorisations that are not required

Section 5.23 of the EP&A Act specifies authorisations that are not required for approved SSI including:

- a permit under Sections 201, 205 or 219 of the *Fisheries Management Act 1994*
- an approval under Part 4 or an excavation permit under Section 139 of the *Heritage Act 1977*
- an Aboriginal heritage impact permit under Section 90 of the *National Parks and Wildlife Act 1974*
- a bush fire safety authority under section 100B of the *Rural Fires Act 1997*
- various approvals under the *Water Management Act 2000*, including a water use approval under Section 89, a water management work approval under Section 90 or activity approvals (other than aquifer interference approvals) under Section 91.

3.2.2 Approvals that must be applied consistently

Section 5.24 of the EP&A Act identifies approvals or authorisations that cannot be refused if they are necessary for carrying out an approved SSI, and must be substantially consistent with an approval issued under Division 5.2 of the Act, which include (as relevant to the Project):

- an environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997
- a consent under section 138 of the Roads Act 1993.

Related legislation and regulations of relevance to the Project are listed in **Table 3-2**.

Table 3-2 Legislation and regulations that are applicable

Legislation	Requirement	Relevance to the Project
<i>Biodiversity Conservation Act 2016</i>	<p>The <i>Biodiversity Conservation Act 2016</i> aims to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future.</p> <p>The <i>Biodiversity Conservation Act 2016</i> also contains listed threatened species, populations and communities which need to be considered.</p> <p>Under section 7.9 of the <i>Biodiversity Conservation Act 2016</i>, an application for SSI must be accompanied by a biodiversity development assessment report (BDAR) unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values.</p>	<p>A BDAR waiver was granted for the Project on 19 November 2019 (refer Appendix I). As such, a BDAR is not required to be prepared for the Project.</p> <p>The biodiversity impacts associated with the Project, including potential impacts on listed threatened species, populations and communities are assessed in Chapter 15 of this EIS.</p>
<i>National Parks and Wildlife Act 1974</i>	<p>The <i>National Parks and Wildlife Act 1974</i> aims to promote both the conservation of nature and the conservation of objects, places and features of cultural value within the landscape.</p> <p>The act defines both Aboriginal places and objects. Under section 86, it is prohibited to harm or desecrate an Aboriginal place or object.</p>	<p>The potential for Aboriginal places or objects to be present within the Project area and the potential for impact to any of these places or objects is assessed in Chapter 15 of this EIS.</p>
<i>Protection of the Environment Operations Act 1997</i>	<p>The <i>Protection of the Environment Operations Act 1997</i> aims to protect, restore and enhance the quality of the environment, having regard to the need to maintain ecologically sustainable development. Chapter 3 of the <i>Protection of the Environment Operations Act 1997</i> requires that an environment protection licence be obtained for works classified as 'scheduled activities' under Schedule 1.</p> <p>The Act requires that noise emitted from the operation of a project is not considered 'offensive'.</p> <p>Section 148 of the Act requires immediate notification of pollution incidents causing or threatening material harm to the environment to the relevant authority.</p>	<p>The Project does not meet any of the corresponding definitions for a 'scheduled activity' under Schedule 1, and therefore an environment protection licence is not required. Operational noise emissions from the Project area are considered in Chapter 13 of this EIS.</p> <p>The construction environmental management plan (CEMP) would include measures for managing potential pollution incidents.</p>
<i>Biosecurity Act 2015</i>	<p>The <i>Biosecurity Act 2015</i> provides a framework for the prevention, elimination and minimisation of biosecurity risks posed by a biosecurity matter.</p> <p>Under Part 3 of the <i>Biosecurity Act 2015</i>, all persons are required to minimise biosecurity risks including through the control of noxious weeds on their land.</p>	<p>The approach to managing weeds during construction is provided in Chapter 16 of this EIS.</p>

Legislation	Requirement	Relevance to the Project
<p><i>Contaminated Land Management Act 1997</i></p>	<p>The <i>Contaminated Land Management Act 1997</i> establishes the process for investigating and remediating land that the EPA considers to be contaminated significantly.</p> <p>Section 60 of the <i>Contaminated Land Management Act 1997</i> outlines the circumstances in which the NSW Environment Protection Authority (EPA) should be notified in relation to the contamination of land.</p>	<p>The EPA would be notified in writing of any contamination identified within the Project area, in accordance with the requirements of Section 60 of the Act.</p>
<p><i>Heritage Act 1977</i></p>	<p>The <i>Heritage Act 1977</i> aims to promote understanding and encourage conservation of the State's heritage. It provides for the identification, registration and protection of items of State heritage significance while encouraging their adaptive reuse.</p> <p>Section 32 of the <i>Heritage Act 1977</i> protects places, buildings, works, relics, movable objects or precincts of heritage significance by means of either Interim Heritage Orders (IHO) or by listing on the NSW State Heritage Register (SHR).</p> <p>Under section 170 of the <i>Heritage Act 1977</i>, NSW Government agencies are required to maintain a register ('section 170 register') of their heritage assets.</p> <p>Section 170A(1)(c) of the Act requires that the owner of a heritage item listed on the relevant section 170 register must provide the Heritage Council with written notice prior to demolition of any place, building or work entered in its register.</p> <p>In accordance with Section 146 of the <i>Heritage Act 1977</i>, the Heritage Council must be notified of the location of a relic, which is uncovered during construction if it is reasonable to believe that the Heritage Council is unaware of the location of the relic.</p>	<p>An assessment of heritage items potentially affected by the Project is provided in Chapter 14 of this EIS. Several items listed in RailCorp's section 170 register are found within the Project area.</p> <p>The Heritage Council will be notified by TfNSW/Sydney Trains prior to works involving demolition of components of any contributory components of the Redfern Railway Station Group.</p> <p>The Heritage Council would be notified in writing of any relic uncovered during construction, in accordance with the requirements of Section 146 of the <i>Heritage Act 1977</i>. This requirement would be included in the CEMP for the Project.</p>

Legislation	Requirement	Relevance to the Project
<i>Roads Act 1993</i>	<p>The <i>Roads Act 1993</i> sets out the rights of persons on or adjacent to public roads. It establishes procedures for the opening and closing of public roads, regulates the carrying out of activities on public roads, provides for the classification of roads and confers certain functions to the relevant roads authorities.</p> <p>Section 138 requires approval from the relevant roads authority to impact, or carry out work on or over, a public road.</p> <p>Clause 5(1) of Schedule 2 to the <i>Roads Act 1993</i> exempts public authorities from this requirement, in respect of unclassified roads.</p>	<p>The Project would impact on local roads including Little Eveleigh Street, Marian Street, Rosehill Street, Cornwallis Street, Ivy Street and Lawson Street. Gibbons Street is a State Road managed by TfNSW (former Roads and Maritime Services). As TfNSW is a public authority, approval under Section 138 from the relevant roads authority (City of Sydney Council) is not required, however ongoing consultation would occur.</p> <p>Relevant Road Occupancy Licences (ROLs) or local Council equivalent would be obtained however for any road closures required.</p>
<i>Water Management Act 2000</i>	<p>The <i>Water Management Act 2000</i> aims to provide sustainable and integrated management of the water sources of the State for the benefit of both present and future generations.</p> <p>Temporary dewatering and construction activities that interfere with aquifers are generally identified as aquifer interference activities in accordance with the <i>Water Management Act 2000</i> and the <i>NSW Aquifer Interference Policy</i> (NSW Office of Water, 2012). However, the aquifer interference approval provisions of the <i>Water Management Act 2000</i> have not commenced, and licensing of these activities is carried out under Part 5 of the <i>Water Act 1912</i>. A licence under Part 5 is required for dewatering activity that would require the extraction of more than three megalitres of groundwater per year.</p> <p>No other approvals under this Act would be required, as outlined in Section 3.2.1.</p>	<p>Excavation (including piling) would be undertaken to construct the Project. Although groundwater may be intercepted, it is anticipated that any dewatering required would be below three megalitres and therefore would not require a water licence.</p>
<i>Waste Avoidance and Resource Recovery Act 2001</i>	<p><i>The Waste Avoidance and Resource Recovery Act 2001</i>, encourages the most efficient use of resources in order to reduce environmental harm.</p>	<p>Waste resulting from the Project would be managed in accordance with the requirements of this Act. Further details of waste management are provided in Chapter 21 of this EIS.</p>

3.3 Local government planning instruments

Redfern Station is located in the suburbs of Redfern and Eveleigh within the City of Sydney LGA to which the *Sydney Local Environmental Plan 2012* (Sydney LEP 2012) applies. However, as outlined in **Table 3-1**, the Project is located within the Redfern-Waterloo Authority Sites (State Significant Precincts SEPP) which identifies the land use zoning for the Project area.

Under Section 5.22 of the EP&A Act, environmental planning instruments (including LEPs) do not apply to SSI. However, the City of Sydney would be consulted about the wider aims of the LEP including to support the City of Sydney, recognising the area around Redfern Station as an important location for business, educational and cultural activities and tourism.

3.4 Commonwealth legislation

3.4.1 Environment Protection and Biodiversity Conservation Act 1999

Under Part 3 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), approval from the Australian Minister for the Environment would be required for an action that:

- has, will have, or is likely to have a significant impact on a matter of national environmental significance
- is undertaken on Commonwealth land and has, will have, or is likely to have a significant impact on the environment
- is undertaken outside Commonwealth land and has, will have or is likely to have a significant impact on the environment of Commonwealth land
- is undertaken by the Commonwealth and has, will have or is likely to have a significant impact on the environment.

Matters of national environmental significance comprise:

- World Heritage properties
- National Heritage places
- Wetlands of International Importance
- Commonwealth-listed threatened species and ecological communities
- Commonwealth-listed migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

The biodiversity assessment undertaken for the EIS (refer **Chapter 14**) included a search of the EPBC Act Protected Matters Search Tool, which found that five listed threatened ecological communities, 10 threatened flora species, 20 threatened fauna species and 18 migratory species listed under the EPBC Act have the potential to occur within one kilometre of the Project area.

The biodiversity assessment concluded that while there were records of several EPBC Act listed species in the vicinity of the Project area, there is a general lack of suitable habitat for native fauna within the Project area owing to the highly urbanised nature of the environment. A site inspection also confirmed that no threatened flora or vegetation was present.

As the Project would not significantly impact biodiversity matters listed under the EPBC Act or any other matters of national environmental significance as confirmed by the EPBC Act Protected Matters Search Tool, an application for approval under the EPBC Act is not required.

3.4.2 Disability Discrimination Act 1992

The *Disability Discrimination Act 1992* aims to eliminate as far as possible discrimination against persons on the ground of disability in areas including access to premises and the provision of facilities, services and land. The Project has been, and would continue to be, designed to be independently accessible and comply with the objectives and requirements of the Act.

3.4.3 Disability Standards for Accessible Public Transport 2002

Section 33.1 of the *DSAPT 2002* requires all new public transport premises, infrastructure, and conveyances (i.e. transfers of property title) to comply with the requirements of the standards, unless unjustifiable hardship is incurred by implementation. The Project would continue to be designed to comply with these standards.

4 Project development and alternatives

A number of options were investigated in order to identify a preferred Project. This chapter provides an overview of the options considered, including options identified by the community, and the justification for the preferred Project.

4.1 Planning for Redfern Station

Redfern Station has been subject to several accessibility and user experience upgrades in recent years. Recent projects undertaken at Redfern Station include:

- Redfern Station Lift Project (2014)
 - involved various works as part of the TAP, including improved accessibility at Lawson Street (station entrance and new access ramps to Redfern station concourse level), a new lift connecting Redfern Station concourse to Platforms 6 and 7, extension of Platforms 6 and 7, and reconfiguration of the pedestrian crossing and footpath at Lawson Street station entrance.
- Redfern Station improvement works (2018)
 - involved a new station entrance on the corner of Gibbons Street and Lawson Street and a bike storage facility, replacing the old Gibbons Street entrance
 - provided improved customer movement through Redfern Station and better interchange with Platforms 11 and 12
 - increased capacity to handle ongoing growth of patronage.
- Platform 6 and 7 reconstruction (ongoing)
 - involves the reconstruction of the Platforms 6 and 7 retaining face to meet Sydney Trains safety requirements and standards, and to mitigate hazards associated with the platform surface and structure.

Ongoing accessibility and capacity constraints, together with future demand requirements, remain key justifications for proceeding with a new upgrade to Redfern Station. The development of the Project and alternatives considered are outlined further below.

4.2 Project planning and design process

Development of the preferred option for the Project has been a result of the ongoing planning and design process, including consultation with customers, the community and key stakeholders. The Project alternatives discussed in **Section 4.3** below build on previously considered concept designs, refined to consider both revised constructability and environmental constraints. Four of the designs were shortlisted through a multi criteria analysis (MCA) and then presented to the community for consultation, to inform the ongoing design development. Two community proposed designed options were also considered.

4.2.1 Principles in project development

Preliminary design principles have been developed to guide the design of the Project, so that appropriate design quality is achieved for internal spaces and the public domain. The design principles include:

- functionality, accessibility and circulation – ensure that access between platforms and surrounding destinations is safe, quick, efficient and available to all members of the community, including those with accessibility issues such as people with a disability, limited mobility and parents/carers with prams
- customer information and wayfinding – ensure that movement around Redfern Station is made easy with clear signage, and that information about train services are readily available
- safety – ensure the safety of all customers and staff

- customer comfort and amenity – reduce overcrowding and provide for customer amenities
- urban design – an outcome that not only fulfils transport customer needs, but benefits the local area and its community by improving precinct connectivity and amenity
- heritage – sensitive integration with and response to the heritage values of the station and surrounding precinct
- social and community values – consideration of the associations of the local Aboriginal community with the place and involvement of the community in the design process and outcome
- constructability – safe delivery of the Project in a live operating rail environment while minimising disruptions
- community feedback – on-going evolution of the Project in response to community feedback
- environment and sustainability – consideration of the principles of ecologically sustainable development outlined in Section 7 of the EP&A Regulation (refer **Chapter 24** of this EIS for further information). The Project also aims to meet certain requirements outlined by the Infrastructure Sustainability Council of Australia (ISCA), with the aim of receiving an ‘excellent’ ISCA rating. This has been considered throughout the design and the preparation of this EIS. Sustainability is considered further in **Chapter 20** of this EIS.

4.2.2 Integration with other development

The Project has been designed to integrate with other approved and planned projects within the vicinity of Redfern Station. The Project would serve to improve connectivity to these precincts and provide an efficient transport solution for workers and visitors to these employment centres. The strategic context of the Project in relation to government plans guiding development in surrounding precincts is described in **Chapter 2** of this EIS. Developments in the vicinity of the Project include (refer to **Figure 1-1**):

- South Eveleigh (formerly known as Australian Technology Park) (DPIE application reference number SSD 7317)
 - a business and technology hub
 - approval was obtained in 2016 for the construction of three large buildings comprising of parking, retail, commercial, childcare, gym and community office uses along with extensive landscaping and public domain improvements throughout the precinct and extension and augmentation of physical infrastructure/utilities as required
 - works are currently continuing with Modification 18 to SSD 7317
 - when complete, this development will result in an additional 10,000 workers within the South Eveleigh precinct.
- Carriageworks
 - currently the largest multi-arts centre in Australia following redevelopment in 2007, which houses numerous cultural and arts institutions and companies. It is expected that the patronage to Carriageworks would increase given the number of events and programs hosted at this location
 - regularly hosts large events bringing in visitors from across Sydney and internationally
- Sydney Metro City and Southwest: Waterloo Over Station Development (DPIE application reference number SSI 15 7400)
 - a new metro underground station, located in Waterloo between Botany Road and Cope Street, Raglan Street and Wellington Street with an integrated mixed use development above (Waterloo Metro Quarter) that is subject to a Critical State Significant Infrastructure planning process
 - approval for Sydney Metro was obtained in January 2017 and construction is currently underway

- the new Sydney Metro Waterloo Station is expected to open to the public in 2024
- University of Sydney - Campus Improvement Program
 - involves a 68 per cent increase to its Camperdown-Darlington campus floor space by the end of 2020, and is expected to accommodate a 21 per cent increase in students on the campus as well as 4,000 units of student accommodation
- Royal Prince Alfred Hospital
 - includes a proposed increase in patient and research facilities.
- City of Sydney active transport improvements
 - Lawson Street separated cycleway and footpath improvements
 - Burren Street/Wilson Street separated cycleway and footpath improvements
- various other residential and commercial developments:
 - 1 Lawson Square mixed use redevelopment
 - 60-78 Regent Street redevelopment
 - 80-88 Regent Street redevelopment
 - 90-102 Regent Street, Redfern
 - 11 Gibbons Street, Redfern development
 - The Regent Hotel, 56-58 Regent Street, Redfern
 - Pemulwuy Student Accommodation Project
 - North Eveleigh Precinct.

4.3 Project options considered

4.3.1 Do nothing

A 'do nothing' option was considered where platforms at Redfern Station would continue to be accessed by the existing stairways. This option would not cater for the forecasted customer growth predicted for Redfern Station or address the current accessibility issue. This option was therefore discounted as it does not fulfil the other Project objectives outlined in **Section 1.4**.

4.3.2 Original design options

Throughout the design development phase, various options were developed with consideration to the following design characteristics:

- cross corridor connection or connection to eastern side of the Station only, in order to:
 - cater for the short-term patronage increase arising from the South Eveleigh precinct, and provide access to Redfern Station from the eastern side via Marian Street, or
 - cater for precinct growth and extend the concourse from Marian Street to Little Eveleigh Street or Wilson Street.
- various concourse widths:
 - a four-metre-wide concourse that would cater for the year 2036 patronage demand, and would be replaced as part of future development at Redfern Station and North Eveleigh, or
 - a six-metre-wide concourse that would cater for patronage demand up to 2036, have a higher aesthetic quality and would not preclude future development opportunities at Redfern Station and North Eveleigh.
- various concourse entrances/exits:
 - an entrance at Little Eveleigh Street to the north west

- an entrance at Wilson Street to the north west
- an entrance at Marian Street to the south east
- an entrance at Cornwallis Street to the south east.

Engagement with the community and stakeholders has been ongoing for a number of years regarding potential opportunities for cross-corridor access and improvements in and around Redfern Station. The Redfern Station Upgrade – New Southern Concourse was announced in February 2019. In May and June 2019, consultation began with the local community and stakeholders. Transport customers, key stakeholder groups and community members were initially asked to provide feedback on an early concept, that connects Marian Street with Little Eveleigh Street.

In July and August 2019, the community was presented with four different options, including the original concept. The original concept was referred to as Option 1 in this consultation phase. Options 2 and 3 connected Marian Street with Wilson Street via a ground level pathway and aerial walkway respectively, and Option 4 connected Cornwallis Street with Marian Street via either a ground level, or aerial walkway. These options are further described in **Table 4-1**.

Heritage considerations were also key in the development and assessment of options, including opportunities and constraints associated with existing heritage elements. TfNSW engaged heritage experts to work closely with the design team during the design process, to prepare advice and provide input into the options analysis.

Overall 12 options were developed for consideration (including the two options developed by community groups). These options are described in **Table 4-1**. Figures are provided for the shortlisted options (refer to **Section 4.3.5**) and the local community group designs (refer to **Section 4.3.3**).

Table 4-1 Options considered

Option	Description
Option 1 (refer to Figure 4-1)	<ul style="list-style-type: none"> • six metre wide long concourse between Marian Street and Little Eveleigh Street and upgrade of Little Eveleigh Street* • new entrance at Little Eveleigh Street • new entrance at Marian Street via stairs and lift • inclusion of a Family Accessible Toilet and toilet cubicles at Little Eveleigh Street • lifts to all platforms at the new southern concourse.
Option 2 (refer to Figure 4-2)	<ul style="list-style-type: none"> • six metre wide long concourse between Marian Street and Platform 1 • new entrance at Wilson Street including stairs and accessible connecting pathway to Platform 1 • new entrance at Marian Street via stairs and lift • lifts to all platforms at the new southern concourse.
Option 3 (refer to Figure 4-3)	<ul style="list-style-type: none"> • six metre wide long concourse* between Marian Street and Platform 1 with a three metre aerial walkway to Wilson Street which runs parallel to the Railcorp boundary adjoining residential properties • new entrance at Wilson Street via an elevated walkway adjacent to residential properties • new entrance at Marian Street via stairs and lift • lifts to all platforms at the new southern concourse.
Option 4 (refer to Figure 4-4)	<ul style="list-style-type: none"> • six metre wide long concourse* between Cornwallis Street and Platform 1 with a three metre aerial walkway to Wilson Street • secondary bridge linking Platform 8-9 and Platform 10 • new entrance at Wilson Street via an elevated walkway adjacent to residential properties • new entrance at South Eveleigh via Cornwallis Street stairs • lifts to Platforms 1, 2-3, 4-5, 6-7 at the new southern concourse • lifts to Platforms 8-9 and 10 at the secondary pedestrian bridge.

Option	Description
Option 5 (refer to Figure 4-5) (Community group design)	<ul style="list-style-type: none"> community group design three way concourse between North and South Eveleigh via two entrances on the station's south-eastern side each adjoining Marian Street and Cornwallis Street connecting to Wilson Street via a ground level pathway to the north-west.
Option 6 (refer to Figure 4-6) (Community group design - also known as 'H design')	<ul style="list-style-type: none"> community group design concourse connecting to Platforms 1 to 10 (similar to Option 1 concourse) an ungated cross corridor footbridge positioned further south, placing the station entrances in South Eveleigh and connecting directly straight across to Wilson Street a linking unpaid concourse would then extend off the footbridge along the rail corridor connecting to the gated concourse.
Option 7	<ul style="list-style-type: none"> four metre wide short concourse** between Marian Street and Platform 2-3 one new entrance with a four metre wide stairway at Marian Street lifts to Platforms 2-3, 4-5 and 6-7 at the new southern concourse lift to Platform 8-9 at the existing northern concourse no lift access to Platforms 1 or 10.
Option 8	<ul style="list-style-type: none"> four metre wide short concourse** between Marian Street and Platform 2-3 one new entrance with a four metre wide stairway at Marian Street one new entrance adjacent the existing northern concourse at the corner of Lawson Street and Little Eveleigh Street lifts to Platforms 2-3, 4-5, 6-7 and 10 at the new southern concourse lifts to Platforms 1 and 8-9 at the existing northern concourse.
Option 9	<ul style="list-style-type: none"> four metre wide long concourse** between Marian Street and Platform 1 new entrance at Wilson Street including stairs and accessible path to Platform 1 new entrance at Marian Street via stairs and lift lifts to Platforms 1, 2-3, 4-5, 6-7, and 10 at the new southern concourse lift to Platform 8-9 at the existing northern concourse.
Option 10	<ul style="list-style-type: none"> six metre wide short concourse between Marian Street and Platforms 2-3 one new entrance with a four metre wide stairway at Marian Street customer facilities at the entrance one new entrance adjacent the existing northern concourse at the corner of Lawson Street and Little Eveleigh Street lifts to Platforms 2-3, 4-5, 6-7, 8-9, and 10 at the new southern concourse lift to Platform 1 at the existing northern concourse.
Option 11	<ul style="list-style-type: none"> modification to a version of Option 2 with a straightened bridge alignment on the Platform 1 end six metre wide long concourse between Marian Street and Platform 1 new entrance at Wilson Street including stairs and accessible path to Platform 1 new entrance at Marian Street via stairs and lift lifts to all platforms at the new southern concourse.
Option 12	<ul style="list-style-type: none"> six metre wide long concourse* between Cornwallis Street (South Eveleigh) and Little Eveleigh Street secondary pedestrian bridge linking Platform 8-9 and Platform 10 new entrance at Little Eveleigh Street new entrance at South Eveleigh via stairs lifts to Platforms 1, 2-3, 4-5, 6-7 at the new southern concourse lifts to Platforms 8-9 and 10 at the secondary pedestrian bridge.

Notes:

* provides for full access between the eastern and western sides of the rail corridor.

** provides for station platform access/egress from the eastern side of the rail corridor via Marian Street only.

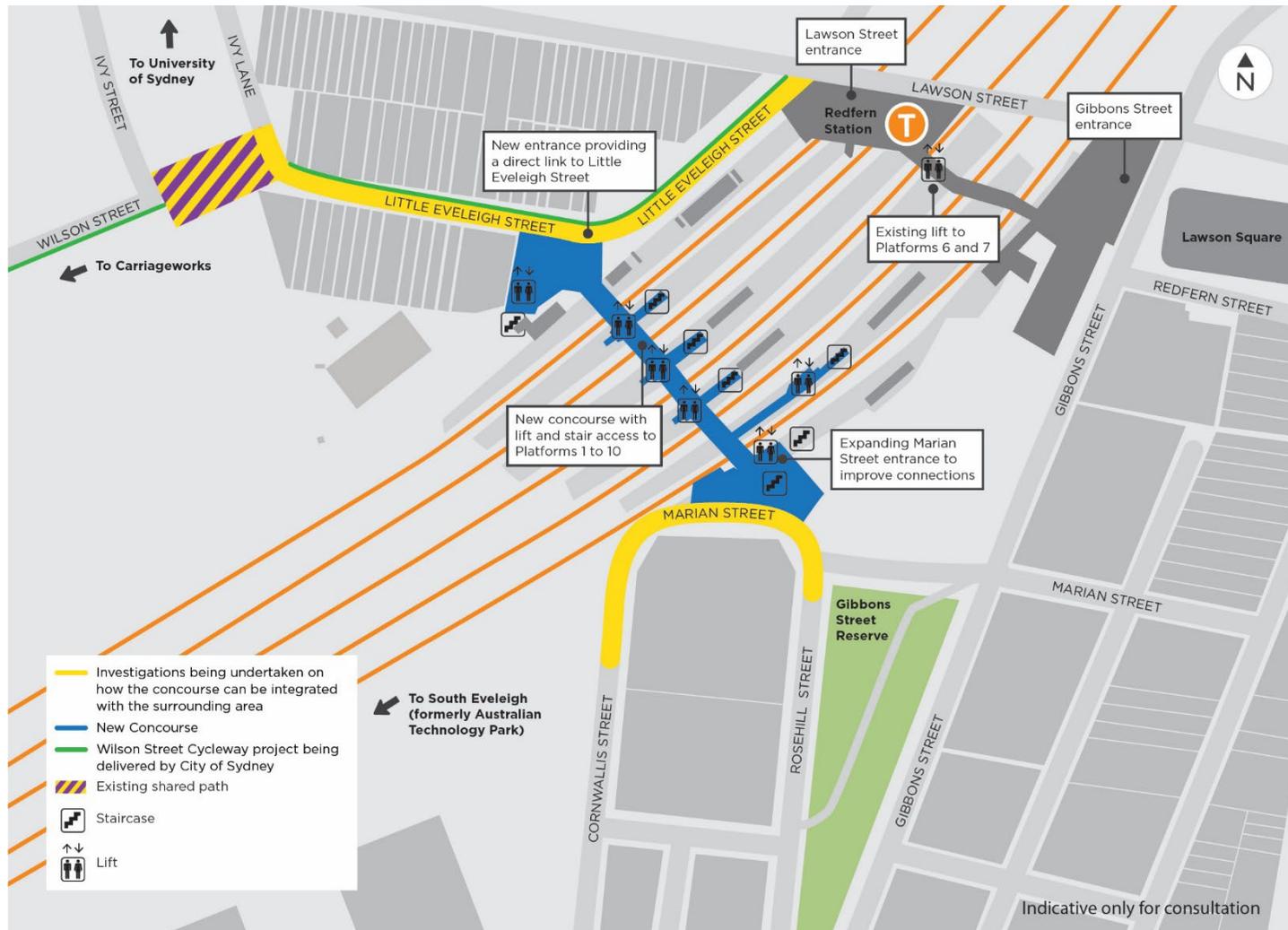


Figure 4-1 Option 1

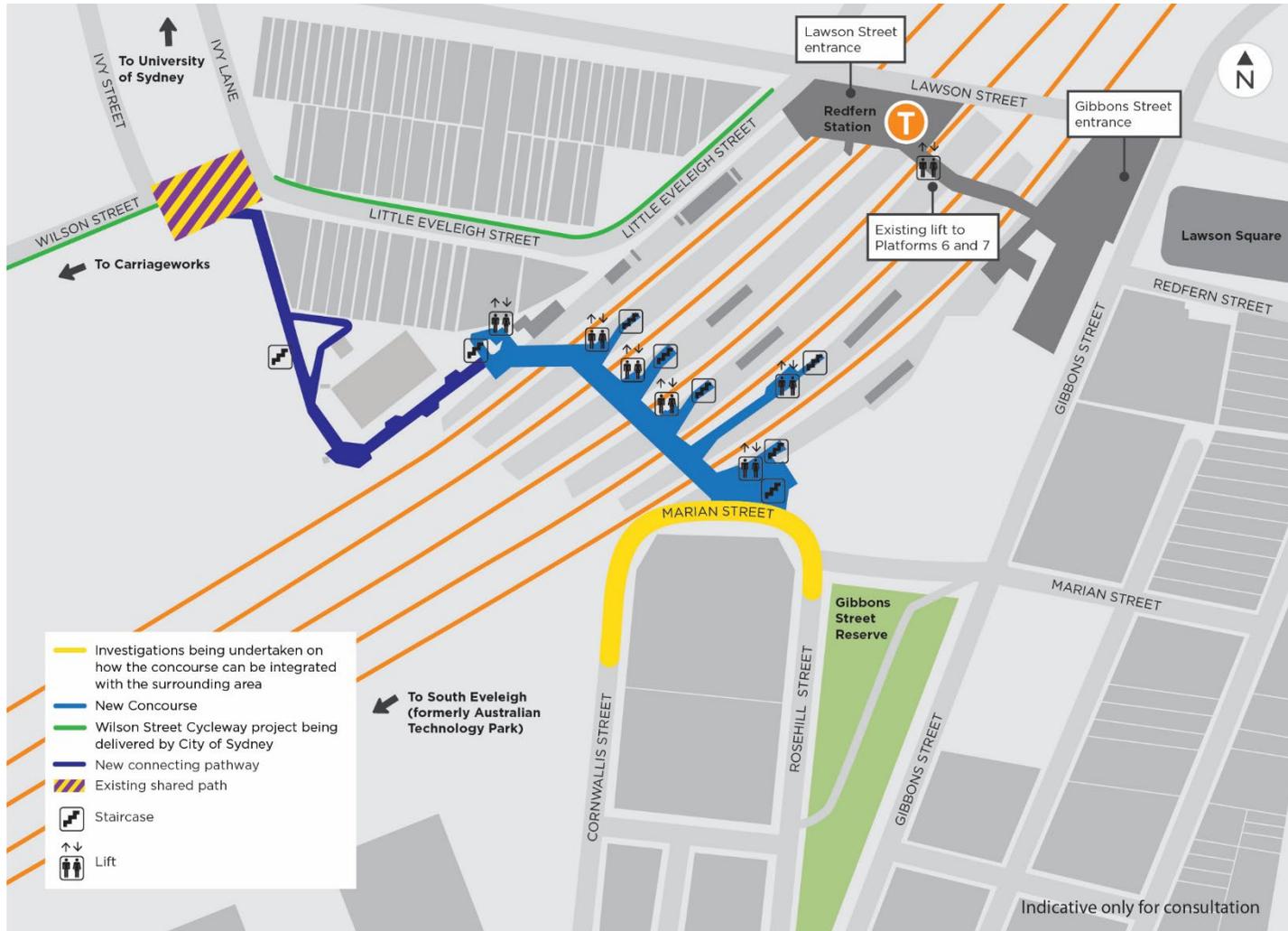


Figure 4-2 Option 2

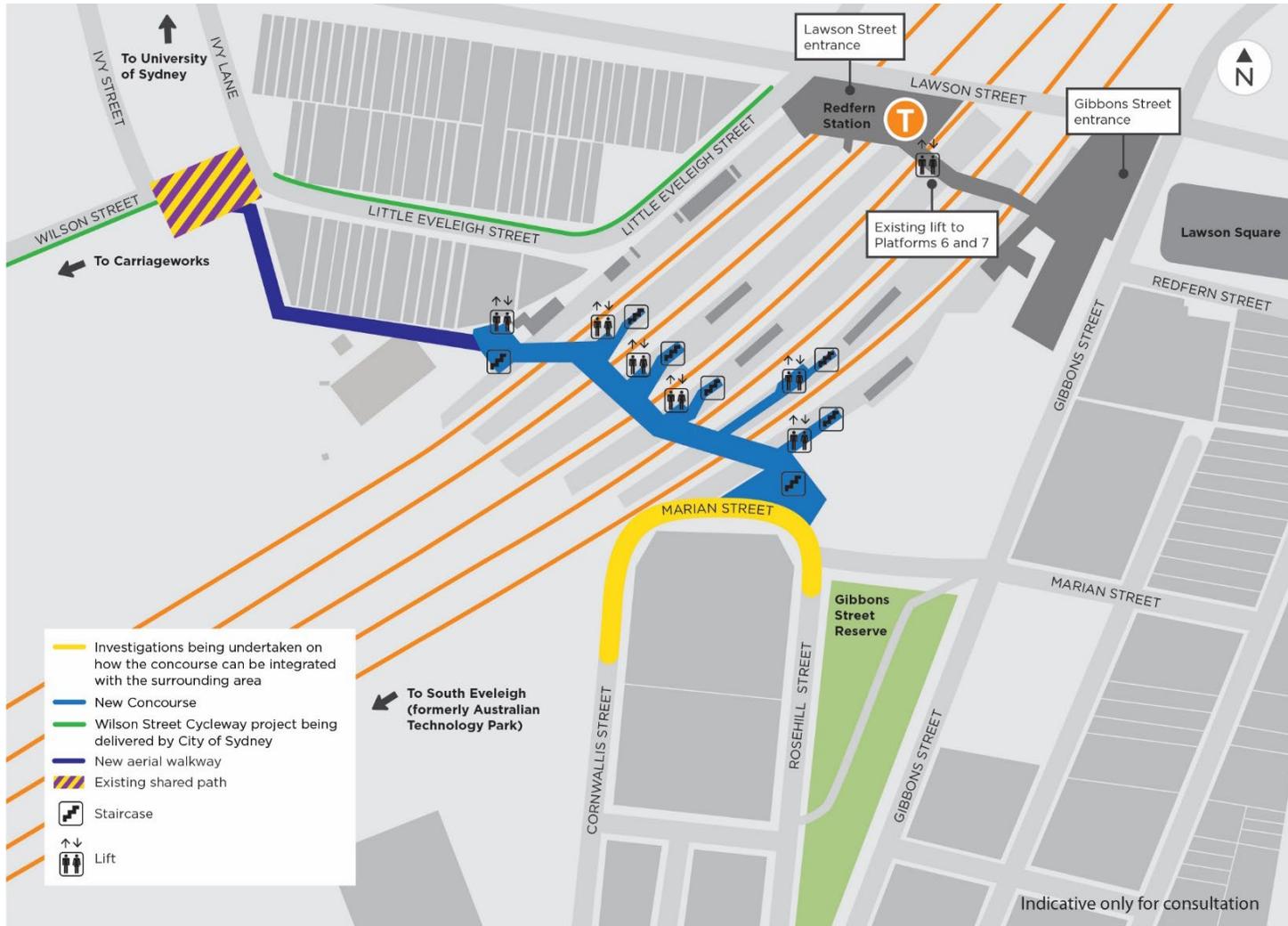


Figure 4-3 Option 3

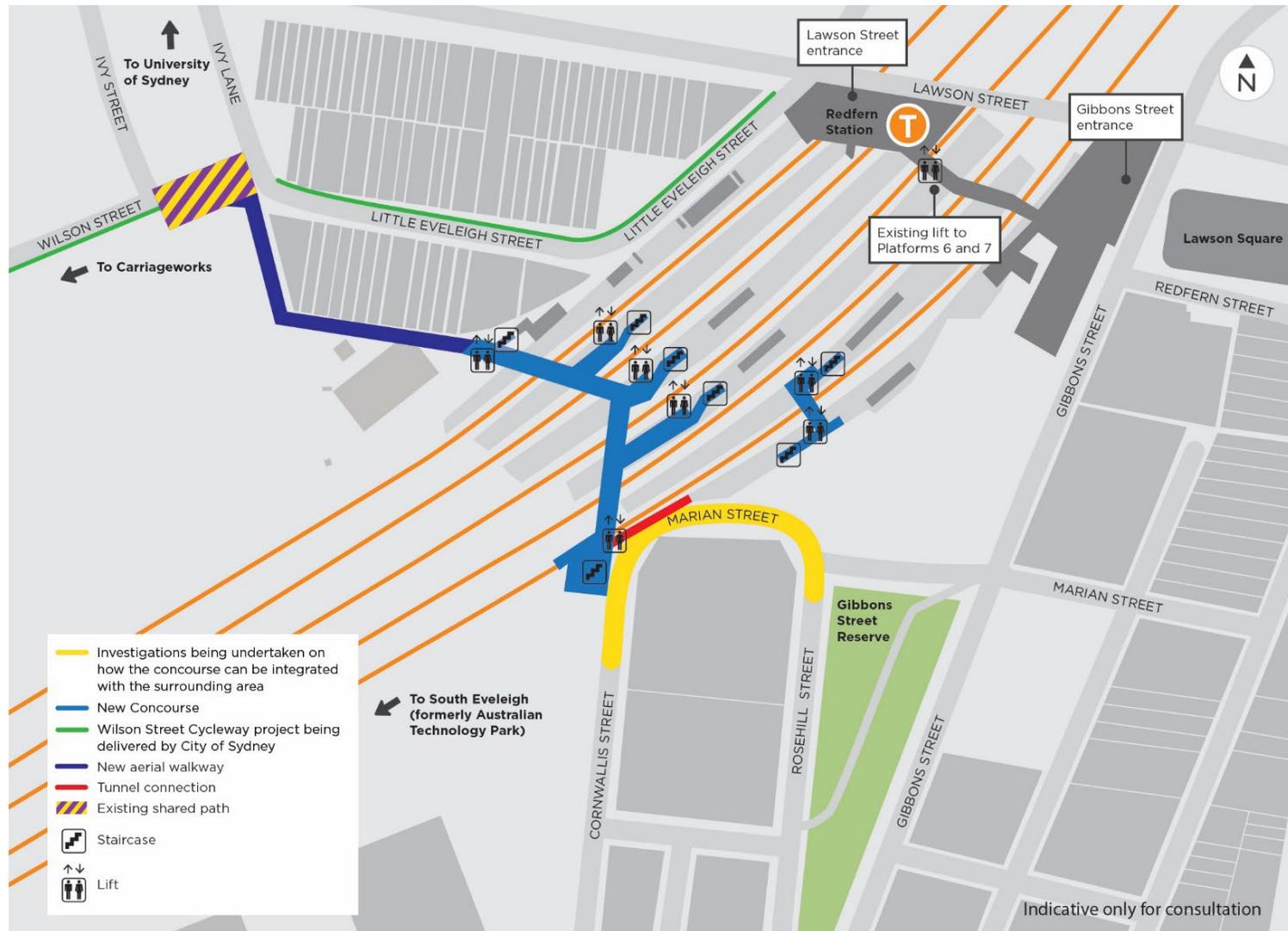


Figure 4-4 Option 4

4.3.3 Community group options

Two alternative designs were also submitted by a local community group and were considered by TfNSW alongside the other four options. These designs were referred to as 'Option 5' (refer **Figure 4-5**) and Option 6 (also called 'H-design') (refer **Figure 4-6**). Both designs include an entrance on Cornwallis Street closer to South Eveleigh and on Wilson Street, as well as a concourse with separated paid and unpaid pathways. Whilst these two designs would provide cross-corridor connections, they were not progressed due to the following issues and challenges:

Option 5

- visual impacts to residents of the nearby 'Watertower' building due to the concourse shape wrapping the corner-line of the building, effectively creating a wall to the rail corridor
- the bulk of the larger concourse and bridge structure would create a comparatively greater visual impact
- challenges to constructability, such as limited space available to place the larger cranes that would be required to lift the extended concourse spans
- a cycleway ramp structure is illustrated in some of the plans provided between the concourse and the pathway connection to Wilson Street. To achieve compliant gradients, a significant ramp structure would be required, and would reach around 90 metres in length and approximately 4.5 metres in height. To complete a cycle route along the concourse, a second ramp would also be required on the concourse's other side. This cycleway configuration would be complex, and the changing gradients and additional ramps would also be unsuitable for those with accessibility needs
- more complex wayfinding with increased number of decision points and areas of pedestrian-cyclist cross-flow on the concourse could lead to congestion or collisions.

Option 6/H-design

- significantly increased customer journey distance from street to platforms, which could impact ease of access for customers with limited mobility or other accessibility requirements
- increased construction time and complexity, including the need to realign tracks and relocate elements of the existing rail infrastructure
- challenges to constructability such as limited space available to place the larger cranes that would be required to lift the extended concourse spans
- the bulk of the larger concourse would create a significantly greater visual impact to station heritage
- increased distance to bus connections on Gibbons Street
- increased distance for connection to Platforms 11 and 12.

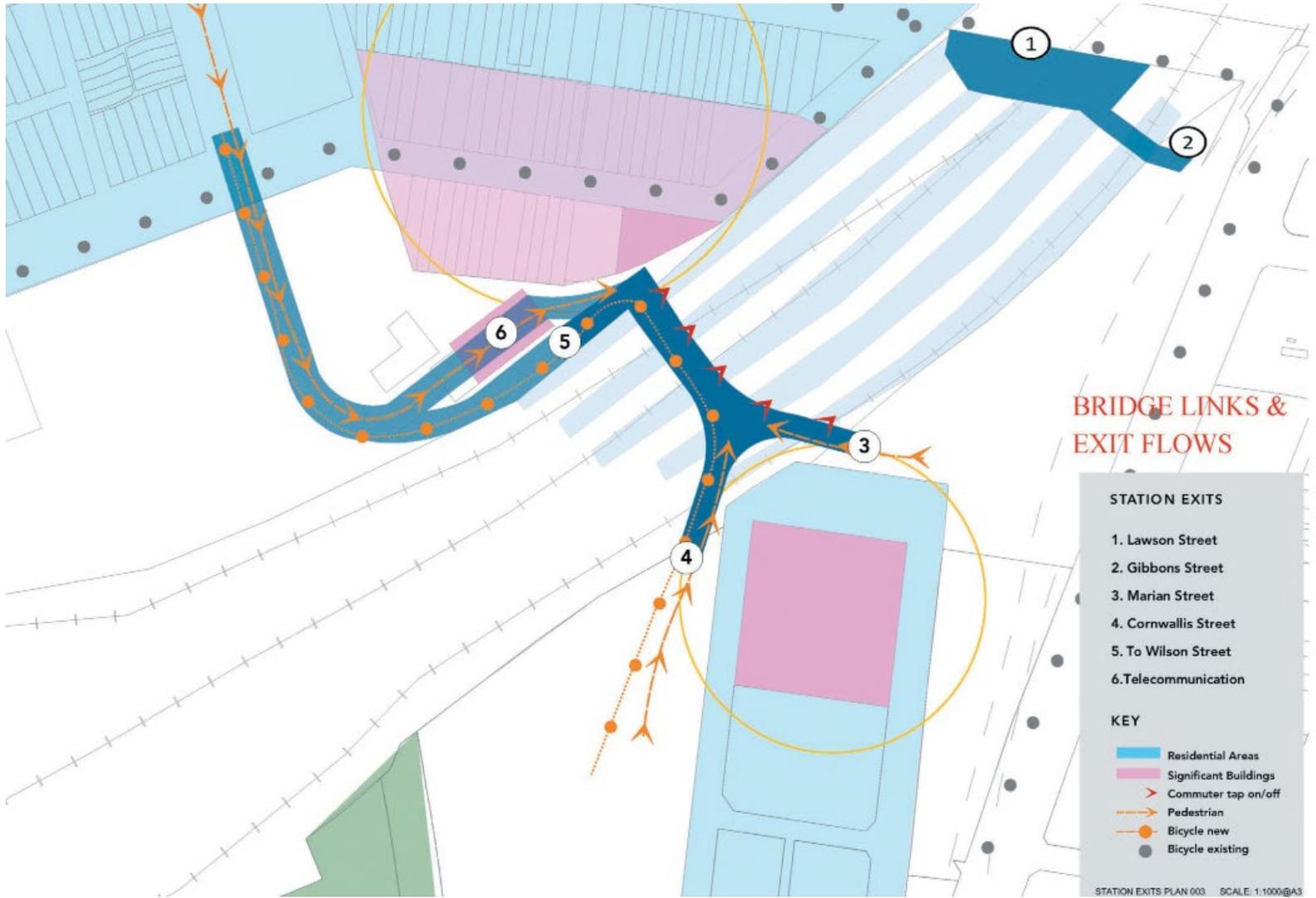


Figure 4-5 'Option 5' received as feedback during community consultation for the Project

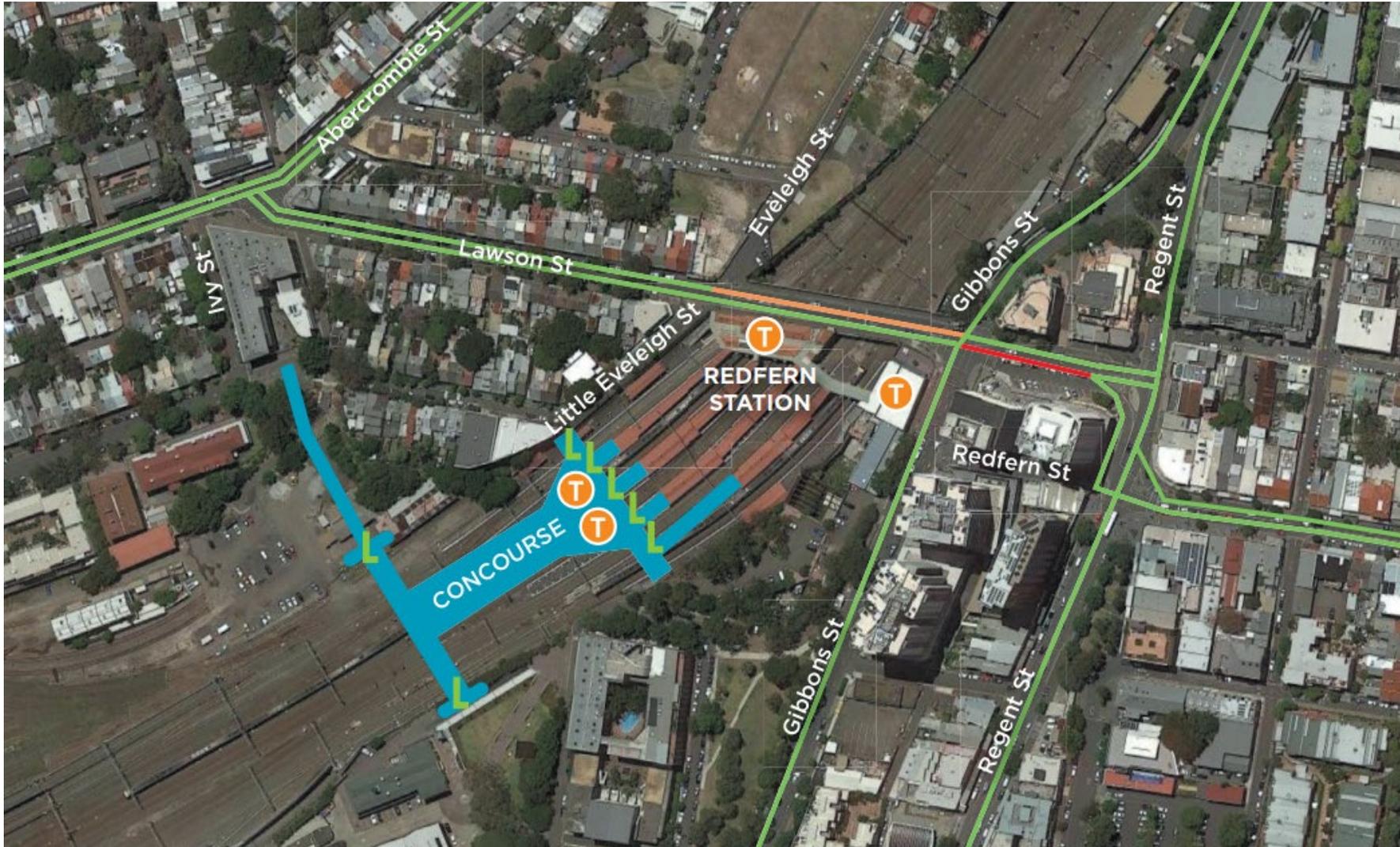


Figure 4-6 Option 6/'H-design' received as feedback during community consultation for the Project

4.3.4 Other options considered

The following suggestions put forward by Heritage NSW, Department of Premier and Cabinet were also considered:

- widening the northern concourse
- underground concourse (tunnelling beneath station)
- reinstatement of a footbridge at the same location as the former footbridge (1914-1996).

Whilst these three designs would alleviate some of the constraints at the current Redfern Station, they were not progressed due to the following issues and challenges:

- widening the northern concourse
 - involves the widening of the existing northern concourse
 - this option was not preferred as there is not enough space to expand the concourse taking into consideration:
 - projected growth in future patronage
 - lack of available floorspace to widen the existing stairs to improve platform clearance times.
- underground concourse (tunnelling beneath station)
 - involves the tunnelling of an underground concourse
 - this option would not include new elements above ground. This option was not proceeded with due to technically challenging and cost-prohibitive reasons including:
 - potential conflicts with the existing Engine Dive track running beneath the platforms and rail corridor
 - tunnel depth would trigger the requirement for escalators to access platforms.
- reinstatement of a footbridge at the same location as the former footbridge (1914-1996)
 - the former footbridge was located on the southern end of the platforms. This option would involve the construction of a 6 metre wide footbridge between Wilson Street and Cornwallis Street
 - this option was not considered viable as in this location the platforms are at their narrowest width and hence would not comply with current rail safety standards.

4.3.5 Shortlisting of options

Multi criteria analysis

The options as described in **Table 4-1** were evaluated using a MCA process (except for the community options), which assisted in the identification of the preferred option. The process involved scoring each option against a set of weighted criteria in a MCA workshop. The criteria are outlined in **Table 4-2**.

Table 4-2 Multi-criteria analysis weighting summary

Criteria	Description	Weighting
Infrastructure	Accommodates supporting infrastructure (including station systems) and removes redundant and/or end of life assets.	10.0%
Facility Operations and Maintenance	Maximises opportunity for safe and efficient operation and maintenance (including cleaning).	15.0%
Deliverability	Innovation in construction, continuity of service, minimised impact on local community and deliverable in program timeframe.	15.0%

Criteria	Description	Weighting
Customer Experience	Ease of accessing the station and customer facilities, personal safety and security, convenience and comfort.	20.0%
Transport Integration	Connectivity to the transport interchange.	10.0%
Urban Design and Precinct Planning	Integrates into surroundings and does not preclude future development at the station.	10.0%
Environment, Sustainability and Heritage	Complies with environmental legislation, protects and enhances heritage items and significant trees, and supports opportunities for sustainability initiatives.	20.0%

The outcomes of the MCA showed that Options 1, 2, 3, 4 and 11 were preferred. Option 11 is a modification of Option 2 and wasn't considered as it did not provide improvements to the Option 2 design. Options 1, 2, 3 and 4 are shown in **Figure 4-1** to **Figure 4-4**. These options were considered to be feasible and would meet the following criteria:

- improve Redfern Station accessibility (in accordance with *Disability Standards for Accessible Public Transport 2002*)
- improve pedestrian flow and reduce congestion to 2036 and beyond 2036
- enhance pedestrian connectivity to key local destinations
- protect and promote heritage and local culture.

Generally, designs that connected Platforms 1 to 10 in the southern portion of the station to Marian Street only were not progressed, as it was considered that they would not provide adequate access to locations north and west of the station, including areas where future precinct growth would likely occur. Design options with a narrower (four metre) concourse were also not progressed, as it was considered that they would not cater for levels of patronage demand expected by 2036.

4.3.6 Community consultation

As discussed in **Section 4.3.2** of this EIS, consultation began with the local community and stakeholders in May and June 2019. Transport customers, key stakeholder groups and community members were asked to provide feedback on an early concept, that connects Marian Street with Little Eveleigh Street. Options 1, 2, 3 and 4 were then presented to the community and key stakeholders in July and August 2019. More than 400 responses were received from a range of stakeholders, including station customers and community members, community groups, residents and landowners, local organisations and City of Sydney Council. The responses helped the Project team understand what was important to the community as well as their views on the four different design options presented. Community consultation undertaken for the Project is described further in **Chapter 6** of this EIS.

Overall Option 1 garnered the most positive feedback and is the preferred option. It provides the easiest, most accessible and connective journey, while also providing good sightlines throughout the concourse and entrances in comparatively activated areas. When discussing Option 1, a number of local respondents acknowledged the value of Little Eveleigh Street's character to the local area, with around 10% of responses indicating a preference to retain the building at 125-127 Little Eveleigh Street.

One challenge that respondents perceived for Option 1 was the narrowness of Little Eveleigh Street and whether the street could cater for additional pedestrians alongside cars and cyclists. Resident amenity was also identified as a challenge to be considered for this option, particularly regarding noise, privacy and parking. These potential issues are addressed **Chapter 8**, **Chapter 9**, and **Chapter 14** of this EIS.

The outcomes of consultation undertaken was included in a Consultation Report that has influenced the design and development of the Project. Further details of the community consultation undertaken for the Project are described in **Chapter 6** of this EIS.

4.4 Justification for the preferred option

Option 1 was selected as the preferred option for the Project for the following reasons:

- it was the preferred option selected by customers during the consultation periods in May and June 2019 and in July and August 2019 (refer **Section 4.3.2** and **4.3.6** of this EIS)
- it has the shortest and most direct journey from station platforms to nearby streets
- the straight walkway design with clear wayfinding makes it easy for customers to navigate and is preferred by customers with accessibility needs
- customers perceived that this option provides comparatively better personal safety
- the design can be future-proofed to integrate with potential developments in the future
- it provides separation of lifts, stairs and ticket gates on the concourse which reduces congestion and improves safety.

The preferred option has been further developed into the Project the subject of this EIS (refer **Chapter 5** of this EIS for the Project description).

4.4.1 Heritage considerations

Consistent with the design principles identified in **Section 4.2.1**, the heritage and the heritage significance of the Project area were a key consideration when selecting the preferred option for the Project. From a heritage perspective, Option 1 was identified as the preferred option for the following reasons:

- advantages:
 - separation of stair and lift locations would reduce the bulk of built form
 - straight and symmetrical concourse alignment would reduce the visual impact of the new structure in a heritage precinct
 - there would be opportunities for adaptive re-use of 125-127 Little Eveleigh Street and the ability to retain characteristics that contribute to the Darlington Heritage Conservation Area.
- disadvantages:
 - impact on a Platform 1 building and 125-127 Little Eveleigh Street which is a contributory item in Darlington Heritage Conservation Area
 - visual impacts on heritage listed items (i.e. a new footbridge would have a visual impact on the presentation of the heritage listed Redfern Railway Station Group, and views to the heritage listed Eveleigh Railway Workshops from the station would also be impacted)
 - new stairs would be near existing platform buildings
 - relocation of overhead wiring structures would require the demolition of privacy screens to platform buildings
 - stairs to Platform 8/9 would increase the bulk and complexity of the concourse structure and would be near to the platform building.

Option 1 was considered in a number of heritage workshops, with key heritage considerations including:

- the form and materiality of the design
- the specific impacts to the Platform 1 building and 125-127 Little Eveleigh Street.

This is discussed further in **Chapter 10** of this EIS.

5 Project description

Chapter 5 describes the Project and summarises key design parameters and construction methodology. The SEARs (Item 2, SEAR 1(b)) relating to the description of the Project, including key components and activities required to construct and operate the Project is provided in this chapter. The description of the Project is based on the concept design and understanding of current construction approach and is subject to further detailing which would incorporate construction innovations, stakeholder input and improvements to enhance social and economic benefits.

5.1 Overview and key components

The Project involves the upgrade of Redfern Station through the construction of a new concourse at the southern end of the station platforms, providing both lift and stair access to Platforms 1 to 10. The new concourse would extend between Marian Street and Little Eveleigh Street and include associated interchange upgrades of Little Eveleigh Street, Marian Street, and parts of Cornwallis Street and Rosehill Street.

The Project forms part of the TAP. The TAP has the objective of providing a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure.

All Project components described are subject to further design. Changes may be made during the ongoing design development and community consultation processes. The Project area (i.e. the area within which the construction and operation of the Project would be contained) is presented in **Figure 5-1**.

The key Project components are shown **Figure 5-2** and include:

- a six metre wide concourse between Little Eveleigh Street and Marian Street
- new stair and lift access from the concourse to Platforms 1 to 10
- an upgraded station entrance at Marian Street including station services and customer amenities
- a new station entrance at Little Eveleigh Street including station services and customer amenities
- formalisation of a shared zone on Little Eveleigh Street, including:
 - safety improvements to vehicle, cyclist and pedestrian interactions
 - improvements to streetscape such as landscaping, lighting, drainage and pavements
 - relocation of approximately 20 parking spaces (including 18 resident/restricted parking spaces, one accessible parking space and one car share scheme parking space)
 - utility adjustments.
- upgrade of Marian Street/Cornwallis Street/Rosehill Street area
 - extension of existing shared zone including part of Rosehill Street
 - safety improvements to vehicle, cyclist and pedestrian interactions including footpath widening
 - improvements to streetscape such as lighting, drainage, landscaping and pavements as well as utility adjustments
 - changes to street parking arrangements including removal of approximately 16 parking spaces (including relocation of one car share scheme parking space).
- operation of the Project

Other components of the Project include:

- relocation of the shuttle bus zone from Little Eveleigh Street to Lawson Street
- kiss and ride on Lawson Street, and associated footpath upgrade

- kiss and ride on Gibbons Street, and associated footpath upgrade
- footpath widening on Ivy Street
- relocation of a building on Platform 1 to accommodate the concourse
- repurposing, relocations and alterations to platform building features and other platform features, including privacy walls, doors, screens and roofing, platform seats and electrical equipment
- addition of platform canopies
- platform resurfacing on all platforms and associated drainage alterations
- installation of station operational components and infrastructure including:
 - wayfinding and signage
 - tactile ground surface indicators (TGSi)
 - rubbish bins
 - CCTV
 - passenger information system (e.g. passenger information display, public address and hearing loops)
 - emergency equipment (e.g. for fire and life safety).
- service relocations and upgrades including:
 - relocation of overhead wiring structures
 - installation of a new rail signal between Platforms 1 and 2.

Early works (such as alterations and relocations to utilities, power and signalling, communications systems, hazardous material removal works, addressing of existing safety issues/non-conformances and associated site offices/laydown areas) would not form part of the Project and would be subject to a separate environmental assessment and approval process.

5.1.1 Concourse and new station entrances

The proposed new concourse and new station entrances would provide a direct connection between Little Eveleigh Street to the north-west of the station, and Marian Street to the south-east.

The concourse would include six new steel and glass lifts and covered stairways connecting the concourse to each of the 10 platforms. The concourse itself would be approximately six metres wide and span approximately 80 metres between the new station entrances on Little Eveleigh Street and Marian Street. The bottom of the concourse would provide the required clearance for overhead wiring and ongoing train operations. Rainwater would be collected from the roof of the concourse and directed into tanks for reuse in flushing toilets and other non-potable uses at the station.

Access to the platforms would be closed after hours. Concourse and station entrances are proposed to remain open, where possible. Consultation with key stakeholders is ongoing to confirm out-of-hours access arrangements.

The Little Eveleigh Street station entrance would be located at the existing location of 125-127 Little Eveleigh Street, owned by the NSW Government. As a contributory item in the Darlington Heritage Conservation Area (refer to **Chapter 14**), it is proposed to retain as much as possible of 125-127 Little Eveleigh Street, including incorporating the building's exterior and elements of the interior into the design of the Little Eveleigh Street station entrance (refer to **Section 5.2.6**).

The Little Eveleigh Street station entrance and surrounding area would include the following customer facilities:

- standard toilet and family accessible toilet
- approximately 60 bicycle parking spaces on Little Eveleigh Street

- station operational components and infrastructure including:
 - wayfinding and signage
 - Opal card readers and top up machines
 - ticket gates
 - CCTV
 - emergency equipment (e.g. for fire and life safety)
 - passenger information systems (e.g. passenger information display, public address and hearing loops).
- heritage interpretation and/or public art.

The Marian Street station entrance would be located on land currently consisting of a Sydney Trains car park and fenced vegetated area adjacent to Marian Street. The entrance would include the following customer facilities:

- approximately 20 new bicycle parking spaces
- services building
- station operational components including:
 - wayfinding and signage
 - Opal card readers and top up machines
 - ticket gates
 - CCTV
 - emergency equipment (e.g. for fire and life safety)
 - passenger information systems (e.g. passenger information display, public address and hearing loops).
- heritage interpretation and/or public art.

The Marian Street station entrance would occupy a small section of the existing Sydney Trains car park, resulting in a loss of up to 16 car parking spaces within this area.

The concourse and station entrances have been designed not preclude future development.

5.1.2 Formalisation of Shared Zone at Little Eveleigh Street, footpath widening on Ivy Street, and associated works

It is proposed to create a shared zone at Little Eveleigh Street in order to improve connectivity and address increased foot traffic between Redfern Station and key precincts to the west, including Carriageworks and surrounding education and health precincts. This would require several changes to Little Eveleigh Street, including the relocation of approximately 20 restricted car parking spaces (including 18 resident/restricted parking spaces, one accessible parking space and one car share scheme parking space from Little Eveleigh Street) to a new car park within existing railway corridor land at the western end of Little Eveleigh Street (refer to **Figure 5-2**). The establishment of the new car park would require some tree trimming and removal of approximately 18 trees.

It is noted that the location of the new car park is within the Redfern North Eveleigh precinct. Planning for the urban renewal of this precinct is underway, and the car park location may therefore be an interim measure. In the event that the car park would be affected by this process, any proposed reconfiguration or relocation of the offset parking arrangements would be undertaken in consultation with relevant stakeholders, and in a manner which ensures that the principle of offset parking is provided in perpetuity, and remains within reasonable walking distance of Little Eveleigh Street.

A new kiss and ride area would also be provided nearby on Lawson Street. The kiss and ride would require three existing parking spaces to be removed (currently permitting two hour restricted/permit holder unrestricted parking). A new bus zone would also be established in an existing restricted

parking area on Lawson Street, near the intersection of Little Eveleigh Street. These works would require footpath upgrades from Little Eveleigh Street, along Lawson Street.

Pavement resurfacing and drainage works would be required to establish the shared zone and accessible station entrance. The shared zone would include cars, cyclists and pedestrians sharing the new pavement on Little Eveleigh Street. The roadway would be able to be safely used by service vehicles up to 8.8 metres in length. Traffic signage and traffic calming devices (such as speed humps) may also be installed.

In addition to the shared zone, footpath widening works would occur within Ivy Street to improve pedestrian safety and connectivity with Abercrombie Street, as well as to the education and health precincts to the west of the station. No parking spaces would be removed to facilitate the widening of the footpath.

Some vegetation may require trimming or removal. Landscaping and street lighting adjustments would be undertaken along the extent of the shared zone and comply with safety in design principles. This would include ensuring entry to residences are not blocked, and would also include space for residential wheelie bins adjacent to each residence. Improvements to drainage would be undertaken and would require connection to existing storm water drainage infrastructure at Little Eveleigh Street and Ivy Lane. Adjustment to underground utilities may also be required to ensure continuity of services to the local area.

5.1.3 Upgrade of Marian/Cornwallis/Rosehill Street and associated works

To improve pedestrian and vehicle safety in the vicinity of the proposed Marian Street entrance, it is proposed to extend the existing shared zoned on Marian Street along sections of Cornwallis Street and Rosehill Street (refer to **Figure 5-2**).

This would require changes to sections of Marian Street, Cornwallis Street and Rosehill Street including drainage works and the permanent removal of approximately 16 car parking spaces including five unrestricted parking spaces and eleven restricted parking spaces (currently permitting two-hour restricted/permit holders unrestricted parking). One car share scheme parking space would be relocated to a new location further south along Rosehill Street. Adjustments to footpaths, drainage and street lighting would also be required.

Pavement works would be undertaken as part of the shared zone upgrade, including installation of a traffic calming device (speed hump or equivalent). The roadway would be able to be safely used by service vehicles up to 8.8 metres in length. Approximately 17 trees would require trimming or removal to accommodate the works.

A new kiss and ride would also be located on nearby Gibbons Street, which would require the removal of approximately three restricted car parking spaces. The existing footpath along Gibbons Street would also be upgraded to connect to the existing footpath providing access to the station entrance.

5.1.4 Platform and platform building alterations

The Project would include the releveling and resurfacing of sections of Platforms 1 to 10 to achieve DSAPT compliance.

External brick privacy screens and walls would be removed from the heritage platform buildings on Platforms 4 to 9 to provide space for efficient and safe pedestrian movement at the base of the new stairways. In addition, the existing office building at the southern end of Platform 1 would require relocation to the west along the platform, to facilitate construction of the proposed concourse. This would also result in the removal or trimming of approximately 7 trees on or adjacent to Platform 1.

Existing services would need to be relocated in and around platforms. New or relocated wayfinding signage and customer infrastructure including seating, rubbish bins, lighting, CCTV, passenger information systems, emergency equipment (for fire and life safety) and tactile ground surface indicators (TGSIs) would be included on platforms and platform access points, reflecting the revised operational layout of the station.

5.1.5 Changes/additions to rail infrastructure

A new signal structure would be required between Platforms 1 and 2, approximately 50 metres towards the city from the current signal structure (which would be retained).

The position of the concourse would require some of the existing overhead wiring (OHW) structures to be adjusted/upgraded. This includes relocation of the OHW that would be attached to the underside of the new concourse as well as the OHW structures either side of the concourse. Relocation of OHW structures would involve installing piles for new footings, steelwork and lowering of wires. OHW works are anticipated to extend approximately 200 metres north of the station and 450 metres south of station (refer to **Figure 5-1**).

5.1.6 Services upgrades

The new services building proposed near the Marian Street entrance would contain condensers, a store room, toilets (including a family accessible toilet), a communications room (containing racks/equipment), transformers and a low voltage (LV) switch room.

5.1.7 Materials and finishes

Materials and finishes for the Project have been selected based on the criteria of durability, low maintenance, cost effectiveness, lifecycle impacts, to minimise visual impacts on the heritage precinct, support sustainable outcomes, and to be aesthetically pleasing.

Materials proposed to be used for the Project include:

1. concrete for the concourse deck, supports, lift base and stairs
2. concrete finish for the concourse deck
3. asphalt for platform regrading and resurfacing
4. brickwork or cladding with anti-graffiti surface on communications and services building
5. pavers for forecourt areas and shared zones
6. prefinished metal sheet roofing for platform canopies and concourse and lift roofing
7. painted cladding for walls at entrances
8. aluminium battens to concourse ceiling
9. aluminium panels to stair ceiling panels
10. painted structural steel elements to concourse, entrances, lifts and stairs
11. perforated aluminium screens to the concourse façade and platform stairs
12. fully framed glazed panels to areas of the concourse facade
13. fully framed glazed panels to the lift shaft.

Opportunities and allowance would be made for artwork and heritage interpretation to be incorporated into the Project. This is discussed further in **Chapter 14**.

The design would be submitted to an independent Design Review Panel at various stages for independent peer review before being accepted by TfNSW. An Urban Design and Public Domain Plan has also been prepared (refer to **Appendix C**). The Urban Design and Public Domain Plan communicates the public domain design arising from a robust urban design analysis and consultation with key stakeholders. This is discussed further in **Chapter 8**.



FIGURE 5-1: PROJECT AREA AND OVERVIEW OF KEY FEATURES

Indicative and subject to detailed design.

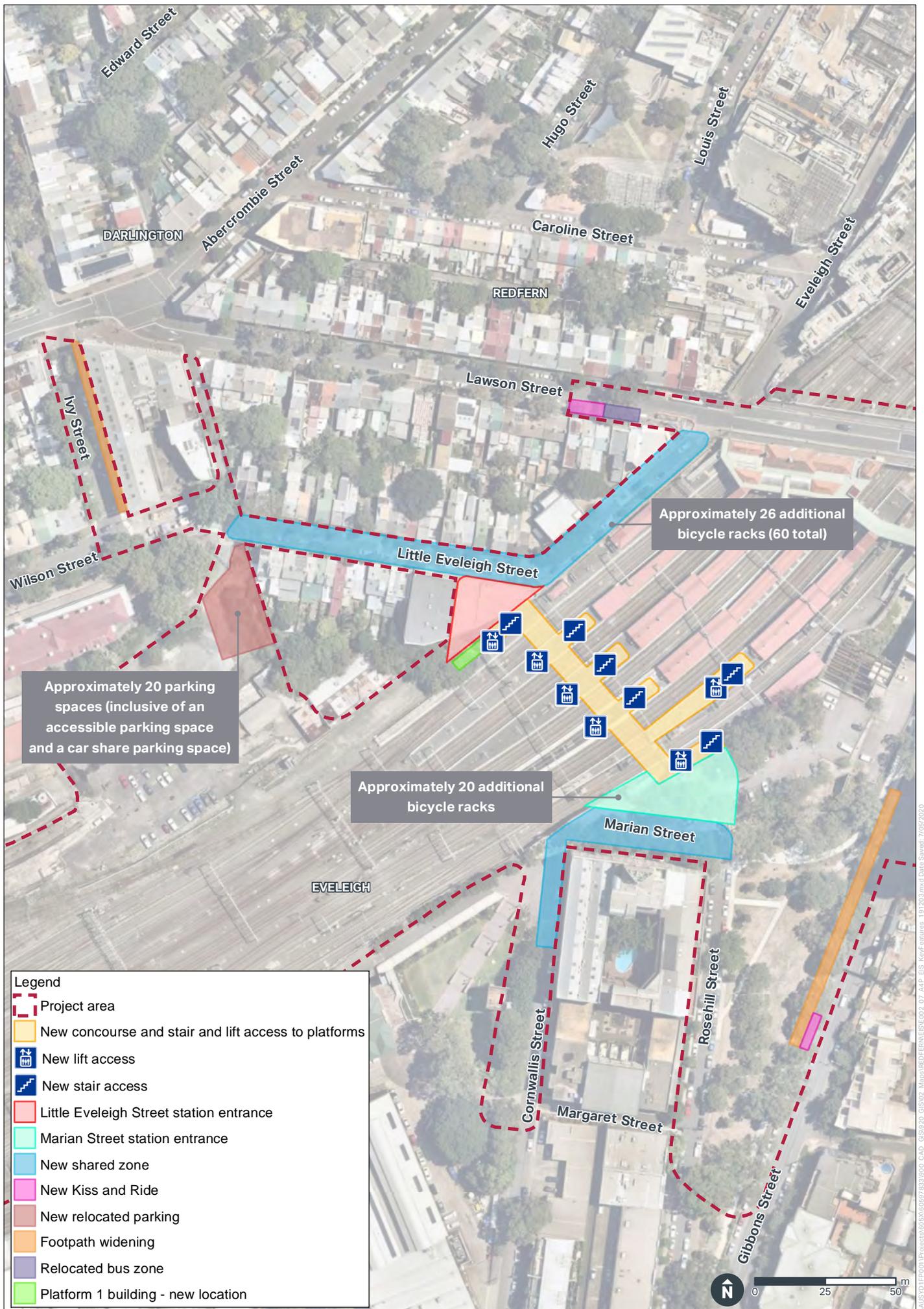


FIGURE 5-2: KEY FEATURES OF THE PROJECT
Indicative and subject to detailed design.

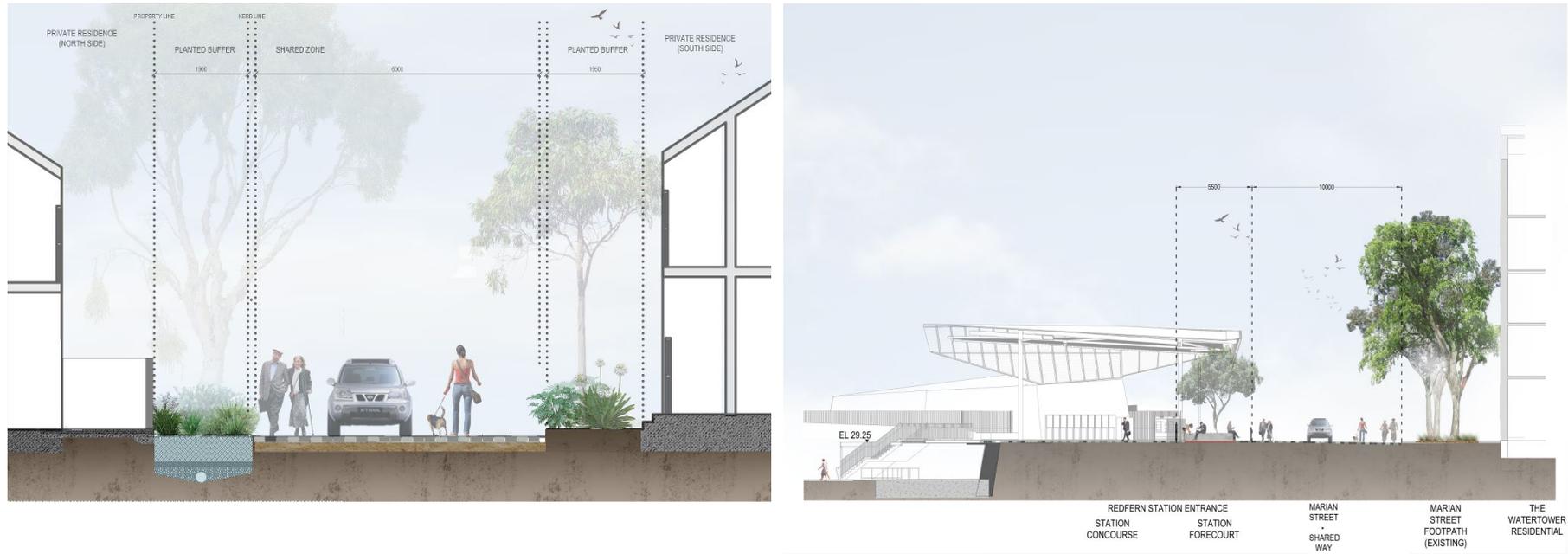


Figure 5-3 Indicative cross section – Little Eveleigh Street and Marian Street shared zones

5.2 Construction of the Project

5.2.1 Overview

Construction of the Project would broadly involve the following key stages:

1. site establishment and enabling works
2. building modification works
3. overhead wiring relocations/adjustments
4. main construction works, including platform preparation works, installation of the concourse and station entrances
5. Little Eveleigh Street/Ivy Street, Marian Street/Cornwallis Street/Rosehill Street, Lawson Street and Gibbons Street road works.

These stages are described in more detail below.

The construction methodology presented in this section is indicative and would continue to be refined as the design process continues. A final construction methodology and program would be developed by the Construction Contractor.

Key construction areas, including the proposed ancillary facilities (i.e. construction compounds) and haul routes proposed for use during construction, are shown in **Figure 5-4**.

Construction of the Project is proposed to commence in late 2020/early 2021 once all necessary approvals (as relevant) are obtained and continue for approximately 18 months.

5.2.2 Site establishment and enabling works

Site establishment and enabling works would include:

- clearing of ancillary facility/construction areas
- removal of hazardous materials (as required)
- installation of temporary accessways and wayfinding signage
- installation of site offices including minor modifications as required, utility connections within the ancillary facility areas and temporary access ways to the site office location
- establishment of temporary waste and stockpile areas
- erection of hoarding and fencing including the integration of physical acoustic measures as required
- installation of construction environmental management measures such as tree protection and sediment and erosion controls
- undertrack crossing pipes for concrete supply
- possession related works.

Site establishment and enabling works would occur over approximately eight-twelve weeks at the beginning of the construction program.

5.2.3 Building modification works

Building modification works would be undertaken over various stages of the Project including the various components outlined in **Table 5-1**.

Table 5-1 Modification works

Component	Work proposed
125-127 Little Eveleigh Street	<ul style="list-style-type: none"> removal of hazardous materials (as required) clear out and backfill of basement vegetation removal enlargement of openings for the station entrance and concourse connection installation of foundations for the new concourse partial demolition of interior features (including walls and doors) ancillary works and services - fittings and fixtures (cladding, painting, light fixtures, electrical, mechanical, hydraulic and fire life safety services and/or similar) façade restoration installation of an internal lift.
Marian Street entrance	<ul style="list-style-type: none"> removal of hazardous materials (as required) demolition of part of the existing car park vegetation removal demolition of existing stairway (after opening of the new concourse).
Platform privacy screens and walls, and seats	<ul style="list-style-type: none"> removal of hazardous materials (as required) demolition of privacy screens at the western end of heritage buildings on Platforms 4 to 9 relocation of platform seats adjacent to heritage platform buildings.
OHW structures	<ul style="list-style-type: none"> removal of hazardous materials (as required) demolition of OHW structure between Platforms 7 and 10 demolition of OHW structures between Platforms 1 and 10 to the west of existing heritage platform buildings.
Platform 1 building	<ul style="list-style-type: none"> removal of hazardous materials (as required) demolition of the existing timber walls and roof of associated annex structure relocation of the remaining structure approximately 10 metres west along the platform (to allow for the installation of the concourse and associated lift and stairs to Platform 1). Works would include removal of existing services, micro-piling (if required), excavation.

5.2.4 Overhead wiring relocations/adjustments

The OHW are described in **Section 5.1.5**.

OHW would occur over approximately 10 months during rail possession periods and not as continuous work.

5.2.5 Main construction works

Station entrances

The main construction works would commence with the re-purposing of 125-127 Little Eveleigh Street as described in **Section 5.2.3**. A new car park would be constructed within the existing railway corridor land at the western end of Little Eveleigh Street prior to the removal of the parking spaces on Little Eveleigh Street. Fit out of the Little Eveleigh Street station entrance would include the installation of

electrical and mechanical components including lighting, Opal card readers and signage. Operational infrastructure to be installed is described in **Section 5.1.1**. This stage may require temporary traffic control and diversions on Little Eveleigh Street and nearby roads, as required. The Little Eveleigh Street station entrance works would occur over approximately eight months throughout the 18 month construction period.

Construction of the Marian Street station entrance would commence with the clearing of existing vegetation (approximately 17 trees) and levelling of the site with engineered fill. Piling would then be undertaken to allow the station entrance infrastructure to be built, including construction of a station services building.

Fit out of the Marian Street station entrance would include the installation of customer amenities and station operational infrastructure including lighting, Opal card readers and wayfinding signage. Operational infrastructure to be installed is described in **Section 5.1.1**. This stage may require temporary traffic control and diversions on Marian Street and nearby roads, as required. The Marian Street station entrance works would occur over approximately eight months throughout the 18 month construction period.

Installation of concourse

Construction of the new concourse would be undertaken over a period of approximately 18 months. Construction of the support structures for the concourse would require excavation and installation of reinforced concrete piles, concrete foundations and support structures. These would be constructed behind enclosed safe work areas that would allow for commuter use of platforms while the works proceed.

Once complete, the installation of the concourse would be undertaken. Concourse construction would include lifting pre-cast concrete sections into place by crane. Once the key structural elements are lifted into place, work on the concourse would be able to continue during standard construction hours.

Access for delivery of equipment and material to the various platforms is possible by crossing the railway tracks outside of train operational hours. Concrete would be delivered in through pipes installed under tracks.

5.2.6 Little Eveleigh Street/Ivy Street, Marian Street/Cornwallis Street/Rosehill Street, Lawson Street and Gibbons Street roadworks

Roadworks in the Little Eveleigh Street area would generally be undertaken concurrently with the station upgrade works over a period of approximately nine months. They would be undertaken with the aim of minimising disruption to residents and the community in line with mitigation measures (refer to **Chapter 13**), including temporary closures and diversions as outlined in **Chapter 12**). Access would be maintained for vehicles, pedestrians and cyclists throughout construction, however some diversions may be required.

During construction, some street parking would also be intermittently unavailable along Little Eveleigh Street and Marian Street, before the permanent loss or relocation of parking (refer to **Section 5.1.2** and **Section 5.1.3**). The works would involve milling of existing asphalt, excavation and paving of the new shared zone and roadways (refer to **Figure 5.1**). Removal and management of hazardous materials and relocating of services may also be required. Vegetation trimming and removal of a small number of trees (about two) would also be required along Little Eveleigh Street (refer to **Chapter 16**). The works on Ivy Street (footpath widening) and Lawson Street (new kiss and ride and bus zone) would also be undertaken.

Similarly, Marian Street and the northern portion of Rosehill Street would be subject to regrading and paving for the extended shared zone (refer to **Section 5.1.3**). Some street parking would be intermittently unavailable, before the permanent removal of approximately 16 parking spaces along Marian Street, Rosehill Street and Cornwallis Street (refer to **Section 5.1.3**). There would also be some kerb and gutter realignments, as well as the removal of some existing landscaping and relocation of lighting. The works on Gibbons Street (kiss and ride and footpath upgrade) would also be undertaken.

All vegetation removed would be subject to potential offset requirements under the *TfNSW Vegetation Offset Guide* (TfNSW, 2019b or current equivalent). Vegetation offsets and offset locations would be confirmed during detailed design.

5.2.7 Construction program and working hours

It is anticipated that the Project would be undertaken over an approximate period of 18 months commencing late 2020/early 2021, once all necessary approvals are obtained (as relevant). Construction stages may occur concurrently as construction progresses. The indicative program of works, showing the potential overlap of these stages is provided in **Table 5-2**. The impact assessment of noise impacts particularly impacts on sensitive receivers, is discussed in **Section 13.4.1** of **Chapter 13** of this EIS).

Construction hours are defined in the *Interim Construction Noise Guideline* (DECC, 2009) and the *TfNSW Construction Noise and Vibration Strategy 2019* (**Appendix E**) as:

- Monday to Friday 7am to 6pm
- Saturday 8am to 1pm
- no work on Sundays or public holidays.

Work outside of the above hours may be required in some cases for the safety of workers and to minimise disruptions to customers, pedestrians and motorists. Some of the works would also need to be undertaken during standard rail possession periods (when trains are not running) to minimise disruption to rail operations and risk to rail worker safety. During some possessions, lines would remain live to enable the running of trains. Examples of works that would be required in possessions and may occur inside or outside standard construction hours include overhead wiring works, concourse and lift installation and some work on platforms.

It is anticipated that the works would be undertaken over approximately 20 standard rail possession periods with continual work from Friday evening to Monday morning. Approximately two additional (non-standard) rail possession periods are proposed including a possession across the 2020 Christmas period. During these possessions, standard mitigation and management measures would be implemented to minimise impacts to the community, including providing alternative transport arrangements and notifications. There is also the potential for mid-weeknight work to be required throughout various stages of the Project depending on the activity required.

The approach to out-of-hours work would involve preparing an Out-of-Hours Work Protocol to guide the assessment, management, and notification of works outside the recommended standard construction work hours. The protocol would be developed to ensure that out-of-hours works are managed effectively during construction, to reduce incidents and minimise impacts on the community.

The protocol would:

- be consistent with the *TfNSW Construction Noise and Vibration Strategy* (TfNSW, 2019)
- align with the construction environmental management framework for the Project (refer to **Appendix D**)
- take into account the results of the construction noise assessment for the Project
- be prepared in accordance with the conditions of approval for the Project
- provide guidance for the preparation of out-of-hours work plans in consultation with key stakeholders and the community
- document procedures to control potential impacts
- identify responsibilities for implementation and management including managing complaints.

The protocol would be prepared in consultation with relevant key stakeholders.

Table 5-2 Indicative program of works

Construction	Month																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Stage 1: Site establishment and enabling works																		
Stage 2: Building modification works																		
Stage 3: Overhead wiring relocations/ adjustments																		
Stage 4.1: Main construction works – Station entrances																		
Stage 4.2: Main construction works – Installation of concourse																		
Stage 5: Roadworks (Little Eveleigh Street/Ivy Street, and Marian Street/Cornwallis Street/Rosehill Street, Lawson Street and Gibbons Street)																		

5.2.8 Construction plant and equipment

An indicative list of plant and equipment that would be required to construct the Project is provided below. Additional equipment that may be required would be identified during detailed design by the Construction Contractor. The indicative list includes:

- chipper/mulcher
- chainsaw
- compactor
- telehandlers
- trucks
- excavators
- hand tools
- cranes
- piling rigs
- scissor lifts
- road rail vehicles
- hydraulic jacks
- light vehicles
- vacuum sucker truck
- jackhammer
- plate compactors
- welding tools.
- site office modules
- generators
- temporary hoarding

- concrete pumps
- elevated work platforms
- mobile construction lighting
- mobile drilling equipment
- power tools.

5.2.9 Construction traffic

Construction traffic would generally not exceed 20 heavy vehicle movements per day at peak construction periods, with the most movements anticipated during the modification of 125-127 Little Eveleigh Street and during roadworks on Little Eveleigh Street and Marian Street. Additionally, up to 40 light vehicle movements per day are anticipated (not including worker transport to and from site). On average, approximately three heavy vehicle movements and 20 light vehicles movements can be expected on a typical day. The potential access locations and haulage routes to the ancillary facilities are shown on **Figure 5-4**. Where Council roads (non-classified) are affected consultation with City of Sydney Council would be undertaken. This is discussed further in **Chapter 10** of this EIS.

The Project would utilise existing hi-rail access points on the Sydney Trains network during possession periods.

5.2.10 Construction ancillary facilities

Three construction ancillary facilities are proposed for the construction of the Project as outlined below. The proposed location of these facilities is shown on **Figure 5-4**.

Ancillary facility 1

The Eveleigh Maintenance Centre would be utilised as site offices, a waste storage facility, stockpile area (outside flood extents), designated area for fabrication activities and an administration centre for the Project. This would include the establishment of several site sheds and car parking facilities and stockpile area.

Ancillary facility 2

This area is currently owned by Sydney Trains and would be partly utilised as a construction laydown area and temporary waste storage facility. This laydown area would be accessed from either Carriageworks Way or Little Eveleigh Street and would provide construction parking facilities and rail corridor access. It is anticipated that some components of the concourse would be assembled here prior to installation within the rail corridor.

Ancillary facility 3

Part of Gibbons Street Reserve would be used as a laydown area for construction equipment and infrastructure, a temporary waste storage facility and a designated area for fabrication activities. The facility would be accessed from Gibbons Street. Due to the existing slope of the reserve it may be necessary to temporarily level part of the Reserve to provide a safe work area. Up to two trees would also require removal, along with some tree trimming to establish this ancillary facility. This temporary levelling works would require approximately 200 tonnes of spoil to be removed.

Following completion of works at Redfern Station, the Gibbons Street Reserve would be returned to passive recreational use for the community in consultation with City of Sydney Council.

The existing Sydney Trains car park on Marian Street would be utilised for a site office compound and an administration centre for the Project. This would include the erection of several site sheds and car parking facilities. The Project would also utilise a storage area underneath the existing car park on Marian Street for site facilities and the storage of construction equipment and materials.

Transport for NSW is investigating options for developing the land to the east of Redfern Station, above the underground T4 Eastern Suburbs and Illawarra Lines, including the site that is currently the car park off Marian Street. These investigations include improving access to the underground Platforms 11 and 12, which would make Redfern Station fully accessible. The temporary use of the site will not preclude plans to develop the site and provide improved access to Platforms 11 and 12.

The final arrangement and location(s) of ancillary facilities and site office compound may be subject to refinement as part of the confirmation of the construction methodology. The impacts of any such refinements would be subject to further assessment as part of the planning approvals process.

5.2.11 Temporary hoardings and impacts on pedestrians

Erection of site hoarding and fencing would be required to provide temporary enclosure of work sites and work areas to safely separate the public from the construction works and to facilitate the delivery of plant and materials. It is anticipated that during construction, access along Little Eveleigh Street and Marian Street would be maintained at all times for residents and where possible only single lane/partial road closures would be undertaken.

Hoarding/fencing would be required in areas of heavy pedestrian usage such as along Gibbons Street, Marian Street and Little Eveleigh Street, including the temporary closure and/or diversion of pedestrian thoroughfares as well as management of pedestrians around work sites and past work site access points. Hoarding/fencing may also be erected to protect buildings or structures and to provide protection from dust and debris generated during construction.

The type of hoarding or fencing used would be confirmed during detailed design and would consider the following principles:

- reflect the context within which the construction sites are located and are sensitive to existing visual characteristics of neighbouring areas
- include artwork, graphics and images to enhance the visual appearance of temporary works in high visibility locations
- provide community information, including contact numbers for enquiries, compliments or complaints
- ensure safety for vehicles and pedestrians is not compromised, with the principles of Crime Prevention through Environmental Design to be applied in the design of hoarding and/or fencing
- minimise impacts to the visibility of businesses in the vicinity, and where this is not possible signage would be provided to direct people to any obscured businesses
- be regularly inspected and kept clean and free of dust build up. Graffiti would be covered through suitable means or removed or painted over promptly
- consider use of chain-link or similar style of steel fencing in areas with limited public interface (i.e. away from stations and public streets).

5.2.12 Construction workforce

A typical construction workforce would consist of approximately 110 workers, including management, design and construction workers.

Workers would be encouraged to travel to the site utilising public transport. If this is not possible, workers would be required to park a pre-determined distance away from the station and/or within pre-defined areas (e.g. potential additional parking area within the current Sydney Trains car park on the north side of the rail corridor). This is in order to minimise impacts to local residents, businesses and station customers. A Green Travel Plan would be prepared for the construction phase of the project.

Approximately 20 light vehicle spaces would be made available for work vehicles within the existing Sydney Trains car park on Marian Street for the duration of the Project.

5.2.13 Earthworks and waste

Construction works would involve the following earthworks:

- excavation for foundations to a maximum depth of 18 metres (e.g. for concourse works), and to shallower depths for other rail corridor works and overhead wiring footings
- excavation for roadworks/footpath upgrades at Little Eveleigh Street/Ivy Street and Marian Street/Rosehill Street roadworks (to a depth of approximately 2.5 metres)
- excavation within the Gibbons Street reserve
- excavation for proposed car park (to a depth of approximately two metres).

Various components of construction works would generate spoil and waste volumes. **Table 5-3** provides an estimate of waste and spoil volumes during construction and **Chapter 21** describes waste and resource management.

Table 5-3 Estimated spoil and waste volumes

Component	Spoil/waste volumes (approximate)
Site establishment and enabling works	200 tonnes (Gibbons Street Reserve)
Utility and overhead wiring relocations/adjustments	150 tonnes
Main construction works	250 tonnes from demolition and 1920 tonnes from piling and foundations (at 125-127 Little Eveleigh Street) 1,200 tonnes (Marian Street entrance) 320 tonnes (drainage works)
Little Eveleigh Street and Ivy Street works	2,500 tonnes
Marian Street roadworks	550 tonnes
Total	7,090 tonnes

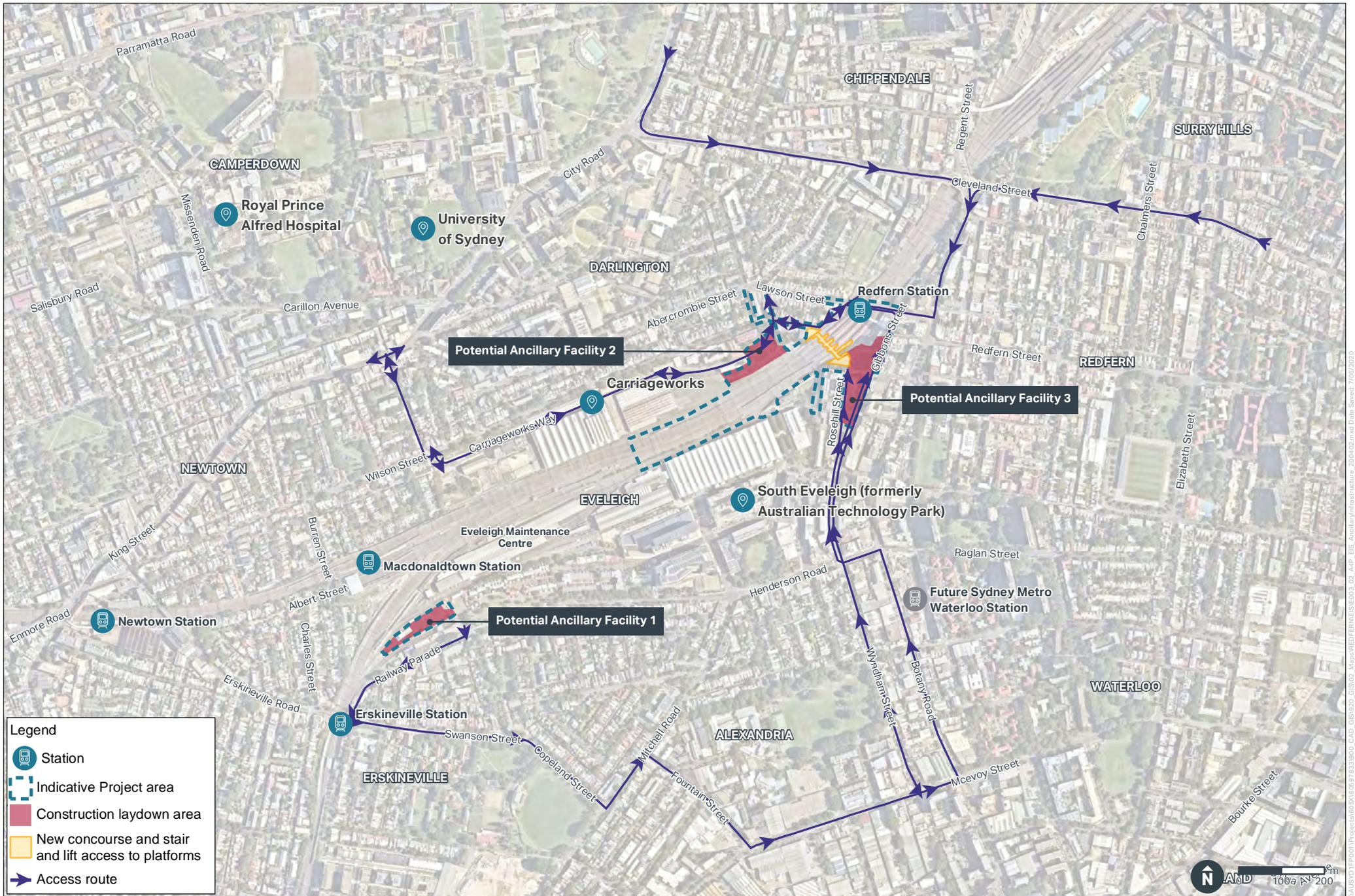


FIGURE 5-4: ANCILLARY FACILITIES

5.3 Property requirements

The Project would mainly be located on land that forms part of the existing rail corridor and adjacent land owned by the NSW Government or the Council. The design of the Project has avoided the need to permanently acquire private land and properties. Construction of the Project would require the temporary use of NSW Government and Council owned land.

5.3.1 Permanent use of NSW Government owned land outside the rail corridor

TfNSW does not propose to acquire any property as part of the Project. Existing properties and land directly impacted by the Project are owned by the NSW Government. The Project would require relocation of the tenants of 125-127 Little Eveleigh Street, which is currently under lease from the NSW Government.

5.3.2 Temporary use of property

Some areas of land would need to be temporarily occupied for construction compounds and other work sites during construction of the Project (refer to **Section 5.2.11**). These areas are generally located within road reserves or other Council owned land adjacent to the rail corridor. Following further design development, consultation would be undertaken with the relevant landowners.

5.4 Operation of the Project

Following construction of the Project, Redfern Station would continue to operate as a major transportation hub with trains arriving and departing throughout the day and night. Key operational components of the Project directly related to customer experience include the following elements:

- new southern covered concourse
- six lifts and stairways providing access to Platforms 1-10
- family accessible toilet and public toilets
- passenger information systems
- kiss and rides
- Opal card readers and top up machines
- bicycle spaces
- Little Eveleigh Street station entrance
- Marian Street station entrance
- introduction of a formalised shared zone along Little Eveleigh Street, and extension of the shared zone at Marian Street.

Once commissioned, the proposed services building at the Marian Street station entrance would become an integral part of the station where most of the electrical, mechanical and communications, and wastewater management infrastructure would be controlled and managed. Periodic maintenance including inspections and repairs would take place inside and outside of the building to ensure continuous operation of the station. The services building would also house cleaning and storage areas for station staff.

During operation, ongoing maintenance would be required for key operational components. This would be undertaken by Sydney Trains in line with standard maintenance policies. These standard policies would also include incident and emergency management procedures.

It is estimated that approximately 100,000 pedestrians would use the new concourse each day by 2036, including exit/entry, transfers and cross corridor usage.

6 Stakeholder and community engagement

This chapter describes the stakeholder and community engagement undertaken and proposed for the Project.

6.1 Introduction

This chapter responds to the Secretary's environmental assessment requirements (SEARs) as relevant to stakeholder and community engagement. **Table 6-1** describes where the SEARs have been addressed in this chapter.

Table 6-1 Secretary's environmental assessment requirements

Secretary's environmental assessment requirement	Where addressed
The project must be informed by consultation, including with relevant local, State and Commonwealth government agencies, infrastructure and service providers, special interest groups, affected landowners, businesses and the community, and Aboriginal representative groups, not limited to Local Aboriginal Land councils.	Details of consultation carried out to inform the Project development are provided in Section 6.3 , Section 6.4 and Section 6.5 . Further details are provided in Appendix B .
The Proponent must document the consultation process, justify and demonstrate how the project has responded to the inputs received.	Details of consultation carried out to inform the Project development are provided in Section 6.4 . Further details are provided in Appendix B .
The Proponent must describe the timing and type of community consultation proposed during the design and delivery of the project, the mechanisms for community feedback, the mechanisms for keeping the community informed, and procedures for complaints handling and resolution.	Consultation which has occurred during the development of design to date is described in Section 6.3 . Consultation proposed during ongoing design and delivery is described in Section 6.5 .

6.2 Consultation approach and objectives

A Community and Stakeholder Engagement Plan has been developed by TfNSW to guide engagement with local communities, stakeholders and government agencies through the design phase of the Project (refer to **Appendix B**). Stakeholder and community consultation undertaken for the Project has been an integral part of developing the design for the Project and informing and scoping the investigations for this EIS.

Consultation is proposed to continue during the ongoing development of the Project (and into construction, if the Project is approved, refer to **Section 6.5.5**).

6.2.1 Project stakeholders

Extensive stakeholder mapping has been undertaken to identify the Project stakeholders and their areas of interest/potential issues. It is important to recognise that due to the dynamic nature of communities, the relevant stakeholders and stakeholder interest levels may change over time and in relation to the Project.

Residents in Redfern and surrounding suburbs are generally active in their community and have an interest in proposed developments within the local area. There is an active community group that covers the suburbs of Redfern, Eveleigh, Darlington and Waterloo ('REDWatch') and similarly active community groups in the nearby suburbs of Alexandria and Erskineville. These groups, along with local residents have lobbied for an accessibility upgrade at Redfern Station for many years. Nearby stakeholders such as Mirvac in South Eveleigh and the University of Sydney have also lobbied for an upgrade as well as improved connections to the station.

Stakeholders identified for the Project include the following:

- State government agencies, including:
 - Sydney Trains
 - Department of Planning, Industry and Environment
 - the former Roads and Maritime Services (now TfNSW)
 - Sydney Metro Authority
 - the Environment, Energy and Safety Group (former NSW Office of Environment and Heritage)
 - Heritage NSW
 - NSW Environmental Protection Authority
 - NSW Department of Primary Industries (Office of Water)
 - State Transit Authority.
- NSW Members of Parliament (including Minister for Transport and Roads, Minister for Planning and Public Spaces, and Member for Newtown)
- City of Sydney Council
- transport customers (existing and potential)
- public utilities (Sydney Water, Telstra, Optus, Ausgrid, Jemena Gas)
- Sydney Local Health District and Royal Prince Alfred Hospital
- The University of Sydney
- Department of Education, schools, colleges and training facilities, and childcare centres and preschools
- TAFE NSW (Eora College)
- NSW Police
- Emergency services (ambulance and fire)
- Metropolitan Local Aboriginal Land Council
- Aboriginal and Torres Strait Islander groups, organisations, and community representatives (e.g. Tribal Warrior, Aboriginal Housing Company, Aboriginal Legal Services, Aboriginal Medical Service Redfern, Yarn'n Employment Services, Redfern Jarjum College, Wyanga Aboriginal Aged Care)
- Not-for-profit organisations (e.g. The Big Issue, Women and Girls' Emergency Centre, National Centre of Indigenous Excellence)
- Accessibility groups (e.g. Accessible Transport Advisory Committee, First People's Disability Network Australia)
- local residents, businesses (e.g. Mirvac, Commonwealth Bank of Australia, Carriageworks, and other surrounding businesses), industry groups (e.g. South Sydney Business Chamber and NSW Indigenous Chamber of Commerce) and property owners
- interested community groups (e.g. Reconnect Redfern, REDWatch, Lift Redfern, Redfern Station Community Group, Alexandria Residents Action Group, East Chippendale Community Group)
- Transport groups and organisations (e.g. Australian Taxi Industry Association, NSW Taxi Council, taxi companies, Bike Sydney)
- the broader community.

Ongoing identification and analysis of Project stakeholders will be undertaken, which is critical to determine appropriate timing of communications and community engagement activities. It also provides insight into potential issues that may arise over the course of the engagement.

6.2.2 Consultation objectives

The consultation objectives for the Project are to:

- increase public knowledge about the station upgrade
- seek customer, community, resident and stakeholder input into planning and design for the station upgrade and surrounding streetscapes and provide feedback as to how their input has been taken into account
- establish clear lines of communication with the community
- be open and accountable, and report back to the community and project team on engagement activities
- build relationships with the community, customers, and stakeholders
- meet regulatory requirements.

6.3 Consultation and engagement activities to date

6.3.1 Community, business and residents

Concept design consultation:

Engagement with the community and stakeholders has been ongoing for a number of years regarding potential opportunities for cross-corridor access and improvements in and around Redfern Station. On 27 February 2019, the NSW Government announced that Redfern Station would have an accessibility upgrade as part of the TAP. This announcement included a new pedestrian concourse at the southern end of the station that would provide easy access to Platforms 1 to 10 with six new stairs and lifts along with better connectivity with the surrounding areas including key destinations such as South Eveleigh, Carriageworks, as well as health and education centres.

Following the 27 February announcement of the Project, consultation began with the local community and stakeholders. Consultation activities were undertaken with the local community across two consultation periods (May to June 2019, and July to August 2019).

In May and June 2019, the community was invited to provide feedback on an early concept for a new southern concourse. As a result of feedback received, four design options (including the original preferred design) were developed and presented to the community for consideration in July and August 2019 (the four design options are described in **Chapter 4** of this EIS). Feedback from the community, stakeholder groups, and station customers has assisted in progressing to a preferred option.

Consultation activities undertaken in the May–June 2019 consultation period included:

- community group and stakeholder meetings
- doorknocking residents of Little Eveleigh Street on Wednesday 15 and Thursday 16 May to provide information about the Project
- letters sent to owners and residents of Little Eveleigh Street with information about the Project and offer of individual meetings
- placement of Project consultation signage at each of the station entrances and on Little Eveleigh Street
- distribution of around 15,900 newsletters to businesses and residents within one kilometre of Redfern Station, south of Cleveland Street
- distribution of around 8,000 newsletters to customers at the station during peak periods periodically throughout the consultation period and ahead of community information sessions

- webpage¹ with Project information including Frequently Asked Questions (FAQs), newsletter and link to online survey (now closed)²
- three community drop-in information sessions held at Redfern Station for community members to meet and speak with the Project team. These sessions were held:
 - 4pm to 7pm Tuesday 21 May
 - 8am to 11am Saturday 25 May
 - 4pm to 7pm Wednesday 29 May.
- meetings with residents on Marian Street and Little Eveleigh Street
- community Infoline number³ and email address⁴
- posters at the station advising where to view the concept designs and how to provide feedback.

Consultation activities undertaken in the July–August 2019 consultation period included:

- stakeholder forum on 4 July to introduce the four design options and encourage discussion between stakeholders on the comparative benefits and challenges of each
- door knock of residents of Little Eveleigh Street on 24 July to provide updated information about the Project and the four options, with letter and offer of individual meetings
- placement of project consultation signage at each of the station entrances and at the kiss and ride area on Little Eveleigh Street
- distribution of around 20,150 newsletters to businesses and residents within one kilometre of Redfern Station, south of Cleveland Street, and including East Chippendale
- distribution of around 5,500 newsletters to customers at the station across three weekday evening peak periods
- individual meetings/presentations with stakeholder, disability, community and resident groups
- webpage with project information including FAQs, newsletter, stakeholder forum presentation and link to an online survey regarding the options
- community Infoline number and email address
- posters at the station advising where to view the concept designs and how to provide feedback.

A second stakeholder forum was held on 4 November 2019, to discuss the results of the July-August 2019 consultation period and how they had shaped the preferred design of a modified Option 1. As an outcome of the discussions held in this forum, Transport for NSW committed to undertaking a co-design process with local residents on the streetscapes of Marian and Little Eveleigh Streets.

Residents of Little Eveleigh Street were door knocked on 5 November 2019 to provide an update of the project, with a letter and offer of individual meetings. Around 19,200 newsletters with a project update were also distributed to businesses and residents within one kilometre of the station.

6.3.2 Non-government stakeholders

Meetings have been held with non-government stakeholders including community representative groups, local businesses, employer and educational organisations, and local designation organisations. These included:

- University of Sydney
- Carriageworks

¹ <https://www.transport.nsw.gov.au/projects/current-projects/redfern-station-upgrade-new-southern-concourse>

² <https://yoursay.transport.nsw.gov.au/RedfernNSC>

³ 1800 684 490

⁴ projects@transport.nsw.gov.au

- Mirvac
- Commonwealth Bank of Australia
- REDWatch
- Reconnect Redfern
- Lift Redfern
- The Big Issue
- Blind Citizens Australia.

The Project team presented the four options to the Accessible Transport Advisory Committee (ATAC) which included representatives from a number of different disability support organisations, as well as the City of Sydney's Inclusion Advisory Panel, on Wednesday 31 July 2019. Transport for NSW also met with ATAC on 25 November 2019 to discuss the feedback received during the July-August 2019 consultation period and preferred option.

6.3.3 Government agency stakeholders

TfNSW has undertaken government agency consultation to date with the aim of ensuring that relevant agencies are involved in the strategic planning process and are consulted on planning approval requirements and the environmental assessment process.

Meetings undertaken to date have included:

- NSW Heritage
- Department of Planning, Industry and Environment
- Environment, Energy and Science Group
- Sydney Local Health District and Royal Prince Alfred Hospital
- NSW Member for Newtown
- NSW Police
- City of Sydney Council.

Several agencies were also involved in the SEARs application process, to inform the SEARs issued for the Project.

6.3.4 Aboriginal and Torres Strait Islander communities and stakeholders

Redfern Station is within close proximity and has important ties to the local Redfern Aboriginal community. The station has historically served as an important transport connector between this local community and Aboriginal people from other areas of NSW. Dedicated engagement with the local Aboriginal and Torres Strait Islander community has been undertaken for the Project. Meetings have been held with Aboriginal and Torres Strait Islander stakeholder organisations, including:

- Metropolitan Local Aboriginal Land Council
- TAFE Eora
- National Centre of Indigenous Excellence (NCIE)
- Indigenous Chamber of Commerce

Representatives from local Aboriginal organisations and community groups were also invited to a targeted Aboriginal Engagement Forum on 5 June 2019 in addition to the two stakeholder forums.

6.4 Results of consultation

6.4.1 Feedback from community

Feedback received from the community and stakeholders during the two consultation periods (May – June 2019 and July – August 2019) is described below. Key themes of the feedback received from the community included:

- support for improving accessibility at Redfern Station
- support for a new southern concourse
- concern for traffic management and crowding on Little Eveleigh Street
- preference for lift access to Platforms 11 and 12
- enquiries into other options explored
- concern for traffic and pedestrian management on Marian Street/Cornwallis Street.

Submissions and feedback received during the May–June consultation period included:

- 119 online survey responses
- 38 feedback forms received over the three community drop-in information sessions
- 51 submissions received via the Project email address.

The perceived potential for congestion on Little Eveleigh Street and Marian Street due to an increased number of pedestrians, cyclists and vehicles was a key theme. Some responses also proposed relocating the concourse entrance to other streets, such as Wilson Street and Cornwallis Street.

Other suggestions by the community included providing lift access to Platforms 11 and 12, having un-gated cross-corridor access via the new southern concourse and facilitating bicycle access across the concourse. Potential impact to heritage and the visual amenity of surrounding streets were also identified as aspects that were important to the community.

Submissions and feedback received during the July–August consultation period included:

- 223 survey responses
- 45 submissions received via the Project email address
- some verbal feedback via the Project Infoline and in meetings.

Feedback received during the July - August consultation period continued to show overarching support for improving accessibility and reducing congestion at Redfern Station. However, differing levels of support were received regarding each of the four design options presented, with respondents expressing differing viewpoints about the potential benefits and negatives of each option.

More than half of the people who responded to the survey lived in the local area, and used the station to travel to and from home or to access various local destinations, including South Eveleigh, Carriageworks, the University of Sydney and local shops, cafes and restaurants.

In general, Option 1 received the highest levels of support (refer **Chapter 4** for further information).

6.4.2 Feedback from non-government stakeholders

Key issues raised during consultation with non-government stakeholders included:

- general support for improving accessibility and relieving congestion at Redfern Station
- interface of station concourses with future precinct development
- request to consider options for bicycle access across concourse and connections with City of Sydney's bicycle routes
- traffic management and crowding on Little Eveleigh Street
- traffic and pedestrian management on Marian Street/Cornwallis Street

- provision of lift access to Platforms 11 and 12
- opportunities for ongoing community feedback into the design process.

6.4.3 Feedback from government stakeholders

Key items raised during consultation with government stakeholders included:

- support for improving accessibility at Redfern Station
- provision of lift access to Platforms 11 and 12
- justification for the Project in regard to heritage impacts will need to be demonstrated
- request to consider how heritage items could be retained and protected
- requirements around providing heritage benefits to offset heritage impacts
- request to assess the presence of microbats in existing structures
- traffic and pedestrian management on Marian Street/Cornwallis Street
- traffic and pedestrian management on Little Eveleigh Street
- consideration of crime prevention principles
- requests to consider community group options
- request to consider options to allow unpaid access to the new concourse.

6.4.4 Feedback from Aboriginal and Torres Strait Islander communities and stakeholders

Key items raised in engagement with Aboriginal and Torres Strait Islander communities and stakeholders include:

- accessibility to platforms
- opportunities for design to incorporate Aboriginal culture and heritage
- employment and training opportunities.

6.4.5 Incorporation of feedback into development of the Project

A Consultation Report has been prepared with further details and analysis of community and stakeholder feedback (refer to **Appendix B**). This feedback and the issues raised to date, together with issues put forward during ongoing consultation during preparation of the EIS, has been considered in the ongoing development of the Project.

The feedback received from the community resulted in some modifications to the Option 1 design (which was chosen as the preferred Project option – refer to **Chapter 4** of this EIS) on Little Eveleigh Street, including:

- garden buffers and landscaping to separate properties from the shared zone on Little Eveleigh Street
- on-street parking required to be removed on Little Eveleigh Street to be relocated nearby
- through-traffic minimised on Marian Street and Little Eveleigh Street with general traffic restrictions proposed
- resident and trade/deliveries and service vehicles allowed 24 hours per day on Little Eveleigh Street during construction and operation of the Project.

6.5 Future consultation and engagement

6.5.1 Ongoing consultation

As part of the consultation process, the community and community groups were also asked how they would like to be consulted during the next stages of the Project. The majority of these responses suggested that newsletter and email updates, followed by other online channels are the primary

methods that the general community wish to be used for consultation. Community groups also requested opportunities for community input into the design process through forums such as workshops.

Community and stakeholder consultation will continue throughout the ongoing process of development of the Project, and there will be further opportunities for the community and stakeholders to provide feedback on the Project as the design evolves.

6.5.2 Co-design process

Co-design processes involve community in the iterative development of solutions. This is driven by the underlying belief that engagement with community in the development and delivery of products or services will lead to better (and shared responsibility for) outcomes, in this case the Project outcomes.

Co-design of the streetscapes would be undertaken for the Project. The key aim of this process would be to provide residents of Little Eveleigh Street and Marian Street opportunity to collaborate with the Project team and other key stakeholders such as the City of Sydney in the design for these streetscapes. The process also aims to:

- understand the values and concerns of residents
- understand what residents would like to see or view as an opportunity for these streetscapes
- provide residents with opportunities to access key project specialists and better understand the process and constraints of design.

The co-design program, including a series of facilitated workshops, was scheduled to occur in early 2020 prior to the public display of the EIS. However, Australian Government guidelines around social distancing during the COVID-19 situation has resulted in the temporary postponement of face-to-face engagement activities such as these workshops. Online engagement would be used as a precursor to later face-to-face methods (or further online engagement if necessary). The co-design process would occur prior to the completion of the design program, with its form taking into consideration relevant health advice.

6.5.3 Aboriginal and Torres Strait Islander communities and stakeholder ongoing consultation

Ongoing engagement with local Aboriginal and Torres Strait Islander communities is planned throughout the life of the Project, to ensure that community needs and concerns are addressed. The engagement would include:

- meetings to discuss design development and heritage interpretation opportunities
- meetings to discuss employment and training opportunities.

Aboriginal heritage and culture has also been considered, and will continue to be considered and incorporated into the detailed design of the Project.

6.5.4 Public exhibition of Environmental Impact Statement

The development application and this EIS will be placed on public display by DPIE for a minimum statutory period of 28 days, in accordance with Schedule 1 of the EP&A Act. During the exhibition period any person may make a submission regarding the Project, and these submissions will be considered in the assessment of the development application. Submissions can be made online at <https://www.planningportal.nsw.gov.au/major-projects> or in writing (citing development application number SSI-10041) and addressed to the planning officer listed below:

Department of Planning, Industry and Environment
Attention: Director – Transport Assessments
GPO Box 39
Sydney NSW 2001

Consultation activities proposed to be undertaken during the public exhibition of the EIS include:

- release of an EIS summary document

- media releases
- online community information video sessions
- newsletter letterbox drop
- Project webpage updates
- newspaper advertising
- station posters
- phone calls and emails to persons or organisations who have registered to be on the project contact list
- social media campaigns
- offer of online stakeholder meetings (including Aboriginal and Torres Strait Islander engagement, local businesses, government agencies)
- door knocking adjacent residents should social distancing and health guidelines during COVID-19 allow.

During exhibition of the EIS, government agencies would also be offered Project briefings.

The feedback from this consultation period will be considered alongside the recommendations of the specialist studies being undertaken and will contribute towards developing a final detailed design to progress to construction (pending Project approval).

A 'Response to Submissions' report will be prepared following the EIS exhibition period. This report will summarise the key issues raised by the community and government agencies and provide a response to these issues.

6.5.5 Consultation during construction

Should the Project be approved, the construction contractor would consult with the community and stakeholders during construction. A *Community Liaison Management Plan (CLMP)* would be developed for engagement during the construction of the Project, in line with Section 4 of the Construction Environmental Management Framework (CEMF) in **Appendix D** of this EIS. This plan would be a working document that would be updated periodically to reflect any changes in the community, environment, or feedback received and includes:

- identification of potential construction impacts and mitigation measures
- details of stakeholders who may be impacted and details of how they will be consulted
- ongoing communication and consultation with stakeholders, local councils and other government agencies
- provision of regular updates to the nearby community
- development and implementation of a community complaints and response management system
- the mechanisms and tools that will be used to inform and consult the community such as notifications, phone calls, meetings, emails, posters/signage, online surveys, social media and doorknocks
- details on how members of the community can contact the project team
- Project website that would have up to date information available.

7 Environmental scoping assessment

This chapter describes the process undertaken to scope the environmental assessment contained within this EIS. This process began with the preliminary scoping within the Scoping Report prepared for the Project (TfNSW, 2019d). It also describes the subsequent prioritisation of environmental issues following provision of the SEARs and consultation undertaken for the Project.

7.1 Overview

The Scoping Report prepared for the Project (TfNSW, 2019d) contained a preliminary environmental risk analysis undertaken for the Project. It identified and categorised the potential environmental issues to be considered in the EIS, based on a risk rating for each issue, in accordance with the former Department of Planning and Environment's *Scoping an Environmental Impact Statement, Draft Environmental Impact Assessment Guidance Series June 2017* (Department of Planning, Industry and Environment (DPIE), 2017). This guideline sets out a methodology which provides a consistent framework for identifying environmental, social and economic matters which are likely to be impacted by the Project and the activities which are likely to cause those impacts.

The environmental risk analysis was undertaken in accordance with the principles of the Australian and New Zealand standard *AS ISO 31000:2018 Risk Management – Guidelines*. This involved ranking the risks by identifying the consequence of the impact and the likelihood of each impact occurring. The definitions of the consequence levels used for the assessment are provided in **Table 7-1**, and the likelihood in **Table 7-2**. The risk matrix is provided in **Table 7-3**. This risk analysis was used to categorise issues as 'key' or 'other.'

Table 7-1 Risk analysis consequence definitions

Consequence	Description
Major	<ul style="list-style-type: none"> • long term detrimental impacts on the environment or population • large impact area • reportable incident to external agency • may result in large fines and prosecution; operational constraints • high level of community concern.
Moderate	<ul style="list-style-type: none"> • substantial temporary or minor long-term detrimental impacts on the environment or population • moderate impact area • reportable incident to external agency • action required by reportable agency • community interested.
Minor	<ul style="list-style-type: none"> • minor impacts on the environment or population • small impact area • no operational constraints • some local community interest.

Table 7-2 Risk analysis likelihood definitions

Likelihood	Description
Unlikely	Unlikely to happen
Possible	Could happen and has occurred elsewhere
Likely	Could easily happen and would probably occur

Table 7-3 Risk matrix

		Consequence		
		Major	Moderate	Minor
Likelihood	Unlikely	Medium	Medium	Low
	Possible	High	Medium	Low
	Likely	High	High	Medium

7.2 Summary of environmental issues to be considered

Using the framework described above, the preliminary environmental risk analysis undertaken for the Project in the Scoping Report is presented in **Table 7-4**. The risk analysis identifies an initial risk rating for each of the environmental issues without mitigation. A description of how the risk ratings were derived are found in the Scoping Report (TFNSW, 2019d).

Further information regarding the existing environment and potential impacts associated with each environmental issue, along with mitigation and management, are provided in the respective chapter for each environmental assessment in this EIS (refer Chapters 8 to 22). **Chapter 25** of this EIS then discusses the residual risk for each environmental issue.

Table 7-4 Preliminary environmental risk assessment

Environmental issue	Consequence	Likelihood	Risk rating
Traffic, transport and access	Major	Likely	High
Noise and vibration	Major	Likely	High
Aboriginal heritage	Moderate	Unlikely	Medium
Non-Aboriginal heritage	Major	Likely	High
Social and business impacts	Major	Likely	High
Landscape character, visual amenity and urban design	Moderate	Likely	High
Land use and property	Moderate	Possible	Medium
Biodiversity	Minor	Unlikely	Low
Soils, geology, groundwater and contamination	Major	Unlikely	Medium
Flooding, hydrology and water quality	Major	Unlikely	Medium
Air quality	Minor	Likely	Medium
Hazard and risk	Moderate	Unlikely	Medium
Waste and resources	Minor	Likely	Medium
Climate change and sustainability	Minor	Likely	Medium

7.3 Prioritisation of potential issues

Based on the preliminary environmental risk analysis outlined above, key issues for the Project have been identified as those with a risk ranking of high, while other issues are those with a risk ranking of medium or low.

The issues identified have been re-ordered in this EIS in accordance with the Secretary's environmental assessment requirements (SEARs) issued for the Project, and further investigations undertaken for this EIS. The revised issues are shown in **Table 7-5**. Key issues identified are addressed first in this EIS, followed by other issues.

Table 7-5 Revised key issues and other issues

Issue	Where addressed in this EIS
Key issues	
Urban design	Chapter 8
Landscape and visual	Chapter 9 Technical report 1 – Landscape character and visual
Land use and property	Chapter 10
Social	Chapter 11 Technical report 2 – Social
Traffic and transport	Chapter 12 Technical report 3 – Traffic, transport and access
Noise and vibration	Chapter 13 Technical report 4 – Noise and vibration
Non-Aboriginal heritage	Chapter 14 Technical report 5 – Non-Aboriginal heritage
Aboriginal heritage	Chapter 15 Technical report 6 – Aboriginal heritage
Other issues	
Biodiversity	Chapter 16
Soils, groundwater and contamination	Chapter 17
Flooding, hydrology and water quality	Chapter 18 Technical report 7 – Flooding, hydrology and water quality
Air quality	Chapter 19
Hazard and risk	Chapter 20
Waste and resources	Chapter 21
Climate change and sustainability.	Chapter 22

7.4 Format of assessment chapters

For the benefit of the reader, a standardised approach has been adopted for the structure of each of the assessment chapters. The purpose of a standardised chapter structure is to provide a clear and consistent approach to the assessment of environmental impacts within this EIS. The standard structure of sections for each assessment chapter is as follows:

1. Introduction
2. Method of assessment

3. Existing environment
4. Impact assessment
5. Mitigation and management

A general description of the purpose and content of each of these sections is provided in **Table 7-6**.

Table 7-6 Assessment chapter structure and content description

Section	Content description
Introduction	Provides an overview of the scope of the assessment for the chapter. It sets out the SEARs relevant to the assessment and describes where they have been addressed. Where applicable this section also provides reference to the relevant specialist report which have been prepared for the assessment.
Method of assessment	<p>Provides the methodology which has been applied to guide the assessment. This includes (but is not necessarily limited to):</p> <ul style="list-style-type: none"> • the study area/area of investigation for the assessment • applicable guidelines and standards which have been applied to the assessment • key assumptions and limitations applied to the assessment. <p>For each environmental assessment there is an explanation of the approach to identifying impacts and assessing whether a potential impact is likely to be considered significant. Assessments can either be quantitative (relying on criteria, standards and thresholds) or qualitative (using certain scientific material, but ultimately making decisions based on professional judgement).</p>
Existing environment	<p>A description of the existing environment. Where applicable this is with reference to the supporting specialist report. This may include (but is not necessarily limited to):</p> <ul style="list-style-type: none"> • key features and/or receptors which are relevant to the assessment • background information/monitoring • details of previous studies which contain relevant information.
Impact assessment	<p>An assessment of the impacts of the construction and operation of the Project within the context of the existing environment, in accordance with the method of assessment described. The level of detail and focus of the impact assessment is guided by the Project SEARs. Each matter has been assessed as either:</p> <ul style="list-style-type: none"> • a 'Key Issue Assessment' in accordance with Desired Performance Outcome 3 (Assessment of Key Issues) of the SEARs (refer Appendix A) • an 'Other Issue Assessment' where the impacts are reported in this EIS and which can typically be managed through routine mitigation and management measures. <p>Where existing criteria, guidance, environmental standards or assessment methodologies exist, the significance of an impact is based on that information. Where possible and/or necessary quantitative judgements about the significance of an impact is made using this information. Where no explicit guidance or information exists, qualitative judgements of the significance of an impact are made. Where qualitative judgements are required, some or all of the following impact characteristics are considered to understand the impact:</p> <ul style="list-style-type: none"> • extent – the area potentially affected by the impact • magnitude – the size or amount of the impact

Section	Content description
	<ul style="list-style-type: none"> • duration – how long the impact is likely to last • frequency – whether the impact is continuous, brief or intermittent • timing – if the impact occurs at a particularly sensitive time • permanence – whether the impact is permanent or temporary. <p>The judgement as to whether an impact is significant depends on the importance or sensitivity of the receptor (e.g. as defined by legislation, policy, standards or guidance) and the magnitude of the impact affecting it (as decided by quantitative or qualitative means).</p> <p>The impact assessment sections of each chapter deal with impacts from the Project only; potential cumulative impacts (i.e. those in conjunction with impacts from other surrounding projects) are addressed in Chapter 23 of this EIS.</p>
Mitigation and management	<p>Provides an analysis of how the potential environmental impacts can be avoided, minimised or managed.</p> <p>Performance outcomes and mitigation measures are summarised in this section.</p> <p>A Construction Environmental Management Framework has been developed for the Project (refer Chapter 24 of this EIS). CEMPs would be developed for the Project and align to this framework. The CEMPs would outline performance outcomes to be achieved and include the mitigation and management measures for construction of the Project.</p> <p>At the end of each mitigation and management section in this EIS, the likely residual impacts expected (post-mitigation) are outlined and a discussion of the acceptability of any residual impacts with reference to relevant standards or guidelines is provided.</p>

8 Urban design

An Urban Design and Public Domain Plan (DesignInc, 2020) has been prepared for the Project and is included in **Appendix C** of this EIS. This chapter summarises the key aspects of that plan, and how the Project has been designed to address the SEARs.

8.1 Introduction

This chapter considers the potential urban design benefits and constraints arising from the Project. The scope of this urban design assessment is to:

- describe how the document: Urban Design and Public Domain Plan informs the detailed design of the Project
- assess the Urban Design and Public Domain Plan against the SEARs and outline how those requirements have been addressed
- provide recommendations on measures to be implemented in further detailed design planning in order to meet the relevant urban design objectives and requirements of the SEARs.

The relevant urban design SEARs are outlined in **Table 8-1**.

Table 8-1 SEARs

SEARs	Where addressed in this EIS
Place and Urban Design	
1. identify how the Project contributes to a well-designed built environment and meets the objectives of Better Placed.	Section 8.4.2
2. identify accessibility elements and assess impacts on: <ol style="list-style-type: none"> cross corridor pedestrian and cyclist access, and the locations of public transport gate lines impacts on cyclists and pedestrian access, amenity and safety across and adjoining the Project opportunities to integrate cycling and pedestrian elements with the surrounding network. 	Section 8.4.3
3. identify the design process that has been used to inform the EIS design and will be used to refine the design, including, for example, the use of design review panels and consultation with community and other stakeholders.	Section 8.4.4
4. provide before and after visual representations of the Project from key receiver locations, state heritage items and conservation areas to illustrate the visual impacts.	Section 9.4 in Chapter 9
5. identify how the Project will achieve a net increase in tree canopy in the vicinity of the project.	Section 8.4.5 and Section 9.5.1 in Chapter 9
6. address the maintenance of the Project.	Section 8.4.6

8.2 Method of assessment

The methodology used to address the urban design considerations and public domain implications for the Project involved:

- review of the Urban Design and Public Domain Plan (**Appendix C** of this EIS) to understand the study area identified for this assessment

- a site inspection of the station and public domain to identify urban design constraints and opportunities
- review the urban design objectives of the Project to confirm whether they enhance the station amenity and integration with the surrounding area. The Project objectives were developed based on the NSW Government's '*Better Placed*' guidelines and TfNSW's policy document '*Around the Tracks – urban design for heavy and light rail*'
- review of existing urban design studies and strategies for areas affected by the Project. These include:
 - Central to Eveleigh Urban Transformation Strategy, Urban Growth NSW, 2016
 - North Eveleigh Concept Plan, for Redfern-Waterloo Authority, URBIS, 2008
 - Heritage Interpretation Plan Redfern Train Station, Interim Final Report, Curio Projects, 2018
 - Eveleigh Works Interpretation Plan, prepared for State Rail Authority NSW, Paul Davies Pty Ltd, Architects Heritage Consultants, 2000
- assessment of the temporary impact of construction of the Project on the public domain and setting of the study area
- assessment of whether measures to create, promote and enhance connectivity across the rail corridor, as identified in the Urban Design and Public Domain Plan are effective
- assessment of whether there are impacts to connectivity associated with the Project
- demonstration of how the proposed urban design and public domain elements would be consistent with the existing and desired future character of the area.

8.3 Existing environment

8.3.1 Study area

The study area for this assessment is delineated by Lawson Street to the north, Gibbons Street to the east, Marian Street and South Eveleigh to the south, and Little Eveleigh Street and the North Eveleigh Carriageworks site to the west.

The existing northern concourse at Redfern Station is located at the high point of the surrounding neighbourhood of Redfern with expansive views of the city skyline to the north. The existing station is open and located within a cutting. There are views over the existing heritage platform buildings from the northern concourse across to Marian Street, Little Eveleigh Street to the rail corridor and South Eveleigh.

The southern end of Redfern Station is characterised by more public open space within the sloping Gibbons Street Reserve and South Eveleigh. It also borders residential areas, such as the Watertower building, residences on Little Eveleigh Street, and the North Eveleigh Precinct lands.

Land use in the area primarily comprises low density residential, commercial and mixed-use and includes South Eveleigh and Carriageworks. The built form character of Redfern Station is defined by the heritage of its mid-Victorian architecture of the station and surrounding suburbs.

Redfern was originally a working-class suburb inhabited by railway and factory workers. Redfern and the surrounding suburbs played a large role in the social network of railway workers throughout Sydney's history. During the late nineteenth and twentieth centuries, many Aboriginal people found employment in factories in Redfern (as well as Chippendale, Waterloo and Alexandria), though Aboriginal associations with Redfern became more pronounced in the 1970s when the Aboriginal Housing Company purchased properties there. To the present date Redfern Station has important ties to the local Redfern Aboriginal community.

In recent years, Redfern's location in close proximity to the city, has led to gentrification of the suburb giving rise to rising housing prices. However, there are still areas within Redfern-Chippendale and Waterloo-Beaconsfield experiencing high levels of unemployment, as well as a large number of social housing residences in these areas (ABS, 2016).

New high-rise residential developments have recently been completed between Regent and Gibbons Streets, with restaurants and shops activating these street fronts. A new residential conversion of the TNT buildings between Lawson and Redfern Street is being undertaken. A 24-storey student tower has been proposed for the former 'Block' site owned by the Aboriginal Housing Company (the Pemulwuy Project) and is currently under construction.

There are no commuter car parks near the station. Car parking to the west within North Eveleigh, and the car park to the east, accessed from Marian Street are currently used by Sydney Trains staff. Both timed and untimed public street parking in nearby streets including Cornwallis Street are available to the public.

The suburb of Darlington is located west of the station, and the suburb of Eveleigh to the south and west and includes Redfern Station. The areas west of the station, towards the University of Sydney, are characterised by two storey brick terraces, three storey warehouse conversions, and some heritage items related to the history of the railway yards, with a large portion of the area being designated as a Heritage Conservation Area or within the NSW State Heritage Listed Redfern Railway Workshops.

The main pedestrian pathways between the University of Sydney and Redfern Station are located along Little Eveleigh Street and Lawson Street.

The western side of the station around Little Eveleigh Street is characterised by street trees and small residential front porches and gardens, typical of the terrace housing typologies which frame the street. A small, paved plaza at the end of Little Eveleigh Street prevents vehicle movements accessing Wilson Street. There is also a small single-lot 'pocket' park in the middle of Little Eveleigh Street.

The street is narrow with street parking on one side and a narrow contraflow bike lane. The width of the footpaths is variable, between less than a metre to 1.8 metres wide. Such disparity occurs due to the number and diversity of elements which protrude or interfere with the footpaths along the edges of the street including street trees, entry steps to residences and planter beds.

The residential setbacks vary along the street frontage. In some cases, access to the residences occur directly off the footpath or with steps protruding onto the footpath, further reducing the footpath widths. There are several large gum trees near Ivy Lane to the northern end.

To the east of Redfern Station, tall residential apartments are typically newer developments, with ground floor commercial and retail uses with apartments above. Medium density residential apartment blocks are typically older buildings, with some comprising re-purposed industrial buildings fringing the rail corridor.

8.3.2 Urban design opportunities and constraints

Existing urban design constraints identified for the study area include:

- narrow footpaths along Little Eveleigh Street with vehicular/cyclist/pedestrian conflicts
- narrow platforms, in particular Platform 8/9, which limits the stair and lift landing locations
- the tunnel and vent stacks on and below Platform 1 limit the positioning of the concourse
- a narrow Marian Street shared zone route and stair access entry/exit point from Platform 10 to South Eveleigh resulting in a conflict between pedestrian and cars
- Redfern Station is listed on the NSW State Heritage Register
- the majority of the wider study area is within a Heritage Conservation Area
- the need to cater for the future developments within the precinct
- the level difference between Rosehill and Marian Streets, and Gibbons Street
- existing residential driveways on Little Eveleigh, Marian and Cornwallis Streets.

Urban design opportunities within the study area include:

- new pedestrian concourse providing east-west corridor access
- new lifts and stair access to all above ground platforms

- heritage interpretation opportunities provided by the heritage context of the Station and wider study area
- improved accessibility at Marian Street and Little Eveleigh Street through a new shared zone
- new station entries with an activated and enhanced public domain along Little Eveleigh and Marian Streets
- potential to maximise street trees, tree canopy and landscaped areas in the study area, with new paving treatments where possible
- additional bicycle parking
- new kiss and ride and community bus zone on Lawson Street and Gibbons Street.

8.4 Impact assessment

This section addresses each of the Place and Urban Design SEARs for the Project and provides commentary on how the urban design elements of the Project meet the SEARs. It considers:

- the 'Better Placed' guidelines
- how the Project addresses the accessibility elements of the Project
- how the Project has been designed, and the process for ongoing design development
- how the Project would result in a net increase in tree canopy
- how maintenance of the Project, including public domain, would be managed.

8.4.1 Urban design during construction

Construction of the Project would require the temporary use of barriers, hoardings and fences which have the potential to impact upon existing pedestrian and cyclist connectivity in the Project area. This could potentially increase the walking distances of customers while also potentially adding extra obstacles on already narrow footpaths.

While these impacts have a high potential to occur, they would be temporary and readily manageable through measures outlined throughout this EIS. Potential urban design impacts during construction are therefore considered minimal.

8.4.2 The objectives of 'Better Placed' guidelines

The Project design has been developed based on the built environment design policy of the NSW's Government Architect 'Better Placed' document and TfNSW's policy document '*Around the Tracks – urban design for heavy and light rail*'. The objectives of the 'Better Placed', as well as an assessment of the Project against these guidelines is provided below.

Objective 1 – Better Fit, contextual local and of its place

The Project would provide a clear alternative and direct route to cross Redfern Station. The Project would also re-establish the previous east-west link across the rail corridor that was once provided by the 1914 footbridge.

The Project would integrate with the surrounding neighbourhood by retaining the building at 125-127 Little Eveleigh Street, as it is a Contributory Item in the surrounding Darlington Conservation Area. The building is proposed to be adaptively re-used as a station entry with the interior of the station portion of the building to be transformed into a forecourt, exposing the heritage fabric of the building. Much of the exterior of the building would be retained, with a canopy opening to the ticket gate-line. The remainder of the building would be designed so as to not preclude other uses (e.g. retail and office space) in the future.

The existing station is State heritage listed and buildings within the station precinct would be retained. One station building on Platform 1 would be relocated further south along the platform to accommodate the new concourse. The design of the concourse is simple in form and colour, to both complement and be sympathetic to the existing heritage buildings.

The Marian Street entrance would be an open, shaded plaza area. The plaza would include seating, and pedestrian priority shared zones would provide an improved public amenity for the neighbourhood.

The proposed shared zone on Little Eveleigh Street and the extension to the existing shared zone on Marian Street would improve the public domain conditions, as well as, pedestrian accessibility to the surrounding neighbourhoods by reduced traffic speeds, improved pedestrian safety and enhanced walkability.

Objective 2 – Better Performance, sustainable adaptable and durable

The Project would establish a durable and sustainable station concourse and station entrance that would be resilient to changing climates. The materials chosen for the footbridge and stairs are durable and would provide weather protection to customers while allowing natural air flow. Rainwater harvesting would be used for toilets, cleaning and irrigation and would further improve the stations resilience and sustainability. The replacement of an asphalt footpath with paving treatments, as well as planting beds for new trees on Little Eveleigh Street would promote a more amenable public domain. The Project would therefore integrate water sensitive urban design (WSUD) into the public domain, resulting in overall sustainable outcomes.

Objective 3 – Better for Community, inclusive connected and diverse

The Project would provide connectivity and permeability across the rail corridor and into the station that is accessible to all using Platforms 1-10. The alignment of the bridge and location of new station entries allows for a direct, connection across the rail corridor.

A draft Heritage Interpretation Strategy (Tonkin Zulaikha Greer Architects, 2019) has been prepared for the Project. It highlights the way in which the Project seeks to engage with the local artists and Aboriginal community to use the station as an opportunity to tell their story through multiple heritage interpretation, landscape design and public artworks. Section 6.5 of **Chapter 5** of this EIS outlines the process for the engagement with the Aboriginal community during the next stages of the Project.

Objective 4 – Better for people, safe, comfortable and liveable

The Project would maximise the amenity of the public domain and multi-modal transportation connections through the development of a new public space at Marian Street and Marian Street shared zone. The proposed entry plaza at Marian Street would provide an inviting new station entry, with improved amenity, seating and shading, which would enliven the space, enabling activation and improved safety and security.

Positive public space outcomes would also be realised through a new shared zone on Little Eveleigh Street including improved planting areas in front of houses paving treatments along the entire length of the street and lighting upgrades providing improved amenity, safety and security.

The Project would enable access to the aboveground areas of the station with lift access being provided to and from Platforms 1-10. Unisex ambulant toilets and a family accessible toilet are provided in the re-purposed 125-127 Little Eveleigh Street building. A family accessible toilet would also be provided at the Marian Street entrance. The proposed concourse landings at platform level would extend to the existing station platform buildings and provide additional covered and shaded area on the station platforms.

The short, straight alignment of the Project also allows for clear sightlines that support better perceptions of safety. Crime Prevention Through Environmental Design (CPTED) techniques have also been incorporated into the design both within the concourse and externally of the Station.

Objective 5 – Better working, functional efficient and fit for purpose

The Project would allow for an easily navigable station that is designed for current and future growth of the neighbourhood and city. The concourse layout would be simple, clear, and consistent for improved wayfinding. The glazed viewing windows intermittently placed along the concourse would provide corridor views to the existing heritage station and platform buildings as well as landmarks such as South Eveleigh and the Eveleigh Railway Workshops assisting with customer orientation and appreciation of the heritage items within the precinct.

Objective 6 – Better value, creating and adding value

The Project would improve public amenity and allow for future growth and activation of spaces by providing new public space at Marian Street.

The shared zone upgrade to Little Eveleigh Street would transform the existing street which consisted of street parking into a pedestrian focussed public domain, with visual separation and privacy for residents using planted edge treatments and soft lighting. The new shared zone on Little Eveleigh Street would provide improved landscape and urban design outcomes.

The Project would offer the opportunity of expanding the walking catchment of Redfern Station and the local community. These changes would enhance the customer experience. The improved station precinct is expected to encourage more pedestrian activity and passive surveillance, which may discourage antisocial behaviour such as graffiti and vandalism. Furthermore, possible abatement measures, such as garden buffers and landscaping to separate properties from pedestrians would be considered during detailed design.

Objective 7 – Better look and feel, engaging, inviting and attractive

The Project would provide a design that is inviting, engaging, and visually attractive. It would integrate views, vistas, and heritage interpretation to engage users. It is visually interesting on its own while providing a backdrop to the existing station precinct to the north.

8.4.3 Accessibility

The following key features of the Project demonstrate how pedestrian and cyclist access, amenity and safety would be maintained or improved by the design of the Project:

- the alignment of the bridge and location of new station entries provide a direct cross corridor connection between Little Eveleigh Street and Marian Street
- transport gate lines are proposed at the entrance to the concourse off Marian Street and at the repurposed 125-127 Eveleigh Street, with the footbridge to have a straight alignment across the corridor. From the top of stair at Marian Street concourse there is a clear sightline to Little Eveleigh Street
- the Project layout is simple, clear, and consistent
- improved cyclist amenities including new bike hoops on the north end of Little Eveleigh Street, with new landscaped areas to provide a visual and physical buffer to residences, and new bike hoops adjacent to the Marian Street entrance
- restricted speeds for traffic improving safety for cyclists and pedestrians in both directions.

8.4.4 The design process

The design process for the Project has included the following stages:

- precinct and site context analysis and familiarisation
- opportunities and constraints analysis
- design optioneering
- multi-criteria analysis
- four design review panel sessions with the independent TfNSW Design Review Panel between September 2018 and November 2019
- public and stakeholder consultation throughout 2019 and 2020
- customer centred design.

The concept design development has been developed through an iterative and collaborative approach. Further details on this process is provided in **Chapter 4** of this EIS.

The detailed design process will continue to be informed by stakeholder consultation, and will be subject to review by the independent TfNSW Design Review Panel.

8.4.5 Tree canopy

Removal of several street trees is required for the construction of the Project. The design has and would continue to be informed by the TfNSW *Tree Offset Guide* (TfNSW, 2019), and a positive balance in tree planting would be achieved through new tree planting in the areas surrounding the Station, including along Little Eveleigh Street and Marian Street.

Tree removal would be mitigated using the following principles outlined in the *Tree Offset Guide*:

- offset 100 per cent of any vegetation cleared
- achieve an 'improved or maintained' ecological outcome when offsetting impacts on native vegetation
- offset the heritage, public amenity and/or visual landscape value of any trees removed where they may not have ecological value.

Project commitments regarding an increase in tree canopy are provided in **Chapter 9** of this EIS and the potential biodiversity impacts of the Project are discussed in **Chapter 16** of this EIS.

8.4.6 Maintenance

The Project has been designed to consider the cost of maintenance. The Project would include perforated metal screens as part of the design of the concourse would better conceal dirt and graffiti that is difficult to remove compared to other materials such as glass.

Maintenance of public domain elements along Little Eveleigh Street and Marian Street would be the responsibility of City of Sydney.

Maintenance of the train station facilities and concourse would be the responsibility of Sydney Trains.

Where there would be maintenance requirements, cladding and external material choices have been chosen in consultation with City of Sydney and Sydney Trains and informed by their feedback.

8.5 Management and mitigation

8.5.1 Overview

A CEMF (**Appendix D** of this EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

Urban design of the temporary construction works is a key consideration of the CEMP. The management of these works would be developed for the Project as identified by Section 6.4 of the CEMF. Further, an Urban Design and Public Domain Plan has been prepared early in the design process to ensure that urban design is a key consideration in the design (refer to **Appendix C** of the EIS).

The section includes a compilation of the performance outcomes and mitigation measures, including those that would be included in the CEMP.

8.5.2 Performance outcomes

The performance outcomes for the Project in relation to Urban Design include:

- minimal impacts to existing structures during construction
- a public domain that is accessible, legible and safe during construction
- a public domain that is accessible, legible and safe during operation
- public domain finishes reference the City of Sydney Public Domain Manual
- selection of materials that are durable and easy to maintain during operation
- clear pedestrian circulation space inside and outside the station, at station entries and adjoining streets during operation

- landscaping with street trees selected for canopy and shade.

The Project would be designed, constructed and operated to achieve these performance outcomes.

8.5.3 Mitigation

A list of mitigation measures which would be implemented during the construction and operation of the Project are provided in **Table 8-2**.

Table 8-2 Mitigation measures

ID	Mitigation Measure	Applicable location (s)
Construction		
UD1	Tree retention and planting would continue to be a key priority in informing design decisions throughout detailed design.	Project area
Operation		
UD2	A maintenance plan would be prepared in consultation with City of Sydney and TfNSW outlining the maintenance responsibilities of each entity with a particular focus on the transition areas between the public domain and the Station.	Project area

9 Landscape character and visual

This chapter provides a summary of the results of the Landscape and visual impact assessment (AECOM, 2020). A full copy of the assessment report is provided as **Technical report 1 – Landscape and visual**.

9.1 Introduction

The Place and Urban Design requirements in the SEARS relate to visual ‘character’ and ‘quality’ of the surrounding environment as well as visual impacts. These requirements are addressed in this chapter which incorporates all of these considerations and uses terminology which is consistent with the relevant industry assessment guidelines (refer to **Section 9.2**). This chapter also considers the construction and operational impact of the Project on the urban landscape and visual setting of the Project and identifies performance outcomes supported by mitigation measures to manage the potential impact.

As well as addressing the SEARs, this chapter also addresses the commitments made in the Scoping Report (TfNSW, 2019d) for the Project. The relevant SEARs and requirements from the Scoping Report, and where these are addressed, are outlined in **Table 9-1**.

Table 9-1 SEARs and Scoping Report requirements

SEARs	Where addressed in this EIS
Place and Urban Design	
1. identify how the Project contributes to a well-designed built environment and meets the objectives of Better Placed.	Section 8.4.2 in Chapter 8
2. identify accessibility elements and assess impacts on: <ol style="list-style-type: none"> cross corridor pedestrian and cyclist access, and the locations of public transport gate lines impacts on cyclists and pedestrian access, amenity and safety across and adjoining the Project opportunities to integrate cycling and pedestrian elements with the surrounding network. 	Section 8.4.3 in Chapter 8
3. identify the design process that has been used to inform the EIS design and will be used to refine the design, including, for example, the use of design review panels and consultation with community and other stakeholders.	Section 8.4.4 in Chapter 8
4. provide before and after visual representations of the Project from key receiver locations, state heritage items and conservation areas to illustrate the visual impacts.	Section 9.4
5. identify how the Project will achieve a net increase in tree canopy in the vicinity of the project.	Section 8.4.5 in Chapter 8 and Chapter 16
6. address the maintenance of the Project.	Section 8.4.6 in Chapter 8

Scoping report	Section addressed
Landscape and visual	Section 9.3
1. review topographic maps and aerial photography to identify features such as landform, elevation, land cover and distribution of residential properties and visual receptor locations.	
2. review available information on likely landscape sensitivities including zoning or other designations relevant to landscape and visual amenity.	Section 9.3
3. determine the potential extent and visibility of the Project.	Section 9.4
4. assess the landscape character impact and visual impact of the Project.	Section 9.4
5. identify mitigation measures to be integrated into the design development process to address the residual adverse impacts identified in the assessment.	Section 9.5

9.2 Method of assessment

The methodology for the assessment was undertaken following the *Guidelines for Landscape and Visual Impact Assessment*, Third Edition (Landscape Institute and Institute for Environmental Management (UK), 2013) (GLVIA3).

To identify elements and features relevant to the Project, a landscape character assessment was undertaken. Landscape Character Zones (LCZs) have been defined to provide a framework to more clearly describe the area and assess how the Project would affect the elements that make up the landscape.

9.2.1 Study area

The Project study area includes a 250 metre radius from the proposed station entry on Little Eveleigh Street. This study area extent is considered conservative given the low elevation of the station platforms and the visual screening provided by the nearby buildings. The study area is only relevant for the visual receptors who would receive views during operation, as the ancillary facilities have been assessed based on proximity.

9.2.2 Landscape character assessment

Assessment of landscape effects deals with the effect of change and development on landscape as a resource in its own right. Landscape effects are assessed at operation of the Project. Landscape effects are not assessed during construction as these effects are temporary and cease to have an impact on landscape character at the conclusion of construction. Impacts to landscape character are determined based on the sensitivity of the element of change and the magnitude of change that is likely to occur.

The consideration of potential impacts on landscape character is determined based on the existing landscape and its sensitivity to change, and the magnitude of change that is likely to occur. The sensitivity and magnitude of landscape effects address the following specific criteria:

- sensitivity of the landscape to proposed change, based on:
 - susceptibility to change – ability of the landscape receptors to accommodate the proposed development without undue consequences
 - value of the landscape, which may relate to the physical state of the landscape and its intactness from a physical, functional or ecological perspective, heritage or cultural values that may be associated with the landscape, or educational or recreational values
- magnitude of the landscape effect, based on:
 - size or scale of change

- geographical extent of effects
- duration and reversibility of effects.

The extent of sensitivity and magnitude are each assessed and graded as being High, Moderate, Low or Negligible. A matrix is then used to combine the ratings for sensitivity and magnitude to provide an overall ranking of impact on landscape character which is graded as being High, High to Moderate, Moderate, Moderate to Low, Low or Negligible in relation to the existing environment (refer **Table 9-2**). Where there is no effect on the magnitude of change for a receptor, a No Impact rating can be given.

Table 9-2 Landscape character impact grading matrix

		MAGNITUDE			
		HIGH CHANGE	MODERATE CHANGE	LOW CHANGE	NEGLIGIBLE CHANGE
SENSITIVITY	HIGH	HIGH	HIGH TO MODERATE	MODERATE	NEGLIGIBLE
	MODERATE	HIGH TO MODERATE	MODERATE	MODERATE TO LOW	NEGLIGIBLE
	LOW	MODERATE	MODERATE TO LOW	LOW	NEGLIGIBLE
	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE

9.2.3 Visual impact assessment

The evaluation of potential effects on visual amenity is based on the sensitivity of the viewpoint (and the visual receptors it represents) to change, and the magnitude of change arising from the Project that is likely to occur. The sensitivity and magnitude of visual effects address the following specific criteria:

- the sensitivity of each viewpoint is mainly a function of:
 - the occupation or activity of the people experiencing the view at particular locations
 - the extent to which their attention or interest may be focused on the views and the visual amenity
 - value attached to the view experienced
- the magnitude of change to views and visual amenity depends on:
 - size or scale of change in the view with regard to the:
 - loss or addition of features and changes in its composition
 - degree of contrast or integration of any new features with the existing landscape in terms of form, scale and mass, line, height, colour and texture
 - nature of the view of the Project in terms of amount of time it would be experienced, and whether the views would be full, partial or glimpses
 - geographical extent of the visual effect with different viewpoints including the:
 - angle of view in relation to the main activity of the receptor
 - distance of the viewpoint from the Project
 - extent of area over which the changes would be visible
 - duration and reversibility of visual effects, for example:
 - duration in terms of short term (0-5 years), medium term (6-15 years) or long term (16-30+ years)
 - reversibility with regard to the prospects and practicality of a proposed change being reversed in a generation.

The extent of sensitivity and magnitude are assessed and graded as being High, Moderate, Low or Negligible. A matrix is then used to combine the ratings for sensitivity and magnitude to provide a ranking of visual impact (refer **Table 9-3**). A qualitative assessment further assigns a rating of Adverse, Neutral or Positive to the change in the views seen by receptors.

In addition to assessing the visual impact at operation, a high-level commentary has been provided around likely construction effects of the Project. Visual receptors have been considered in terms of the views they are likely to obtain from locations within proximity of the Project. Viewpoint locations are shown in **Figure 9-1**.

Table 9-3 Visual impact grading matrix

		MAGNITUDE				EFFECT		
		HIGH CHANGE	MODERATE CHANGE	LOW CHANGE	NEGLIGIBLE CHANGE	ADVERSE	NEUTRAL	POSITIVE
SENSITIVITY	HIGH	HIGH	HIGH TO MODERATE	MODERATE	NEGLIGIBLE			
	MODERATE	HIGH TO MODERATE	MODERATE	MODERATE TO LOW	NEGLIGIBLE			
	LOW	MODERATE	MODERATE TO LOW	LOW	NEGLIGIBLE			
	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE			

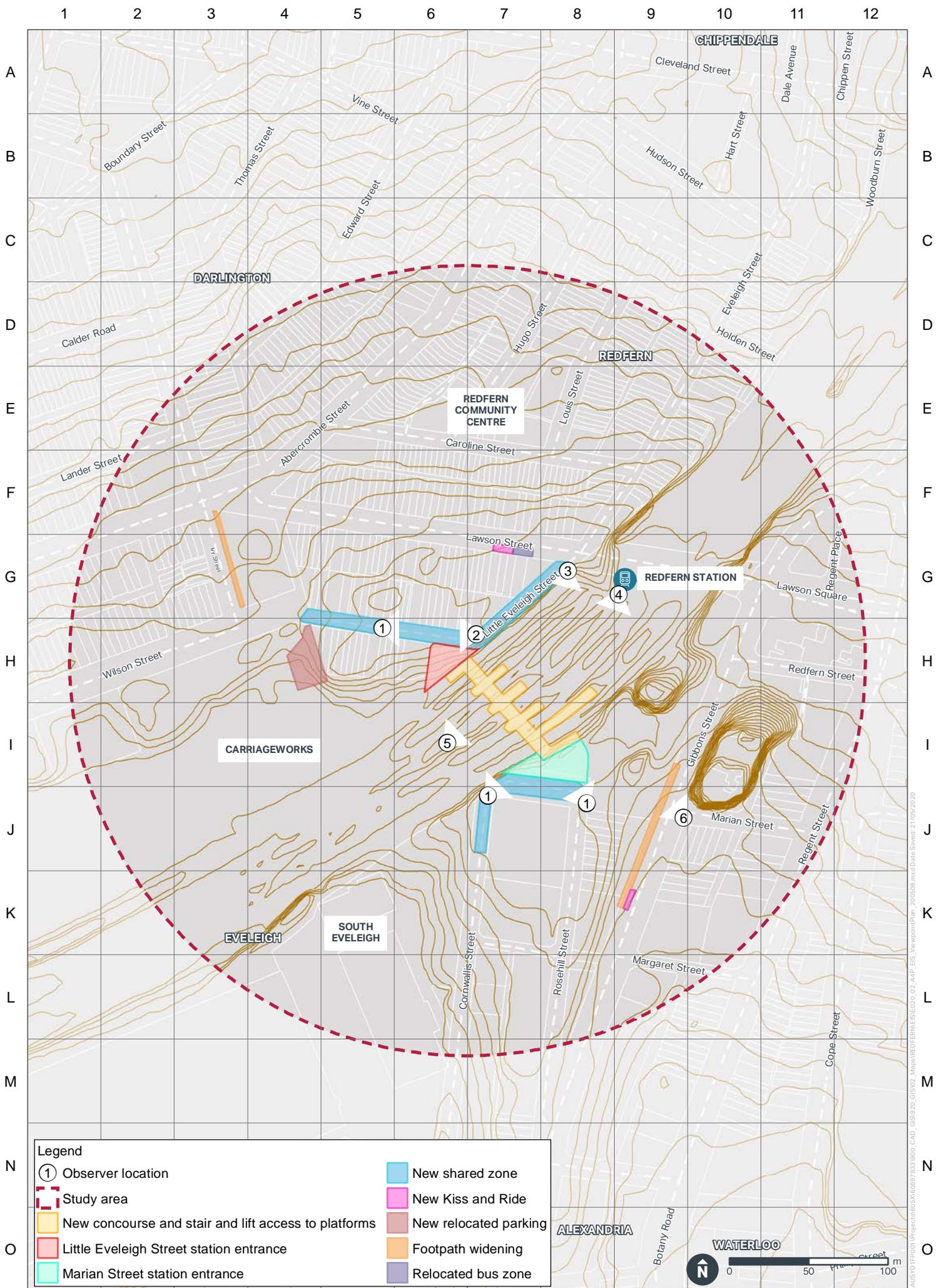


FIGURE 9-1: PLAN OF VIEWPOINTS

Source: Imagery © Nearnmap, 2019.

9.3 Existing environment

Five Landscape Character Zones (LCZs) have been identified within the broader landscape setting (refer to **Figure 9-2**):

- LCZ 1: Rail Corridor
- LCZ 2: Community and Education
- LCZ 3: Mixed Use Commercial and Residential
- LCZ 4: Residential
- LCZ 5: Public Recreation

Each landscape character zone is discussed below.

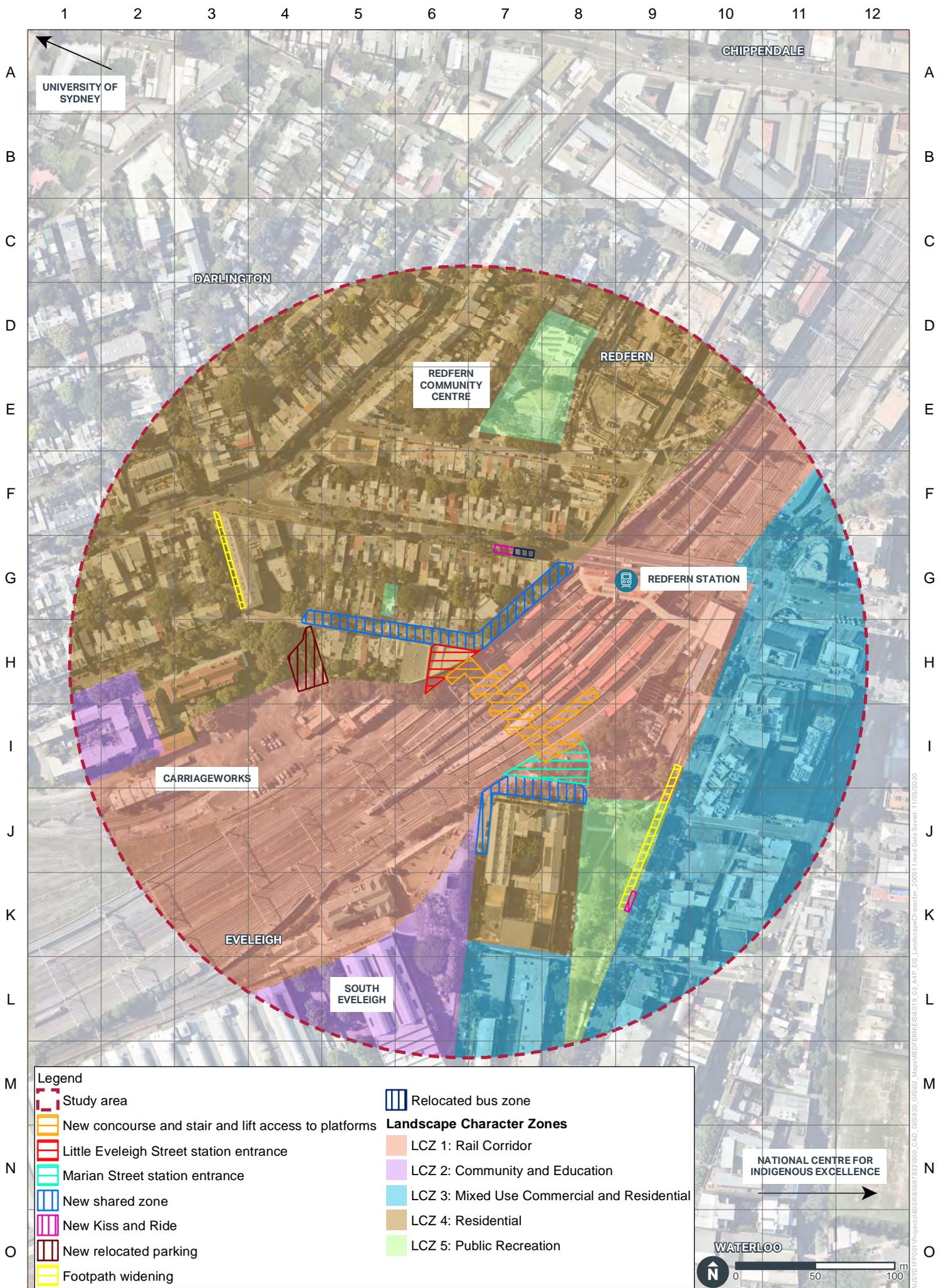


FIGURE 9-2: LANDSCAPE CHARACTER ZONES

Source: Imagery © Nearmap, 2019.

9.3.1 LCZ 1 – Rail Corridor

LCZ 1 includes Redfern Station and the rail corridor. This area is generally flat and comprises a wide, linear corridor which contains rail infrastructure such as tracks, gantries, overhead wiring, signals and operating trains. Small built form lies within the corridor, comprising of the existing station concourse and platform buildings, sheds and electrical infrastructure.

Redfern Station has multiple station entrances from which to enter the rail corridor. Each entrance has a different character, reflecting the different time at which each was constructed. The multiple entrances at Redfern station each reflect the character of the time in which they were constructed, such as the Lawson Street entrance, which was the original entry to the station constructed in the mid 19th Century. Other, more recent entries were constructed to spread the pedestrian load to the platforms. The Gibbons Street entrance is the newest entrance, with the more modern architecture characterising the entrance. The Marian Street entrance is a minor station entry which provides an entrance to and connectivity from the south to the rail network onto Platform 10 alone. It comprises a single gate entry with limited architectural features.

The platforms of Redfern Station lie below the surrounding landscape in a rail cutting. The platforms and rail corridor are visually contained by the retaining walls on either side of the corridor.

9.3.2 LCZ 2 - Community and Education

Community and education facilities within the area include South Eveleigh, Carriageworks, the University of Sydney and the National Centre of Indigenous Excellence. These facilities typically comprise of large buildings set within precincts. Precincts are often landscaped areas with well-planned pedestrian networks. Built form and landscaping within this LCZ interprets the change overtime of these areas and often retains the heritage elements within them.

9.3.3 LCZ 3 - Town Centre and Retail

This area comprises largely of commercial areas to the east of the Project along Redfern and Gibbons Streets, and to the south of the Project between Cornwallis and Rosehill Streets. The character of this area is defined by wide, busy streets, tall buildings with similar setbacks from the street, and built form typically fronting the footpath. The streetscape includes limited vegetation and typically signalised road intersections, with housing of varying density including tall residential developments along Gibbons Street as well as one to two storey shops.

Within the study area part of this LCZ is designated as Local Centre under the *Sydney Local Environmental Plan 2012* and forms part of the town centre of Redfern. This area (which lies to the east of the station) differs from the western side of the station (which contains some pockets of smaller scale retail and cafe) and contains a mix of hotels, strip retail shopping, a police station and ground floor commercial/retail under tall residential buildings.

9.3.4 LCZ 4 – Residential

This area primarily consists of residential areas with either single or double storey semi-detached housing or taller residential apartments. Lower density residential development is typically found to the west of Redfern Station, and medium to high density housing to the immediate east of the station. Residential terraces are punctuated by occasional small-scale retail and cafes on main roads.

To the east of Redfern Station lies a small area of this LCZ between Cornwallis and Rosehill Streets, bounded to the north by Marian Street and to the south by Margaret Street. This residential comprises two apartment blocks. These residential buildings are a slightly higher density than the residential development to the west of the rail corridor, but are similar in character, positioned on quiet, narrow streets and with tree, shrub and groundcover planting at the street interface.

The residential development to the west of the station is typically older and smaller in scale, comprising of single and double storey terrace housing, typically of the Victorian era, with balconies overlooking the road corridor and similar awning and fencing details. The area to the west of the station is listed in the Sydney LEP 2012 as a heritage conservation area.

9.3.5 LCZ 5 – Public Recreation

Three public spaces are located within the study area which include Gibbons Street Reserve, Little Eveleigh Street Reserve and the park outside of the Redfern Community Centre. These spaces are

well vegetated with mature trees and shrubbery and provide formal seating and in the case of the park outside the Redfern Community Centre, a formal playground. Spaces with significant community value include Little Eveleigh Reserve and the Redfern Community Centre which are located within the Darlington Heritage Conservation Area.

9.4 Impact assessment

9.4.1 Construction

Impacts on the landscape character was not assessed for the construction period of the Project as these effects are temporary and cease to have an impact on landscape character at the conclusion of construction. As such, only visual impacts were assessed, as provided in this section.

Visual

As described in **Chapter 5** of this EIS, construction activity due to the Project would occur in several locations, including:

- three ancillary facility areas and associated proposed traffic routes
- Redfern Station and surrounds with construction works comprising:
 - a six metre wide concourse between Little Eveleigh Street and Marian Street
 - new stair and lift access from the concourse to Platforms 1 to 10
 - an upgraded station entrance at Marian Street including station services and customer amenities
 - a new station entrance at Little Eveleigh Street including station services and customer amenities
 - formalisation of a shared zone on Little Eveleigh Street

upgrade of Marian Street/Cornwallis Street/Rosehill Street area. Vegetation removal would be required to facilitate this construction work, with a number of trees being removed within the Project area (refer to **Chapter 16** of this EIS. Construction elements would include site sheds, site hoarding and fencing, car parking facilities for construction vehicles, mobile construction equipment, lighting and elevated work platforms including cranes and scissor lifts.

Visual impacts associated with construction would be temporary in nature and are discussed in **Table 9-4**. Further detail on the influences of and sensitivity to change and magnitude of change are provided in **Technical report 1 – Landscape and visual**.

Table 9-4 Visual impacts from construction

Construction location	Anticipated change	Sensitivity of construction location	Magnitude of anticipated change	Significance of visual impact and summary of key points
Ancillary Facility 1 - Eveleigh Maintenance Centre	Eveleigh Maintenance Centre would be utilised as site offices and an administration centre for the Project. This would include the construction of several site sheds and car parking facilities.	Low	Low	Low (neutral) Visual receptors would include train passengers, rail workers and limited views by recreational users of a nearby park and a small number of residents. The scale and use of this site would be temporary and similar to the existing use of the site, and visually contained within the existing Eveleigh Maintenance Centre.
Ancillary Facility 2 - Sydney Trains	This area would be partly utilised as a construction laydown area. This laydown area would be accessed from either Carriageworks Way or Little Eveleigh Street and would provide construction parking facilities and rail corridor access. It is anticipated that some components of the concourse would be assembled here prior to installation within the rail corridor.	Low	Low	Low (neutral) Receptors would include train passengers, rail workers and a small number of residents. The scale and use of the site would be temporary and similar to the existing use of the site, and the changes would be seen from the immediate surrounding areas only.
Ancillary Facility 3 - Gibbons Street Reserve and Marian Street carpark	Part of Gibbons Street Reserve would be used as a laydown area. This would require the removal of approximately two trees. Due to the existing slope of the reserve, re-levelling of part of the Gibbons Street Reserve would be required to enable a safe work area. It is anticipated about 200 tonnes of spoil would be required to be cut and filled to establish a level safe work area. The existing car park on Marian Street would be utilised as site offices and an administration centre for the Project. This would include the erection of several site sheds and car parking facilities. The Project would also utilise a storage area under the existing car park on Marian Street	Moderate	Moderate	Moderate (adverse) Receptors would include a moderate number of residential receptors, workers/visitors in nearby commercial properties, passers-by (vehicles, pedestrians and cyclists) and rail workers, holding differing values of the view. The scale and use of the site would be dissimilar to the existing use of the site, would be seen from the surrounding area as well as tall residential apartments. The reserve would be reinstated post-construction.

Construction location	Anticipated change	Sensitivity of construction location	Magnitude of anticipated change	Significance of visual impact and summary of key points
	for the storage of construction equipment and materials.			
Construction surrounding - Redfern Station	<p>From the surrounding streetscape, site hoarding and fencing are anticipated to be visible surrounding rail corridor construction. Within the streets, visible construction elements would include:</p> <ul style="list-style-type: none"> • site sheds • site hoarding, noise attenuation fencing and fencing of work sites • car parking facilities • mobile construction equipment • lighting and elevated work platforms including cranes and scissor lifts. <p>Trees would also need to be removed to accommodate the Marian Street Entrance, the concourse, the roadworks on Little Eveleigh Street, and the new car park off Eveleigh Street. Road works and associated landscaping would be visible within the upgraded streets of Little Eveleigh Street and Marian Street.</p>	High	High	<p>High (adverse) Receptors include train passengers, residential receptors and rail workers, holding differing values of the view. The scale and use of the site would be temporary but would not be similar to the existing use and would contrast to the existing character of the area, and would be seen from several surrounding areas.</p>

Construction location	Anticipated change	Sensitivity of construction location	Magnitude of anticipated change	Significance of visual impact and summary of key points
Traffic Route	An increase in heavy vehicular traffic would occur within the access routes. This change would be temporary, occurring during the 18 month construction period, but would be seen as a change to traffic volume and vehicle type by receptors along these routes, which would include the more sensitive residential and commercial receptors, pedestrians, and recreational users of nearby public open space. While these receptors would potentially have high value associated with views from locations along these routes, the change would not result in a significant one as the magnitude of change would be low, considering the existing use and character of the roads would not change and the change would be temporary and highly reversible.	Negligible	Low	Negligible This change would be temporary and reversible, and although seen as a change to traffic volume and vehicle type by receptors along these routes, the existing use and character of the roads would not change.

9.4.2 Operation

Landscape character

Operation impacts to landscape character are discussed in **Table 9-5**. Landscape effects are not assessed during construction as they are temporary and cease to have an impact on landscape character at the conclusion of construction. As such, no construction impacts are outlined in **Table 9-5**.

Further detail on the influences of sensitive change and magnitude of change are provided in **Technical report 1 – Landscape and Visual**.

Table 9-5 Landscape character impacts

LCZ	Anticipated change	Sensitivity of LCZ	Magnitude of anticipated change	Significance of landscape character effect and summary of key points
1 – Rail Corridor	<ul style="list-style-type: none"> • Introduction of a six metre wide concourse bridging the rail corridor between Little Eveleigh Street and Marian Street • New stair and lift access from the concourse down to Platforms 1 to 10 • A new station entrance on Little Eveleigh Street would be accessed via the upgraded/repurposed building next to the rail corridor. 	Moderate	High	<p>High (Positive) The Project would have a high refinement of architectural design, with the new station entrances integrated into the surrounding setting with landscaping and the adaptive reuse of an existing building. The proposed concourse would comprise a new elevated element within the rail corridor.</p>
2 – Community and education	No impact	Negligible	Negligible	<p>Negligible (Neutral) There would be negligible changes to landscape character arising from the Project on this LCZ.</p>
3 – Mixed use commercial and residential	No impact	Negligible	Negligible	<p>Negligible (Neutral) There would be negligible changes to landscape character arising from the Project on this LCZ</p>

LCZ	Anticipated change	Sensitivity of LCZ	Magnitude of anticipated change	Significance of landscape character effect and summary of key points
4 – Residential	<ul style="list-style-type: none"> • Upgrade of Little Eveleigh Street, including creation of a new station entrance and shared zone, removal and relocation of approximately 20 restricted residential parking spaces, vegetation trimming and removal, re-planting of vegetation, landscaping and street lighting adjustments • Pavement re-surfacing and footpath widening works within Ivy Street • Kiss and ride on Lawson Street, with associated footpath upgrade • Relocation of shuttle bus zone from Little Eveleigh Street to Lawson Street • Upgrade of Marian Street/Cornwallis Street/Rosehill Street would include the creation of an upgraded station entrance (at Marian Street) and shared zone, removal of approximately 16 parking spaces, trimming and removal of some trees, and adjustments to footpaths and street lights. 	High	Low	<p>Moderate (Positive) The Project would have a high quality of architectural design and would be integrated into the surrounding setting with landscaping.</p>
5 – Public recreation	<ul style="list-style-type: none"> • Changes would be limited to Gibbons Street Reserve. These changes include: <ul style="list-style-type: none"> - A new footpath upgrade located along the edge of the Reserve - Removal of approximately two trees • Little Eveleigh Street Reserve is adjacent to the street upgrades of Little Eveleigh Street. No works would occur in this reserve. 	High	Low	<p>Moderate (Neutral) While the Project would have a high quality of architectural and landscape design, trees would be removed within and adjacent to the reserves, therefore the Project would result in both positive and negative changes. It is therefore considered to be an overall Moderate (neutral) change. Landscaping and replacement of trees would assist in mitigating impacts of the Project on landscape character.</p>

Visual

Visual effects of the Project are assessed for the following key visual receptors:

- rail and bus commuters and motorists passing through or around Redfern Station
- workers in the nearby retail and hospitality sectors
- local residents surrounding the Station.

'Before' and 'after' photomontages were prepared for each of the above listed viewpoints.

Visual impacts associated with operation are discussed in

Table 9-6. Further detail on the influences of sensitive change and magnitude of change are provided in **Technical report 1 – Landscape and visual.**

Table 9-6 Operational visual impacts

Viewpoint	Anticipated change	Sensitivity of viewpoint	Magnitude of anticipated change	Significance of visual impact and summary of key points
Viewpoint 1 - Little Eveleigh Street (West)	<ul style="list-style-type: none"> • A shared zone on Little Eveleigh Street, which would include: <ul style="list-style-type: none"> - the relocation of approximately 20 restricted car parking spaces. - shared zone including cars, cyclists and pedestrians sharing the new pavement on Little Eveleigh Street and new station entrance - traffic signage and traffic calming devices - vegetation trimming or removal - landscaping and street lighting adjustments • A new entrance to Redfern Station at the re-purposed warehouse building at 125-127 Little Eveleigh Street. 	High	Moderate	<p>High to Moderate (Positive)</p> <p>The high quality of the proposed streetscape design, coupled with additional landscaping, would be a positive visual influence. The proposed concourse and new entrance would improve passive surveillance however would increase the number of pedestrians.</p>



Figure 9-3 Viewpoint 1- Little Eveleigh Street West facing east (Source: Novo Rail)



Figure 9-4 Photomontage of Viewpoint 1 - Little Eveleigh Street West facing east with the Project in Place (Source: Novo Rail)

Viewpoint	Anticipated change	Sensitivity of viewpoint	Magnitude of anticipated change	Significance of visual impact and summary of key points
<p>Viewpoint 2 - Little Eveleigh Street (East)</p>	<ul style="list-style-type: none"> A shared zone on Little Eveleigh Street, which would include: <ul style="list-style-type: none"> the relocation of approximately 20 restricted car parking spaces shared zone including cars, cyclists and pedestrians sharing the new pavement on Little Eveleigh Street and new station entrance potential traffic signage and traffic calming devices potential vegetation trimming or removal landscaping and street lighting adjustments. It is worth noting that a system of co-design is underway which aims to ensure that the visual outcome of the streetscapes are in keeping with local residents requirements, as well as the preservation of the visual identity of the area. A new entrance to Redfern Station at the re-purposed warehouse building at 125-127 Little Eveleigh Street. The new entrance would include a new canopy, station signage, lighting and openings in the warehouse façade. 	<p>High</p>	<p>Moderate</p>	<p>High to Moderate (Positive) The high quality of the streetscape design, coupled with additional landscaping, would be a positive visual influence to views along the streetscape, however, the addition of substantially more pedestrians within the road corridor could be viewed as positive or negative depending on the visual receptor.</p>



Figure 9-5 Viewpoint 2- Little Eveleigh Street East facing west (Source: Novo Rail)



Figure 9-6 Photomontage of Viewpoint 2 - Little Eveleigh Street East facing west with the proposed street upgrade in place (Source: Novo Rail)

Viewpoint	Anticipated change	Sensitivity of viewpoint	Magnitude of anticipated change	Significance of visual impact and summary of key points
<p>Viewpoint 3 - Lawson Street</p>	<ul style="list-style-type: none"> • A shared zone would be created on Little Eveleigh Street, which would include: <ul style="list-style-type: none"> - the relocation of approximately 20 restricted car parking spaces - shared zone including cars, cyclists and pedestrians sharing the new pavement on Little Eveleigh Street and new station entrance - potential traffic signage and traffic calming devices - potential vegetation trimming or removal - landscaping and street lighting adjustments - new bicycle spaces adjacent to the fencing to the left of frame • The proposed pedestrian concourse spanning the rail corridor, seen in the middle ground to background of the view. 	<p>High</p>	<p>Moderate</p>	<p>High to Moderate (Positive) The change would be positive, particularly given the road resurfacing and addition of landscaping.</p>



Figure 9-7 Viewpoint 3- Lawson Street facing south (Source: Novo Rail)



Figure 9-8 Existing view of Viewpoint 3- Lawson Street facing south with the Project in Place (Source: Novo Rail)

Viewpoint	Anticipated change	Sensitivity of viewpoint	Magnitude of anticipated change	Significance of visual impact and summary of key points
Viewpoint 4 - Lawson Street Concourse	<ul style="list-style-type: none"> • The pedestrian concourse in the middle ground and background of view • Covered stairways would be seen joining the pedestrian concourse with the existing platforms 1-10 • New entrance at Marian Street • Vegetation removal to the left of frame in the middle to background where the proposed pedestrian concourse joins Marian Street. 	Moderate	High	<p>High to moderate (Positive) The addition of a large piece of infrastructure within a rail corridor is considered appropriate given the function-driven design of rail infrastructure. The high quality of design results in a positive change to the view from this location.</p>



Figure 9-9 Viewpoint 4 - Lawson Street concourse facing south (Source: Novo Rail)



Figure 9-10 Photomontage of Viewpoint 4 - Lawson Street concourse facing south with the Project in Place (Source: Novo Rail)

Viewpoint	Anticipated change	Sensitivity of viewpoint	Magnitude of anticipated change	Significance of visual impact and summary of key points
<p>Viewpoint 5 - Redfern Station platform</p>	<ul style="list-style-type: none"> The proposed pedestrian concourse would be seen. The concourse would comprise of: <ul style="list-style-type: none"> six new steel and glass lifts and covered stairways connecting the concourse to Platforms 1 to 10 the concourse would be about six metres wide and span about 80 metres between Little Eveleigh Street and Marian Street Vegetation removal to the right of frame in the middle to background where the proposed pedestrian concourse joins Marian Street. 	<p>Low</p>	<p>High</p>	<p>Moderate (Positive) The addition of a large piece of infrastructure within a rail corridor is considered appropriate given the function-driven design of rail infrastructure. The lower sensitivity of the visual receptor at this location decreases the visual impact rating from this viewpoint.</p>



Figure 9-11 Viewpoint 5 - Redfern Station Platform facing north (Source: Novo Rail)



Figure 9-12 Photomontage of Viewpoint 5 - Redfern Station Platform facing north with the Project in Place (Source: Novo Rail)

Viewpoint	Anticipated change	Sensitivity of viewpoint	Magnitude of anticipated change	Significance of visual impact and summary of key points
Viewpoint 6 - Gibbons Street	<ul style="list-style-type: none"> • At street level: <ul style="list-style-type: none"> - a new kiss and ride on Gibbons Street - upgrades and adjustments to footpaths and street lighting on Gibbons Street and Marian Street - some vegetation removal or trimming • From elevated residence and businesses: <ul style="list-style-type: none"> - a new kiss and ride on Gibbons Street - upgrades and adjustments to footpaths and street lighting on Gibbons Street and Marian Street - the new Marian Street station entrance, shared zone and associated landscaping - the new concourse spanning the rail corridor - some vegetation trimming or removal. 	Moderate	Low	<p>Moderate to low (neutral) The viewing distance and screening from existing vegetation from ground level rather than the sensitivity of the visual receptor at this location decreases the visual impact rating from this viewpoint.</p>



Figure 9-13 Viewpoint 6 - Gibbons Street facing east (Source: Novo Rail)



Figure 9-14 Photomontage of Viewpoint 6 - Gibbons Street facing east with the Project in Place (Source: Novo Rail)

Viewpoint	Anticipated change	Sensitivity of viewpoint	Magnitude of anticipated change	Significance of visual impact and summary of key points
<p>Viewpoint 7 - Marian Street</p>	<ul style="list-style-type: none"> Road pavement and footpath upgrades to the existing shared zone used by cyclists and pedestrians on Marian Street and the retention of existing paving treatments on Cornwallis Street. Removal of 16 parking spaces including five unrestricted parking spaces, and eleven restricted parking spaces (signed two-hour restricted/permit holders unrestricted) Removal of vegetation The upgraded Marian Street station entrance, including: <ul style="list-style-type: none"> the new concourse to the left of the view about 20 additional bicycle spaces services building, station forecourt and seating areas station operational components including wayfinding and signage, gate lines, station signage and top up machines, CCTV and heritage interpretation and/or public art The proposed pedestrian concourse spanning the rail corridor. 	<p>High</p>	<p>High</p>	<p>High (positive) The high quality of the design of the streetscape and station entrance would result in a positive visual influence to views within the streetscape. The proposed new entrance would increase pedestrians, and improve passive surveillance within the street, with improved visual amenity provided by the design.</p>

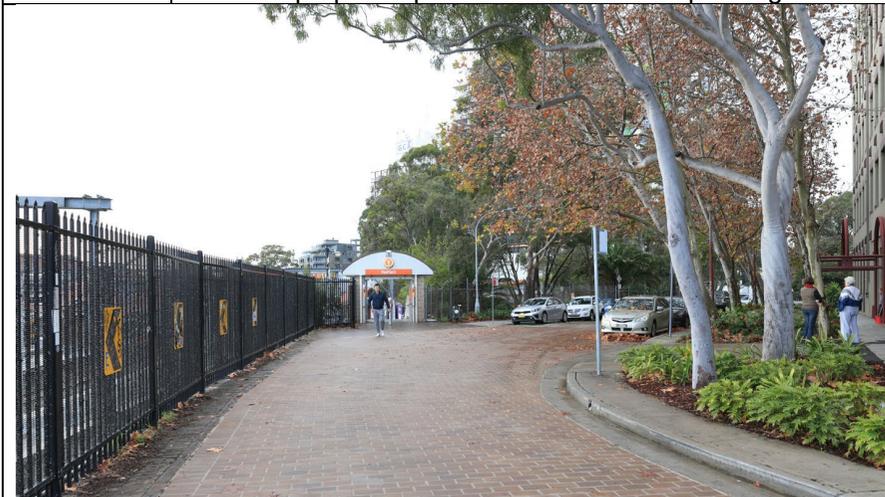


Figure 9-15 Viewpoint 7- Marion Street facing north-east (Source: Novo Rail)

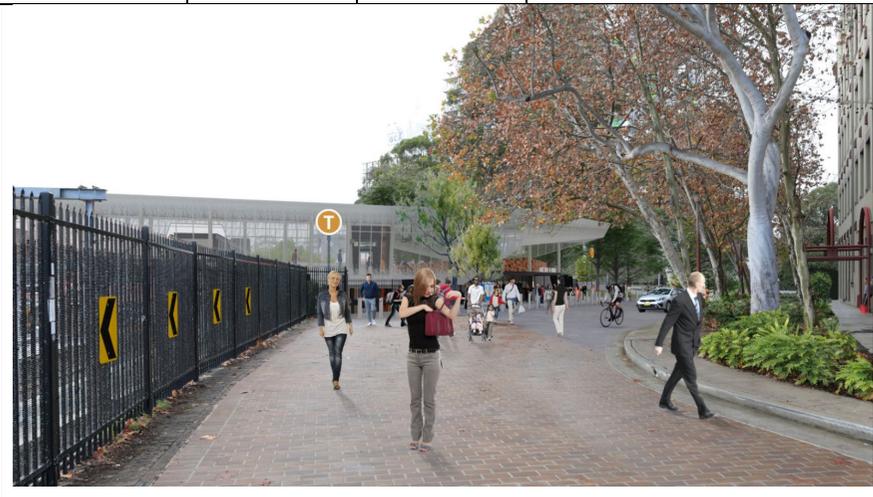


Figure 9-16 Photomontage of Viewpoint 7- Marion Street facing north-east with the Project in Place (Source: Novo Rail)

Viewpoint	Anticipated change	Sensitivity of viewpoint	Magnitude of anticipated change	Significance of visual impact and summary of key points
<p>Viewpoint 8 - Rosehill Street</p>	<ul style="list-style-type: none"> Road pavement and footpath upgrades to extend the existing shared zone on Marian Street and retention of existing paving treatments on Rosehill Street Removal of parking spaces Removal of vegetation The new Marian Street station entrance, including: <ul style="list-style-type: none"> about 20 new bicycle spaces services building station operational components including wayfinding and signage, Opal card readers and top up machines, ticket gates, CCTV, and heritage interpretation and/or public art Direct views along the proposed pedestrian concourse and the station precinct. 	<p>Moderate</p>	<p>High</p>	<p>High (Positive) The high quality of the streetscape and station entrance design would result in a positive visual influence on views within the streetscape. The proposed station entrance would increase pedestrians, and improve passive surveillance within the street and within Gibbons Street Reserve, with improved visual amenity provided by the design.</p>



Figure 9-17 Viewpoint 8 - Rosehill Street facing west (Source: Novo Rail)



Figure 9-18 Photomontage of Viewpoint 8 - Rosehill Street facing west with the Project in Place (Source: Novo Rail)

9.4.3 Summary of outcomes

Construction

During the construction period, the Project would result in a concentration of construction works at and around Redfern Station, reducing in intensity with distance from the Station. The construction activity at and immediately surrounding Redfern Station would be a significant visual change, however, these changes would be temporary and predominantly contained within the rail corridor, which is reasonably visually contained.

The construction activity would also include increased traffic, including heavy vehicles, using the access routes to and from the Project area. During the construction period at the ancillary facility areas, works were considered to have a Moderate and Low adverse or neutral effect. This result is primarily due to the existing use of most of the ancillary facility areas, which are typically industrial and rail-related, meaning that the change in use to ancillary facilities would not be a significant one, and would result in a similar view to these sites from their surrounds.

A summary of the Project on visual amenity during construction is shown in **Table 9-7**.

Table 9-7 Summary of effects on views and visual amenity

VIEWPOINT	SENSITIVITY	MAGNITUDE	SIGNIFICANCE OF VISUAL EFFECTS	ADVERSE	NEUTRAL	POSITIVE
ANCILLARY FACILITY 1 - EVELEIGH MAINTENANCE CENTRE	LOW	LOW	LOW		✓	
ANCILLARY FACILITY 2 - SYDNEY TRAINS	LOW	LOW	LOW		✓	
ANCILLARY FACILITY 3 - GIBBONS STREET RESERVE AND MARIAN STREET CAR PARK	MODERATE	MODERATE	MODERATE	✓		
REDFERN STATION	HIGH	HIGH	HIGH	✓		

Operation

Landscape character

Two of the five LCZs were subject to negligible change from the Project. LCZ (LCZ 1 - Rail Corridor) returned a high to moderate impact on landscape character. The Project is largely located within this LCZ which contains a number of items of State heritage significance and the addition of a large piece of infrastructure, has increased sensitivity to change. Heritage values within an area also increase the landscape value associated with this LCZ. While the changes are rated as high within this LCZ, they are considered acceptable due to the placement of the infrastructure within a working rail corridor. The reuse of an existing building on Little Eveleigh Street and the low profile station entry with landscaping at Marian Street assists in integrating the Project into the surrounding areas beyond the rail corridor, while the design of the pedestrian concourse is consistent in character with other existing infrastructure within the LCZ.

The other two LCZs affected were LCZ 4 - Residential and LCZ 5 - Public Recreation. The Project would lie next to these LCZs and affect only small proportions of each. The overall Moderate ratings for each of these LCZs were due to the high sensitivity of these LCZs rather than the magnitude of change, which was low in both cases. A summary of the Project on landscape character is shown in **Table 9-8**.

Table 9-8 Summary of effects on landscape character

LANDSCAPE CHARACTER ZONE	SENSITIVITY	MAGNITUDE	SIGNIFICANCE OF LANDSCAPE EFFECTS	ADVERSE	NEUTRAL	POSITIVE
LCZ 1 - RAIL CORRIDOR	HIGH	HIGH	HIGH			✓
LCZ 2: COMMUNITY AND EDUCATION	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE		✓	
LCZ 3 - TOWN CENTRE AND RETAIL	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE		✓	
LCZ 4 - RESIDENTIAL	HIGH	LOW	MODERATE			✓
LCZ 5 - PUBLIC RECREATION	HIGH	LOW	MODERATE		1	✓

1. Trees would be removed adjacent to one of the reserves (Gibbons Street Reserve), therefore the Project would result in both positive and negative overall changes and a neutral impact.

Visual amenity during operation

The effect of the Project on key views and visual amenity was considered a High (positive) effect (i.e. returned an overall rating of either High or High to Moderate) from seven out of the eight viewpoints. This was due to a combination of sensitive receptors at these locations, including residential receptors or recreational users of public open space, and a highly visible new structure (the proposed concourse), two new station entries bringing substantial pedestrian movement into residential streets, and road upgrades to the east and west of the rail corridor. The change was considered positive from all but one location, where it was deemed neutral due to the viewing distance to the Project and screening vegetation. The positive result was due to the upgrade of the streetscapes in Little Eveleigh Street and Marian Street/Cornwallis Street/Rosehill Street to include shared zones, and the high quality of design of the new/upgraded station entrances and pedestrian concourse. A summary of the Project on visual amenity during operation is shown in **Table 9-9**.

Table 9-9 Summary of effects on views and visual amenity during operation

VIEWPOINT	SENSITIVITY	MAGNITUDE	SIGNIFICANCE OF VISUAL EFFECTS	ADVERSE	NEUTRAL	POSITIVE
VIEWPOINT 1 - LITTLE EVELEIGH STREET WEST	HIGH	MODERATE	HIGH TO MODERATE			✓
VIEWPOINT 2 - LITTLE EVELEIGH STREET EAST	HIGH	MODERATE	HIGH TO MODERATE			✓
VIEWPOINT 3 - LAWSON STREET	HIGH	MODERATE	HIGH TO MODERATE			✓
VIEWPOINT 4 - LAWSON STREET OVERBRIDGE	MODERATE	HIGH	HIGH TO MODERATE			✓
VIEWPOINT 5 - REDFERN STATION PLATFORM	MODERATE	HIGH	HIGH TO MODERATE			✓
VIEWPOINT 6 - GIBBONS STREET	MODERATE	LOW	MODERATE TO LOW		✓	
VIEWPOINT 7 - MARIAN STREET	HIGH	HIGH	HIGH			✓
VIEWPOINT 8 - ROSEHILL STREET	MODERATE	HIGH	HIGH TO MODERATE			✓

9.5 Management and mitigation measures

9.5.1 Overview

A CEMF (**Appendix D** of the EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

A Visual Amenity Management Sub-Plan would be developed for the Project as identified by Section 6.4 of the CEMF.

The chapter includes a compilation of the performance outcomes and mitigation measures, including those that would be included in the Visual Amenity Management Sub-Plan of the CEMP.

9.5.2 Performance outcomes

Landscape character and visual impacts from construction and operation of the Project can be mitigated through the use of a range of measures, with the objective that the Project meets a range of performance outcomes. The landscape character and visual performance outcomes for the Project are as follows:

- construction sites and compounds are planned and managed to minimise adverse visual effects
- the obtrusive effects of lighting are minimised during construction
- the obtrusive effect of lighting are minimised during operation
- materials and finishes for the concourse are selected with consideration of minimising visual impacts
- additional tree removal and trimming of vegetation is avoided where possible to minimise changes in landscape character
- there is a net increase in trees within the vicinity of the Project area to minimise adverse landscape impacts
- community artwork investigated and included as appropriate
- graffiti avoidance measures are incorporated into the design.

9.5.3 Mitigation measures

A list of mitigation measures which would be implemented during the Project are provided in **Table 9-10**.

Table 9-10 Mitigation measures

ID	Mitigation measure	Applicable location(s)
Construction		
LV1	Provide well-presented and maintained construction hoarding and site fencing with shade cloth (or similar material) (where necessary) to minimise visual impacts on key viewpoints during construction. The construction ancillary facilities would be designed to limit or deter graffiti. Hoardings, site and acoustic fencing would be removed following construction completion.	Project area
LV2	Provide cut-off or directed lighting within the construction areas, with lighting location and direction considered to ensure glare and light spill is minimised.	Project area
LV3	Construction personnel to keep the construction areas clean and tidy, including refuse placed in appropriate waste bins.	Project area
LV4	Implement measures to minimise tracking of dirt and mud into public roads and other public spaces.	Project area
LV5	Limit disturbance of vegetation to the minimum amount necessary to construct the Project, particularly within the streetscapes affected by the Project.	Project area

ID	Mitigation measure	Applicable location(s)
LV6	Consider measures to limit or deter graffiti within ancillary facilities.	Ancillary facilities
Operation		
LV7	Community artwork opportunities would be investigated in keeping with existing cultural artwork in Redfern surrounding the station.	Pedestrian concourse
LV8	Street trees would be planted on Little Eveleigh Street and Marian Street at the new station entrances. Tall shrub plantings would also be considered along the rail corridor boundary at Marian Street to assist in preserving privacy of residents within the Watertower residential building.	Little Eveleigh Street and Marian Street
LV9	Lighting would be designed to minimise upward spread of light, and to minimise light spill and glare.	Project area
LV10	Proposed structures/fencing would be designed to limit or deter graffiti.	Project area
LV11	The ongoing maintenance and repair of the concourse and station entrances would be in accordance with Sydney Trains maintenance requirements.	Project area

The construction activity at and immediately surrounding Redfern Station would be a significant visual change, however, these changes would be temporary and predominantly contained within the rail corridor. Despite the proposed mitigation, there would be a residual construction visual amenity impact.

Overall, the effects of the Project on landscape character and visual amenity during operation were considered largely positive, especially within LCZ 1 - Rail Corridor.

These residual impacts of the Project, post mitigation, is discussed in **Chapter 23** of this EIS.

10 Land use and property

This chapter considers the potential land use implications of constructing and operating the Project. It also provides an assessment of the potential impact on property, including property acquisition requirements, as a result of the Project.

10.1 Introduction

The SEARs relating to land use and property, and where these requirements are addressed are outlined in **Table 10-1**.

Table 10-1 SEARs

SEARs	Where addressed in the EIS
Land Use and Property	
Impacts from construction and operation on potentially affected properties and businesses, including property acquisitions/adjustments, access, amenity and relevant statutory rights.	Section 10.5.1, Section 10.5.2 and Chapter 12 (access) and Chapter 13 (amenity)
Identify opportunities to use surplus or residual land, particularly for the provision of community space (passive and recreational) and ongoing maintenance of the lands.	Section 10.5.2

10.2 Method of assessment

The study area for the purposes of the land use and property assessment includes the existing land uses and properties within and immediately surrounding the Project area.

The assessment of potential land use and property impacts associated with the construction and operation of the Project involved:

- review of the existing environment with reference to existing land uses and aerial photography and a detailed site investigation
- reviewing key strategic planning policies and documents relevant to the study area, to identify planned future priorities, land uses, planning controls and developments
- assessing the potential impacts of construction and operation on existing and likely future land uses and properties in and around the Project
- identifying mitigation measures that would assist in reducing or avoiding land use and property impacts
- analysis of the residual risk of the environmental impact after the proposed mitigation measures have been implemented.

10.3 Existing environment

A description of the Project area for the purpose of the EIS is provided in **Chapter 2** of the EIS. Future land use planning is described in **Section 10.4**.

The Project is situated in the suburbs of Redfern and Eveleigh in Sydney's inner-south, part of the City of Sydney Local Government Area (LGA). Land use zonings within and in the vicinity of the Project are set by the following environmental planning instruments:

- Sydney Local Environmental Plan (LEP) 2012
- Sydney Regional Environmental Plan No 26 – City West

- State Environmental Planning Policy (State Significant Precincts) (State Significant Precincts SEPP) 2005: Redfern-Waterloo Authority Sites.

Under Section 5.22 of the EP&A Act, environmental planning instruments (including LEPs) do not apply to SSI. Further, as outlined in **Table 3-1** of **Chapter 3** of this EIS, the Project is located within the Redfern-Waterloo Authority Sites (State Significant Precincts SEPP) which identifies the land use zoning for the Project area. However, the State Significant Precincts SEPP does not apply to the Project. The City of Sydney would be consulted with regard to the wider aims of the LEP including to support the City of Sydney, recognising the area around Redfern Station as an important location for business, educational and cultural activities and tourism.

10.3.1 Existing land use

The study area includes land which currently forms part of Redfern Station bounded by Lawson Street to the north, Little Eveleigh Street to the west, Gibbons Street to the east and Marian Street to the south. Entrances to Redfern Station include:

- main entrance to Redfern Station at the Lawson Street overbridge located to the north of the station
- Gibbons Street entrance located to the southeast of the station opposite Redfern Street intersection
- Marian Street entrance, located to the south of the station, which provides access directly to platform 10.

The Project area also includes land directly adjacent to either side of the current rail corridor. This land is required to provide for the entrances to the new concourse and would be incorporated into Redfern Station as part of the Project (also refer to **Section 2.2.2** of this EIS).

On the northern side of the rail corridor the Project area includes 125-127 Little Eveleigh Street (Lot 38 & 39 of DP 98). The site is currently occupied by a three-storey building which provides for mixed use including office space for a social enterprise and dwellings. Adjoining this and sharing a common wall (but not directly impacted by the Project) is 129-131 Little Eveleigh Street which is a similarly designed three-storey building currently used as dwellings. Surrounding land use comprises medium density residential characterised by two-storey terrace dwellings.

On the southern side of the rail corridor the Project area includes part of the car park off Marian Street (part of Lot 5 of DP1175706) and part of the road corridor along Marian Street, Rosehill Street and Cornwallis Street. The car park off Marian Street is not for public use and currently provides parking for Sydney Trains employees.

'The Watertower' is a four-storey residential complex which occupies the block which is bound by Marian Street, Rosehill Street and Cornwallis Street. The Watertower building is the former McMurtrie's shoe factory which was converted into apartment living during the late 1970s/early 1980s. The immediately surrounding land use consists of high density residential, parking and public open space.

Wider land use surrounding the Project area is generally characterised by residential land use to the north and west, commercial land uses to the east, and mixed use (commercial and residential) to the north-east and south.

10.3.2 Planning Controls

The majority of the Project area is governed by the provisions of the *State Significant Precincts SEPP 2005* and includes the following zoning provisions:

- The rail corridor is zoned (G) Special Purpose Zone—Infrastructure
- Gibbons Street Reserve is zoned (H) Recreation Zone—Public Recreation
- The car park area off Marian Street is zoned (E) Business Zone—Commercial Core
- Little Eveleigh Street car park is zoned (D) Business Zone – Mixed Use.

The objectives of the (G) Special Purpose Zone—Infrastructure are to provide for railway infrastructure and related facilities while achieving high quality buildings and landscapes. The objectives of the (H) Recreation Zone—Public Recreation are to enable land to be used for public open space or recreational purposes while also enabling development for the enjoyment of the community. The (E) Business Zone—Commercial Core has as its objectives the facilitation of the development of a town centre with employment generating activities and compatible residential development while achieving high quality buildings and landscapes which maximise public transport patronage and encourage walking and cycling. The objectives of (D) Business Zone – Mixed Use is to facilitate employment generating activities compatible with non-residential development, while maximising public transport patronage and encourage walking and cycling.

Other areas within the study area are governed by the provisions of the Sydney LEP 2012 and include:

- Little Eveleigh Street, part of Ivy Street, Lawson Street zoned as (R1) General Residential
- Part of Ivy Street zoned as (B1) Neighbourhood Centre
- Marian Street, Rosehill Street and Cornwallis Street zoned as (B4) Mixed Use.

The objectives of the (R1) General Residential zone are to provide for the housing needs of the community through a variety of housing types and densities, while enabling other land uses that support the day to day needs of residents, without compromising the existing predominantly residential land use pattern of the zone. The objectives of the (B4) Mixed Use zone are to provide a mixture of compatible land uses which support the viability of centres in accessible locations which maximise public transport patronage and encourage walking and cycling.

10.4 Future land use and development

10.4.1 Strategic planning

Relevant strategies directing future land use planning for the study area are summarised below. These strategies are further detailed in **Chapter 2** of this EIS.

Greater Sydney Region Plan

The Project is located in the Eastern Harbour City defined by The Greater Sydney Region Plan (Greater Sydney Commission, 2018). Refer to **Chapter 2** of this EIS.

District Plans

The Project is located within the Eastern City District of Greater Sydney. The Eastern City District Plan (the District Plan), developed by the GSC and released in March 2018, sets out aspirations and proposals for Greater Sydney's Eastern District. It is a guide for implementing the Region Plan at a District level and is a bridge between regional and local planning.

The District Plan reiterates the objectives set out in the Region Plan with regard to the planning for a city supported by infrastructure (Planning Priority E1) and Providing services and social infrastructure to meet people's changing needs (Planning Priority E3).

Through its location at one of Sydney's key stations, the Project would help achieve the objectives of the Region and District Plan by supporting the '30-minute city' and promoting north-south and east-west connections. The Project would provide enabling infrastructure to address the identified capacity needs of Redfern Station as well as the forecast patronage growth in the Redfern and North Eveleigh Precinct, along with maximising the utility of existing infrastructure and providing for accessible access for all patrons.

Redfern and North Eveleigh Precinct Renewal Redfern Station is within the Redfern and North Eveleigh Precinct where the NSW Government is working to shape the area by involving the community in planning to help deliver holistic renewal outcomes.

Redfern and North Eveleigh Precinct is around 10 hectares in area and part of the Sydney Innovation and Technology Precinct. The NSW Government is investigating opportunities for renewal of the precinct which would also provide new public spaces and community facilities, improve walking and

cycling connections and help to make Redfern North Eveleigh Precinct a centre of technology and innovation in Australia.

Redfern Station performs an essential role in the area and in the wider Sydney CBD rail network. It is located immediately adjacent to the Redfern Street retail strip and is pivotal to the success and connectivity of key residential, commercial and educational/research sites in the precinct. It serves a broad patronage including nearby South Eveleigh, the University of Sydney, Royal Prince Alfred Hospital, TAFE Eora and Carriageworks.

10.4.2 Future development

There are no current development proposals for land that would be used for the Project.

A search of City of Sydney Council's development application (DA) register, the NSW major project tracking system and a review of other government agency websites found a number of approved, proposed or future developments in proximity to Redfern Station. A list of identified projects with the potential to contribute to cumulative impacts is provided in **Section 23.2**.

10.5 Impact assessment

10.5.1 Construction

As outlined in **Section 5.3**, the Project would be mainly located on land that forms part of the existing rail corridor and adjacent land owned by the NSW Government or City of Sydney Council. The Project design has avoided the need to permanently acquire private land and properties.

Construction of the Project would require the temporary and permanent use of NSW Government or City of Sydney Council owned land as outlined in **Table 10-2**.

Table 10-2 Use of NSW Government or Council owned land

Land within the Project area	Use
125-127 Little Eveleigh Street (Lot 38 DP 98, Lot 39 DP 98)	Construction of station entrance at 125-127 Little Eveleigh Street which is currently under lease from the NSW Government. The Project would therefore require relocation of the existing tenant of 125-127 Little Eveleigh Street. This is discussed further in Chapter 11 .
Gibbons Street Reserve (Lot 1 DP 4209, Lot 2 DP 4209, Lot 3 DP 4209, Lot 4 DP 4209, Lot 6 DP 4209, Lot 7 DP 4209, Lot 8 DP 4209, Lot 9 DP 4209, Lot 10 DP 4209, Lot 4 DP 264605, Lot 5 DP 264605, Lot 6 DP 264605, Lot 1 DP 431984, Lot 1 DP 776019)	Gibbons Street Reserve would be used as a construction ancillary facility. This would result in a temporary loss of public open, passive recreational space. Gibbons Street Reserve would be restored as a passive recreational area following construction.
Railway corridor (Lot 3 DP 862513, Lot 2 DP 1011782, Lot 5 DP 1175706, Lot 4007 DP 1194309)	Temporary use as a worksite. Permanent additional infrastructure (station entrances, concourse, Little Eveleigh Street car park). Marian Street car park would be returned to be used by Sydney Trains, following construction.
Eveleigh Maintenance Centre (Lot 52 DP 1001467)	Temporary use as an ancillary facility. This area would be restored post construction.

Land within the Project area	Use
Road reserves within the Project area (Marian Street, Railway Parade, Cornwallis Street, Rosehill Street, Gibbons Street, Lawson Street, Little Eveleigh Street, Ivy Street)	Temporary restrictions during construction. Marian Street, Cornwallis Street and Rosehill Street would include an extended shared zone, Gibbons Street would now include a kiss and ride, Lawson Street would include a kiss and ride and shuttle bus zone, Little Eveleigh Street would include a formalised shared zone, Ivy Street would include a widened footpath.

As all land that would be temporarily occupied for construction ancillary facilities and other work sites is generally located within road reserves or other government owned land adjacent to the rail corridor, the impact on land use is generally considered minor. The operation of the rail corridor and Redfern Station would continue throughout construction works (subject to possession periods).

The use of some existing on-street areas including Little Eveleigh Street and Marian Street (used typically for parking and loading) and some off-street parking areas, would be temporarily partially restricted during construction. The Marian Street car park would be restored following construction. Impacts on parking during construction are considered in **Chapter 8**.

The potential impact of the Project on properties and businesses in relation to access and amenity is discussed in **Chapter 11**, **Chapter 12** and **Chapter 13** of this EIS.

10.5.2 Operation

Operation of the Project would result in minimal direct impacts to land use. The Project would involve the continued use of a rail corridor and Redfern Station for transport purposes. Operational impacts on land use are described in **Section 10.5.1**.

The Project presents opportunities for positive change within the vicinity of Redfern Station, supporting planned urban renewal projects in the precinct and creating an attractive, vibrant and highly accessible space. The Project has also been designed so as to not preclude future connections with the broader urban renewal planning e.g. a direct connection to Wilson Street.

Overall, the Project is anticipated to integrate positively with the renewal objectives proposed for the Redfern and North Eveleigh Precinct, by providing a public transport facility that can meet future needs and be accessible by all users.

10.6 Management and mitigation

10.6.1 Overview

A CEMF (**Appendix D** of this EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect. It includes a framework for the management of residual land, post construction (Section 5.7 of the CEMF).

The chapter includes a compilation of the performance outcomes as well as mitigation measures to be included in the CEMP.

10.6.2 Performance outcomes

The performance outcome for the Project in relation to land use and property include:

- effective construction design and planning to minimise residual land to allow integration with adjoining land uses and provide accessibility to properties and community facilities
- consultation with individual property owners/managers to identify individual concerns and develop and document strategies to address these concerns.

The Project would be designed, constructed and operated to achieve these performance outcomes.

10.6.3 Mitigation measures

A list of mitigation measures which would be implemented during the construction of the Project are provided in **Table 10-3**.

Table 10-3 Mitigation measures

Reference	Mitigation measure	Location
Construction		
LP1	Temporary use areas, including public open space at the Gibbons Street Reserve, would be restored to their pre-existing condition (as a minimum) as soon as practicable following completion of construction. This would be undertaken in consultation with Council and/or the landowner.	Project area

Mitigation measures to manage the potential for air quality, noise, dust, social, traffic and transport, waste and hazard and risks, as they relate to minimising the potential for land use and property impacts are described in **Chapter 24** of this EIS.

Following the implementation of the management measure above, there would be residual impacts from the Project on land use and property. These residual impacts are discussed in **Chapter 23** of this EIS.

11 Social impacts

This chapter provides a summary of the results of the social impact assessment undertaken for the Project. A full copy of the assessment report is provided as **Technical report 2 – Social**.

11.1 Introduction

This chapter aims to provide an understanding of the community context within which the Project would be undertaken, considering community perceptions, while recognising the diversity of stakeholder interests and values. **Table 11-1** sets out the SEARs relevant to social impacts and identifies where the requirements have been addressed in this EIS.

Table 11-1 SEARs

SEARs	Where addressed in this EIS
Social impacts	
Prepare a social impact assessment, considering relevant factors in Chapters 3 and 4 of the SIA Guideline (DPE, 2017).	Sections 11.2, 11.3, 11.4, and 11.5
Impacts from construction and operation on potentially affected properties and businesses, including property acquisitions/adjustments, access, amenity and relevant statutory rights.	Section 11.4 Note that this is also addressed in Chapter 10 of this EIS
Identify opportunities to use surplus or residual land, particularly for the provision of community space (passive and recreational) and ongoing maintenance of the lands.	Note that this is addressed in Chapter 10 of this EIS

11.2 Method of assessment

11.2.1 Study area

The study area for the Social Impact Assessment (SIA) was defined based on the need to consider local, community and regional impacts. The most significant potential social impacts, particularly those related to amenity, health and wellbeing, and severance and connectivity, are anticipated to occur in closer proximity to the Project area (i.e. the area within which the construction and operation of the Project would be contained). Broader scale potential impacts relate to the wider area and include improved connectivity between Redfern Station and surrounding destinations.

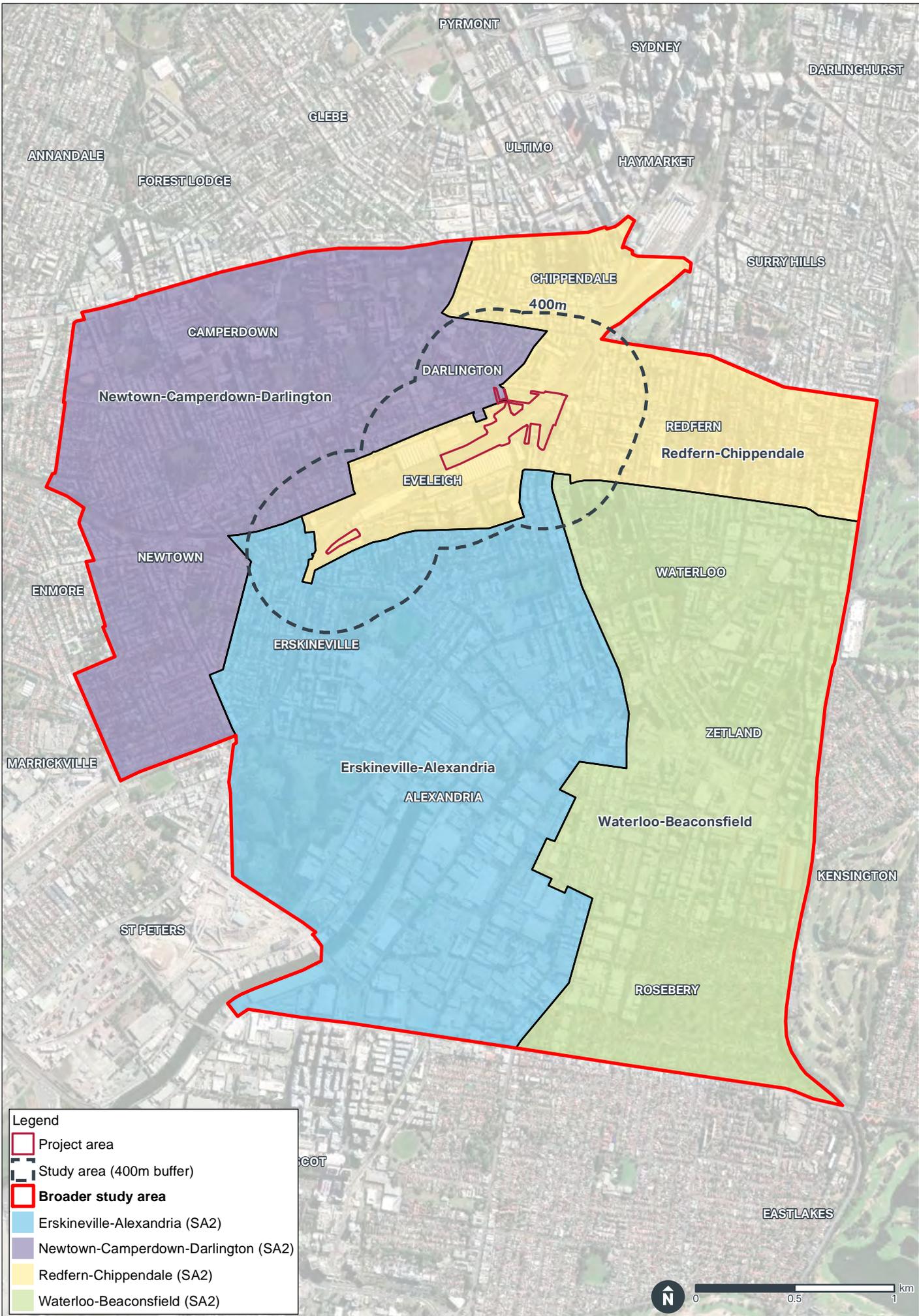
Redfern has been a centre for the Aboriginal community in Sydney since at least the late 19th century. Since this time the suburb has maintained a well-known Aboriginal identity and has been the crucible for a range of Aboriginal social movements. This is evident in the Aboriginal social infrastructure that remains in the area such as the Metro Aboriginal Land Council (MALC), the National Centre of Indigenous Excellence (NCIE), and the Aboriginal Legal Service and Aboriginal Children's Service.

The study area for the SIA is defined as:

- the study area – considers impacts within the direct vicinity (within 400 metres) of the Project area
- the broader study area – considers impacts within the Statistical Area Level 2 (SA2) geographic boundaries. SA2 levels, as defined by the Australian Bureau of Statistics (ABS), are geographical regions that reflect functional areas and represent how communities interact socially and economically. The following SA2s were chosen as they either overlapped with, or were in close proximity to the study area:
 - Redfern-Chippendale
 - Newtown-Camperdown-Darlington
 - Erskineville-Alexandria
 - Waterloo-Beaconsfield.

The Surry Hills SA2 has not been considered as part of the broader study area given only a small section of the area is captured within the 400 metre radius of the Project area. However, a community social infrastructure item (a church) has been considered as part of the assessment. Residents of Surry Hills would logically fall into the catchment of Central Station as opposed to Redfern Station.

The Waterloo-Beaconsfield SA2 was included in the broader study area given that Redfern Station is the closest interchange station. **Figure 11-1** shows the study area and the broader study area, within which the Project area sits.



Legend

- Project area
- Study area (400m buffer)
- Broader study area
- Erskineville-Alexandria (SA2)
- Newtown-Camperdown-Darlington (SA2)
- Redfern-Chippendale (SA2)
- Waterloo-Beaconsfield (SA2)

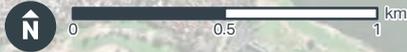


FIGURE 11-1: STUDY AREA

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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11.2.2 Statutory context, policies and social impact guidelines

The assessment of social impacts is essential to the assessment of environmental impacts under both Commonwealth and NSW State environmental planning legislation, whereby 'environment' is defined to include the social environment in the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The SIA has been prepared with reference to relevant factors in chapters three and four of the *Social Impact Assessment Guideline for State Significant Mining, Petroleum Production and Extractive Industry Development, DPIE 2017*, (hereafter referred to as the SIA Guideline). It is noted that a significant point of difference between the extractive industry and the transport industry, is that transport is designed, built and operated for community interaction and use, where extractive industries are not. It is acknowledged that this Project is a transport related SSI and although the SIA Guideline relates to resource projects, it presents a number of techniques and methodologies for the assessment of social impacts, in order to assist in the development of a social impact assessment approach. The assessment has been undertaken to be consistent with the recommended objectives.

11.2.3 Development of the social baseline

The social baseline for the Project was developed from a number of information sources. These include:

- the forecast of customer growth for Redfern Station by 2036
- database searches collated from the Australian Bureau of Statistics (ABS) analysed at the SA2 level
- review of major development applications to inform the assessment of potential cumulative impacts on the community
- review of previous studies
- data obtained from community and stakeholder engagement.

11.2.4 Approach and methodology

In implementing the SIA Guideline, the following steps have been followed:

- identifying the area of social influence within which the Project may result in potential social impacts
- identifying the social indicators with the potential for social change resulting from the Project
- carrying out a desktop review of social indicators and other relevant data in order to create a baseline profile of the community
- carrying out community and stakeholder engagement to seek direct feedback on community views, concerns and social impacts
- predicting and analysing the extent and nature of potential social impacts, which has involved:
 - identifying and explaining the project components or activities that may result in social impacts (both positive and negative)
 - taking into consideration factors such as the spatial extent, duration, severity, and sensitivity of receptors in characterising potential social impacts
- evaluating the significance of the social impacts
- identification of residual negative social impacts, which has involved:
 - identifying the magnitude of potential social impacts resulting from the Project, and the sensitivity of the receiving community
- consideration of the potential cumulative social impacts (refer to **Chapter 23** of this EIS)

- identification of measures to be employed to mitigate and manage potential social impacts of the Project.

Assessment of significance

A relevant and robust assessment methodology has been applied to determine the significance of social impacts resulting from the Project. The impact assessment framework that was used is shown in **Figure 11-2**.

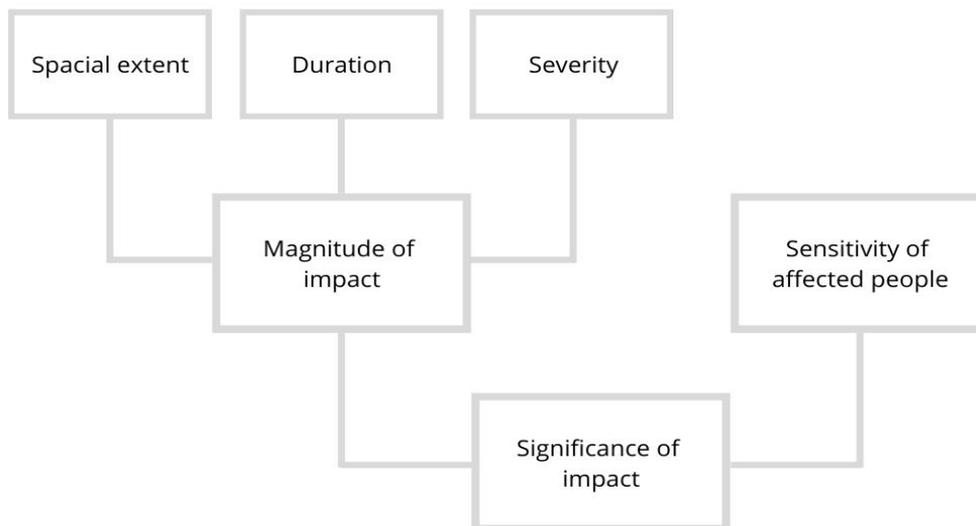


Figure 11-2 Assessment for determining significance of social impacts

The significance of each potential social impact has been assessed with reference to the magnitude of the impact (based on the spatial extent, duration and severity of the impact), and the sensitivity of the potentially affected population. The criteria established for this assessment were based on:

- **Spatial extent** – the geographic area affected by the impact, considering the number or proportion of people affected
- **Duration** – the timeframe over which the impact would occur
- **Severity** – the intensity or degree of change from the existing condition as a result of the impact
- **Sensitivity** – the susceptibility or vulnerability of people, receptors or receiving environments to adverse changes caused by the impact, or the importance placed on the matter being affected.

The magnitude of each impact has been determined with reference to the values detailed in **Table 11-2**. The spatial extent, duration and severity of each impact was considered in determining the magnitude.

Table 11-2 Magnitude levels and their constituent levels

Magnitude	Definition
Negligible	No discernible positive or negative changes caused by the impact. Change from the baseline remains within the range commonly experienced by receptors.
Low	A discernible change from baseline conditions. The impact is to a small proportion of receptors over a limited geographical area and mainly within the vicinity of the project. The impact may be short term, or some impacts may extend over the life of the project.
Moderate	A clearly noticeable difference from baseline conditions. The impact is to a small to large proportion of receptors and may be over an area beyond the vicinity of the project. Duration may be short term to medium or some impacts may extend over the life of the project.

Magnitude	Definition
High	A change that dominates over existing baseline conditions. The change is widespread or persists over many years or is effectively permanent.

The sensitivity of potentially affected people was determined with reference to the values detailed in **Table 11-3**. Findings on the sensitivity of affected people were based on their ability to adapt to change, their vulnerability, the level of concern raised in feedback during community and stakeholder consultation, or changes to community identity, values, or goals.

Table 11-3 Sensitivity levels and their constituent factors

Sensitivity	Definition
Negligible	No vulnerability and able to absorb or adapt to change. Issues not raised in feedback during community and stakeholder consultation, or would not result in change to community identity, values, or goals.
Low	Minimal areas of vulnerabilities and a high ability to absorb or adapt to change. Issues rarely raised in feedback during community and stakeholder consultation, or minor change to community identity, values, or goals.
Moderate	A number of vulnerabilities but retains some ability to absorb or adapt to change. Issues raised in feedback during community and stakeholder consultation, or moderate change to community identity, values, or goals.
High	Multiple vulnerabilities and/or very little capacity to absorb or adapt to change. Issues raised in feedback from a number of community members and affected people during consultation or significant change to community identity, values, or goals.

The assessment matrix in **Table 11-4** has been used to determine the significance of each social impact as a function of the magnitude of the impact and the sensitivity of potentially affected people. The sensitivity of the affected people refers to the susceptibility or vulnerability of people or receiving environments to adverse changes caused by the impact, or the importance placed on the matter being affected. Sensitivity of receptors is also defined by the ability for people to adapt to change.

Table 11-4 Significance of social and economic impacts

Sensitivity	Magnitude				
	High	Moderate	Low	Negligible	
High	High	High-Moderate	Moderate	Negligible	
Moderate	High-Moderate	Moderate	Moderate-Low	Negligible	
Low	Moderate	Moderate-Low	Low	Negligible	
Negligible	Negligible	Negligible	Negligible	Negligible	

Community and stakeholder consultation

This SIA has been informed by the community and stakeholder engagement carried out for the Project to date. Details of the consultation activities carried out for this Project are provided in **Chapter 6** of this EIS. Local community plans have been reviewed and feedback received during consultation has been analysed to provide insights into community identity, values, priority issues and goals. A summary of these outcomes is provided in **Technical report 2 – Social**.

11.3 Existing environment

11.3.1 Area of social influence

The area of social influence differs from the study area in that it accounts for people who may not live in close geographic proximity to the Project but are affected by its presence. This may include people commuting to Redfern Station from other parts of Sydney as part of their journey to work or study, or businesses that serve the area but are not located within it.

Other receptors in the broader area of social influence have been selectively included in the assessment of certain impacts as relevant, such as access and connectivity, health and wellbeing and impacts relating to crime and safety.

11.3.2 Demographic profile

The broader study area demonstrates positive growth in all four SA2s between 2011 and 2016. The highest percentage of population increase was recorded for Waterloo-Beaconsfield (+56.7%), and the lowest in Newtown-Camperdown-Darlington (+15.4%). The median growth across the area was +26.2%.

The highest growth within the study area is anticipated for the City of Sydney LGA between 2026 and 2031 (1.9%). This is due to the existing high-density nature of this area.

Census data shows a median unemployment rate of 6.5% across the broader study area, this is likely attributed to the proportionately higher tertiary student population in the area, particularly students living in Redfern-Chippendale (tertiary student population in Redfern-Chippendale comprises 22.4% compared with 9.3% in Erskineville-Alexandria). For comparison, the tertiary student population across the Greater Sydney Region is 8% (Census of Population and Housing (ABS), 2016).

In 2016, the most common mode of transport to work for residents in the broader study area was by train or tram, with 40.5% of employed persons in Redfern-Chippendale using public transport as at least one of their methods of travel to work. This infers a greater dependence on public transport in the broader study area than in Greater Sydney, where on average 22.8% of employed persons travel to work using at least one mode of public transport. Redfern Station is a key station in Sydney and the patronage forecasts for 2024 for Redfern Station is estimated to be 17,360 people during AM peak hour (includes entries, transfers and exits) and 14,120 people during PM peak hour (includes entries, transfers and exits).

The socio-economic indices for areas (SEIFA) are scores and ratings used to broadly define the relative socio-economic advantage and/or disadvantage of an area in terms of a person's access to material and social resources, and the ability to participate in society (ABS, 2016). Redfern-Chippendale and Waterloo-Beaconsfield scored lower than the study areas of Newton-Camperdown-Darlington and Erskineville-Alexandria. Redfern-Chippendale was subject to the comparatively highest level of disadvantage compared with the other SA2 areas in the broader study area, especially Erskineville-Alexandria. Overall, the SEIFA scores in Redfern-Chippendale reflect a moderate level of advantage.

A small proportion (2.5%) of residents in the study area indicated a need for assistance with core activities in the 2016 Census, less than the Greater Sydney average of 4.9%. There were also proportionately fewer residents in the study area that provide unpaid assistance to a person with a disability (6.5%), when compared with the Greater Sydney average of 11.1%.

In recent years, Redfern's location in close proximity to the city, has led to gentrification of the suburb giving rise to rising housing prices. However, there are still areas within Redfern-Chippendale and Waterloo-Beaconsfield experiencing high levels of unemployment, as well as a large number of social housing residences in these areas (ABS, 2016). This is reflected in the average rent and income of the area where the weekly household income at Redfern-Chippendale is \$1,562 and Waterloo-Beaconsfield is \$1,747. This demonstrates a lower median weekly household income compared to Greater Sydney at \$1,750.

Data comparisons between 2011 and 2016 show a notable change in cultural diversity in the Redfern-Chippendale SA2, with a 10.7% increase in residents born overseas, and a 0.5% decrease in the Aboriginal and Torres Strait Islander population over this period. Despite the decline, the identity of Redfern as a cultural hub for Aboriginal people prevails. This is evident in the Indigenous social infrastructure that remains in the area (refer to **Section 11.3.6**).

Other key demographic characteristics of the study area include:

- a high number of residents within the study area were born overseas (42.5%), reflecting greater cultural diversity than Greater Sydney (36.7%)
- the Aboriginal and Torres Strait Islander population within the study area is equal to the Greater Sydney average of 1.5%

- there is a much higher percentage of group households in the study area (17%), when compared with Greater Sydney (4.7%). This is likely due to the younger demographic profile and proximity to tertiary education facilities. In 2016, there were 10,342 private dwellings in the Redfern-Chippendale SA2 area, with an occupancy rate of 90.7%
- the average monthly rental payment and mortgage payments were higher than the average across Greater Sydney. This is contrasted with a lower median weekly household income in Redfern-Chippendale (\$1,562) and Waterloo-Beaconsfield (\$1,747) than in Greater Sydney (\$1,750).

11.3.3 Transport network

The existing transport networks surrounding the study area are outlined in **Table 11-5**.

Table 11-5 Transport network surrounding the study area

Public transport	
Train services	Redfern is well served by the Sydney Trains network, with a number of suburban and intercity services stopping at Redfern Station. These services are well patronised, with Redfern Station being the sixth busiest on the Sydney Trains network in 2018. The existing access arrangements do not provide accessibility for several groups of people including those with a disability, limited mobility and parents/carers with prams.
Bus services	There are eight bus routes that connect residential areas to local transport interchanges, employment and retail areas. These routes are discussed in Chapter 12 of this EIS.
Active transport network	
Cyclist connectivity	The area around Redfern Station is well connected to the Sydney Bike Network, with a mix of on-street and off-street cycling routes within 800 metres of Redfern Station. This is further discussed in Chapter 12 of this EIS.
Pedestrian connectivity	There are footpaths along the streets surrounding Redfern Station, linking to the four station entrances: on Lawson Street, at the corner of Lawson Street and Gibbons Street, Marian Street, and at the corner of Little Eveleigh Street and Lawson Street. The rail corridor through Redfern is a significant barrier to pedestrian movements in an approximate north-south direction. Pedestrian crossings of the rail corridor are limited to Cleveland Street (350 metres northeast) and Lawson Street, with no other crossings until Burren Street, adjacent to Macdonaldtown Station, 1.4 kilometres to the south-west.
Road network	
Roads	The roads adjacent to Redfern Station include a mix of local and regional roads. Additional information regarding the road network can be found in Chapter 12 of this EIS.

11.3.4 Businesses

The nearest commercial/retail centre to Redfern Station with a range of businesses is located along Redfern Street (between Regent Street and Chalmers Street), and along Regent Street/Botany Road (between Wells Street and McEvoy Street), to the east of Redfern Station. Additionally, there are smaller clusters of businesses closer to Redfern Station, including those on Little Eveleigh Street, Lawson Street, Gibbons Street, Marian Street, and within the station itself.

Redfern Street, as well as in Darlington to the west of Redfern Station and Alexandria to the south, is home to a number of restaurants, bars and cafés. Regent Street and Botany Road also contain a variety of retail and other commercial properties. To the south of Henderson Road, Botany Road

transitions into mainly light industrial properties. Carriageworks is located 600 metres west of Redfern Station on Wilson Street, and the South Eveleigh technology and business hub is located approximately 300 m south of Redfern Station on Locomotive Street.

A list of businesses in proximity to Redfern Station is outlined in **Technical report 2 – Social**. The businesses identified in this section are indicative and not exhaustive.

11.3.5 Employment centres

Strategic centres

The study area falls within the Greater Sydney Commission's Eastern Economic Corridor, which stretches from Macquarie Park to Sydney Airport, and contributed two-thirds of NSW's economic growth in the 2015-16 financial year. This corridor includes the Harbour CBD, which is Australia's financial capital and global gateway.

Precinct centres

The Project is the first stage of the Redfern and North Eveleigh Precinct Renewal, which is discussed in **Chapter 2** and **Chapter 10** of this EIS. The Project is pivotal to the success and connectivity of key residential, commercial and educational/research sites in the precinct. It serves a broad patronage including nearby South Eveleigh, the University of Sydney, Royal Prince Alfred Hospital, TAFE Eora and Carriageworks.

Local centres

Local centres provide access to a range of day-to-day goods and services, such as retail, health, commercial and civic services. Local centres can range from a small collection of shops to larger local centres, such as those anchored by a supermarket. As the Project is located near to the Redfern town centre, once the Project is completed and in operation, the improved access and connectivity and business outcomes would allow opportunities for this local centre to be further developed, and can provide local opportunities for casual, part-time or full time employment.

11.3.6 Social infrastructure

There are several social infrastructure facilities identified within proximity to the Project area such as educational facilities, health, medical and emergency services, places of worship, community service facilities (including Aboriginal housing assistance services) and sporting and recreational facilities.

Redfern has an extensive network of Aboriginal social infrastructure, including legal, health and employment service centres, child-care and aged care centres, community service centres, and educational facilities. These facilities provide opportunities for:

- educational, recreational and health services and programs
- community, cultural and social activities
- places that build community connections and relationships
- places that improve the inclusion of community members.

A list of social infrastructures in proximity to Redfern Station is outlined in **Technical report 2 – Social**.

11.3.7 Community identity, values and aspirations

Community values and goals play an important role in how communities perceive potential social impacts. The identification of these goals and values assists the assessment of potential impacts, as it provides an insight into how community identity, cohesion and sense of place may be affected by the Project.

Neighbourhood identity, community safety, health and wellbeing, and community cohesion are highly valued intangible community values. Heritage items, local features (such as trees, public amenity and public art), and social infrastructure are examples of more tangible physical aspects of community value.

As the study area falls within the boundaries of the City of Sydney and Inner West Council LGAs, local community plans for these councils have been reviewed. This includes City of Sydney *Sustainable Sydney 2030: Community Strategic Plan 2017-2021* (City of Sydney, 2017) and Inner West Council's *Our Inner West 2036: A community strategic plan for the Inner West community* (Inner West Council, 2018). The LGAs share a number of common themes within their defined community identity.

Key priorities across both LGAs include themes such as:

- liveability and environment, including the promotion of sustainable development and environmental management
- governance and engagement, including fostering a responsible and collaborative relationship amongst community members
- economy and employment, including support for social and creative enterprises
- cultural diversity, including the recognition and celebration of Aboriginal and Torres Strait Islander people, and the cultivation of a welcoming and inclusive community environment
- community identity and wellbeing, including creating resilient, caring and inclusive communities
- connectivity, including physically and virtually connected communities.

Redfern has historically been recognised as the cultural centre for Aboriginality in Sydney, as it has historically had a larger Aboriginal and Torres Strait Islander population when compared to other parts of the city (ABS, 2016). While there has been a decline in the Aboriginal and Torres Strait Islander population in Redfern in recent years, the identity of Redfern as a cultural hub for Aboriginal people prevails. This is evident in the Aboriginal social infrastructure that remains in the area (refer to **Section 11.3.6**).

11.3.8 Stakeholder and community consultation

TfNSW has carried out various consultation activities to inform the Project. Details of the engagement activities that have been carried out to date, and the ongoing and planned consultation activities are in **Chapter 6** of this EIS.

The key issues raised by stakeholders and community members across two consultation periods in May to June, and July to August 2019 included:

- traffic, pedestrians, safety and bus connections
- heritage impacts
- concourse width, cycling routes and unpaid access
- urban design, local character and visual amenity
- amenity impacts
- concourse alignment and alternative suggestions.

11.3.9 Aboriginal community engagement

Engagement with local Aboriginal community members and stakeholder groups has also been carried out to inform the Project. Engagement with the local Aboriginal community is ongoing and would continue throughout the Project. Key focus areas for Aboriginal engagement on this Project include:

- Project design
- heritage interpretation and/or community art opportunities
- employment and procurement opportunities.

11.4 Impact assessment

11.4.1 Construction

Amenity impacts

The amenity and character of an area contributes to the community's shared identity and sense of place. Amenity refers to the sounds, look and feel of a place and the activities that take place within it. Impacts or changes to amenity during construction can include any factor that impedes, alters or enhances a resident or visitor's enjoyment of their home or daily activities. Examples include changes to noise levels, views, access to services, or changes to air quality. A summary of the significance of these impacts is in **Table 11-6**.

Feedback received during community consultation identified that the main concerns relating to the Project included amenity impacts, such as noise, increased crowding, access, commuter impacts, traffic disruptions and minimising the length of construction. Community members also raised concerns about the visual impacts of the Project, including vegetation removal, and how heritage values would be managed and integrated into the Project.

Table 11-6 Summary of significance of amenity impacts

Amenity impact	Impact summary	Significance of social impact
Traffic and access	<p>The Project would require partial road closures and the temporary diversion of roads, footpaths and cycleways, which would potentially affect traffic movements and access to the road network as well as active transport in the study area. These changes to traffic and access are described in further detail in Chapter 12 of this EIS. Impacts are considered to be minimal given appropriate diversion routes would be in place to mitigate impacts on pedestrians and cyclists.</p> <p>The shuttle bus services at Redfern Station would be permanently relocated during construction of the Project (refer to Chapter 5 of this EIS). This relocation would not significantly increase the distance pedestrians would need to travel to the station given its close proximity to the existing shuttle bus zone.</p> <p>Bus services along Gibbons Street may also experience minor delays due to construction vehicle movements and other construction activities associated with the proposed kiss and ride facility adjacent to the existing bus stop.</p> <p>It is anticipated that construction of the Project would be primarily carried out during standard Sydney Trains rail shutdown periods to aid safe construction. Two additional rail shutdown periods are proposed, including a possession across the Christmas period. During these shutdown periods, standard measures including providing alternative transport arrangements and notification would be provided to minimise impacts to the community.</p> <p>Whilst the majority of the above changes would be minimal and generally limited to the station precinct, there is the potential for certain groups</p>	<p>The magnitude of these impacts would be low, and the sensitivity of affected people would be moderate. On this basis, the significance of the overall social impact on traffic and access would be moderate-low.</p>

Amenity impact	Impact summary	Significance of social impact
	<p>to be affected to a greater degree than others. This includes vulnerable groups such as the elderly, young people and people with reduced mobility, or those people from non-English speaking backgrounds, as they may have difficulty understanding signposted diversion routes. Such impacts would be avoided or mitigated through the implementation of suitable alternative arrangements that limit disruption to existing pathways, station entrances and other local infrastructure as far as practicable.</p>	
Noise and vibration	<p>Exposure to noise and vibration has the potential to contribute to a range of impacts to people's work, recreation, social and home lives. This includes interference with daily activities or the enjoyment of these activities and interference with concentration and memory particularly with regard to children's school performance and business activity that depends on quiet environments. High levels or certain types of disruptive noise may also result in disruption of sleep and rest patterns and may create or exacerbate health concerns such as hearing impairments and cardiovascular health (elevated blood pressure). Increased levels of noise would be generated during construction of the Project. This noise would be in line with typical construction activities such as the operation and movement of heavy and light machinery, vehicles, materials and other equipment. It would also include noise generated directly by construction workers and their access to and from the Project area. Changes to noise and vibration are discussed in further detail in Chapter 13 of this EIS.</p> <p>The greatest noise impacts during day time work would be experienced during roadworks, particularly for residents of Little Eveleigh Street, Ivy Street, Marian Street, Cornwallis Street, and Rosehill Street. Residents located on the western side of Redfern Station, including Little Eveleigh Street, Lawson Street and Wilson Street are likely to experience the greatest impacts during night time work associated with the station upgrades.</p> <p>However, the implementation of mitigation measures would minimise and manage noise impacts on noise sensitive receivers where possible and could include measures such as carrying out noise intensive work during less sensitive time periods, and ensuring sensitive receivers are kept informed during construction.</p> <p>Vibration impacts during construction may affect heritage-listed items within the Project area if</p>	<p>The magnitude of these impacts and the sensitivity of affected people is likely to be high. On this basis, the significance of the overall social impact on noise and vibration is considered high.</p>

Amenity impact	Impact summary	Significance of social impact
	<p>these items fall within the minimum work distances for vibration intensive works. If these minimum working distances are complied with, no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage. A construction noise and vibration management plan would be in place to minimise the construction traffic noise levels and reduce the risk of negative impacts occurring.</p>	
Visual amenity	<p>Visible construction elements would be expected to typically include a range of site sheds, site hoarding and fencing of work sites, car parking facilities for a variety of construction vehicles bringing in workers and materials, mobile construction equipment and lighting, equipment and plant such as elevated work platforms including cranes and scissor lifts, as discussed in Chapter 9 of this EIS.</p> <p>The Project also proposes to use part of the Gibbons Street Reserve as a laydown area for construction equipment. The aforementioned impacts would be visually prominent, but in keeping with similar temporary construction works, and would be transitory over a period of about 18 months from 2020 until completion of the Project.</p>	<p>As the visual impacts of construction would be temporary and localised, the magnitude of impact has been considered to be low. The sensitivity of community members to visual impacts has been determined to be high. There would be a moderate social impact to visual amenity during construction.</p>

Amenity impact	Impact summary	Significance of social impact
Air quality	<p>During construction, activities such as earthworks and the use of construction machinery have the capacity to generate dust and exhaust emissions, as discussed in Chapter 19 of this EIS</p> <p>Nuisance dust has the potential to affect nearby residents and sensitive receivers, such as those with respiratory illnesses. The perceived impact to air quality as a result of construction activities can also affect residents and visitors to the area by increasing anxiety and reducing their capacity to enjoy the local environment. Receivers in close proximity to construction ancillary facilities are likely to be most affected by these impacts.</p>	<p>The anticipated magnitude of air quality impacts on local amenity is considered to be low. This is based on the actual impact of construction on air quality, being akin to that of similar infrastructure projects, and further noting that impacts are expected to be effectively mitigated by measures identified in Chapter 19 of this EIS. The sensitivity of local residents has been determined to be low, in the context of the heavily urbanised surrounding environment, including arterial roads and the active rail corridor. Construction air quality impacts would be effectively mitigated by measures identified in Section 18.5 of Chapter 18 of this EIS (Air Quality). As such the social impact to amenity as a result of changes to air quality during construction are considered to be of low significance.</p>

Considering the above, the overall significance of amenity impacts on the social environment is considered to be moderate.

Health and wellbeing

The magnitude of impacts to health and wellbeing during construction is considered to be low. The sensitivity of people is considered to be moderate, resulting in a moderate-low significance of impacts to health and wellbeing during construction of the Project. Impacts to the health and wellbeing of people who work, visit, and live in the local area may arise from direct Project impacts such as changes to air quality and noise, or indirectly, such as increased stress and anxiety associated with changes to amenity. Some sections of the community, including certain community facilities or social infrastructure (including the secondary school and art gallery on Little Eveleigh Street and medical facilities on Gibbons Street), may be more susceptible to certain health and wellbeing impacts. Impacts to health and wellbeing may arise from a combination of amenity impacts, such as increased noise and vibration, changes to air quality, changes to access, and visual changes resulting from construction activities.

Changes to amenity during construction could also result in stress associated with decreased feelings of safety, perceived changes in property value, or perceived increases in crime. These could result from increased interactions between construction vehicles and pedestrians, reduced sightlines as a result of construction hoarding, and increased noise and vibration during construction.

Changes to demographic profile

Construction of the Project has the potential to influence the social makeup of an area through the employment of a construction workforce. The employment of approximately 110 workers for construction of the Project would result in a modest increase in employed persons in the area, and an increase in persons travelling to the study area for work. There is no proposed property acquisition as part of the Project, as all temporary and permanent works would occur on property already owned by the NSW Government or local council. The Project would, however, require relocation of the existing tenants of 125-127 Little Eveleigh Street, which would be subject to ongoing consultation.

Given the construction timeframe for the Project (18 months), it is possible that some workers may choose to relocate to the area, however with high rental prices, and the easy accessibility of the area by public transport and private vehicles, this trend is expected to be limited.

Given the local population size, the number of construction workers, and the lack of property acquisition, it is considered that construction of this Project would produce a negligible magnitude of change to the local demographic profile of the study area. As the community comprises predominantly group or single person households within a younger age bracket than is observed across Greater Sydney, the sensitivity of affected people is considered to be low. As a result, the overall social impact of the Project on the demographic profile of the study area is considered to be negligible.

Property

The Project area sits primarily within the existing bounds of Redfern Station. Exceptions to this include the temporary and permanent use of NSW Government owned land at 125-127 Little Eveleigh Street, and construction ancillary facility locations (Gibbons Street Reserve, Sydney Trains land and land with the Eveleigh Maintenance Centre) as described in **Chapter 5** of this EIS.

A summary of the significance of these impacts is discussed in **Table 11-7**.

Table 11-7 Summary of significance of changes to property

Property impact	Impact summary	Significance of social impact
Ancillary facility 1 and 2, and the Sydney Trains Marian Street car park	Ancillary facility 1 and 2, and the Sydney Trains Marian Street car park are NSW Government owned properties that are not publicly accessible.	The social impact of using this land has been assessed as being negligible.
125-127 Little Eveleigh Street	<ul style="list-style-type: none"> The Project includes the permanent use of NSW Government owned land at 125-127 Little Eveleigh Street, which is currently under lease from the NSW Government. The business is an independent not-for-profit social organisation that provides work opportunities for marginalised, homeless and disadvantaged people. With a high proportion of disadvantaged people concentrated in central Sydney, proximity to the CBD and public transport are considered to be important to the operation of the organisation. The NSW Government is working with the leaseholder to minimise impacts to the organisation and its employees, which includes providing assistance with relocation to alternative suitable accommodation. 	The magnitude of lease discontinuation at 125-127 Little Eveleigh Street is considered to be low. The sensitivity of affected employees and the people they work with is considered to be moderate, due to their inherent vulnerability as marginalised community members and their location sensitivity. The social impact of using this land has been assessed as being moderate-low.

Property impact	Impact summary	Significance of social impact
Gibbons Street Reserve	<p>Part of Gibbons Street Reserve would be used as a laydown area for construction equipment and infrastructure. This construction ancillary facility would be accessed from Gibbons Street and would be fenced off from public use during construction.</p> <p>While community concern about the temporary loss of green space is possible, it should be noted that following the completion of work at Redfern Station, the Gibbons Street Reserve would be returned to passive recreational use for the community, in consultation with City of Sydney Council.</p> <p>In addition, alternative open space is available nearby (for example, at Daniel Dawson Reserve and Jack Floyd Reserve).</p>	<p>The magnitude of the impact has been assessed as being low. The sensitivity of receptors has been assessed as being moderate. The social impact of temporary use of the Gibbons Street Reserve during construction of the Project is therefore considered to be moderate-low.</p>
Property values	<p>The property value for residential properties is heavily influenced by liveability factors, such as local amenity, location and accessibility to transport, employment and social infrastructure. Business property values are generally driven by factors such as visibility, customer access, and proximity or access to markets or suppliers.</p> <p>Impacts to residential property values during construction are more likely to result from uncertainty about the magnitude of potential amenity, accessibility and health and wellbeing impacts. Long term property values would be more influenced by the long-term benefits of the operational Project, as perceived in the land and property markets as a result in improvements to equitable access to transport, improved pedestrian safety, and enhanced walkability provisions to Redfern Station.</p> <p>The potential for business property value impacts resulting from the Project relate mostly to temporary changes associated with construction, such as changes to passing trade, and temporary access restrictions for deliveries. These impacts are likely to be highly specific to the individual business, according to type and current location.</p> <p>Generally future movements in the value of a property are difficult to forecast as they are subject to numerous variables, including specific attributes of the property, location of the property, capital investments, demand and supply factors and other changes in the wider property market.</p>	<p>It is considered likely that residents and potential purchasers would recognise the temporary nature of construction activities, therefore limiting the magnitude of changes to property values. On this basis the magnitude of change is considered to be negligible, with sensitivity of the residents and businesses considered to be high. As such the overall social impact of the construction of the Project on property value is determined to be negligible.</p>

Considering the above, the overall significance of property impacts on the social environment is low.

Business impacts

Construction of the Project may affect businesses within the study area as a result of temporary changes in passing trade, access (due to temporary and permanent traffic and pedestrian changes), parking, and impacts to local amenity. The potential impact on business revenue would vary depending on the nature of a specific business and its location. A summary of the significance of these impacts is discussed in **Table 11-8**.

Table 11-8 Summary of significance of business impacts

Business impact	Impact summary	Significance of social impact
Passing trade	<p>Business that is generated by customers who unintentionally choose to visit a business because they see it when travelling past or decide to stop while en-route to another destination, is referred to as passing trade.</p> <p>During construction of the Project, existing pedestrian, cyclist and traffic movements, and parking provisions may alter slightly as a result of upgrades to adjacent local roads, station entrance works, footpath diversions, and to allow safe ingress and egress to the construction ancillary facilities.</p> <p>The introduction of a construction workforce along Little Eveleigh Street/Lawson Street may also improve the passing trade of some businesses, such as cafes. This could generate increased business revenue, resulting in a direct benefit.</p>	<p>The spatial extent of impacts would be local, the duration and severity of impacts would vary depending on the location and type of the business affected. On this basis, the magnitude of change is determined to be low. The sensitivity of businesses to the loss of customers would be moderate given that at least some businesses likely rely on passing trade as a key source of revenue. As such the overall social impact of changes to passing trade along Little Eveleigh Street/Lawson Street resulting from the construction of the Project would be moderate-low.</p>

Business impact	Impact summary	Significance of social impact
Parking	<p>Intermittent temporary parking loss on the Marian Street/Cornwallis Street/Rosehill Street loop, Little Eveleigh Street, Ivy Street, Gibbons Street and Lawson Street during construction may cause continued inconvenience to business customers and may encourage customers to visit a different business.</p> <p>Alternative parking within 400 metres of the lost parking spaces is, however, available for business employees and customers. Results from the community survey conducted in May-June 2019 indicated that 17.9% of respondents most often used Redfern Station for leisure purposes, and a further 6% most often use Redfern Station to visit family and/or friends, which is likely to include visiting business premises. Additionally, the most common mode of transport to work for residents in the study area was by train or tram, with 40.5% of employed persons in Redfern-Chippendale using public transport as at least one of their methods of travel to work (ABS, 2016). Of the 119 respondents to the community survey, 100 also stated that they walked to/from Redfern Station. These people are less likely to require car parking, reducing the overall sensitivity of the broader community to losses to local parking.</p>	<p>The extent of impacts to parking for businesses during construction would be local, with varying durations (as some parking loss would be permanent) and is therefore considered to be of low magnitude. The sensitivity of potentially affected people has been determined to be low, based on the location of alternative parking spaces and the general community makeup. As such, the social impact of the loss of parking on businesses during construction is considered to be low.</p>
Servicing and deliveries	<p>The delivery and dispatch of goods is an important supporting service that is vital to business operations. Disruptions to services such as rubbish collection, changes to the availability of nearby parking spaces and/or loading zones, and partial road closures or diversions could restrict or reduce servicing, delivery and dispatch opportunities for local businesses during construction of the Project. The implications of these impacts could include increased vehicle and time related costs, and potentially reduce revenue for businesses.</p> <p>In some areas (such as Little Eveleigh Street), impacts such as parking restrictions and restrictions on through traffic for non-local vehicles would likely be experienced for the majority of the construction period, with closures and diversions limited to shorter time periods, as needed. The management of services, such as rubbish collection would be managed in consultation with City of Sydney Council. Access for emergency services would be maintained during construction.</p>	<p>Anticipated impacts are likely to be intermittent and localised resulting in a low overall magnitude of change. As the provision of services and the delivery/dispatch of goods needs to take place within close proximity to businesses, the sensitivity has been determined to be moderate. The social implications of impacts to servicing and deliveries for businesses during construction of the Project is therefore determined to be of moderate-low significance.</p>

Business impact	Impact summary	Significance of social impact
Amenity	<p>Certain business types (such as cafes), rely to an extent on high levels of local amenity. Aspects that contribute to amenity include traffic, noise, visual, and air quality.</p> <p>Construction of the Project has the potential to temporarily disrupt the amenity of the areas around Redfern Station and the construction ancillary facilities.</p> <p>The severity of amenity impacts on each individual business would vary, depending on the business's proximity to construction activities and the nature of the business. Businesses that depend on a high level of amenity, such as cafes and the art gallery located on Little Eveleigh Street, and health and beauty type businesses located on Gibbons Street would be particularly affected during construction.</p>	<p>The overall construction impacts on the amenity of businesses has been determined to be of low magnitude. The sensitivity of potentially affected people differs based on business type and as such, the sensitivity of impacts would be moderate. The social implications of construction on the amenity of businesses is therefore determined to be of moderate-low significance.</p>

The overall magnitude of impacts to businesses during construction of the Project is low. The sensitivity of businesses during construction, is considered to be moderate. As a result, the severity of business impacts during construction of the Project is moderate-low.

Economic impacts

Construction activity can benefit the local economy with associated economic stimulus from increased expenditure at local businesses through purchases made by construction workers, and indirect employment and expenditure through the provision of goods and services required for construction. The benefits of increased passing trade associated with construction work would be influenced by the proximity of the business to the construction work and the nature of the business.

It is anticipated that the construction workforce for this Project would consist of approximately 110 workers. These workers are considered likely to contribute to the local economy, particularly through food and beverage purchases. This would go some way to offsetting any reduction in trade through amenity or access disruptions to businesses. In terms of overall employment in the areas, despite the Project's potential contribution to local employment, the magnitude of this benefit is considered to be modest, due to the relatively small workforce required to complete the work and the fact that contractors are likely to retain staff who would travel from other parts of Sydney.

The magnitude of this effect is considered to be negligible. The sensitivity of affected people is considered to be low, considering the relatively higher proportion of unemployment in the Redfern-Chippendale SA2. As such, the employment benefits of construction would be negligible.

Access and connectivity

Construction of the Project would result in temporary impacts to the existing road, public transport and active transport networks in the local area. A summary of the significance of these impacts is discussed in **Table 11-9**.

Table 11-9 Summary of significance of access and connectivity

Access and connectivity impact	Impact summary
Property access	<p>The anticipated impacts to property access during construction of the Project would include:</p> <ul style="list-style-type: none"> • potential space constraints impacting access for residents of Marian Street/Cornwallis Street/Rosehill Street, with particular impacts for residents of 1 Marian Street, and residents on the northern side of Margaret Street • potential space constraints impacting access for residents of Little Eveleigh Street. This would include impacts to pedestrians accessing residences and commercial establishments, as well as to vehicles accessing existing off-street parking areas. There may also be impacts associated with longer walking distances as a result of changes to parking • potential impacts associated with longer walking distances as a result of temporary parking diversions for residents who use street parking on Ivy Street • potential impacts to pedestrians accessing residences and commercial developments on Lawson Street near Little Eveleigh Street as well as temporary disruptions to existing off-street parking areas. There may also be impacts associated with longer walking distances as a result of changes to parking.
Public transport	<p>During normal operations, rail-lines periodically undergo scheduled temporary closures to enable maintenance of tracks and other rail infrastructure. These temporary rail shutdowns are established and are a normal part of operations. The Project would utilise these temporary shutdowns to safely undertake works within the rail corridor. Normal train replacement services would be expected to run during these periods.</p> <p>During times when train services continue to operate at Redfern Station, train customer movement on the station platform would be temporarily affected due to the reduced space, particularly during construction of lift areas and stairway landings. The reduced space on the platform may increase customer congestion and reduce the amount of standing/waiting and passageway areas. Customers disembarking at Redfern Station may also experience increased congestion, particularly during morning peak periods.</p> <p>Construction of the Project would also require temporary periodic closure of Redfern Station during non-scheduled possession periods (approximately two), as well as a minor relocation (20 m) from Little Eveleigh Street to Lawson Street of an existing shuttle bus zone (refer to Chapter 5).</p> <p>Changes to the provision of train services during non-scheduled rail shutdowns and the relocation of bus stops has the potential to cause travel disruptions, increase travel times and affect accessibility due to changed travel routes, and the potential for additional walking times. Impacts to accessibility of platforms may cause stress associated with crowding, reduced feelings of safety, and may cause delays due to missed trains.</p>

Access and connectivity impact	Impact summary
Active transport	<p>During construction, the Project is expected to cause temporary disruptions to existing footpaths and cycling facilities outside the station, including temporary impediments to cycle thoroughfare along Little Eveleigh Street and Marian Street, and temporary removal of bicycle spaces on Little Eveleigh Street (refer to Chapter 5 of this EIS).</p> <p>Changes to the existing cycle and pedestrian network has the potential to affect commuter departure times, cause travel disruptions, increase travel durations, affect movement patterns and accessibility, and decrease safety. Depending on the length and terrain of alternative routes, people may be more inclined to take a shorter, less safe option, rather than diverting around the recommended detour route. These changes may also disproportionately affect people from non-English speaking backgrounds, as they may have difficulty understanding the signposted diversion routes.</p> <p>Work to upgrade pedestrian facilities surrounding Redfern Station would be carried out in a manner that ensures public access routes within the study area are maintained, and that pedestrian diversions are minimised. Diversions would be in place for cyclists during construction, as the existing cycleways would be temporarily unavailable.</p>
Parking and kiss and ride	<p>Amenity impacts associated with changes to parking was raised as a matter of importance during consultation by respondents who identified as local residents. Informal pick-up and drop-off activity on Marian Street and Lawson Street would at times be affected by the movement of construction vehicles, and intermittent road closures. The use of Little Eveleigh Street as an informal pick-up and drop-off zone would also be precluded by construction activities for the majority of the construction period. The intermittent, temporary and eventual permanent removal of parking and changes to road conditions resulting in changes to informal drop off and pick up activities has the potential to result in stress and frustration associated with driving to find alternative parking or stopping zones. Elderly people, those with a disability or families with young children, who may have difficulty walking greater distances, would be particularly affected if they are required to park or stop further away from their destinations. It should be noted that the Little Eveleigh Street car park would be in place before works commence on the share zone on Little Eveleigh Street to off-set the parking loss.</p>
Access to social infrastructure	<p>Access to social infrastructure is important to the amenity of an area and can disproportionately affect vulnerable community members who rely on access to essential services.</p> <p>Redfern is home to an array of Aboriginal community service facilities, most of which are located on the eastern side of the station. Access impediments to social and essential services can detrimentally affect people by limiting their access to these facilities, ultimately affecting social inclusion.</p>

Considering the above, the magnitude of impact is considered to be low. The sensitivity of stakeholders has been determined to be high, due to the importance of the station as a means of travel to and from work, the prevalence of active transport as a means of accessing the station, and the impact of potential access impediments on vulnerable community members. As such, the significance of social impacts on access and connectivity during construction has been determined to be moderate.

Heritage and character

During consultation, it was identified that the local character of Redfern is of importance to the community. A summary of the significance of heritage and character impacts are discussed in **Table 11-10**.

Table 11-10 Summary of significance of heritage and character impacts

Heritage and character Impact	Impact summary
Relocation of the Platform 1 Office Building	<p>Changes to the historical fabric of Redfern Station has the potential to affect the social historical connection with the area, which has been identified as being of significant importance to the local community. Changes to heritage items and buildings can affect an individual's sense of self and their connection to place, which is an important factor that contributes to one's wellbeing.</p> <p>Relocating the Platform 1 Office building approximately 15 metres west along Platform 1 would provide an appropriate visual and historical setting for the item, by placing it in closer vicinity to Carriageworks and the Eveleigh Railway Workshops. It would also allow opportunities for future adaptation of the building, and has ensured that 125-127 Little Eveleigh Street, a contributory item within Darlington Conservation Area, is retained to provide access from the concourse to Little Eveleigh Street. The relocation has also avoided potential demolition of the building with the building also proposed to be adapted.</p>
Construction of the concourse and other platform elements	<p>During construction of the new concourse, the impact of seeing interactions between heritage items and construction machinery has the potential to cause stress and anxiety for people who value these elements highly. These impacts could also temporarily affect people's connection with the area.</p> <p>The new concourse would reference historical views that once existed when the former footbridge was in place and would enable the continued use of Redfern Station by increasing its efficiency and longevity, ensuring the station is retained as a tangible link to the construction of the line and as a major suburban station that served the Eveleigh Railway Workshops and the surrounding suburbs.</p>
Little Eveleigh Street	<p>The proposed streetscape modifications to Little Eveleigh Street would result in a beneficial impact on the aesthetic significance of Darlington Conservation Area.</p> <p>Whilst not being specifically listed as a heritage building, 125-127 Little Eveleigh Street is a contributory item within the Darlington Heritage Conservation Area. The Project includes constructing a new station entrance within the existing building at 125-127 Little Eveleigh Street. As part of the work, a significant portion of the facade would be retained. It is also proposed that the original windows of the building would be reinstated. Adaptation of 125-127 Little Eveleigh Street as part of the rail network would ensure the continued use of the building and would retain its significance within the conservation area.</p> <p>During community consultation, it was noted that retaining 125-127 Little Eveleigh Street was important for maintaining the look and feel of the area. Whilst much of the façade would be retained, construction work, and the presence and noise associated with construction machinery could potentially cause stress and anxiety in people who are concerned about the preservation of the building.</p>

During construction, the overall impacts to the heritage and character of the station precinct has been determined to be high. The sensitivity of receivers is moderate, considering the community interest in preserving historical features of the local area. As such, the overall social significance would be considered to be high-moderate.

11.4.2 Operation

Amenity impacts

The amenity and character of an area contributes to the community's shared identity and sense of place. It is affected, and affects the sound, look and feel of a place, as well as the activities that take place there. It is recognised that activities that have a long life and within close proximity to people's homes, such as this Project, have a high potential to influence amenity in both a positive and negative way.

Given the varied nature of the existing environment and potential impacts in different locations of the Project, the assessment of operational amenity impacts has been organised according to location, specifically Little Eveleigh Street and Marian Street. This reflects where the potential long-term amenity impacts are anticipated for the Project. A summary of the significance of these impacts is discussed in **Table 11-11**.

Table 11-11 Summary of significance of amenity impacts

Amenity impact	Impact summary
Little Eveleigh Street entrance	<p>During consultation, concerns were raised by the community regarding the loss of amenity, particularly regarding noise, privacy and parking for residents on Little Eveleigh Street. Many respondents questioned the street's ability to manage additional pedestrians using the street alongside cars and cyclists.</p> <p>The Project is not anticipated to significantly generate additional vehicular traffic. However, by providing a DSAPT accessible station, this could potentially increase the vehicular traffic whereby people who would otherwise not have been able to use the station prior to the upgrade works are now dropped off at this accessible station. The shared zone and new entrance at Little Eveleigh Street may also pose a higher risk between vehicle, cyclist and pedestrian interaction, given the increased pedestrian volumes. It is noted that cyclists would not have a marked cycle lane within the shared zone, however the shared zone is designed to be a safe zone for all modes of transport and pedestrians would have right of way, with a speed limit of 10km/h. The formalisation of the shared zone would require the relocation of 20 parking spaces to a new car park at the western end of Little Eveleigh Street. This relocation may result in inconvenience and reduced feelings of safety when there is an increased walking distance between destinations, especially at night. Signage would be in place to inform users of the change in traffic conditions. In shared zones drivers must give way to people walking. Speed humps may be installed at the entrance to the area to improve the safety of the shared zone as it would help identify the street as a pedestrian area.</p> <p>The improved station precinct is expected to encourage more pedestrian activity and passive surveillance, which may discourage antisocial behaviour such as graffiti and vandalism.</p> <p>The Project is not anticipated to generate significant additional vehicular traffic, and therefore negligible impacts to traffic noise around Redfern Station are expected. For most receivers along Little Eveleigh Street the use of the new car park would reduce current noise levels associated with parking cars. Short term noise events deriving from car parking activities during night time may cause sleep disturbance for some residents on Little Eveleigh Street living in proximity to the new car park. However, it is unlikely that the car park would be used frequently between 2:00 am and 5:00 am when background noise is quieter due to the rail not being operational. Therefore, it is unlikely that residents would notice the change in the acoustic environment at night as a result of the relocated car park.</p> <p>Noise from commuters walking along Little Eveleigh Street would be noticeable, However, this noise not be considered to have characteristics that would typically irritate such as low frequency or tonal components. However, the increase in the presence of people utilising the shared zone would result in an increase in footfall noise and conversations may lead to a minor increase of stress and anxiety for some residents, particularly at night.</p> <p>The shared zone upgrade to Little Eveleigh Street would provide an increased accessible space by the removal of car parking, transforming it into a pedestrian focussed public domain, with visual separation and privacy for residents using planted edge treatments and soft lighting. The street would be more 'active' with</p>

Amenity impact	Impact summary
	<p>improved lighting and upgraded wayfinding and an increase in pedestrian activity. These changes would benefit university students, visitors to Carriageworks, general commuters and users of Little Eveleigh Street.</p> <p>Impacts to air quality during the operation of the Project would be negligible as the Project would not result in a change in land use.</p>
Marian Street entrance	<p>During consultation, concerns were raised by the community regarding the loss of amenity, particularly regarding privacy for residents on Marian Street. Concerns were also expressed about road safety close to the Marian Street entrance, due to interactions between pedestrians, cyclists and vehicles, particularly with the increase of customers accessing South Eveleigh from the existing Marian Street entrance.</p> <p>The loss of parking spaces on Marian Street would likely cause an inconvenience for local residents, and place additional pressure on other surrounding car parking, particularly given that no replacement measures are proposed for the loss of these spaces. However, the reduced number of cars in the area due to the removal of existing car parking along these streets would increase the level of pedestrian and cyclist safety. Traffic signage with the speed limit would be installed to indicate that the street is a shared zone to increase safety and awareness. The Project would also offer the opportunity of expanding the walking catchment of Redfern Station and the local community. Other opportunities would include a more direct access between platforms to South Eveleigh, and surrounding suburbs such as Alexandria as these areas are key locations of employment and are home to a number of businesses. The proposed extension of the Marian Street shared zone would also enhance the customer experience and walkability along the south-east access to the Station. Access to bus services on Gibbons Street would be enhanced by the Project, with shorter travel distances between the platforms and the bus stops, via the upgraded entrance at Marian Street.</p> <p>Given that there is already a station entrance in this location on Marian Street, noise from commuters walking along Marian Street would not be considered loud relative to these existing ambient noise levels. However, the increase in the presence of people utilising the shared zone would result in an increase in footfall noise and conversations which may lead to a minor increase of stress and anxiety for some residents, particularly at night.</p> <p>During consultation privacy was raised as an issue for residents who lived on either side of the concourse, particularly the Marian Street medium rise residential building. Suggestions were made to protect privacy such as enclosing the concourse, constructing screens or planting vegetation, or lowering the aerial walkway to restrict sightlines into properties. These design considerations would be further explored during detailed design. Furthermore, the Project would provide new landscape treatments including new planting and trees for visual separation and privacy for residents.</p> <p>Increased pedestrian traffic and subsequent street lighting upgrades at the Marian Street entrance would change the visual outlook and general character of the area.</p> <p>Marian Street would be more 'active' with improved lighting and upgraded wayfinding.</p>

At the Little Eveleigh Street entrance, the changes to amenity would be permanent and highly localised. It is also noted that the Project would increase the presence of people passing through or lingering on Little Eveleigh Street. This may lead to a minor increase of stress and anxiety for some residents. Considering the degree of change from the existing environment as discussed above, the magnitude of amenity impacts on Little Eveleigh Street entrance is considered to be moderate and the

sensitivity of Little Eveleigh Street to the anticipated change is considered to be high. As such, the significance of the overall amenity impact to Little Eveleigh Street entrance would be high-moderate.

At the Marian Street entrance, the changes to amenity would be permanent and highly localised. Considering the degree of change from existing environment as discussed above, the magnitude of amenity impacts on Marian Street entrance is considered to be low and the sensitivity of Marian Street to the anticipated change is considered to be moderate. As such, the significance of the overall amenity impact to Marian Street entrance would be moderate-low positive.

Crime and safety

It was established during consultation that local residents and the community place a high value on personal safety, accessibility, connectivity as well as the local character and urban design. The option for the Little Eveleigh Street connection to Marian Street presented more favourable outcomes and was the most preferred as opposed to the Wilson Street to Marian Street connection (refer to **Chapter 4** of this EIS for more information about the options and alternatives for the Project). This connection provided better accessibility, connectivity and ease of journey outcomes and was the preferred option for NSW Police from a crime safety perspective.

The selected option would direct more people onto Little Eveleigh Street, however, the detailed design of the Project would continue to investigate how to discourage crime and antisocial behaviour to improve safety and security of customers and staff. This would be undertaken in accordance with the principles of Crime Prevention through Environmental Design (CPTED) and in consultation with NSW Police and the City of Sydney.

Changes to the demographic profile

Operation of the Project is not anticipated to result in a change to the demographic profile of the study area. Rather, the access improvements associated with the Project are expected to assist in facilitating and servicing the urban development and renewal that has and is continuing to occur in the study area.

On this basis the magnitude of change would be negligible. The sensitivity of affected people is considered to be low. As a result, the overall social significance of the Project on the demographic profile of the study area is considered to be negligible.

Property

There would be relatively minor changes to property in and around the Project. Areas such as the existing Marian Street car park and Gibbons Street Reserve would be restored to their existing uses once the Project is operational. An entrance to the concourse would pass through the building at 125-127 Little Eveleigh Street with part of the building available for business use.

Whilst the Project may result in changes to local property prices the nature of the market is highly variable and difficult to predict. Broadly, it is expected that the increase in access and amenity in the area would contribute to improved local amenity, which may be reflected in property prices.

Overall the operational Project would result in low magnitude changes to property, in an area deemed to be of moderate sensitivity. As such the social impact of the operational Project would be moderate-low.

Business impacts

Impacts to local businesses arising from the operation of the Project would be long term and permanent. These may include changes to passing trade, access, parking (for customers, employees and suppliers) and changes to local amenity. A summary of the significance of economic impacts during operation is discussed in **Table 11-12**.

Table 11-12 Summary of significance of economic impacts

Business impacts	Impact summary
Passing trade	Operation of the Project would result in changes in travel patterns for pedestrians, vehicles and public transport users, resulting in varying impacts to local businesses. It is expected that Little Eveleigh Street would experience an

Business impacts	Impact summary
	<p>increase in pedestrian traffic, particularly for students and staff accessing the University of Sydney. Given that there is already a station entrance at Marian Street, the increase of customers using this entrance would occur regardless of this Project due to external factors such as general growth in the area and the development of South Eveleigh.</p> <p>At present, neither of these areas have any businesses that appear to rely on passing trade, with the exception of 'Pride of Redfern' located on the corner of Little Eveleigh Street and Lawson Street and 'Chapter Five Espresso' and the art gallery 'Duckrabbit' located on Little Eveleigh Street. These businesses may experience a noticeable reduction in passing trade should people, such as students attending the university, choose to exit the station using the new pedestrian footbridge then travel west along Little Eveleigh Street, rather than travel via Lawson Street. However, this impact would be moderated to some extent, given that the kiss and ride and relocated bus stop are located nearby and the Project would include opportunities for signs/pedestrian wayfinding to local businesses.</p>
Changes to local traffic arrangements	<p>There would be no impact to business access during operation of the Project. Little Eveleigh Street and the Marian Street/Cornwallis Street/Rosehill Street shared zone component of the Project would maintain all existing property access arrangements, including access to off-street vehicle parking and space for waste collection.</p>
Amenity	<p>The Project enhances pedestrian access and is not expected to generate significant traffic volumes. The improved accessibility to the station may attract additional patrons, in particular people with a disability, prams or luggage who may not be able to use the station currently. These patrons would be expected to arrive on foot, bus or other non-private vehicle means. These additional patrons to the station precinct can in turn potentially affect surrounding businesses.</p> <p>The change in the acoustic environment during operation (noise emitted from the Opal card reader, car park noises and pedestrian noise), is unlikely to impact businesses within the vicinity of the Project. As discussed above, businesses on the corner of Little Eveleigh and Lawson Street may experience a noticeable reduction in passing trade should people choose to exit the station using the new pedestrian footbridge. As such, the acoustic environment may decrease near these businesses.</p> <p>The urban design components of the Project would make the area more visually appealing, which may change customers' perception of the area and therefore a willingness to come to the area. Design components could also explore opportunities for signs/pedestrian way finding to local businesses, resulting in a positive impact on local businesses.</p> <p>The Project, once operational, would not generate dust or other direct emissions and therefore would not affect the amenity of local businesses.</p>

Based on the above components, the magnitude of change to local amenity is considered to be moderate, with sensitivity of businesses considered to be low. As such, the overall social significance of operation of the Project on businesses is determined to be moderate-low.

Economic impacts

The Project would provide an increase in transport amenity and improve access and connectivity in the area, which would facilitate and encourage increased economic productivity and land use efficiency. Higher economic productivity would be facilitated with customers and staff in the area able to enjoy reduced travel times across the station precinct to retail outlets, cafes and commercial premises such as banks.

The Project is expected to contribute to economic and employment growth and support the known employment growth (such as Commonwealth Bank at South Eveleigh) surrounding the station. It provides the opportunity for new business development surrounding the station precinct and stimulation for existing businesses.

During operation, the Project would result in moderate magnitude changes to economic impacts, in an area deemed to be of low sensitivity. As such the social impact of the operational Project would be moderate-low (positive).

Access and connectivity

The operational Project would result in permanent changes to the existing road and active transport networks in the local area. During consultation, some respondents considered that there is not enough cycling infrastructure and bicycle storage facilities within the area and that accessibility to the station by bicycle could be improved.

Providing equitable access to public transport for disabled persons, parents of young children and the elderly, in conjunction with increased walkability for a greater number of prospective public transport users travelling to, from and within Redfern Station, has the potential to provide social and economic benefits to the area. A summary of the significance of access and connectivity impacts during operation is discussed in **Table 11-13**.

Table 11-13 Summary of significance of access and connectivity impacts

Access and connectivity impact	Impact summary
Public transport	<p>Respondents to the community survey expressed concern about existing levels of congestion on the concourse and platforms, particularly during peak periods. It was also noted that this crowding causes customers to miss trains. Operation of the Project would result in improved access to train and bus services surrounding Redfern Station intended to improve the experience of all passengers using the station, including less mobile people.</p> <p>Changes to the connectivity and accessibility of the public transport network have the potential to contribute to a number of direct and indirect social and health benefits, including reduced stress. Improvements to accessibility are a particular feature, with Redfern Station currently lacking provision for disabled and low-mobility customers for the majority of platforms. As people often choose to shop, visit and spend their time at convenient and accessible locations, changes to the accessibility and reliability of the public transport network may also result in benefits to businesses and social infrastructure in the study area.</p> <p>Overall, the negative operational impacts of the Project on public transport operations are limited, with substantial positive impacts, generally associated with customer amenity, convenience and safety, offering a better customer experience.</p>
Active transport	<p>Provision of the new concourse, shared zones and bicycle spaces would provide greater accessibility across the rail corridor, encouraging increased active transport and social connections within the local area. Additionally, the proposed shared zones would contribute to a better experience for customers accessing Redfern Station. In particular, this would provide benefits to people with reduced mobility such as people with mobility devices, other less mobile people, people with luggage and parents with prams.</p> <p>During consultation, some respondents suggested that creating ungated access across the rail corridor would achieve better connectivity within the local area, particularly for those who may not be station customers or do not have access to an Opal or credit card to tap on and off at either end of the concourse (which does not incur a charge).</p>

Access and connectivity impact	Impact summary
	<p>Some stakeholder groups however requested installation of the Opal barriers to create a more formalised entrance and to deter customers from not tapping on for their fare ride. Tapping on and off to access the concourse to use the cross corridor access poses a social equity issue and mitigation measures to address this may include signage to inform users that an Opal card or contactless payments (e.g. American Express, Mastercard or Visa debit or credit card), would be required to access the concourse, however, once tapped off on the other side, charges would be reversed (i.e. no charge). Existing pedestrian routes would remain available for the small group of people who do not have an Opal card or contactless payments to use the concourse. A customer education campaign would be enacted to inform the community of the process and encourage use of the concourse.</p>
Community cohesion	<p>Community cohesion refers to the connections and relationships between individuals and their neighbourhoods. Access to a diverse range of local and regional infrastructure, a variety of meeting places which encourage strong support networks, and minimal barriers to movement are key elements that contribute to cohesive communities.</p> <p>The Project not only provides connectivity between the platforms at Redfern Station and access to both Marian Street and Little Eveleigh Street, but also provides cross corridor connectivity. The Project would enable some cross-corridor connectivity benefits as it would address the existing desire line constraint. Furthermore, the Project would:</p> <ul style="list-style-type: none"> • alleviate a point of community severance (the rail corridor), which has only one existing narrow pedestrian crossing over the Lawson Street bridge • provide a connection that is away from busy roads, hence encouraging social interaction • provide ready access to the suburb of Redfern as a whole, both in and out by allowing for more connectivity for pedestrian traffic.
Road network	<p>Once operational, the Project is expected to result in only small changes to the local road network.</p> <p>The introduction of formalised kiss and ride facilities on Lawson Street and Gibbons Street would allow for additional modal access to Redfern Station. Footpath upgrades, which are also proposed as part of the kiss and ride facilities, would provide equitable access between the kiss and ride locations and the station. These facilities can also be accessed by taxis, which would further provide accessibility benefits for those who do not drive and/or are outside of walking distance to public transport.</p> <p>During operation, there would be a higher risk of vehicle, cyclist and pedestrian interactions along Little Eveleigh Street, due to the increased pedestrian volumes associated with the proposed station entrance and shared zone. However, with many pedestrians already using the road as a pathway due to the narrow width of existing footpaths on Little Eveleigh Street, the slower speed limit of 10 km/h and street treatments would help road users interact in a safer, more pedestrian-friendly way.</p>

With consideration of the overall impacts to access and connectivity discussed above, the magnitude of change is determined to be high positive given that the Project would significantly improve access to the growing precinct with significant social infrastructure, as well as to Redfern Station. The sensitivity of receivers to changes to access and connectivity would be high positive given that the provision of an additional station entrance, introducing lifts to platforms and a new concourse would allow for greater access to public transport modes and provide equitable access to the station. As such, the

overall social significance of changes to access and connectivity resulting from the operation of the Project would be high positive.

Social infrastructure

A summary of the significance of social infrastructure impacts during operation is discussed in **Table 11-14**.

Table 11-14 Summary of significance of social infrastructure

Social infrastructure Impact	Impact summary
Educational facilities	<p>Operation of the Project would improve public and active transport access and connectivity to educational facilities such as Key College, University of Sydney and TAFE NSW - Eora. This may encourage students and employees of these educational facilities to take trips that they may have been avoided due to inaccessibility, and in doing so would increase physical activity. Improved footpaths and shared zones would reduce traffic speeds, improve pedestrian safety and enhance walkability.</p> <p>The closest educational facility to the Project is The Key College located approximately 20 metres from the proposed entrance at Little Eveleigh Street. Students and teachers may experience a minor disturbance from noise impacts as a result of the operational Project from commuter noise arising from the Little Eveleigh Street entrance. This may affect the communication, productivity and concentration capacity between students and teachers. The noise assessment highlighted that the noise generated by commuters/pedestrians walking through the shared zones to and from the new station entrances and other local areas would not be loud in an absolute sense (e.g. in the context of the overall existing noise environment) at nearby residential receivers). Outcomes of noise impacts are discussed in Chapter 13 of this EIS.</p>
Care, health, medical and emergency services facilities	<p>Operation of the Project would improve public and active transport access and connectivity to the available health and emergency services. No operational noise or vibration from the Project is likely to affect the users of these facilities, given the separation between the Project and these service facilities. The Project may facilitate improved community health outcomes through better access to health, emergency and medical facilities.</p> <p>The Project would particularly benefit those groups that currently experience transport or mobility difficulties such as the elderly, youth, those with a disability, non-drivers or people without access to a private vehicle.</p>
Places of worship	<p>The operation of the Project would generally improve the public transport access and connectivity to the community and their places of worship. It would benefit those people who currently experience transport or mobility difficulties, non-drivers and people without access to a private vehicle to be able to attend their places of worship.</p>
Community service facilities	<p>Community and key Aboriginal community service facilities located near the Project would benefit from the improved transport and connections to other transport modes. The Project would also facilitate access for people in the Aboriginal community with a disability to visit an area significant to them. This would particularly benefit people who currently experience transport or mobility difficulties, non-drivers and people without access to a private vehicle.</p>
Sporting and recreational facilities	<p>The Project would provide greater accessibility across the rail corridor to a number of sporting recreational facilities within proximity to the Project and would encourage increased active transport and social connections more generally, including for vulnerable groups. The Project may also encourage the use of public transport, walking and cycling to these sporting and recreational facilities and to other cycling networks.</p>

Considering the above potential positive and negative impacts to social infrastructure, the magnitude of change is considered to be low positive, with sensitivity of the users of these social service facilities considered to be low. As such, the overall social significance of the operation of the Project on social infrastructure is determined to be low positive.

Heritage and character

The community places value in the historical significance of the area as evidenced in consultation. The Project would result in positive impacts to the historical character by enhancing the community's capacity to access, appreciate and understand the values of the historical character of the area. This would ultimately create a stronger sense of connection to the space and improve the visual amenity of the area. The Project would explore opportunities to enhance the historical significance of the area such as heritage interpretation works to augment the community's sense of place and connection to the community's history. Adaptation of 125-127 Little Eveleigh Street as part of the rail network would ensure the continued use of the building and would retain its significance within the conservation area. The proposed concourse, platform canopies, stairs and lifts, have been sited at the southern end of the Redfern Station and away from significant historic structures, allowing for the majority of heritage elements at the Station to be retained.

The proposed concourse would result in indirect impacts on the aesthetic values of the Station, where the Project would affect significant views and the open feel of the station. These have been mitigated by ensuring a maximum level of transparency is achieved through the glazed and perforated metal panels on the concourse as well as the bulk and scale of the concourse which are kept to a minimum. The concourse would also provide opportunity to reference former historic views accessible from the demolished 1914 footbridge which is considered a beneficial impact. By retaining the key heritage features and majority of platform structures at Redfern Station, the Project would ensure that Redfern Station would retain its State heritage significance. Furthermore, the Project would respect and/or enhance the heritage significance by future-proofing the station's commuter demand to at least 2036, which ensures the longevity of the heritage listed station as a tangible link to the construction of the line and as a major suburban station that served the Eveleigh Railway Workshops and the surrounding suburbs.

With consideration of the overall social impacts to the heritage and character of the station precinct, once operational, the magnitude of change is determined to be moderate (positive). The sensitivity of receivers to changes to the historical character would be moderate. As such, the overall social significance would be considered to be moderate (positive).

11.5 Management and mitigation

11.5.1 Overview

A CEMF (**Appendix D** of this EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

Prior to construction, potential amenity impacts would be managed in line with mitigation measures identified in other relevant technical disciplines and their relevant CEMP, sub-plans and supporting documentation. The technical disciplines used to inform this assessment include:

- Traffic, transport and access
- Noise and vibration
- Visual amenity
- Heritage.

Consultation with relevant stakeholders would also be undertaken to mitigate construction impacts. Consultation and stakeholder engagement would be carried out in accordance with the Community Liaison Management Plan developed for this Project (refer to **Chapter 6** of this EIS).

11.5.2 Performance outcomes

The social performance outcome for the Project are as follows:

- adverse social and economic impacts are minimised through ongoing consultation with individual property owners and the community to document, address and develop strategies to address community concerns.

The Project would be designed, constructed and operated to achieve this performance outcome.

11.5.3 Mitigation measures

A list of mitigation measures which would be implemented to manage and/or mitigate the potential social impacts of the Project are outlined in **Table 11-15**.

Table 11-15 Mitigation measures

ID	Mitigation measure	Applicable location(s)
Construction		
SE1	Implementation of the Project's Community Liaison Management Plan including engagement with residents on both Little Eveleigh Street and Marian Street, City of Sydney Council, NSW Police and other stakeholders.	Study area
SE2	<p>Construction ancillary facilities within private and public reserves and parks would be planned to minimise impacts on existing recreational and sporting infrastructure, with construction laydown areas located in areas of open space, where possible. Establishment and use of the laydown areas would consider public safety and maintaining safe access to recreational areas.</p> <p>Private and public reserves and parks proposed for the construction laydown areas would be returned to their original or improved condition following construction (or as otherwise agreed with the relevant authority).</p> <p>Public access to areas of reserves and parks not utilised for construction laydown areas would be maintained throughout construction.</p>	Ancillary facilities
SE3	TfNSW would investigate opportunities to source construction workers from the local community.	Study area
SE4	Access to properties including businesses would be maintained throughout the Project. Temporary measures such as traffic control would need to be implemented to enable this to occur.	Study area
SE5	<p>Construction activities undertaken in proximity to businesses would maintain visibility of business frontage, associated signage and access points, where possible. Temporary signage would be provided in the vicinity of a business if construction works obstruct views to the business.</p> <p>Business impacts resulting from changes to amenity or access would be managed in line with mitigation measures identified for other relevant environmental issues.</p>	Study area
SE6	<p>Engagement with the local Aboriginal community is ongoing and would continue throughout the Project. Key focus areas for Aboriginal engagement on this Project include:</p> <ul style="list-style-type: none"> • Project design • heritage interpretation and /or community art opportunities • employment and procurement opportunities. 	Study area

ID	Mitigation measure	Applicable location(s)
Operation		
SE7	<p>During detailed design, the Project would investigate opportunities to encourage the community to use the concourse as a connectivity link. This may include elements such as wayfinding signage to assist customers in identifying exits that help them get to their destination efficiently and signage to inform users that an Opal card or contactless payments (e.g. American Express, Mastercard or Visa debit or credit card), is required to access the concourse, however, once tapped off on the other side, charges would be reversed (i.e. no charge).</p> <p>A customer education campaign would be enacted to inform the community of the process and encourage use of the concourse.</p>	Little Eveleigh Street and Marian Street entrances
SE8	During detailed design, the Project would investigate opportunities to augment the community's sense of place and connection to the community's history through elements associated with heritage interpretation works such as installing historical plaques/signage and public art.	All
SE9	The Project would investigate further opportunities during detailed design to encourage social interaction and reduce opportunistic crime and discourage antisocial behaviour, particularly at Little Eveleigh Street, in accordance with the principles of CPTED and in consultation with NSW Police and the City of Sydney.	All, in particular at Little Eveleigh Street
SE10	Upon opening of the Project, TfNSW would undertake a review of the operation of the shared zones, in consultation with residents and relevant stakeholders, including consideration of any additional mitigation that may be required.	Little Eveleigh Street and Marian Street

The construction activity at and immediately surrounding Redfern Station would result in residual (negative) social construction impacts, post mitigation. However, these changes would be temporary.

Following the implementation of the mitigation measures, there would be a moderate (positive) level of residual social operational impacts from the Project.

Further consideration of cumulative impacts is discussed in **Chapter 23** of this EIS.

12 Traffic, transport and access

This chapter provides a summary of the traffic, transport and access assessment undertaken for the Project. A full copy of the assessment report is provided as **Technical Report 3 – Traffic, transport and access**.

12.1 Introduction

Table 12-1 sets out the SEARs relevant to traffic, transport and access and identifies where the requirements have been addressed in this chapter.

Table 12-1 SEARs

Secretary's environmental assessment requirements	Where addressed in this EIS
Transport and traffic	
Construction transport and traffic (vehicle, pedestrian and cyclists) impacts, including, but not necessarily limited to:	
a. a considered approach to access route identification and scheduling of construction vehicle movements, including deliveries	Section 12.4.1
b. indicative daily number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements)	Section 12.4.1
c. construction worker parking	Section 12.4.1
d. the nature of existing traffic (types and number of movements) on construction access routes	Section 12.3.4 and Section 12.4.1
e. access constraints and impacts on pedestrians and cyclists	Section 12.4.1
f. the need to close, divert or otherwise reconfigure elements of the road, pedestrian and cycle network during construction and the duration of these changes	Section 12.4.1
g. temporary and permanent impacts to street parking, including to residents and businesses.	Section 12.4.1
Operational transport impacts (and model where appropriate), including:	
a. property and business access and on-street parking	Section 12.4.2
b. impacts on cyclists, pedestrian access and safety.	Section 12.4.2

12.2 Method of assessment

12.2.1 Assessment methodology

A qualitative assessment was undertaken to identify potential impacts on road, public transport and active transport networks during construction and operation of the Project. The methodology for the assessment included:

- an overview of the existing environment around Redfern Station, including observations during AM, midday and PM weekday peak periods of train passenger travel behaviours, public transport interchange facilities, access facilities to the station, active transport links, parking and taxi facilities and the surrounding road network. Existing traffic volumes collated from SCATs data and traffic surveys undertaken to inform the design of the Project were also reviewed and summarised
- review of the Project and design parameters
- trip generation forecasts for construction vehicles, and a qualitative assessment of the likely impacts during construction

- an assessment of the likely impacts on road users including drivers, pedestrians (including customers such as those with access requirements for disability, carers with prams or people with luggage); cyclists; public transport; parking; pick up/drop off facilities; property access, emergency services; delivery vehicles and garbage truck access within the Project area during construction and operation (refer **Figure 12-1**)
- recommendations for mitigation measures to alleviate the identified transport, traffic and access impacts associated with construction and operation of the Project.

Construction and operation of the Project would generate additional vehicle trips in the surrounding road network that includes Gibbons Street, Lawson Street, Little Eveleigh Street, the Marian Street/Cornwallis Street/Rosehill Street loop, Ivy Lane, Ivy Street and Wilson Street. However, the volume of these additional trips would be very low in proportion to the surrounding road network, and as such, traffic surveys and traffic modelling were not undertaken for the Project.

12.2.2 Study area

The study area for this assessment covers Redfern Station, Little Eveleigh Street, Ivy Street, the Marian Street/Cornwallis Street/Rosehill Street loop and associated transport interchange facilities on Lawson Street and on Gibbons Street (refer **Figure 12-1**).

12.3 Existing environment

The suburb of Redfern is located about three kilometres south of the Sydney central business district, within the City of Sydney LGA. Redfern Station is a major transport hub providing Redfern and surrounding employment and educational precincts key links and connections to Sydney's public transport network.

The land use surrounding Redfern Station consists of residential areas (low to high density) and mixed-use areas, including educational facilities, parks and community facilities.

Redfern Station and its associated service infrastructure and facilities is described in **Chapter 3** of this EIS.

12.3.1 Train passenger travel demand

Rail station entries and exits counts published by TfNSW in its Open Data portal reveal Redfern Station was the sixth busiest station on the Sydney Trains network in 2018, with approximately 62,300 entries and exits per average weekday.

Historical patronage for Redfern Station between 2004 and 2018 shows trips have notably increased in 2017 and 2018. The increase in frequency of passengers is seen as contributing to its high ranking in terms of patronage in the Sydney Trains network, as well as a response to meet the level of demand.

12.3.2 Accessibility and facilities

The majority of the station facilities are located on the concourse level, with the island platforms located below. The platforms are accessed either by stairs or by escalators to underground Platforms 11 and 12, and a lift providing access to Platforms 6 and 7. Equitable access at Redfern Station is limited.

An online survey undertaken by TfNSW in 2019 identified that the primary mode of access to and from Redfern Station was by walking (84%), followed by cycling (14%). During the off-peak period (i.e. periods outside of standard peak hours being 7am - 9am and 4pm - 6:30pm), there was an increase in the proportion of rail customers accessing the station via kiss and ride (ride share or car pool).

A map showing the location of Redfern Station and associated facilities is provided in **Figure 12-2**.



Figure 12-2 Current Redfern Station facilities (TfNSW, 2020, modified by AECOM)

12.3.3 Surrounding traffic and transport facilities

Table 12-2 provides a summary of the traffic and transport facilities surrounding the Redfern Station Precinct.

Table 12-2 Traffic and transport facilities within the Study area

Surrounding facilities	Description
<p>Pedestrian</p>	<ul style="list-style-type: none"> access to Redfern Station is provided from four station entrances located at Lawson Street, corner of Gibbons Street and Lawson Street, Marian Street and the corner of Little Eveleigh Street and Lawson Street stair access to Platforms 1 to 12 escalator access to Platforms 11 and 12 lift access to Platforms 6 and 7 footpaths along streets surrounding the station link to the station entrances

Surrounding facilities	Description
	<ul style="list-style-type: none"> pedestrian crossings facilities to Redfern Station from Lawson Street, corner of Gibbons Street and Lawson Street, Marian Street and corner of Little Eveleigh street and Lawson Street.
Bus services	<ul style="list-style-type: none"> two bus stops (Stand A and Stand B) located along Gibbons Street within walking distance to the station; stand A provides seating and shelter, while Stand B provides a bench eight bus routes service the two bus stops (301, 302, 303, 308, 309, 309X, N11 and N20) primarily operated by the State Transit Authority stand B also caters for temporary bus services and some charter services on Little Eveleigh Street, a designated No Parking zone with buses excepted for a 15-minute limit, is used by shuttle buses operated by nearby organisations, including the University of Sydney, Royal Prince Alfred Hospital and Tribal Warrior.
Cycling facilities	<ul style="list-style-type: none"> mix of on-street and off-street cycle routes within 800 metres of Redfern Station Figure 12-3) study area is well connected to the Sydney Bike Network with a regional cycle route passing along Lawson Street an off-road shared path along Gibbons Street to Marian Street, and links with shared paths in Eveleigh a shared traffic lane on Little Eveleigh Street, is provided in the westbound direction, and a cycle route is provided in the eastbound direction. This route links with Newtown and Ashfield and is provided with wayfinding bicycle storage spaces including a bicycle locker (32 spaces) at the corner of Lawson Street and Gibbons Street, and 17 bicycle hoops on Little Eveleigh Street (providing 34 spaces) in addition, three bicycle hoops are provided on Cornwallis Street (providing six spaces) and informal bicycle spaces are observed on the shared path on Gibbons Street and Marian Street, although no formal bicycle parking spaces are provided.
Commuter parking facilities	<ul style="list-style-type: none"> no commuter parking facilities available around Redfern Station there is time-restricted on-street parking in surrounding streets, including Gibbons Street, Cornwallis Street, Marian Street, Rosehill Street, and on Little Eveleigh Street primarily used by residential, retail and commercial establishments as well as other local attractors in the Eveleigh area.
Kiss and ride facilities	<ul style="list-style-type: none"> no formal kiss and ride zone in the study area short-term parking areas and No Parking/No Stopping zones on Gibbons Street, Little Eveleigh Street and Marian Street are at times used as informal kiss and ride areas.
Taxi facilities	<ul style="list-style-type: none"> a taxi rank with about three spaces on Gibbons Street.



Figure 12-3 Cycle routes in the study area (CoS, 2020)

12.3.4 Road network and performance

Key roads in the study area include Gibbons Street, Lawson Street, Little Eveleigh Street and the Cornwallis Street, Marian Street, Rosehill Street loop (refer **Figure 12-1**).

Little Eveleigh Street and the Marian Street/Cornwallis Street/Rosehill Street loop are local roads that provide local access to driveways, properties and car parking. Site observations undertaken showed that traffic volumes are low with a good network performance and minimal delays and queuing. Traffic observed generally consist of light vehicles. High pedestrian volumes can also be observed along these roads, with pedestrians often observed walking along the road carriageways and crossing the road outside designated pedestrian crossings.

Gibbons Street and Lawson Street are regional roads and carry a large number of light and heavy vehicles during the network peak hours. Site observations showed that delays and queuing were evident, however, network performance did not appear to be at capacity or at unacceptable levels. Gibbons Street is an approved B-Double route so vehicles up to 26 metres in length are expected to use the route.

Gibbons Street

Gibbons Street is a regional road with a north-south alignment. It is a one-way road in the northbound direction with four traffic lanes. The kerbside lanes are generally used for parking and also cater for interchange facilities for Redfern Station (bus zones and taxi zone). During peak periods, clearway restrictions apply for the eastern kerbside lane.

SCATS for the 6 March 2019 indicates that average weekday traffic volumes are in the region of 26,000 vehicles per day at the intersection of Gibbons Street with Wyndham Street and Boundary Street, with a peak hour flow of between 1,700 – 1,800 vehicles in the AM and PM peak hour.

Lawson Street

Lawson Street is a local road aligned in an east-west direction along the northern boundary of the Redfern Station. The road generally provides one traffic lane and kerbside parking in each direction, with kerbside parking prohibited on the overpass bridge immediately north of Redfern Station. The station entrances on this street have been identified as a high pedestrian activity area, with a speed limit of 40 kilometres per hour. There is a refuge island in front of one of the station entrances for pedestrians to use when crossing the road. The traffic lights at the intersection with Gibbons Street also provides pedestrian crossing facilities.

Traffic surveys undertaken by Austraffic on the 10 March 2020 indicates that average weekday traffic volumes are in the region of 7,700 vehicles per day, with a peak hour flow of 665 in the PM peak hour at its intersection with Little Eveleigh Street.

Little Eveleigh Street

Little Eveleigh Street is a local road to the west of the railway corridor. It has one-way traffic flow from the intersection with Lawson Street through to Ivy Lane. The configuration of Little Eveleigh Street in the travel direction is comprised of kerbside parking spaces to the left (restricted to one hour parking with the exception of permit holders), a shared cycle path and traffic lane, as well as a contraflow cycle path heading back to Lawson Street.

Traffic surveys undertaken by Austraffic on the 10 March 2020 indicates that average weekday traffic volumes are in the region of 681 vehicles per day.

Cornwallis Street/Marian Street/Rosehill Street

The Cornwallis Street/Marian Street/Rosehill Street forms a one-way loop road located to the south and east of Redfern Station. This loop is accessed from Gibbons Street near its intersection with Boundary Street, and links to the station entrance at the southern end of Platform 10 at Marian Street. Key features of the loop include:

- Rosehill Street
 - parking lane on each side of the one-way road (restricted to two hour parking limit with the exemption of permit holders)
 - a travel lane in the centre
- Cornwallis Street
 - kerbside parking lane to the west (restricted to two hour parking limit with the exemption of permit holders)
 - travel lane on the east heading in the direction of travel
 - footpaths on both sides of the road
- Marian Street
 - driveways accessing the car park north of the Gibbons Street Reserve used by Sydney Trains staff and basement off-street parking area of 1 Marian Street (The Watertower Building)
 - designated as a shared zone fronting the station entrance
 - parking lane on each side of the one-way road (restricted to two hour parking limit with the exemption of permit holders).

Traffic surveys undertaken by Austraffic on the 10 March 2020 indicates that average weekday traffic volumes are in the region of 486 vehicles, with a peak hour flow of 64 in the AM peak hour.

Ivy Lane

Ivy Lane is a local road located to the west of the Redfern Station. It is aligned in a north-south direction and connects to Little Eveleigh Street to the south and Lawson Street to the north. The road has one-way northbound traffic flow from its intersection with Little Eveleigh Street through to Lawson Street. It provides local access to driveways and properties and generally would carry local traffic accessing Little Eveleigh Street.

Traffic surveys undertaken by Austraffic on the 10 March 2020 indicates that average weekday traffic volumes are in the region of 600 vehicles, with a peak hour flow of 59 in the PM peak hour.

Ivy Street

Ivy Street is a local road running to the west of the Redfern Station. It is located west of Ivy Lane and has one-way southbound traffic flow south of Abercrombie Street, from Lawson Street through to Wilson Street. North of Abercrombie Street, it is one-way northbound and becomes a two-way north of Lander Street. South of Abercrombie Street, Ivy Street provides local access to driveways, properties and on-street parking, linking to Wilson Street in the south.

Traffic surveys undertaken by Austraffic on the 10 March 2020 indicates that average weekday traffic volumes are in the region of 10 vehicles per day.

Wilson Street

Wilson Street is local collector road generally aligned in an east-west direction, to the west of Redfern Station. It is a two-way road between Ivy Street and Burren Street/Brocks Lane and is one way eastbound, west of Burren Street/Brocks Lane. The road generally provides one traffic lane and kerbside parking in each direction. Near the station, the road is sign-posted with a speed limit of 50 kilometres per hour and caters for on-road cycling.

Traffic survey data for Wilson Street is not available, however from undertaking site observations, it was observed that traffic volumes along Wilson Street are relatively low due to it being a local, residential street.

12.4 Impact assessment

12.4.1 Construction

Potential impacts from construction of the Project to traffic, transport and access are described below. Identified impacts would be experienced at various times throughout the construction phase, as works progress and depending on the activity being undertaken. The indicative construction program and working hours are described in **Section 5.2.7** of **Chapter 5** of this EIS.

Pedestrians

The Project is expected to cause temporary disruptions to the existing pedestrian facilities surrounding the station, particularly for pedestrian access to the station when construction works for the station entrances, platforms and surrounding footpaths are being undertaken. Impacts to pedestrian access, especially for those with disabilities or with a visual impairment and for customers in a wheelchair would include:

- pedestrian diversions along Gibbons Street to the eastern side of the road as a result of the proposed footpath upgrade at Gibbons Street associated with the new kiss and ride facility
- pedestrian diversions to the southern side of Lawson Street associated with the proposed kiss and ride at this location; existing pedestrian facilities such as the pedestrian refuge on Lawson Street would also be utilised
- a partial road closure of Little Eveleigh Street for construction of the shared zone, resulting in limited space for pedestrians to pass through, and the requirement for pedestrian diversions. It is anticipated that pedestrian access would be maintained throughout construction with diverted pedestrian movement along Ivy Street, potentially to the opposite side of the road, due to the footpath upgrade on the eastern side of Ivy Street. Access for Little Eveleigh Street residents would be maintained at all times

- longer travel distance for pedestrians accessing or egressing from Platform 10 at Marian street. This is due to footpath widening and extending the shared zone on Marian Street to include part of Rosehill Street. As such, customers may need to be diverted to use Gibbons Street to travel between Redfern Station and the signposted Eveleigh precinct
- increased risk of collision to pedestrian and vehicle and potential loss of footpath access within the vicinity of the ancillary facilities from increased numbers of light and heavy vehicles at these locations
- increased travel times due to required diversions between Gibbons Street and Rosehill Street/Marian Street for pedestrians as a result of ancillary facility potentially requiring the occupation of these footpaths.

Public transport

The construction of the Project would require temporary periodic closure of the railway corridor, which would affect train movements. As part of routine operations, track possessions are scheduled periodically by Sydney Trains to undertake maintenance and upgrade activities within the rail corridor. It is anticipated that around 20 scheduled weekend track possession periods would be utilised to undertake a number of construction activities, with two additional (non-scheduled) track possession periods proposed. While this would be mitigated using the existing practice of providing replacement bus services to transport train customers', additional travel times could be anticipated due to extra buses on the road network. This is in line with typical travel time adjustments that are required during routine track possession periods undertaken on the Sydney Trains network.

During times when train services would continue to run at Redfern Station, construction work would temporarily reduce the amount of space available for train customer movement on the station platforms, particularly in areas where construction of the lift areas and stairway landings is occurring. The reduced space on the platform may increase customer congestion and reduce the amount of standing/waiting and passageway areas. There may also be space constraints for customers disembarking from trains, where the reduced platform spaces may increase passenger congestion upon egress, particularly during morning peak periods.

Platform 1 is used by Sydney Trains staff to access train operations and maintenance sites to the south west. Staff access to these areas would be impacted by the Project's construction, in particular works on Platform 1. Access for Sydney Trains staff would be maintained by a well signposted new access path to these sites.

The existing shuttle bus zone on Little Eveleigh Street would be relocated to the eastern end of Lawson Street, near Little Eveleigh Street. Customers requiring access to the relocated shuttle bus zone would be required to travel about the same distance as to the existing bus stop, with a requirement to cross Little Eveleigh Street, which has low traffic volumes. As such, the impacts to customers utilising this bus zone are expected to be minor.

Bus services along Gibbons Street would continue to operate during construction activities, however they may experience minor delays due to temporary traffic diversions, construction vehicle movement towards the ancillary facility, the Rosehill Street area and other temporary relocations, such as those relating to construction of the proposed kiss and ride facility adjacent to the existing bus zone. Other bus services in the vicinity of the station are not expected to be affected.

Cyclists

Construction activities associated with converting Little Eveleigh Street into a shared zone would require removal of the cycle route running along the street, potentially requiring diversion via Ivy Street from Wilson Street to Lawson Street during construction.

Construction Ancillary Facility 2 would also require vehicular access via Little Eveleigh Street (refer **Figure 12-1**). The associated increase in light and heavy vehicle movements would potentially impact amenity and safety for cyclists using Little Eveleigh Street in a westbound direction.

Bicycle parking spaces on Little Eveleigh Street would be replaced during construction and additional spaces would be installed, resulting in a total of approximately 60 bicycle parking spaces. Bicycle parking spaces may not be available during these works.

In addition, the existing shared zone on Marian Street would be extended to include part of Rosehill Street, with footpath widening and pavement works proposed at this location. These construction works would potentially require cycle route diversion between Cornwallis Street and Rosehill Street via Boundary Street or Henderson Road to the south. Construction Ancillary Facility 3, located within Gibbons Reserve (refer **Figure 12-1**), may also require the temporary removal of the cycle route in the eastbound direction currently in use at this location (refer **Figure 12-3**). Cycle way diversions would be required for cyclists to travel between Rosehill Street and Gibbons Street

Kiss and ride

Informal pick-up and drop-off activity was observed at the existing shared zone on Marian Street, on Little Eveleigh Street and on Lawson Street. On Marian Street, construction of the Project would impact the informal pick-up and drop-off activity observed in this area with construction vehicles moving around the area, and intermittent road closure to allow for deliveries and movement of equipment.

Informal pick-up/drop-off activity undertaken on Little Eveleigh Street would also cease during the partial road closure and construction activities required for the creation of a shared zone.

Construction works for new kiss and ride facilities on Lawson Street and Gibbons Street would occur concurrently with the footpath upgrade works at these locations. Partial lane closures would be required for these works along with temporary pedestrian and cyclist diversions.

Taxi

The operation of the taxi rank on Gibbons Street is unlikely to be impacted during the construction of the Project.

Parking

Table 12-3 provides a summary of the potential impacts to parking surrounding Redfern Station during construction of the Project.

As described in **Chapter 5** of this EIS, construction workers would be encouraged to travel to the site utilising public transport. If this is not practicable, workers would be encouraged to carpool. Under the Sustainability Management Plan, a Green Travel initiative would be implemented. A workers' reward scheme would be instigated for those who adhere to the initiative.

Workers would be required to park a pre-determined distance away from the station and/or within pre-defined areas, including within construction ancillary facility areas, and the potential additional parking area within the current Sydney Trains car park on the north side of the rail corridor. This is in order to minimise impacts to local residents, businesses and station customers.

Table 12-3 Potential impacts to parking in the Study area

Location	Potential parking impacts
Gibbons Street	Construction of the new kiss and ride facility on Gibbons Street would require the permanent removal of about three existing restricted car parking spaces. In the context of the existing street parking available along Gibbons Street and other roads in the vicinity, this impact would be minor. The proposal to upgrade the existing footpath along Gibbons Street may also restrict access to a number of on-street car parking spaces, due to footpath diversion requirements as well as construction activities. There is existing on-street parking available within 400 metres of this location, primarily along Rosehill Street, Cornwallis Street, Regent Street, Garden Street and Boundary Street.

Location	Potential parking impacts
Lawson Street	<p>Up to four time-restricted (two-hour limit) street parking spaces would become unavailable due to construction works along Lawson Street, before the permanent removal of three parking spaces to accommodate the proposed kiss and ride facility. These parking spaces are typically used by staff and visitors to nearby commercial establishments, as well as residents. These users would need to park further away which may increase the walking distance typically associated with using these car parking spaces.</p> <p>There is existing on-street parking available within 400 metres of this location including on the section of Ivy Street outside of the Project area, Louis Street, Caroline Street, Abercrombie Street and Hugo Street.</p>
Little Eveleigh Street	<p>Access to Construction Ancillary Facility 2 would be from either Carriageworks (subject to approval with the operator of Carriageworks) and/or Little Eveleigh Street.</p> <p>Parking along Little Eveleigh Street would be unavailable when works for establishment of the shared zone commences. These works would require the permanent removal of 20 parking spaces from Little Eveleigh Street (including 18 resident/restricted parking spaces, one accessible parking space and one car share scheme parking space). The same number of spaces would be relocated to the new car park proposed as part of the Project within the existing railway corridor land at the western end of Little Eveleigh Street. The new car park would be constructed prior to the removal of the parking spaces on Little Eveleigh Street.</p> <p>It is noted that the location of the new car park is within the Redfern North Eveleigh precinct. Planning for the urban renewal of this precinct is underway, and the car park location may therefore be an interim measure. In the event that the car park would be affected by this process, any proposed reconfiguration or relocation of the offset parking arrangements would be undertaken in consultation with relevant stakeholders, and in a manner which ensures that the principle of offset parking is provided in perpetuity, and remains within reasonable walking distance of Little Eveleigh Street.</p>
Marian Street/Cornwallis Street/Rosehill Street loop	<p>During construction, some street parking along Marian Street, Cornwallis Street and Rosehill Street would be intermittently unavailable, before the permanent removal of about 16 parking spaces in the location of the shared zone extension, including five unrestricted parking spaces, and eleven restricted parking spaces (signed two-hour restricted/permit holders unrestricted). A car share scheme parking space would also be relocated to a new location further south along Rosehill Street (refer Figure 12-1). The final location of the relocated space would be determined in consultation with City of Sydney Council as part of the detailed design process.</p> <p>Construction vehicles would need to access construction Ancillary Facility 3 using Rosehill Street, and then Marian Street and Cornwallis Street on egress. The required traffic control to allow this may include restricting additional on-street parking on at least one side of Rosehill Street for intermittent periods.</p> <p>There is existing on-street parking available within 400 metres of these lost parking spaces, primarily along Rosehill Street and Cornwallis Street (outside of the Project area), Gibbons Street, Regent Street, Garden Street and Boundary Street.</p>

Location	Potential parking impacts
Ivy Street	The existing on-street parking spaces along Ivy Street may be temporarily unavailable to accommodate construction activities in this area (i.e. footpath widening). During these times, users would need to use alternate parking spaces in other surrounding streets, which would potentially entail longer walking/travel distances to and from cars. There is existing on-street parking available within 400 metres of these parking spaces including on the section of Ivy Street outside of the Project area, Wilson Street, Lawson Street, Abercrombie Street and Lander Street.
Sydney Trains staff car park	<p>The existing Sydney Trains car park on Marian Street would form part of Ancillary Facility 3 for the Project, and be used for a site office compound and an administration centre for the Project, including car parking facilities for construction staff.</p> <p>This would require relocation of the existing car park on Marian Street (currently utilised by Sydney Trains staff). Alternative parking arrangements would be required for these vehicles, and Sydney Trains vehicles would be required to park at the staff car park off the western end of Little Eveleigh Street.</p>

Traffic

The Project would generate only a marginal number of additional traffic movements (about 20 heavy vehicle movements and up to 40 light vehicle movements per day) during peak construction periods. Heavy vehicles would likely be either small, medium or heavy rigid vehicles between 6.4 metres and 12.5 metres in length. The frequency of these vehicle movements would be as required and would depend on the construction stage and activity being undertaken, with most of these movements anticipated during the concourse construction, the works along Little Eveleigh Street and Marian Street, and also for spoil movement.

Heavy vehicles would generally follow established heavy vehicle routes to access the construction ancillary facilities, and only use local roads where required to complete the trip. Key regional access routes to the construction areas include Cleveland Street, Regent Street, Wyndham Street/Gibbons Street and Lawson Street. Locally, Little Eveleigh Street and the Marian Street/Cornwallis Street/Rosehill Street loop would be used to access Construction Ancillary Facility 2 and Construction Ancillary Facility 3. The access route for Construction Ancillary Facility 1 would include Wyndham Street, Botany Road, McEvoy Street, Fountain Street, Mitchell Road, Copeland Street/Swanson Street and Railway Parade (refer **Figure 12-1**).

Traffic modelling has not been undertaken to assess the impact to intersection or network performance as a result of the expected peak volume of construction vehicles (20 heavy vehicles and 40 light vehicles per day). Traffic volume increases of this nature would create negligible traffic impacts on the key local and regional access routes, given that this traffic from the Project would result in a small percentage increase in traffic volumes for these key routes.

The arterial road network generally has higher operating capacity and is more resilient than local roads. Where possible, the vehicle movements would follow the arterial road network, which generally has a higher operating capacity than local roads. Further, construction traffic would largely be generated outside of the network peak periods and distributed throughout the working day.

However, the local roads that would be used to access the construction sites and construction ancillary facilities would generally have lower operating capacity, but also lower background traffic volumes. Potential traffic impacts could include higher safety risks associated with pedestrian, cyclist or vehicle interaction with construction traffic rather than impacts to network performance. Local access for residences would be maintained at all times. In particular, along Little Eveleigh Street and the Marian Street/Cornwallis Street/Rosehill Street loop, partial road closures and diversions for through traffic would be required during specific phases of construction to complete the works. In this instance, access for through traffic would be prohibited for the duration of the closure, and drivers attempting to use Little Eveleigh Street would be diverted along Lawson Street. Drivers accessing the Marian Street/Cornwallis Street/Rosehill Street loop would be for local access as there is no through

route so diversions would not apply here. The impacts to travel time of these drivers are not expected to be significant as these roads generally provide local access rather than a key through route for general traffic, and there is a convenient diversion route along Lawson Street for through traffic. Furthermore, network performance as a result of any diversions and road closures is not expected to deteriorate due to the low number of construction vehicle volumes expected, and also as road closures and construction vehicle movements in general would be planned to occur outside of peak hours where possible.

A construction traffic management plan would be prepared during detailed design in coordination with the construction contractor. All vehicle movements associated with the Project would be scheduled to arrive and depart to a fixed operating schedule to avoid impacts to the road network. This may include queueing/possible reverse manoeuvres at the ancillary areas and work sites and the stacking of heavy vehicles awaiting delivery slots etc. As a worst case assessment, if all 60 vehicle trips were generated in a single hour, it would result in an additional vehicle trip every minute. These additional trips would also likely be distributed across the network at the various work sites and ancillary facilities, further reducing the density of the additional traffic volumes.

Property access

Table 12-4 provides a summary of the potential impacts to property access as a result of the Project.

It is noted that emergency services, delivery vehicles and waste collection vehicles access to Little Eveleigh Street and the Marian Street/Cornwallis Street/Rosehill Street areas would be maintained for emergency, delivery and waste collection vehicles during the Project's construction period. Minor impacts to waste collection efficiency may result from the need to relocate waste bins to areas that are easily accessible by the waste collection services.

Table 12-4 Impacts to property access

Location	Potential property impacts
Gibbons Street	Footpath upgrade works in this location may temporarily impact pedestrian access to/from Gibbons Street Reserve from Redfern Station through the requirement to put pedestrian diversions in place, which may also increase travel times. The portion of the reserve that would be used as an ancillary facility would be unavailable to the public also.
Lawson Street	Footpath upgrades required for the proposed kiss and ride and bus zone at this location would impact pedestrian access along this section of Lawson Street as pedestrian diversions would be required. Pedestrian access would be maintained however, and where required construction hoarding would be erected for pedestrian safety. Construction works would also impact vehicular access to existing parking areas, as three restricted car parking spaces would become unavailable before being permanently removed as part of these works (to accommodate the kiss and ride and bus zone).
Little Eveleigh Street	<p>During construction, access for local vehicles, pedestrians and cyclists would be maintained, however some diversions for through vehicles and space restrictions would be required, and delays would be experienced. These impacts would be experienced over the majority of the construction period, however closures and diversions would be limited to shorter time periods as required within this overall timeframe.</p> <p>Access to driveways would be maintained throughout the Project. However, in some instances access to individual properties may be temporarily impacted. These impacts would be discussed and coordinated with individual residents to minimise the impacts as far as possible.</p>

Location	Potential property impacts
Marian Street/Cornwallis Street/Rosehill Street	During construction, access would be maintained for local traffic, pedestrians and cyclists, however some diversions may be required, and space may be constrained. Some delays may be experienced by pedestrians and with construction vehicles and machinery operating on the street as well as vehicles accessing properties along these streets, particularly 1 Marian Street (The Watertower Building). These could also extend to vehicular access to other properties serviced by Marian Street/Cornwallis Street/Rosehill Street, particularly those on the northern side of Margaret Street.
Ivy Street	Property access would be maintained during construction, however, temporarily impacts may be experienced during times where diversions are required. This may result in longer walking distances as a result of parking diversions for residence.

12.4.2 Operation

Potential impacts from operation of the Project to traffic, transport and access are described below.

Future demand

Based on pedestrian forecasts, it is estimated that approximately 100,000 pedestrians would use the new concourse each day by 2036, including exit/entry, transfers and cross corridor usage.

Forecasted patronage for Redfern Station in 2024 determined that a total of 31,480 individuals are expected to enter, transfer and exit during peak hours of 8am to 9am and 5pm to 6pm.

The Project has been designed to account for the predicted patronage forecasts. Detailed design would continue to consider future patronage demands.

Pedestrians

The Project would improve the customer experience overall within the Redfern Station precinct, primarily by improving accessibility of the station and surrounds. **Table 12-5** outlines the positive impacts (benefits) that would be introduced.

Table 12-5 Operational benefits for pedestrians

Within Redfern Station	Surrounding Redfern Station
<ul style="list-style-type: none"> installation of six new lifts to provide an accessible path of travel to Platforms 1 to 10 and across the railway line improvements to the accessibility of the station for persons with a disability, including wheelchair users and people with a visual impairment additional stair access to the south of the platforms, potentially reducing walk distance for a number of customers, crowding at stairs and platform clearance times upgraded platform levels and surfaces new station entrances at Marian Street and Little Eveleigh Street upgraded footpaths and pavement resurfacing upgraded wayfinding signage. 	<ul style="list-style-type: none"> walking distances mostly decreased and accessibility to active transport modes improved as a result of new entrances at Little Eveleigh Street and Marian Street improved customer experience in the new shared zone areas, including improved paths, reduced traffic speeds and improved pedestrian safety along with enhanced walkability improved pedestrian safety and connectivity with Abercrombie Street and surrounding areas from footpath widening works within Ivy Street improved safety for passengers alighting vehicles from the kiss and ride facilities and associated footpath upgrades provision of a cross corridor route, with security features such as lighting, CCTV cameras and emergency equipment.

During operation of the Project approximately 3,300 and 6,770 pedestrians are anticipated to utilise Little Eveleigh Street and Marian Street respectively during a typical AM peak hour. The shared zones would be designed to provide adequate capacity for these volumes.

Public transport

The Project would bring about the following impacts:

- a positive impact for a number of train customers with special access requirements, who would be able to access all above ground platforms at Redfern Station under the Project
- ease of congestion for customers waiting on platforms, through enabling customers to be more evenly distributed. The Project would potentially divert about 50 per cent of the current customer load on the existing Lawson Street entrances to the new entrance on Little Eveleigh Street, and the upgraded entrance on Marian Street
- a more direct route for shuttle buses using the relocated bus zone on Lawson Street. The relocation of this bus zone would not significantly increase pedestrian walking distance (due to its proposed proximity to the existing bus zone), There would be a reduced turnaround time for buses (when compared to pulling into Little Eveleigh Street at the current bus zone)
- shorter walking distances between the platforms and the bus stop on Gibbons Street, via the new entrance at Marian Street.

Overall, the negative operational impacts of the Project on public transport operations are limited, with mostly positive impacts, generally associated with customer amenity, convenience and safety, offering a better customer experience.

Cyclists

Cyclists and cycle routes around Redfern Station would be impacted in the following ways during the operation of the Project:

- the existing Gibbons Street/Marian Street cycle route would not be adversely affected; however, this cycle route would be enhanced by the expanded share zone along Marian Street
- there would be potentially higher cyclist/pedestrian interactions on Marian Street due to the higher pedestrian volumes associated with the new station entrance
- about 20 additional bicycle parking spaces would be provided at the new Marian Street station entrance, creating a positive impact for cyclists
- there would be a higher risk of cyclist and pedestrian interaction along Little Eveleigh Street, due to the increased pedestrian volumes associated with the new station entrance and shared zone
- additional bicycle spaces would be installed on Little Eveleigh Street, providing a total of 60 bicycle parking spaces at this location, creating a positive impact for cyclists.

Kiss and ride

The introduction of formalised kiss and ride facilities on Lawson Street and Gibbons Street presents a positive impact on the overall operation of the station, as it allows the opportunity for additional modal access to the station.

Taxi

The operation of the Project would have no direct impact on taxi operations, including on the existing taxi rank on Gibbons Street. Taxi customers interchanging to/from train services would gain benefits from the introduction of a kiss and ride facility (which taxis can access) and improved pedestrian facilities along the western side of Gibbons Street.

Parking

Operation of the Project would result in the following impacts to parking:

- Relocation of about 20 parking spaces to a new car park at the western end of Little Eveleigh Street. The parking spaces would be replaced like for like. The relocation of existing on-street parking spaces along Little Eveleigh Street would require the users of these on-street spaces to

walk longer distances to the new car park in some cases, however as the replacement parking is like for like, the impact is expected to be minor

- It is noted that the location of the new car park is within the Redfern North Eveleigh precinct. Planning for the urban renewal of this precinct is underway and the car park location may be an interim measure. In the event that the car park would be affected by this process, any proposed reconfiguration or relocation of the offset parking arrangements would be undertaken in consultation with relevant stakeholders, and in a manner which ensures that the principle of offset parking is provided in perpetuity, and remains within reasonable walking distance of Little Eveleigh Street
- The permanent removal of about 16 car parking spaces as a result of the upgrade of Marian Street/Cornwallis Street/Rosehill Street, including five unrestricted parking spaces and 11 time-restricted spaces. The loss of time-restricted and resident parking spaces would put additional pressure on the surrounding car parking supply, and inconvenience local residents who may need to park further away from their residence. However, this would not likely have an impact on parking amenity as these are likely to be occupied by commuter or all-day parking given their proximity to the station. The existing car share scheme parking space would be relocated to a new location further south along Rosehill Street. In addition, formal loading arrangements would not be provided within the new formalised shared zone areas
- The new kiss and ride and bus zone provided on Lawson Street, near the intersection of Little Eveleigh Street, would require removal of three existing parking spaces. Additionally, three restricted car parking spaces would also require removal on Gibbons Street. The permanent removal of these parking spaces may put additional pressure on the surrounding car parking supply.

Traffic

Operation of the Project is not anticipated to generate significant traffic volumes, and therefore traffic flows around Redfern Station are not expected to be impacted. A reduction in the speed limit to 10 kilometres per hour within the shared zone areas is not anticipated to affect the traffic flow characteristics of the area, which already experience slow operating speeds.

Ongoing maintenance would be required for key operational components and may generate a limited number of additional vehicles accessing the station. Maintenance would be undertaken by Sydney Trains and City of Sydney Council in line with standard maintenance policies.

Property access

There would be no permanent impacts to property or business access during operation of the Project, other than to 125-127 Little Eveleigh Street, which would be required for the new station entrance. This building is owned by TfNSW and would require relocation of the current tenant in mid-late 2020.

The new shared zone areas at Little Eveleigh Street and Marian Street/Cornwallis Street/Rosehill Street would maintain the existing property access arrangements, including access to off-street vehicle parking (relocated) and space for waste collection and deliveries.

12.5 Management and mitigation

12.5.1 Overview

A CEMF (**Appendix D** of the EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

A Construction Traffic Management Sub-Plan would be developed for the Project in line with Section 6.1 of the CEMF.

This chapter includes a compilation of the performance outcomes as well as mitigation measures, including those that would be included in the Construction Traffic Management Sub-Plan.

12.5.2 Performance outcomes

The performance outcomes for the Project in relation to traffic, transport and access are as follows:

- safe and efficient access routes are provided for pedestrians, cyclists and road users, including buses
- maintain access for all customers to Redfern Station, while the station is operational
- access to residences and commercial properties is maintained
- access for emergency vehicles, waste management services and deliveries is maintained
- the local community, relevant authorities and other proponents undertaking concurrent work close to the Project are consulted to minimise disruptions to road, active transport and public transport users
- the local community and relevant authorities are consulted regarding upcoming Project construction activities to minimise disruptions to road, active transport and public transport users the Project provides convenient, safe and direct access for customers to the station during operation.

The Project would be designed, constructed and operated to achieve these performance outcomes.

12.5.3 Mitigation measures

A list of mitigation measures to be implemented during the Project and which are designed to meet the performance outcomes are provided in **Table 12-6**.

Table 12-6 Mitigation measures

ID	Mitigation measure	Applicable location(s)
Construction		
T1	Relocation of bus stops would be carried out by TfNSW in consultation with the City of Sydney, University of Sydney, Royal Prince Alfred Hospital, bus operators and other relevant authorities. Wayfinding and customer information would be provided to notify customers of relocated bus stops.	Little Eveleigh Street and Lawson Street
T2	The new offset parking facilities on Little Eveleigh Street would be constructed prior to the removal of parking, to accommodate parking spaces displaced to facilitate construction activities	Little Eveleigh Street
T3	Road Safety Audits would be carried out to address vehicular access and egress, and pedestrian, cyclist and public transport safety. Road Occupancy Licenses (or equivalent) for temporary road/lane closures would be obtained where required. The audit location would be outlined in the Construction Traffic Management Sub-Plan.	The Project area
T4	Appropriate signage and line marking would be provided to guide pedestrians and cyclists past construction sites and on the surrounding network to allow access to be maintained. Appropriate access measures would further be developed to guide customers with access requirements for disability, including wheelchair users and people with a visual impairment.	The Project area
T5	Community consultation would be carried out and notifications would be issued in advance for any proposed road and pedestrian network changes through appropriate channels and forms of communication.	The Project area
T6	Access to existing properties and buildings would be maintained, where possible, in consultation with property and business owners.	The Project area

ID	Mitigation measure	Applicable location(s)
T7	Construction sites would be managed to minimise construction worker parking on surrounding streets. Workers would be encouraged to use public or active transport and ride share with the implementation of a Green Travel Plan initiative. A workers' reward scheme would be implemented for those who adhere to the initiative.	The Project area
T8	Construction site traffic would be managed to minimise traffic impacts during the peak periods through scheduling construction vehicle movements outside the peak hours. Where possible, group deliveries would be restricted.	The Project area
Operation		
T9	Enhancement of pedestrian and cycle infrastructure at the Station would be further investigated in consultation with relevant authorities, including TfNSW and the City of Sydney.	The Project area
T10	Carry out pre-parking surveys and post-parking surveys and provide the data to City of Sydney. The surveys are to demonstrate that pressures on parking within the Project area and surrounds are managed in accordance with predicted future supply and demand.	The Project area

Overall, the Project is expected to cause temporary impacts to the existing pedestrian, cycle, public transport and surrounding road networks during construction. The implementation of the mitigation measures above would reduce these impacts, however there would still be potential for construction impacts from the Project to contribute to cumulative impacts with other surrounding projects.

Operation of the Project would result in some permanent changes within and surrounding the station, including several benefits to the customer experience. The residual impacts of the Project during operation include:

- the relocation of 20 car parking spaces from Little Eveleigh Street to a new car parking area
- the loss of about 16 car parking spaces (as a result of the Marian Street/Cornwallis Street/Rosehill Street shared zone upgrade)
- the loss of about three car parking spaces on Lawson Street, and the loss of about three car parking spaces on Gibbons Street (as a result of the new kiss and rides and bus zone)
- introduction of a shared zone on Little Eveleigh Street and upgrade to the shared zone on Marian Street/Cornwallis Street/Rosehill Street, including an associated reduction in the speed limit of the shared zones to 10 kilometres per hour, and potentially higher pedestrian/cyclist interactions
- permanent use of 125-127 Little Eveleigh Street (for the new station entrance).

These residual impacts have the potential to contribute to cumulative impacts with other projects in the vicinity. Cumulative impacts are addressed in **Chapter 23** of this EIS.

13 Noise and vibration

This chapter provides a summary of the noise and vibration assessment undertaken for the Project. A full copy of the assessment report is provided as **Technical report 4 – Noise and vibration** of this EIS.

13.1 Introduction

This chapter responds to the SEARs relevant to noise and vibration. **Table 13-1** sets out the relevant SEARs and identifies where they have been addressed in this Chapter.

Table 13-1 SEARs

SEARs	Where addressed in this EIS
Noise and vibration - Amenity	
Assess construction and operational noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must consider cumulative impacts from nearby key infrastructure projects. The assessment must justify impacts to receivers including consideration of sleep disturbance (including the number of noise-awakening events), and, as relevant, the characteristics of noise and vibration (for example, low frequency noise).	Section 13.4.1 Section 13.4.2 Cumulative noise impacts are addressed in Chapter 23 of this EIS.
Construction noise and vibration including:	
a. the nature of construction activities (including transport, tonal or impulsive noise-generating works, as relevant)	Section 13.4.1
b. the intensity and duration of noise (both air and ground borne) and vibration impacts	Section 13.4.1
c. identification of receivers, existing and known future, during construction	Section 13.3 and Section 13.4.1
d. the sensitivity of receivers to the level of impact	Section 13.2.3 Section 13.3
e. the need to balance: <ol style="list-style-type: none"> i. timely conclusion of noise and vibration-generating works with periods of receiver respite; ii. the need to work at night and during planned rail possessions; and iii. other factors that may influence the timing and duration of construction activities 	Section 13.4.1 Section 13.5
f. noise impacts of out of hours works (including utility works), the activities to be undertaken, their estimated duration and justification in terms of the <i>Interim Construction Noise Guideline</i> (DECC, 2009)	Section 13.4.1
g. cumulative noise and vibration including project impacts and concurrent construction activities within the proposal and the construction of other relevant development in the vicinity	Section 13.4.1 Cumulative noise impacts are addressed in Chapter 23 of this EIS
h. details and analysis of the predicted effectiveness of mitigation measures to adequately manage identified impacts, including impacts as identified in (g), and any potential residual noise and vibration impacts following application of mitigation measures	Section 13.5.3

SEARs	Where addressed in this EIS
i. a description of how feedback received during preparation of the Environmental Impact Statement has been taken into account (and would be taken into account following exhibition of the EIS) in the design of mitigation measures, including any tailored mitigation, management and communication strategies for sensitive receivers.	Section 13.5
Noise and vibration - Structural	
Operational noise and vibration impacts resulting from use of the infrastructure on the amenity of local residents.	Section 13.4.2
Construction and operation noise and vibration impacts to the structural integrity and heritage significance of items (including Aboriginal places and items of environmental heritage) in accordance with relevant guidelines.	Section 13.3.2 Section 13.4.1

13.2 Method of assessment

13.2.1 Approach and methodology

The approach for the noise and vibration assessment was to:

- establish the existing background noise levels in the vicinity of the Project
- establish construction noise management levels and vibration limits that would apply to the Project
- predict noise and vibration levels at nearby residential and other sensitive receivers due to the construction of the Project
- predict environmental noise and vibration levels at nearby residential and other sensitive receivers due to operation of the Project
- predict noise levels from additional off-site construction traffic generated by the Project
- recommend mitigation measures, where necessary, to reduce and manage noise and vibration impacts from the Project to comply with established noise management levels and vibration limits.

13.2.2 Policies and guidelines

Relevant policies and guidelines for the assessment of noise and vibration in NSW have been considered during the preparation of the assessment. It is noted that blasting is not a part of the Project, and so the following guideline referenced in the SEARs is not relevant: *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration*, Australian and New Zealand Environment Council (ANZEC) 1990.

The policies and guidelines considered include:

- *Interim Construction Noise Guideline* (ICNG), Department of Environment and Climate Change, 2009
- *Assessing Vibration: A Technical Guideline* (AVATG), Department of Environment and Conservation, 2006
- *NSW Road Noise Policy* (RNP), Department of Environment, Climate Change and Water, 2011
- *Noise Policy for Industry*, Environment Protection Authority, 2017
- *Noise Guide for Local Government*, Environmental Protection Authority, 2013
- *Rail Infrastructure Noise Guideline*, Environment Protection Authority, 2013
- *Development Near Rail Corridors and Busy Roads – Interim Guideline*, Department of Planning, 2008

- *Construction Noise and Vibration Strategy (CNVS)*, Transport for NSW, 2019a
- DIN Standard 4150: Part 3 2016 *Vibration in Buildings - Effects on Structures*, 1999
- British Standard 7385: Part 2 1993 *Evaluation and Measurement of Vibration in Buildings*, 1993
- British Standard 6472: *Evaluation of human exposure to vibration in buildings (1-80 Hz)*, 1992
- Bavarian State Office for the Environment's (Bayerisches Landesamt für Umwelt/BayLfU) *Parking Area Noise*, 2007
- other relevant Australian and British Standards
- *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration*, Australian and New Zealand Environment Council (ANZEC), 1990.

13.2.3 Study area

To assist in determining noise criteria for noise sensitive receivers surrounding the Project, five Noise Catchment Areas (NCAs) were identified, which are shown in **Figure 13-1**. The noise environment throughout a NCA is considered to be similar, considering proximity to major noise sources. These NCAs form the study area for this assessment. The locations of noise logging undertaken for the Project are also shown on **Figure 13-1**. A description of noise logging undertaken and how it is utilised in the assessment is provided in **Section 13.2.4**.

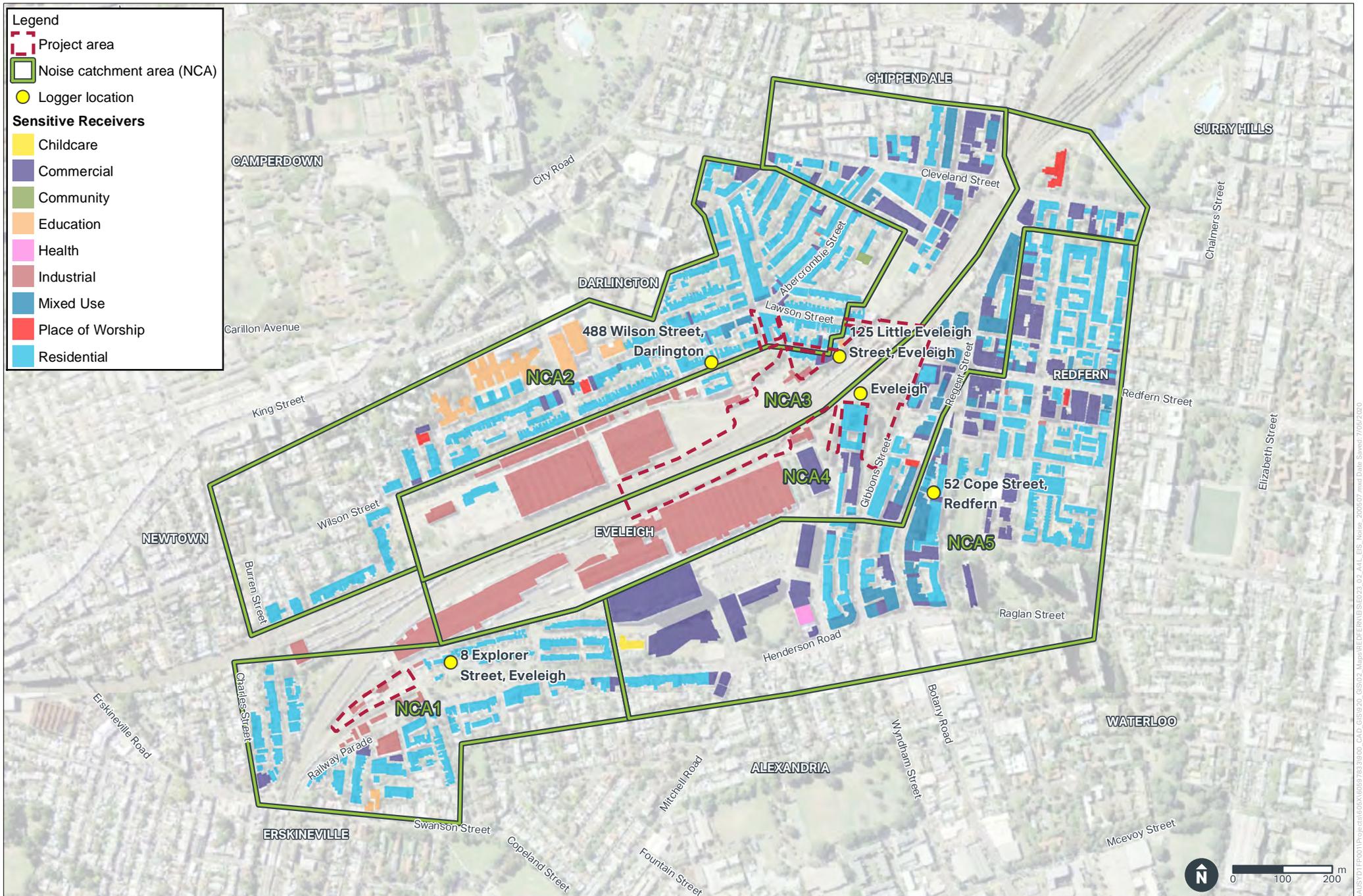


FIGURE 13-1: NOISE CATCHMENT AREAS

13.2.4 Construction noise and vibration criteria

Interim Construction Noise Guideline

The ICNG is a NSW Government document that identifies ways to manage impacts of construction noise on residences and other noise sensitive land uses. It is the principal guideline for the assessment and management of construction noise in NSW. In accordance with the ICNG, a quantitative assessment using representative construction scenarios has been carried out for the construction of the Project.

Noise levels from construction activities are predicted at nearby noise sensitive receivers using environmental noise modelling software and compared to the noise management levels (NML), derived in accordance with the ICNG. NMLs are based on the rating background level (RBL), which is the overall background noise level measured (refer to **Section 13.3.3**). The ICNG's guidance on how to determine and apply NMLs is provided in **Table 13-2**.

Where an exceedance of the NML is predicted, the ICNG advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practices to minimise the noise impact. The proponent should also inform all potentially impacted residents of the nature of the works to be carried out, the expected noise level and duration, as well as provide contact details to facilitate feedback from affected residents during construction.

Where construction noise levels at the receiver reach 75 A Weighted decibel (dB(A)), residential receivers are considered to be 'highly noise affected' and the proponent should, in consultation with the community, consider restrictions to the hours of construction to provide respite periods.

The ICNG defines what is considered to be feasible and reasonable as follows:

- *feasible: a work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements*
- *reasonable: selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.*

Table 13-2 ICNG Residential noise management levels

Time of day	NML, $L_{Aeq,15min}$, dB(A) ¹	How to apply
Recommended standard hours: Monday to Friday 7:00 am to 6:00 pm; Saturday 8:00 am to 1:00 pm; No work on Sundays or public holidays	Noise affected RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15 min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Time of day	NML, $L_{Aeq,15min}$, dB(A) ¹	How to apply
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: <ul style="list-style-type: none"> times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements refer section 7.2.2 of the ICNG.

Notes:

- Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence. Noise levels may be higher at upper floors of the noise affected residence.

The construction NMLs for nearby residential receivers and other sensitive land uses are provided in **Table 13-3** and **Table 13-4**. As discussed above, these NMLs are based on the rating background level (RBL), which is the overall background noise level measured (refer to **Section 13.3.3**). Residential receivers are grouped into the NCAs identified for the Project (refer **Section 13.2.3**).

Table 13-3 Construction noise management levels – Residential receivers

NCA	Period	RBL, L_{A90} dB(A)	Standard hours NMLs, $L_{Aeq,15min}$, dB(A)	Out of hours NMLs, $L_{Aeq,15min}$, dB(A)
1	Day	42	52 (75 – highly noise affected level)	47
	Evening	37	-	42
	Night	32	-	37
2	Day	41	51 (75 – highly noise affected level)	46
	Evening	39	-	44
	Night	35	-	40
3	Day	53	63 (75 – highly noise affected level)	58
	Evening	51	-	56
	Night	39	-	44

NCA	Period	RBL, L _{A90} dB(A)	Standard hours NMLs, L _{Aeq,15min} , dB(A)	Out of hours NMLs, L _{Aeq,15min} , dB(A)
4	Day	53	63 (75 – highly noise affected level)	58
	Evening	51	-	56
	Night	39	-	44
5	Day	44	54 (75 – highly noise affected level)	49
	Evening	44	-	49
	Night	37	-	42

Table 13-4 Construction noise management levels – Other receivers

Land use	NMLs, L _{Aeq,15min} (applies when properties are in use) (external)
Commercial premises (including offices, retail outlets)	70dB(A)
Industrial receivers	75dB(A)
School classrooms	55dB(A) ¹
Places of worship	55dB(A) ¹
Childcare centre	55dB(A) ¹

Notes:

1. This external noise management level is based upon a 45 dB(A) internal noise management level and a 10 dB(A) reduction from outside to inside through an open window.

Sleep disturbance guidelines

The ICNG requires a sleep disturbance analysis where construction works are planned to extend over more than two consecutive nights. The NSW EPA recommends that to minimise the risk of sleep disturbance during the night-time period (i.e. 10:00 pm to 7:00 am), the L_{A1(1 min)} noise level outside a bedroom window should not exceed the L_{A90(15 minute)} background noise level by more than 15dB(A). If this screening criterion is found to be exceeded, then a more detailed analysis must be undertaken and include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period. Sleep disturbance research presented in the *NSW Road Noise Policy* (RNP) (DECCW, 2011) concludes that “*Maximum internal noise levels below 50-55dB(A) are unlikely to cause awakening reactions*”. Therefore, given that an open window provides approximately 10dB(A) in noise attenuation from outside to inside, external noise levels of 60-65dB(A) are unlikely to result in awakening reactions.

A sleep disturbance assessment has been undertaken for the Project in accordance with the ICNG. Sleep disturbance criteria has been developed for the nearest noise sensitive residential receivers, which is presented in **Table 13-5**. The criteria is based on background noise levels measured during the night time (refer **Section 13.3** for measurement of background noise levels).

Table 13-5 Sleep disturbance criteria

NCA	Background noise level	Sleep disturbance criteria (external)	
	(L_{A90}), dB(A)	L_{Amax} , dB(A)	
		Screening level	Awakening reaction
1	32	47	65
2	35	50	65
3	39	54	65
4	39	54	65
5	37	52	65

Construction traffic noise criteria

Noise from construction traffic on public roads is assessed under the *Road Noise Policy* (RNP) (DECCW, 2011). Where the predicted noise increase from construction traffic is 2dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is greater than 2dB(A), and the predicted road traffic noise level exceeds the road category specific criterion, then noise mitigation should be considered for those receivers affected. The RNP does not require assessment of noise impact to commercial or industrial receivers.

Construction vibration criteria

Vibration criteria are set primarily according to whether the particular project activities are continuous in nature or intermittent, whether they occur during the daytime or night-time and the type of receiver to be assessed (e.g. industrial, commercial or residential). The effects of vibration in buildings can be divided into the following categories:

- those in which building damage may occur (i.e. structural damage)
- those in which the occupants or users of the building are inconvenienced or possibly disturbed, (i.e. human disturbance or discomfort).

Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities
- impulsive vibration is a rapid build-up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities
- intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving and jack hammers.

Therefore, vibration levels at sensitive receiver locations must be controlled so as to prevent discomfort and regenerated noise, and in some extreme cases, structural damage. The relevant standards and guidelines utilised for the assessment of construction vibration for the Project are:

- structural damage: German Standard DIN 4150 – *Part 3 – Structural Vibration in Buildings – Effects on Structures* (DIN 4150)
- human comfort (tactile vibration): *Assessing Vibration: A Technical Guideline* (AVATG) (Department of Environment and Conservation, 2006).

Table 13-6 provides the maximum levels of vibration that reduce the likelihood of building damage (structural damage) caused by vibration, as recommended by German Standard (DIN 4150) (noting that DIN 4150 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage).

Table 13-6 DIN 4150: Structural damage safe limits for building vibration

Group	Type of structure	At foundation – Less than 10 Hz	At foundation – 10 Hz to 50 Hz	At foundation – 50 Hz to 100 Hz ¹	Vibration at the horizontal plane of the highest floor for all frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s	40 mm/s
2	Dwellings and buildings of similar design and/or use	5 mm/s	5 to 15 mm/s	15 to 20 mm/s	15 mm/s
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Groups 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order/heritage listed)	3 mm/s	3 to 8 mm/s	8 to 10 mm/s	8 mm/s

Notes:

- At frequencies above 100 Hz, the values given in this column may be used as minimum values.

Table 13-7 provides maximum and preferred Vibration Dose Values (VDVs) for intermittent vibration arising from construction activities (representing the human comfort levels), in accordance with the *Assessing Vibration: A Technical Guideline*. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 13-7 Preferred and maximum vibration dose values for intermittent vibration (m/s^{1.75})

Location	Daytime ¹ Preferred	Daytime Max	Night time Preferred	Night time Max
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions, commercial premises and places of worship	0.4	0.8	0.4	0.8
Workshops or factory environments	0.8	1.6	0.8	1.6

Notes:

- Day is defined as 7:00 am to 10:00 pm. Night is defined as 10:00 pm to 7:00 am.

13.2.5 Operational noise criteria

The noise and vibration assessment included an assessment of industrial noise and non-industrial noise from operation of the Project. The *Noise Policy for Industry* (EPA, 2017) provides guidance in relation to acceptable noise limits for industrial noise emissions (e.g. mechanical plant). Noise from the car park activities, mechanical services and Opal card readers are considered to be industrial noise and are therefore assessed using the *Noise Policy for Industry* (EPA, 2017). It is noted that car park activity noise has been determined in accordance with the guideline *Parking Area Noise* (Bavarian State Office for the Environment, 2007).

Operation of the Project would also result in an increase in additional commuters/pedestrians walking through the new shared zone areas. Noise from additional commuters walking through shared zones is considered non-industrial noise and has been considered using the *Noise Guide for Local*

Government's checklist for 'offensive noise', under the *Protection of the Environment Operations Act 1997*. Criteria for industrial and non-industrial noise is explained further below.

Industrial noise

The assessment procedure in the *Noise Policy for Industry* has two components for industrial noise:

- controlling **intrusive** noise impacts in the short term for residences
- maintaining noise level **amenity** for residences and other land uses.

Both components are assessed at the boundary of the noise sensitive receiver site. These criteria apply to environmental noise emissions from any plant installed as part of the Project, and for residential receivers represent the lower of the intrusive and amenity criteria.

Intrusive noise impacts

The *Noise Policy for Industry* states that the noise from any single noise source should not be greatly above the prevailing background noise level. Industrial noise sources are generally considered acceptable if the A-weighted equivalent continuous sound pressure level of noise from the source, measured over a 15 minute period ($L_{Aeq,15\text{ min}}$) does not exceed the RBL by more than 5dB(A) for the period under consideration. This is termed the intrusiveness criterion.

The RBL is the background noise level to be used for assessment purposes and is determined by the methods given in the *Noise Policy for Industry*. Measurement of the RBLs for the Project is described in **Section 13.3**, and the RBL and the respective intrusiveness criteria for the day, evening and night periods are provided in **Table 13-8**.

Table 13-8 Intrusiveness criteria

Location	Period	RBL (L_{A90}), dB(A)	Intrusiveness criteria (RBL+5), dB(A)
NCA 1 Residential receivers	Day	42	47
	Evening	37	42
	Night	32	37
NCA 2 Residential receivers	Day	41	46
	Evening	39	44
	Night	35	40
NCA 3 Residential receivers	Day	53	58
	Evening	51	56
	Night	39	44
NCA 4 Residential receivers	Day	53	58
	Evening	51	56
	Night	39	44
NCA 5 Residential receivers	Day	44	49
	Evening	44	49
	Night	37	42
Commercial premises	When in use	-	-
School classroom ³	When in use	-	-
Place of worship ³	When in use	-	-
Childcare ³	When in use	-	-

Protecting amenity

To limit continuing increase in noise levels, the maximum ambient noise level within an area from all industrial noise sources should not normally exceed the recommended amenity noise levels specified in the *Noise Policy for Industry*. That is the noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the background creep or amenity criterion. The amenity criteria for the Project is presented in **Table 13-9**.

Table 13-9 Amenity criteria

Type of receiver	Indicative noise amenity area	Time of day	Recommended amenity noise level ¹ , dB(A)	Project amenity noise level ² , dB(A)	
			L_{Aeq} (period)	L_{Aeq} (period)	L_{Aeq} (15 minute)
NCA 1 Residential receivers	Urban	Day	60	55	58
		Evening	50	45	48
		Night	45	40	43
NCA 2 Residential receivers	Urban	Day	60	55	58
		Evening	50	45	48
		Night	45	40	43

Type of receiver	Indicative noise amenity area	Time of day	Recommended amenity noise level ¹ , dB(A)	Project amenity noise level ² , dB(A)	
			L _{Aeq} (period)	L _{Aeq} (period)	L _{Aeq} (15 minute)
NCA 3 Residential receivers	Urban	Day	60	55	58
		Evening	50	45	48
		Night	45	42 ⁴	45
NCA 4 Residential receivers	Urban	Day	60	55	58
		Evening	50	45	48
		Night	45	42 ⁴	45
NCA 5 Residential receivers	Urban	Day	60	55	58
		Evening	50	45	43
		Night	45	40	38
Commercial premises	All	When in use	65	65	68
School classroom ³	All	When in use	45	45	48
Place of worship ³	All	When in use	50	50	53
Childcare ³	All	When in use	45	45	48

Notes:

- Specified in Table 2.2 of the *Noise Policy for Industry*
- The project amenity level is equal to the recommended amenity noise level minus 5dB(A). The Project amenity level is then converted to a 15 minute period by adding 3dB(A).
- External noise levels are based on internal criteria with a 10dB(A) reduction from outside to inside through an open window
- Area dominated by high levels of rail traffic noise, therefore in accordance with the *Noise Policy for Industry* the Project amenity level = existing L_{Aeq}(period, traffic) minus 15dB(A).

Environmental noise emission criteria

A summary of the Project specific noise level criteria for operation of the Project is presented in **Table 13-10**. These criteria have been developed in accordance with the *Noise Policy for Industry* and apply to environmental noise emissions from operation of the Project (e.g. use of mechanical services, Opal card readers and car park activities), and for residential receivers these criteria represent the lower of the intrusive and amenity criteria.

Table 13-10 Summary of environmental noise emission criteria for operation of the Project

Location	Time of day	Project specific noise levels criteria L _{Aeq} , dB(A)
NCA 1	Day	47
	Evening	42
	Night	37
NCA 2	Day	46
	Evening	43
	Night	38
NCA 3	Day	58
	Evening	48
	Night	44

Location	Time of day	Project specific noise levels criteria L_{Aeq} , dB(A)
NCA 4	Day	58
	Evening	48
	Night	44
NCA 5	Day	49
	Evening	43
	Night	38
Commercial premises	When in use	68
Community hall	When in use	58
School classroom	When in use	48

Maximum noise level for sleep disturbance

The *Noise Policy for Industry* requires the potential for sleep disturbance to be assessed by considering maximum noise levels events during the night-time period. Where the subject development/premises night-time noise levels at a residential location exceed the following screening levels, a detailed maximum noise level event assessment should be undertaken:

- $L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5dB, whichever is the greater
- L_{AFmax} 52dB(A) or the prevailing RBL plus 15dB, whichever is the greater.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the number of times this happens during the night-time period.

Based on the measured background noise levels during the night, the sleep disturbance criteria for the nearest noise sensitive residential receivers are presented in **Table 13-11**.

Table 13-11 Night-time sleep disturbance screening levels

Location	Measured night-time RBL, $L_{A90, 15}$ mins dB(A)	Sleep disturbance screening levels, dB(A)	
		$L_{Aeq,15min}$	L_{AFmax}
NCA 1 Residential receivers	32	40	55
NCA 2 Residential receivers	35	40	55
NCA 3 Residential receivers	39	44	59
NCA 4 Residential receivers	39	44	59
NCA 5 Residential receivers	37	42	57

Non-industrial noise

Noise from the additional commuters using the station, i.e. non-industrial noise, does not fall under the *Noise Policy for Industry*. The EPA's *Noise Guide for Local Government* (EPA, 2013) provides the following checklist of considerations to determine whether noise is offensive:

1. Is the noise loud in an absolute sense? Is it loud relative to other noise in the area?
2. Does the noise include characteristics that make it particularly irritating?
3. Does the noise occur at times when people expect to enjoy peace and quiet?
4. Is the noise atypical for the area?
5. Does the noise occur often?
6. Are a number of people affected by the noise?

13.3 Existing environment

The Project is directly surrounded by a mix of residential, commercial and industrial receivers. The closest residential receivers are located adjacent to the railway station, and adjacent to the Project area on Little Eveleigh Street and on Marian Street.

13.3.1 Noise sensitive receivers

Noise sensitive receivers for the Project are identified in **Figure 13-1**, which fall within the five NCAs identified. Non-residential noise sensitive receivers surrounding the Project are listed in **Table 13-12**.

Table 13-12 Notable non-residential sensitive receivers surrounding the Project area

NCA	Receiver	Receiver type
NCA 1	South Sydney Rotary Park	Passive recreation
NCA 1	Solander Park	Passive recreation
NCA 1	St Marys Catholic Primary School	Educational facility
NCA 1	Ethel Street Playground	Passive recreation
NCA 2	Hollis Park	Passive recreation
NCA 2	Darlington Public School	Education
NCA 2	Saint Michael the Archangel Melkite Cathedral	Place of worship
NCA 2	University of Sydney	Educational facility
NCA 2	Church of the Assumption of Our Lady	Place of worship
NCA 2	TAFE NSW - Eora	Educational facility
NCA 2	Charles Kernan Reserve	Passive recreation
NCA 2	Hugo Street Reserve	Passive recreation
NCA 2	Redfern community centre/playground	Passive recreation
NCA 3	Key College	Educational facility
NCA 4	Cathedral of the Annunciation of Our Lady	Place of worship
NCA 4	Prince Alfred Park	Passive recreation
NCA 4	Gibbons Street Reserve ¹	Passive recreation
NCA 4	Carriage works	Passive recreation
NCA 5	Reconciliation Park	Passive recreation
NCA 5	St Vincent de Paul's Catholic Church Redfern	Place of worship
NCA 5	South Eveleigh Playground	Passive recreation
NCA 5	Redfern Park	Passive recreation
NCA 5	Alexandria Park	Passive recreation
NCA 5	Alexandria Childcare Centre	Childcare centre

Notes:

1. Gibbons Street Reserve would be used as a construction compound for the Project.

Known future developments that have the potential to become new noise sensitive receivers for the Project (due their timing) include:

- Sydney Metro City & Southwest: Waterloo Over Station Development
- Pemulwuy Student Accommodation (Located at Eveleigh Street/Vine Street/Louis Street/Caroline Street and Lawson Street, Redfern)
- 1 Lawson Square Redfern (alterations and additions to existing commercial towers)
- Social housing development at 11 Gibbons Street, Redfern
- 90-102 Regent Street, Redfern - Student Accommodation
- The Regent Hotel, 56-58 Regent Street, Redfern (proposed redevelopment)
- Mixed use development (including retail and residential) at No. 48 Regent Street, Redfern.

Due to their timing for completion, it is not expected that they would become new noise sensitive receivers during construction of the Project. Once completed and occupied, these would become new residential and non-residential receivers for operation of the Project. Further information on these developments is provided in **Chapter 23** of this EIS.

13.3.2 Heritage items

There are a number of heritage listed buildings located within or adjacent to the Project area. These heritage items are a mix of local and state heritage significance. Most notably, they include the Eveleigh Chief Mechanical Engineers Office, Eveleigh Railway Workshops and Machinery and the Redfern Railway Station group. Refer to **Chapter 14** of this EIS for further information on heritage listed items.

13.3.3 Existing background noise levels

Long term unattended and short term attended noise measurements were undertaken to establish the existing ambient and background noise environment at potentially affected receivers around the Project.

Unattended noise measurements

Noise measurements were undertaken using a noise logger at a representative location within each NCA (refer **Technical report 4 – Noise and vibration** for specific locations and measurement periods). Noise monitoring affected by adverse weather conditions or extraneous noise events is excluded from the monitoring data.

The noise environment at each of the residential receivers within a NCA is considered to have a similar noise environment to the unattended monitoring location within that NCA. As such, each of the residential receivers is assigned the same background noise level and construction noise management level (NML) (refer to **Section 13.2.4**).

The logger measured noise levels over the sample period then determined L_{A1} , L_{A10} , L_{A90} , and L_{Aeq} levels of the noise environment (i.e. noise levels exceeded for 1%, 10% and 90% of the measurement period respectively). The L_{A90} is taken as the background level. The L_{Aeq} level is the equivalent continuous sound level and has the same sound energy over the sample period as the actual noise environment with fluctuating sound levels.

Table 13-13 presents individual RBLs and the existing L_{Aeq} ambient noise levels selected for each day, evening and night-time period for the NCAs, determined in accordance with the *Noise Policy for Industry*.

Table 13-13 Unattended noise measurement results in dB(A) for all NCAs

NCA	Logger	RBL L_{A90} dB(A)			Log Average L_{Aeq} dB(A)		
		Day ¹	Evening ¹	Night ¹	Day ¹	Evening ¹	Night ¹
1	1	42	37	32	54	53	46
2	2	41	39	35	57	53	48

NCA	Logger	RBL L _{A90} dB(A)			Log Average L _{Aeq} dB(A)		
		Day ¹	Evening ¹	Night ¹	Day ¹	Evening ¹	Night ¹
-	3	54	49	41	64	62	59
3/4	4 ³	53	51	39	61	58	57
5	5	44	44 ²	37	53	54	48

Notes:

- Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays and Public Holidays. Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday and Public Holidays. Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays and Public Holidays.
- The evening level was higher than the daytime level, and so it has been set to the daytime level as recommended by the Noise Policy for Industry.
- The logging results of Logger 4 were used for both NCA 3 and NCA 4 to better interface with the other NCAs i.e. minimise differences in criteria for adjacent NCAs.

Attended noise measurements

Attended noise measurements were conducted at the five unattended noise monitoring locations described above. An additional location was also used to take attended measurements at a receiver on Little Eveleigh Street, close to the station and near to where the new station entrance on Little Eveleigh Street would be located. The measurements were conducted over 15 minute periods. **Table 13-14** provides the results of the attended noise measurements undertaken.

Table 13-14 Attended noise measurement results

Location	L _{Aeq} dB(A)	L _{A90} dB(A)
1	56	45
2	56	42
3	58	50
4	59	53
5	51	46
Additional location on Little Eveleigh Street	54	46

The noise measurements undertaken found that the acoustic environment in NCA 1, 2 and 5 are generally dominated by local vehicle traffic with receivers also affected by rail depending on proximity. The acoustic environment within NCA 3 and 4 are generally dominated by rail noise as well as noise associated with the operation of Redfern Station. Natural sounds are also audible throughout all NCAs. These characteristics are typical of an urban environment.

13.4 Impact assessment**13.4.1 Construction**

The identified residential and non-residential receivers have been assessed against the standard hours and the out of hours NMLs as appropriate. Noise was assessed across the construction stages described below.

There may be differences between predicted and actual noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement, and also the location and orientation of the plant equipment. The acoustic shielding calculated in the model due to fixed building structures would also vary as the construction equipment moves around the Project area.

Construction stages and work hours

Seven distinct construction stages have been considered for the Project, which are described in **Table 13-16**. These would be confirmed by the construction contractor prior to construction commencing and further assessment would be undertaken if required. Construction stages 6 and 7 would not generate construction noise levels higher than the other stages, and therefore have not been modelled (note

however that mitigation measures identified for other stages in the assessment would be implemented for Stage 6 and 7). Further information on the specific activities to be undertaken during each construction stage is provided in **Section 5.3 of Chapter 5**. A full list of construction machinery and equipment and respective sound power levels are provided in **Table 13-15**.

Table 13-15 Equipment sound power levels per construction work package

Construction stage	Equipment	Sound Power Level, dB(A)	
		L _{Aeq}	L _{max}
Stage 1: Site establishment and enabling works ¹ (two months)	Bobcat	104	112
	Crane trucks (semi-trailer and tipper)	108	116
	Excavator (20 tonne)	98	106
	Generator	101	104
	Hand tools	94	102
	Lighting tower	95	98
	Power tools	97	105
	Bored piling rig ²	103	111
Stage 2: Building modification works (six months)	Bored piling rig	103	111
	Concrete pump	106	109
	Concrete truck	106	114
	Crane trucks (semi-trailer and tipper)	108	116
	Demolition saw ³	115	123
	Excavator (20 tonne)	98	106
	Grinder ²	113	121
	Hand tools	94	102
	Impact drill ²	112	120
	Jack hammer ³	113	121
	Nail gun	90	98
	Power tools	97	105

Construction stage	Equipment	Sound Power Level, dB(A)	
		L _{Aeq}	L _{max}
Stage 3: Utility and overhead wiring relocations/ adjustments (ten months)	Bored piling rig	103	111
	Concrete pump	106	109
	Concrete truck	106	114
	Crane trucks (semi-trailer and tipper)	108	116
	Demolition saw ³	115	123
	Excavator (20 tonne)	98	106
	Hand tools	94	102
	Lighting tower	95	98
	Power tools	97	105
Stage 4.1: Main construction works – Station entrances (eight months over an 18 month period) ²	Bobcat	104	112
	Bored piling rig	103	111
	Concrete pump	106	109
	Concrete truck	106	114
Stage 4.2: Main construction works – Installation of concourse (18 months) ²	Crane (450 tonne)	106	114
	Crane trucks (semi-trailer and tipper)	108	116
	Demolition saw ³	115	123
	Excavator (20 tonne)	98	106
	Excavator (with auger)	103	111
	Franna crane	93	101
	Generator	101	104
	Grinder ³	113	121
	Hand tools	94	102
	Hydreama/hirail	94	102
	Impact drill ²	112	120
	Jack hammer ²	113	121
	Lighting tower	95	98
	Manitou (forklift)	92	100
	Mini excavator	94	102
	Mobile crane	104	112
Nail gun	90	98	
Power tools	97	105	

Construction stage	Equipment	Sound Power Level, dB(A)	
		L _{Aeq}	L _{max}
Stage 5: Roadworks (Little Eveleigh Street/Ivy Street, and Marian Street/ Cornwallis Street/Rosehill Street, Lawson Street and Gibbons Street) (nine months)	Bobcat	104	112
	Concrete pump	106	109
	Concrete truck	106	114
	Coring machine ³	115	123
	Crane trucks (semi-trailer and tipper)	108	116
	Excavator (20 tonne)	98	106
	Hand tools	94	102
	Jack hammer ³	113	121
	Lighting tower	95	98
	Line marking truck	102	110
	Mobile crane	104	112
	Plate compactor	108	116
	Power tools	97	105
Stage 6: Demobilisation	Excavator (20 tonne)	98	106
	Generator	101	104
	Crane trucks (semi-trailer and tipper)	108	116
	Hand tools	94	102
	Lighting tower	95	98
	Power tools	97	105
Stage 7: Testing and Commissioning	Hand tools	94	102
	Lighting tower	95	98
	Power tools	97	105

Notes:

1. A chainsaw and mulcher may also be used at this stage however they have not been included in the 'Site establishment and enabling works' modelling as their use is not typical of this construction stage and would be for limited duration at certain locations during daytime only
2. Assumes that the piling rig would not be located adjacent to the other equipment listed in Stage 1. i.e. the same noise sensitive receivers would not be equally affected by the piling rig and the other equipment at any one time
3. A +5 dB(A) correction has been added in accordance with the Construction Noise and Vibration Strategy (TfNSW, 2019a) to account for noise with special audible characteristics.

The majority of works would be undertaken during standard daytime construction hours where reasonable and feasible to do so. Standard construction hours are:

- Monday to Friday 7:00 am to 6:00 pm
- Saturday 8:00 am to 1:00 pm
- No work on Sundays and public holidays.

However, work outside standard hours (out of hours work (OOHW)) would be required for some construction stages to minimise disruptions to traffic, pedestrians, nearby residents and businesses, and also for constructability, safety (particularly working within a live rail environment), continuity of rail services reasons or to meet approval requirements (e.g. Road Occupancy Licence).

Section 2.3 of the ICNG describes five categories of works that might be undertaken outside of standard hours, as follows:

1. *the delivery of oversized plant or structures that police or other authorities determine require special arrangements to transport along public roads*
2. *emergency work to avoid the loss of life or damage to property, or to prevent environmental harm*
3. *maintenance and repair of public infrastructure where disruption to essential services and/or considerations of worker safety do not allow work within standard hours*
4. *public infrastructure works that shorten the length of the project and are supported by the affected community*
5. *works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.*

Some OOHW for the Project would fall within categories 1 to 3. Most OOHW for the Project would also fall into Category 5, as some activities by their nature and location, including concourse and lift installation and some work on platforms, would be required to be undertaken during a standard rail shutdown (i.e. rail possession). It is anticipated that the works requiring rail shutdown would be undertaken over approximately 20 scheduled rail possession periods with continual work from Friday to early on Monday mornings. Approximately two additional (non-standard) rail possession periods are proposed including a possession across the 2020 and 2021 Christmas periods. During these possessions, existing standard protocols would be implemented to minimise impacts to the community, including providing alternative transport arrangements and notifications.

There is also the potential for mid-week night work to be required throughout various stages of the Project depending on the activity required. Certain construction activities, such as overnight concrete pours, would also out of necessity be undertaken outside of the standard construction hours so as to facilitate design and construction quality requirements (i.e. performing the concrete pour continuously). Other works that can be undertaken so as to be inaudible at the nearest residential receivers may also be performed during out of hours periods.

Table 13-16 Construction stages and scheduling

Construction stage and duration	Scheduling ¹
Stage 1: Site establishment and enabling works (two months)	Standard hours which may extend to Period 2 Out of Hours Works (OOHW)
Stage 2: Building modification works (six months)	Standard hours which may extend to Period 1 OOHW
Stage 3: Utility and overhead wiring relocations/ adjustments (ten months)	Standard hours, Period 1 OOHW and during a possession (Period 2 OOHW)
Stage 4.1: Main construction works – Station entrances (eight months of work over 18 months) ²	Standard hours which may extend to Period 1 OOHW
Stage 4.2: Main construction works – Installation of concourse (18 months) ²	Standard hours, Period 1 OOHW and during a possession (Period 2 OOHW)
Stage 5: Roadworks (Little Eveleigh Street/Ivy Street, and Marian Street/Cornwallis Street/Rosehill Street, Lawson Street and Gibbons Street) (nine months)	Standard hours which may extend to Period 2 OOHW
Stage 6: Demobilisation	Standard hours

Construction stage and duration	Scheduling ¹
Stage 7: Testing and commissioning	Standard hours, Period 1 OOHW and during a possession (Period 2 OOHW) (however no noisy work that is audible at sensitive receivers would be undertaken during OOHW)

Notes:

1. Construction hours are as follows:
 - a. Standard hours - Weekdays 7:00 am to 6:00 pm and Saturday 8:00 am to 1:00 pm
 - b. Period 1 OOHW are Weekdays 6:00 pm to 10:00 pm, Saturday 7:00 am to 8:00 am and 1:00 pm to 10:00 pm and Sunday/Public holiday 8:00 am to 6:00 pm
 - c. Period 2 OOHW are Weekdays 10:00 pm to 7:00 am, Saturday 10:00 pm to 8:00 am and Sunday/Public holiday 6:00 pm to 7:00 am.
2. For the purpose of noise modelling, Stage 4.1 and Stage 4.2 have been represented by a single scenario Stage 4.

Three construction ancillary facilities are proposed for the construction of the Project as described in **Section 5.3.10 of Chapter 5**. The assessment for Stage 1: Site establishment and enabling works includes the ancillary facility areas (i.e. noise sources have been modelled from within the ancillary facility areas). Based on the anticipated plant and equipment to be used, it is expected that noise levels from ongoing construction activities within the construction ancillary facility areas would be consistent with or less than the noise levels assessed for the Stage 1 works. However, as the construction ancillary facility areas would be used for the entire Project construction period there may be some cumulative noise impact from the noise generated from the construction ancillary facilities and works from other Project stages. Potential cumulative noise impacts are addressed further below.

Impacts to residential receivers

A comparison of the modelled noise levels against the NMLs for residential receivers is presented in **Table 13-5**. Note that the identified receivers are based on residential buildings impacted, and each receiver/building may contain more than one resident.

Table 13-17 Number of residential buildings where noise levels may exceed NMLs for each construction stage

Stage	Number of residential buildings where noise levels may exceed NML ¹											
	Standard Hours			Out of hours – Daytime				Out of hours – Night-time				Highly Noise Affected level (75 dB(A)) ²
	1-10 dB(A)	11-20 dB(A)	> 20 dB(A)	1-5 dB(A)	6-15 dB(A)	16-25 dB(A)	> 25 dB(A)	1-5 dB(A)	6-15 dB(A)	16-25 dB(A)	> 25 dB(A)	
NCA 1												
Stage 1	27	1	0	44	27	1	0	62	120	27	1	0
Stage 2	0	0	0	0	0	0	0	-	-	-	-	0
Stage 3	0	0	0	0	0	0	0	5	3	0	0	0
Stage 4.1/4.2	0	0	0	0	0	0	0	11	2	0	0	0
Stage 5	0	0	0	5	0	0	0	3	18	0	0	0
NCA 2												
Stage 1	6	0	0	10	6	0	0	70	26	1	0	0
Stage 2	9	14	11	42	9	14	11	-	-	-	-	7
Stage 3	89	0	0	63	89	0	0	149	154	25	0	0
Stage 4.1/4.2	35	12	5	70	35	12	5	208	130	24	9	4
Stage 5	220	84	101	125	220	84	101	140	248	174	141	74
NCA 3												
Stage 1	0	0	0	0	0	0	0	4	20	0	0	0
Stage 2	11	2	3	1	11	2	3	-	-	-	-	5
Stage 3	6	6	0	20	6	6	0	12	13	20	9	5
Stage 4.1/4.2	10	3	0	5	10	3	0	14	29	13	5	3
Stage 5	2	4	20	9	2	4	20	7	30	8	24	24

Stage	Number of residential buildings where noise levels may exceed NML ¹											Highly Noise Affected level (75 dB(A)) ²
	Standard Hours			Out of hours – Daytime				Out of hours – Night-time				
	1-10 dB(A)	11-20 dB(A)	> 20 dB(A)	1-5 dB(A)	6-15 dB(A)	16-25 dB(A)	> 25 dB(A)	1-5 dB(A)	6-15 dB(A)	16-25 dB(A)	> 25 dB(A)	
NCA 4²												
Stage 1	5	0	0	6	5	0	0	12	9	9	2	0
Stage 2	0	0	0	2	0	0	0	-	-	-	-	0
Stage 3	4	0	0	8	4	0	0	9	26	9	0	0
Stage 4.1/4.2	1	0	0	8	1	0	0	15	18	4	1	0
Stage 5	14	1	1	11	14	1	1	34	14	24	3	2
NCA 5												
Stage 1	0	0	0	7	0	0	0	15	10	0	0	0
Stage 2	0	0	0	6	0	0	0	-	-	-	-	0
Stage 3	0	0	0	7	0	0	0	18	8	0	0	0
Stage 4.1/4.2	0	0	0	5	0	0	0	21	7	0	0	0
Stage 5	24	0	0	35	24	0	0	82	64	12	0	0

Notes:

1. These numbers are not cumulative through the ranges of noise emissions shown
2. The highly noise affected level specifies the exceedances of 75dB(A) or more shown in the upper ranges in the table (i.e. in the > 20dB(A) and > 25dB(A) columns)

Construction noise levels are predicted to exceed noise management levels during standard hours and out of hours across all construction stages with varying levels of exceedances.

During the daytime, the largest number of predicted exceedances occur during Stage 5 – Roadworks, due to works occurring on Little Eveleigh Street, Marian Street, Cornwallis Street, and Rosehill Street. The greatest number of exceedances of the noise management levels would occur at receivers in NCA 2. Across all NCAs, up to 100 residential buildings are predicted to be 'highly affected' at times from Stage 5 – Roadworks, due to the close proximity of the works.

During the night-time out of hours works, the largest number of exceedances occur during Stage 5 – roadworks. The greatest number of exceedances of the NMLs would occur at receivers in NCA 2.

Stage 5 – Roadworks is considered to have the greatest number of exceedances of the NMLs due to the close proximity of the works and the progressive nature of the works which would move through the Project area. It should be noted that the overall noise impact on residents would vary depending on location of the works, and residents would not be impacted for the full duration of Stage 5 – Roadworks. The modelled levels on certain receivers is shown graphically in Appendix B of **Technical report 4 – Noise and vibration**.

Impacts to non-residential receivers

The assessment found that construction noise levels are predicted to exceed the NMLs at non-residential receivers across all construction stages at varying levels. **Table 13-18** outlines the number of non-residential sensitive receivers where noise levels may exceed the NMLs. These non-residential sensitive receivers include a number of Sydney Trains' properties, and some commercial offices/shops/cafes.

The greatest number of exceedances of the NMLs for non-residential receivers is during Stage 5 – Roadworks, due to the close proximity and progressive nature of the works (i.e. the works would move throughout the area, affecting a large number of receivers). Key noisy activities of Stage 5 include the use of concrete saws, breakers and jack hammers. It should be noted that the overall noise impact would vary depending on location of the works and receivers would not be impacted for the full duration of the Stage 5 – Roadworks.

Table 13-18 Number of non-residential sensitive receivers where noise levels exceed the NMLs

Stage	Number of other buildings where noise levels may exceed NML		
	1-10 dB	11-20 dB	> 20 dB
Stage 1	5	0	0
Stage 2	0	3	2
Stage 3	2	0	0
Stage 4.1/4.2	2	1	2
Stage 5	6	0	5

Sleep disturbance

Sleep disturbance was assessed for construction Stage 3 and Stage 4.2, which are proposed to be undertaken during Period 2 OOHW (refer **Table 13-16** for information on construction stages and work hours). Based on the sleep disturbance screening level criteria as outlined in **Section 13.3.3**, the assessment found that a number of residential buildings would be affected by potential sleep disturbance impacts. This is detailed further below and shown in **Table 13-19**.

During Stage 1, noise levels at 399 residential buildings within all NCAs are predicted to exceed the sleep disturbance screening level criteria, and noise levels at approximately 57 residential buildings within NCAs 1, 2, 3 and 4 are predicted to exceed the awakening reaction criteria during this stage. The highest impacts are expected during truck movements involving crane trucks entering and leaving the Project area. During Stage 3, noise levels at 361 residential buildings located across all NCAs are predicted to exceed the sleep disturbance screening level criteria, and noise levels at approximately 68 residential buildings within NCAs 2, 3 and 4 are predicted to exceed the awakening reaction criteria during this stage. The highest impacts are expected during steel works (e.g. steel cutting, construction

using power tools). As works for Stage 3 would progress throughout the Project area, it is expected that this is a reasonable indication of the number of exceedances of the awakening reaction at any one time. However, any one building is not likely to be affected for the whole duration of this stage, due to the movement of the works.

During Stage 4.1/4.2, noise levels at approximately 127 residential buildings within NCAs 1, 2, 3 and 4 are predicted to exceed the sleep disturbance screening level criteria, and noise levels at 15 residential buildings within NCAs 2, 3 and 4 are predicted to exceed the awakening reaction criteria during this stage. The highest impacts are expected during hammering and excavation for the concourse support structures.

During Stage 5 - Roadworks, noise levels at 559 residential buildings within all NCAs are predicted to exceed the sleep disturbance screening level criteria (i.e. the screening criteria that then requires further detailed assessment to be undertaken), and subsequently it was found that noise levels at approximately 178 residential buildings within NCAs 2, 3 and 4 are predicted to exceed the awakening reaction criteria during this stage. The highest impacts are expected during hammering and coring for the construction of the shared zones on Marian Street and Little Eveleigh Street. As the roadworks would progress throughout the Project area, it is expected that this is a good indication of the number of exceedances of the awakening reaction at any one time. However any one building is not likely to be affected for the whole duration of this stage, due to the progressive movement of the works through the area.

It is noted that as the works are planned to occur during the night-time for both rail possessions and non-rail possession nights, cumulative noise impacts may occur where the possessions overlap with planned rail maintenance. This may result in an increase of up to 3 dB(A) of the highest noise level predicted for any construction stage and potentially increase the number of impacted receivers. This is discussed further in the cumulative construction noise section below.

Table 13-19 Number of residential buildings where noise levels may exceed sleep disturbance criteria

Stage	Number of residential buildings where noise levels may exceed the sleep disturbance screening level and/or the awakening reaction level	
	Sleep disturbance screening level L_{Amax} , dB(A)	Awakening reaction level L_{Amax} , dB(A)
NCA 1		
Stage 1: Site establishment and enabling works	219	23
Stage 3: Utility and overhead wiring relocations/adjustments	12	0
Stage 4.2: Main construction works – Installation of concourse	3	0
Stage 5: Roadworks	5	0
NCA 2		
Stage 1: Site establishment and enabling works	90	4
Stage 3: Utility and overhead wiring relocations/adjustments	243	16
Stage 4.2: Main construction works – Installation of concourse	72	2
Stage 5: Roadworks	422	141
NCA 3		
Stage 1: Site establishment and enabling works	29	13
Stage 3: Utility and overhead wiring relocations/adjustments	45	35

Stage	Number of residential buildings where noise levels may exceed the sleep disturbance screening level and/or the awakening reaction level	
	Sleep disturbance screening level L_{Amax} , dB(A)	Awakening reaction level L_{Amax} , dB(A)
Stage 4.2: Main construction works – Installation of concourse	37	10
Stage 5: Roadworks	51	26
NCA 4		
Stage 1: Site establishment and enabling works	31	17
Stage 3: Utility and overhead wiring relocations/adjustments	43	17
Stage 4.2: Main construction works – Installation of concourse	15	3
Stage 5: Roadworks	40	11
NCA 5		
Stage 1: Site establishment and enabling works	30	0
Stage 3: Utility and overhead wiring relocations/adjustments	18	0
Stage 4.2: Main construction works – Installation of concourse	0	0
Stage 5: Roadworks	41	0

Construction traffic noise

Construction traffic would generally not exceed 20 heavy vehicle movements and 40 light vehicles movements per day at peak construction periods (not including worker transport to and from site). On average, approximately only five heavy vehicles and 20 light vehicles would be expected on an average day.

The assessment found that road traffic noise levels during construction are unlikely to increase by more than 2dB(A) on Cleveland Street, Regent Street, Wyndham Street/Gibbons Street, Lawson Street, Botany Road, McEvoy Street, Fountain Street, Mitchell Road and Copeland Street/Swanson Street. This is due to the existing high volumes of traffic on these roads and the small percentage increase due to construction traffic.

Whilst the existing annual average daily traffic volumes on Little Eveleigh Street and the Marian Street/Cornwallis Street/Rosehill Street are estimated to be around 300 and 150 vehicles respectively, road traffic levels are also unlikely to increase by more than 2dB(A) due to the low volumes of the construction traffic generated. It is also noted that traffic speeds during the construction period may be reduced, which would generally lessen the level of noise generated.

As noise levels are not expected to increase by more than 2dB, further assessment is not required in accordance with the *Road Noise Policy* (DECCW, 2011).

To minimise the construction traffic noise levels and reduce the risk of negative impacts occurring, construction traffic management (including vehicle movements generated under the Project) would be considered as part of a Construction Noise and Vibration Management Plan (CNVMP), which would be developed for the Project (refer to **Section 13.5**).

Construction vibration

Vibration intensive works for the construction of the Project may include the use of jackhammer/s, bored piling rig/s and plate compactor/s. The minimum working distances of these items of equipment from receivers are provided in **Table 13-20**, which is based on recommendations of the *Construction Noise and Vibration Strategy* (TfNSW, 2019a). If these minimum working distances are complied with,

no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage.

However, a number of heritage-listed items within the Project area may be within the minimum working distances for vibration intensive works, including the following:

- Platform 1 and 10 Retaining walls
- Platform 1 Store and Office Building
- Engine Dive and Ventilation Shafts
- Telecommunications Equipment Centre
- Interlocking Store, Southern Store, Northern Store and Brick Toilet
- Platform 1 to 10 facings
- Platform 4 to 10 Buildings
- Platform 11 and 12 below ground structures.

Where vibration intensive works are required within the minimum working distances, mitigation measures to control excessive vibration would be implemented, as outlined in **Section 13.5**. Specific vibration mitigation measures would be determined during detailed design. This should include as a minimum, building condition surveys and vibration monitoring during construction which would be documented within the CNVMP. If the construction methodology changes during detailed design, then a reassessment of the minimum working distances would be required.

Table 13-20 Minimum working distances of vibration intensive equipment to be used during the Project

Plant	Rating/ description	Cosmetic damage		Human response
		Heritage	Residential/ commercial	
Jackhammer	Handheld	1 metre (nominal)	1 metre (nominal)	Avoid contact with structure
Plate compactor ¹	Handheld	8 metres	5 metres	15 to 20 metres
Pile boring	Less than or equal to 800 mm	4 metres	2 metres (nominal)	4 metres

Notes:

1. No recommendations provided in the Construction Noise and Vibration Strategy for a plate compactor (assumed to be the same as a small roller).

Cumulative construction noise

While most construction activities are expected to occur at distinct scheduled times and at different locations, it is possible that noisy construction activities for the Project may occur at the same time in close proximity to each other. An indicative program for the construction stages is provided in refer **Section 5.3 of Chapter 5**. Overlap between stages may occur for works at the new station entrances on Marian Street and Little Eveleigh Street (Stage 2) in conjunction with utility and overhead wiring relocations/adjustments (Stage 3) and the Main Construction works (Stage 4). In these cases, it is possible that an increase of up to 3dB(A) of the highest noise level predicted for any construction stage may occur (assuming that at any one location equal noise levels from two stages of works are experienced). This may increase the number of receivers where noise levels would be greater than 20dB(A) above the NMLs.

Similarly, there is an overlap of the program of construction works between Stage 3, Stage 4 and Stage 5 (refer **Section 5.3 of Chapter 5**). Noise from use of the construction ancillary facility areas may also contribute to construction noise at receivers. However, it is likely that the other construction stages would dominate cumulative noise levels, and any increase in the overall noise level from the Project would be less than 3dB(A). Any overlapping construction stages and identification of any receivers subject to increased noise levels would be determined during detailed design. Additional

mitigation measures subsequently required would also be identified during detailed design (as described in **Section 13.5** and **Table 13-22**).

There is also potential for construction noise from the Project to combine with noise generated by potential other projects in the area (as identified in **Section 13.3.1**) to create cumulative noise impacts on receivers. Potential cumulative noise impacts with other projects in the area is assessed in **Chapter 23** of this EIS (and also addressed in Section 5.6.2 of **Technical Report 4 – Noise and Vibration**). In summary, it was found that if the noisiest stages of other construction projects were to coincide with the construction of this Project, the greatest increase in noise levels from either project would be a maximum of 3 dB(A). In the case of construction traffic, a maximum noise level increase of 3 dB(A) is also predicted. For context, an increase in noise levels of around 3dB(A) is low (barely noticeable). The decibel scale is explained further in the Definitions section of **Technical Report 4 – Noise and Vibration**. Mitigations measures are provided in **Chapter 23** of this EIS in regards to managing potential cumulative noise impacts with other projects.

13.4.2 Operation

Operation of the Project would introduce a number of mechanical plant and infrastructure (e.g. lifts, new services building, Opal card readers) and a new car park which would generate noise. It is also noted that additional commuters would access the upgraded station from streets close to the new station entrances.

As noted in **Section 13.2.5**, noise from the car park activities, mechanical services and Opal card readers are assessed in this section using the *Noise Policy for Industry*. The receivers mostly likely to be affected by car park activities would not be affected by the mechanical services and Opal card readers, therefore these sources have been considered separately. Receivers affected by noise from Opal card readers could also be affected by noise from mechanical services, however in this case the mechanical services would be designed so that cumulative noise impacts would comply with the relevant criteria. Noise from commuters walking through shared zones has been assessed using the *Noise Guide for Local Government's* checklist for 'offensive noise'.

During operation the Project is not anticipated to significantly generate additional vehicular traffic, and therefore negligible impacts to traffic noise around Redfern Station are expected. The only considerable change the Project would bring is the reduction in the speed limit to 10 kilometres per hour within the new shared zone areas along Little Eveleigh Street and Marian Street/Cornwallis Street/Rosehill Street. This would generally reduce the noise levels from vehicles, however given that the current traffic flow in these roads is already characterised by slow operating speeds of vehicles, this impact is expected to be negligible.

The operation of the Project would also not include any sources of vibration likely to exceed the relevant criteria, and would not give rise to significant vibration. Therefore no further consideration of operational vibration has been undertaken.

Industrial noise

Car park noise

The car park is proposed to have 20 car parking spaces, which would replace the current on-street parking spaces which would be removed as part of the shared zone improvement. Car park activity noise was calculated in accordance with the Bavarian State Office for the Environment's *Parking Area Noise*. For the purposes of assessment, it was assumed that there would be up to four vehicle movements during the daytime and one vehicle movement during the night-time in a 15 minute period.

Predicted noise levels at the most affected residential receivers (157 Little Eveleigh Street (within NCA 3) and 160-166 Little Eveleigh Street (within NCA 2)) indicate that the operational noise levels comply with the relevant criteria at all receivers during the daytime, however there may be small, temporary exceedances (up to 2dB(A)) during the night-time period at the rear/western side of 157 Little Eveleigh Street which is the closest residential receiver. For most receivers along Little Eveleigh Street, the use of the new car park would reduce current parking noise levels, which currently extend along Little Eveleigh Street. However although noise sources such as car engines starting and car doors/car boots closing would be removed from along Little Eveleigh Street when the parking spaces are relocated, there would be additional noise from pedestrians walking through the new shared zone along Little Eveleigh Street. Mitigation measures are described in **Section 13.5**.

Sleep disturbance

A sleep disturbance assessment was undertaken to assess the potential noise impacts from car parking activities (e.g. car door/boot slam, car starting and car accelerating) on nearby sensitive receivers during operation. Results show that the predicted noise levels are expected to exceed the sleep disturbance screening criteria at 157 Little Eveleigh Street and 160-166 Little Eveleigh Street by up to 20dB(A) L_{AFmax} and 12dB(A) L_{AFmax} respectively (sleep disturbance criteria is provided in **Table 13-11**) However due to the nature of the noise sources (e.g. car door/boot slam, cars moving) the noise is likely to be of short duration (i.e. not continuous). The exceedances are due to the close proximity of the nearest car parking space to these receivers.

At other locations, the noise level from the car park would likely be less, due to the acoustic shielding provided by 157 Little Eveleigh Street and distance loss.

To provide context, the existing high background noise levels as measured at 125 Little Eveleigh Street (which currently range between 65 and 75dB(A) from 10:00 pm to 2:00 am, and is reduced from 2:00 am before beginning to rise again after 4:00 am), means the acoustic environment is unlikely to significantly change as a result of the new car park, when the current frequency of cars parking in the existing street parking along Little Eveleigh Street is considered. The car park would be used infrequently between 2:00 am and 5:00 am, and similarly it is also unlikely that the acoustic environment during this time would change significantly from the current frequency of cars parking along Little Eveleigh Street.

Notwithstanding, and noting the exceedance of criteria above, a new solid fence would be constructed between the boundary of the car park and 157 Little Eveleigh Street as part of the Project (and also the boundary with 155 Little Eveleigh Street), which would reduce noise levels by around 5dB(A). Depending on the specific acoustic performance of the proposed fence, consideration would be given to at-receiver treatments such as the provision of mechanical ventilation to allow windows to be closed and/or upgraded glazing at 157 Little Eveleigh Street. The installation of at-receiver treatments would address any residual exceedances. Mitigation measures are described in **Section 13.5**.

Mechanical service noise

Noise sources from mechanical services associated with the operation of the Project are expected to include lift motors, lift air conditioning plant, building air conditioning plant and toilet exhaust fans.

This equipment would be selected during detailed design. However, based on the nature of the mechanical services to be installed, standard noise controls such as appropriate selection and placement of mechanical plant and the inclusion of attenuation measures such as duct lining/attenuators, would be adequate to reduce the noise levels so that they meet the *Noise Policy for Industry* criteria. This would be confirmed once equipment selection is finalised.

Public address system noise

New public address system speakers would be installed at the southern ends of the platforms for regular announcements. Speakers would also be installed in the concourse and within the new station entrances. These speakers would be used for train delay or special event announcements only.

A public address system has not yet been selected, therefore operational noise levels cannot be predicted definitively at this stage of the design. However given the nature of these systems and mitigation measures successfully applied to other projects, it is expected that potential impacts can be readily mitigated during the detailed design stage, and noise levels would be design so as to not be intrusive for nearby residential receivers.

Opal card reader noise

Opal card readers would be installed at the new station entrances. The closest noise receivers for Opal card readers include 124 Little Eveleigh Street (approximately 10 metres from the Opal card readers), and 1 Marian Street (approximately 20 metres from the Opal card readers).

Based on a pedestrian modelling study undertaken for the Project, it is likely that around 825 passengers would be 'tapping on/off' in a 15 minute period in the AM peak commuter hour at the Little Eveleigh Street entrance, and around 1,695 passengers at the Marian Street entrance. Conservatively, it is then assumed that during the night-time period (10:00 pm until trains finish

running) this would be reduced to around 10% of the PM peak commuter hour 'tapping on/off' in a 15 minute period at the Little Eveleigh Street and Marian Street entrances (82 people and 170 people respectively).

Based on the above, the predicted noise levels at these two locations comply with the applicable Project specific noise level criteria (described in **Table 13-10**) during both the daytime and night-time periods. It should be noted that noise from Opal card readers would not be tonal over a 15 minute period at receiver locations, therefore a correction to account for annoying characteristics under the *Noise Policy for Industry* is not required.

Non-industrial noise

Commuters

During operation of the Project, a noticeable increase in pedestrian movements would be experienced on Little Eveleigh Street and Marian Street. The investigations undertaken to inform the design of the Project estimated that approximately 3,300 and 6,770 people would be walking down Little Eveleigh Street and Marian Street respectively during a typical AM peak hour. These pedestrians are expected to exhibit typical behaviour of people entering and leaving train stations, in that the majority of people would be constantly moving toward their destination and not loitering, with minimal conversation, with use of mobile phones being a notable exception.

However there are no specific noise criteria or limits that would apply to this activity. The 'offensive noise' checklist from the *Noise Guide for Local Government* (refer to **Section 13.2.4**) is therefore considered below to determine if nearby noise sensitive receivers are likely to be adversely affected by the Project. The questions in the checklist are as follows:

Is the noise loud in an absolute sense? Is it loud relative to other noise in the area?

The noise generated by commuters/pedestrians walking through the shared zones to and from the new station entrances and other local areas would not be loud in an absolute sense (e.g. in the context of the overall existing noise environment) at nearby residential receivers. Ambient L_{Aeq} noise levels at the nearby residential receivers on Little Eveleigh Street are around 61 to 67 dB(A) during the daytime, 60 to 63 dB(A) during the evening, and 58 to 60 dB(A) during the night-time period when Sydney Trains are in operation. It can also be seen that the ambient L_{Aeq} noise levels at the nearby residential receivers on Marian Street are around 59 to 63 dB(A) during the daytime, 55 to 60 dB(A) during the evening, and 50 to 60 dB(A) during the night-time period when Sydney Trains are in operation (refer Appendix A of **Technical Report 4 – Noise and Vibration**). Noise from commuters walking along these roads would not be considered loud relative to these existing ambient noise levels.

Does the noise include characteristics that make it particularly irritating? Is the noise atypical for the area?

The noise generated by pedestrians would likely comprise footfall noise and conversations, and would not be considered atypical for an urban area. It would not include any characteristics that typically irritate such as low frequency or tonal components. This type of noise would not be considered atypical for an urban area.

Does the noise occur at times when people expect to enjoy peace and quiet? Does the noise occur often?

It is considered that local residential receivers would notice a difference in ambient noise levels due to the large number of commuters utilising the new station entrances and concourse. The noise levels from commuters would be highest during commuter peak periods which would coincide with the noisier parts of the day, and therefore have less of an effect on the overall noise level. The noise is likely to occur on most days.

Based on the above considerations, noise associated with the commuter use of the new station entrances and surrounding shared zones would be noticeable to the closest residential receivers, however is unlikely to be considered 'offensive' as defined in the *Protection of the Environment Operations Act 1997* (refer also **Technical Report 4 – Noise and Vibration** of this EIS). The Project would investigate further opportunities to minimise noise impacts to residents through the ongoing design development of the Little Eveleigh Street and Marian Street shared zones.

Noise from commuters and other pedestrians, including anti-social behaviour, is addressed further in the **Chapter 11** and **Technical report 2 - Social** of this EIS.

13.5 Management and mitigation measures

13.5.1 Overview

A CEMF (refer **Appendix D** of this EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

A Construction Noise and Vibration Management Sub-Plan would be developed for the Project as identified in Section 6.2 of the CEMF, and well as the Construction Noise and Vibration Strategy (CNVS) (refer **Appendix E** of this EIS).

The chapter includes a compilation of the performance outcomes as well as mitigation measures, including those that would be included in the Construction Noise and Vibration Management Sub-Plan.

Mitigation measures have been developed with consideration to some feedback provided by the community during early project-engagement stages. Feedback received during the public exhibition of this EIS in regard to mitigation of noise would be considered and documented in the Response to Submissions report to be prepared. Refer **Chapter 6** and **Chapter 11** of this EIS for further information.

13.5.2 Performance outcomes

The following performance outcomes have been established for this Project:

- construction airborne and ground-borne noise and vibration is effectively managed to minimise adverse impacts on acoustic amenity
- construction vibration is effectively managed to minimise adverse impacts on the structural integrity of buildings and items
- increases in noise emissions and vibration during operation of the Project affecting nearby properties and other sensitive receivers are effectively managed to protect the amenity and well-being of the community
- appropriate mitigation measures outlined in the TfNSW CNVS are identified and implemented to minimise noise and vibration impacts
- specific notifications to the community are issued no later than seven days prior to construction works.

The Project would be designed, constructed and operated to achieve these performance outcomes.

13.5.3 Mitigation measures

A list of mitigation measures which would be implemented during the Project are provided in **Table 13-21**.

Table 13-21 Mitigation measures

ID	Mitigation measure	Applicable location (s)
Construction		
N1	<p>A Construction Noise and Vibration Management Sub-Plan (CNVMP) would be prepared as part of the CEMP. The CNVMP would include all feasible and reasonable safeguards to manage noise emissions from the Project. The CNVMP would include, as a minimum, the following:</p> <ul style="list-style-type: none"> • identification of nearby residences and other sensitive land uses • description of approved hours of work and an Out of Hours Protocol 	All

ID	Mitigation measure	Applicable location (s)
	<ul style="list-style-type: none"> • description and identification of all construction activities, including work areas, equipment and duration (and provision for re-assessment of noise and vibration impacts if required due to changes) • description of the work practices (generic and specific) that would be applied to minimise noise and vibration • works scheduling to minimise the noise impact on sensitive receivers, with consideration given to cumulative noise impacts (and provision for re-assessment of noise and vibration impacts if required due to changes to work stages or other surrounding projects) • a complaints handling process • noise and vibration monitoring procedures, including for heritage-listed items/structures • overview of community consultation required for identified noise intensive works. <p>The CNVMP and CEMP must be updated as required to account for any changes in noise and vibration management issues and strategies, to ensure these documents remain adequate for their purposes.</p>	
N2	<p>All employees, contractors and subcontractors would receive an environmental induction. As a minimum the induction must include:</p> <ul style="list-style-type: none"> • all relevant Project specific and standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on noise generating activities with special audible characteristics (noise with characteristics that can cause annoyance and disturbance, containing noticeable factors such as tonality, low frequency noise, impulsive or intermittent noise events) • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures and complaint handling procedures. 	All
N3	<p>All nearby residents and sensitive receivers impacted by noise levels from the Project which are expected to exceed the NML would be consulted prior to the commencement of the particular activity, with the highest consideration given to those that are predicted to be most affected as a result of the works.</p> <p>The information provided to the receivers will include:</p> <ul style="list-style-type: none"> • programmed times and locations of construction work • the hours of proposed works • construction noise and vibration impact predictions • construction noise and vibration mitigation measures being implemented on site. <p>Community consultation regarding construction noise and vibration would be detailed in a Community Liaison Plan for the construction of the Project and would include a 24 hour hotline and complaints management process.</p>	All

ID	Mitigation measure	Applicable location (s)
N4	If vibration intensive equipment is to be used within the minimum working distances for cosmetic damage described in this EIS (Technical report 4 – Noise and vibration), then attended vibration measurements would be undertaken when work commences, to determine “site specific minimum working distances” and confirm appropriate vibration limits for that structure. The Construction Contractor would be informed of the minimum working distances.	All
N5	For heritage items where the screening criteria are predicted to be exceeded, the more detailed assessment would include condition assessment and specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.	Heritage items
N6	<p>The CNVMP would be implemented with the aim of meeting the construction noise management levels where feasible and reasonable. The following mitigation measures would be included in the CNVMP:</p> <ul style="list-style-type: none"> • use of at-source noise attenuation around equipment where possible • where feasible and reasonable structures such as site sheds, earth bunds and fencing shall be used to shield residential receivers from noise (e.g. including along appropriate sections of the rail corridor fence line of Little Eveleigh Street and Marian Street, and through the use of 1.8 m high fencing around ancillary facility 3). Site topography shall be considered when situating plant • traffic flow (i.e. vehicle movements, including deliveries), parking and loading/unloading areas would be planned to minimise reversing movements within construction sites • loading and unloading of materials/deliveries would occur as far as possible from sensitive receivers • if site access points and roads are altered during detailed design, they would be selected to be as far as possible away from sensitive receivers within rail corridor access constraints • dedicated loading/unloading areas would be shielded if close to sensitive receivers wherever feasible and reasonable • delivery vehicles would be fitted with straps rather than chains for unloading, wherever possible • non-tonal reversing beepers would be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work, including delivery vehicles • on-site storage capacity would be maximised to reduce the need for truck movements during sensitive times • the offset distance between noisy plant and adjacent sensitive receivers would be maximised • plant used intermittently would be throttled down or shut down • noise-emitting plant would be directed away from sensitive receivers where feasible and reasonable • the noise levels of plant and equipment must have operating sound power or sound pressure levels as presented in this EIS (Technical report 4 – Noise and vibration) that would meet the predicted noise levels • quieter and less vibration emitting construction methods would be used where feasible and reasonable (e.g. rubber wheeled instead of steel tracked plant) • where practicable, materials would be pre-fabricated and/or prepared off-site to reduce noise with special audible characteristics occurring on site. Materials can then be delivered to site for installation. 	All

ID	Mitigation measure	Applicable location (s)
N7	Work generating noise with special audible characteristics (such as jack hammers, rock breakers, piling rigs and diamond saws) and/or vibration levels would be scheduled during less sensitive time periods for receivers (for example, before 10:00 pm or as determined during community consultation) where feasible and reasonable.	All
N8	Vehicle movements would be routed away from sensitive receivers and scheduled during less sensitive times where feasible and reasonable. The speed of vehicles would be limited, and the use of engine compression brakes avoided.	All
N9	A noise and vibration monitoring program would be carried out for the duration of works in accordance with the CNVS, CNVMP and any approval and licence conditions. Monitoring of noise would be undertaken at appropriate intervals and in response to complaints during construction. In addition, vibration intensive work would not proceed within the site specific minimum working distances unless a permanent vibration monitoring system is installed approximately one metre from the building footprint, to warn operators (e.g. via flashing light, audible alarm, SMS) when vibration levels are approaching the peak particle velocity objective.	All
N10	In accordance with the CNVS, additional mitigation measures should be implemented according to Table 13-22 and Table 13-23 (and Appendix B of Technical report 4 – Noise and vibration) of this EIS for sensitive receivers where noise levels are predicted to exceed applicable criteria.	As per Table 13-22 and Table 13-23 (and Appendix B of Technical report 4 – Noise and vibration)
Operation		
N11	Mechanical plant selections should be reviewed during the detailed design phase to ensure compliance with the operational noise criteria detailed in this EIS (Technical report 4 – Noise and vibration) is achieved. Standard noise controls such as appropriate selection and placement of mechanical plant and the inclusion of attenuation measures such as duct lining/attenuators are recommended to achieve operational noise criteria.	Redfern Station
N12	Public address system selection should be reviewed during detailed design to ensure that compliance is achieved with the operational noise criteria detailed in Section 13.2.5 .	Redfern Station
N13	The type and design of the new solid fence proposed to be constructed at the boundary of the proposed car park should be developed to optimise the level of acoustic shielding provided. Depending on the acoustic performance of the proposed fence, consideration would be given to at-receiver treatments for 157 Little Eveleigh Street such as the provision of mechanical ventilation to allow windows to be closed and/or upgraded glazing.	Car park boundary and 157 Little Eveleigh Street
N14	The Project would investigate further opportunities to minimise noise impacts to residents through the ongoing design development of the shared zones at Little Eveleigh Street and Marian Street.	Little Eveleigh Street and Marian Street shared zones

The CNVS provides practical guidance on how to minimise, to the fullest extent practicable, the impacts on the community from airborne noise, ground-borne noise and vibration generated during construction of TfNSW projects. This is managed through the application of all feasible and reasonable

mitigation measures. However, predicted exceedances after the application of standard noise-reducing mitigation measures may still occur for the Project, which represents residual noise impacts.

The CNVS recommends the implementation of additional mitigation measures where there are predicted exceedances resulting in residual noise impacts. These additional measures are presented in **Table 13-22**. The provision of additional mitigation measure/s is based on the degree of a predicted exceedance above the RBL, and when the exceedance is predicted to occur, which is related to a receiver's perception of the noise. The RBLs can be found in **Section 13.3**, and Appendix B of **Technical Report 4 – Noise and vibration** shows the location of impacted receivers and degree of noise exceedance predicted (to determine which mitigation measure/s should be applied to which receiver).

In addition to these predicted exceedances there may also be cumulative noise impacts from concurrent construction stages of the Project, as well as from other projects in the surrounding area, as presented in **Section 13.4.1**. Cumulative noise impacts may result in an increase in the overall noise level by up to 3dB(A). Potential cumulative noise impacts from the Project in conjunction with other projects in the area are further addressed in **Chapter 23** of this EIS.

Table 13-22 Additional mitigation measures matrix

Construction hours		Action level ¹ (mitigation measures) ²			
		0 – 10 dB(A) Noticeable	>10 – 20 dB(A) Clearly audible	>20 – 30 dB(A) Moderately intrusive	>30 dB(A) Highly intrusive
Standard	Weekday (7:00 am–6:00 pm) Saturday (8:00 am–1:00 pm) Sunday/Public Holiday (Nil)	-	-	PN, V	PN, V
Out of Hours Work Period 1	Weekday (6:00 pm–10:00 pm)	-	PN, RP ³ , DR ³	PN, V, SN, RO, RP ³ , DR ³	PN, V, SN, RO, RP ³ , DR ³
	Saturday (7:00 am–8:00 am) and (1:00 pm–10:00 pm)				
	Sunday/Public Holiday (8:00 am–6:00 pm)				
Out of Hours Work Period 2	Weekday (10:00 pm–7:00 am)	PN	PN, V, SN, RO ⁴ , RP ³ , DR ³	PN, V, SN, RO ⁴ , RP ³ , DR ³	PN, V, SN, RO ⁴ , RP ³ , DR ³ , AA
	Saturday (10:00 pm–8:00 am)				
	Sunday/Public Holiday (6:00 pm–7:00 am)				

Notes:

- Action level is_j the noise level ($L_{Aeq(15\text{ minute})}$) above background (RBL) - qualitative assessment of noise levels.
- The following abbreviations have been used (refer to **Table 13-23** for further details):
PN: Project notification; V: Verification monitoring; SN: Specific notification; RP: Respite period; DR: Duration reduction; RO: Project specific respite offer; AA: Alternative accommodation.
- Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only (i.e. Saturday 6:00 am-7:00 am and 1:00 pm-6:00 pm, Sundays/Public Holidays 8:00 am-6:00 pm).
- Respite offers during OOHW Period 2 are only applicable for evening periods (i.e. Sundays/Public Holidays 6:00 pm-10:00 pm), and may not be required if a respite offer has already been made for the immediately preceding OOHW Period 1.

Table 13-23 provides an explanation of each additional mitigation measure, as outlined in the CNVS.

Table 13-23 Description of additional mitigation measures

Abbreviation	Mitigation measure	Explanation
PN	Periodic notification	<p>A notification entitled 'Project Update', 'Construction Update' or 'Community Update' or similar is produced and distributed to stakeholders via letterbox drop and distributed to the Project postal and/or email mailing lists. The same information will be published on the TfNSW website.</p> <p>Periodic notifications provide an overview of current and upcoming works across the Project and other topics of interest. The objective is to engage, inform and provide project-specific messages.</p> <p>Advanced warning of potential disruptions can assist in reducing the impact on stakeholders. The approval conditions for projects specify requirements for notification to sensitive receivers where works may impact on them.</p> <p>Content and length is determined on a project-by-project basis and must be approved by TfNSW prior to distribution. Most projects distribute notifications on a monthly basis.</p>
V	Verification	<p>Verification monitoring of noise and/or vibration during construction may be conducted at the affected receiver or a nominated representative location. Monitoring can be in the form of either unattended logging or operator attended surveys. The purpose of monitoring is to confirm that:</p> <p>Attended noise monitoring is to be undertaken as follows:</p> <p>construction noise and vibration from the Project are consistent with the predictions in the noise assessment</p> <p>mitigation and management of construction noise and vibration is appropriate for receivers affected by the works.</p> <p>Where noise monitoring finds that the actual noise levels exceed those predicted in the noise assessment then immediate refinement of mitigation measures may be required.</p>
SN	Specific notifications	<p>Specific notifications are in the form of a personalised letter, or phone call to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. Letters may be letterbox dropped or hand distributed. Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and their specific needs.</p> <p>Alternatively (or in addition to), communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities and provide an individual briefing. Individual briefings are used to inform stakeholders about the impacts of noisy activities and mitigation measures that would be implemented. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the Project.</p> <p>Specific notifications are used to support periodic notifications, or to advertise unscheduled works and must be approved by TfNSW prior to implementation/distribution.</p>

Abbreviation	Mitigation measure	Explanation
RO	Respite offers	The purpose of a respite offer is to provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact. The offer could comprise pre-purchased tickets for activities, restaurants or similar.
AA	Alternative accommodation	Alternative accommodation options may be provided for residents living in close proximity to construction works that are likely to incur unreasonably high impacts. Alternative accommodation would be determined on a case-by-case basis and should provide a like-for-life replacement for permanent residents, including provisions for pets, where reasonable and feasible.
RP	Respite period	<p>OOHW during evening and night periods would be restricted so that receivers are impacted for no more than three consecutive evenings and no more than two consecutive nights in the same NCA in any one week, except where this is a Duration Reduction.</p> <p>A minimum respite period of four evenings/five nights shall be implemented between periods of evening and/or night works.</p> <p>Strong justification must be provided where it is not feasible and reasonable to implement these period restrictions (e.g. to minimise impacts to rail operations), and approval must be given by TfNSW through the OOHW Approval Protocol.</p>
DR	Duration Reduction	<p>Where Respite Periods are considered to be counterproductive to reducing noise and vibration impacts to the community it may be beneficial to increase the number of consecutive evenings and/or nights through an overall Duration Reduction to minimise the duration of the activity.</p> <p>Impacted receivers must be consulted and evidence of community support for the Duration Reduction must be provided as justification for the Duration Reduction. A community engagement strategy must be agreed with and implemented in consultation with Project Community Engagement Representatives.</p>

14 Non-Aboriginal heritage

This chapter provides a summary assessment of the potential impact on non-Aboriginal heritage items and archaeological remains as a result of the Project and identifies mitigation measures to address these impacts. A full copy of the assessment report is provided in **Technical report 5 – Non-Aboriginal heritage**.

14.1 Introduction

The SEARs relating to environmental heritage, and where these requirements are addressed in this chapter, are listed in **Table 14-1**.

Table 14-1 SEARs

SEARs	Where addressed in this EIS
11. Heritage	
1. direct and/or indirect impacts (including cumulative impacts) to the heritage significance of:	
<ul style="list-style-type: none"> a. Aboriginal places, objects and cultural heritage values, as defined under the <i>National Parks and Wildlife Act 1974</i> and in accordance with the principles and methods of assessment identified in the current guidelines; b. Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan; 	Section 15.3 Section 15.4
<ul style="list-style-type: none"> c. environmental heritage, as defined under the <i>Heritage Act 1977</i>; d. (d) items listed on the State, National and World Heritage lists; and e. heritage items and conservation areas identified in environmental planning instruments applicable to the project area. 	Section 14.2.1 Section 14.4
2. Where impacts to State or locally significant non-Aboriginal heritage items are identified, the assessment must:	
<ul style="list-style-type: none"> a. include a significance assessment, a statement of heritage impact for all heritage items and a historical archaeological assessment; 	Appendix B of Technical report 5 – Non-Aboriginal heritage
<ul style="list-style-type: none"> b. assess the consistency of the project against any relevant conservation management plan and outline measures considered to avoid and minimise those impacts in accordance with the current guidelines; 	Section 14.4 Section 14.4.5
<ul style="list-style-type: none"> c. justify impacts to the item of significance; and 	Technical report 5 – Non-Aboriginal heritage Section 14.4

SEARs	Where addressed in this EIS
d. be undertaken by a suitably qualified heritage consultant(s) and/or historical archaeologist.	<p>This Statement of Heritage Impact has been undertaken by:</p> <ul style="list-style-type: none"> • Ameera Mahmood, Senior Heritage Architect (NSW Arch Reg No.8254), AECOM • Chris Lewczak, Principal Archaeologist, AECOM • Dr Susan Lampard, Principal Archaeologist, AECOM

14.2 Method of assessment

14.2.1 Statutory context

The main legislation relevant to non-Aboriginal heritage in NSW is the *Heritage Act 1977* ('the Heritage Act'). The Heritage Act includes provisions to conserve the State's environmental heritage; it provides for the identification, registration, and protection of items of State heritage significance; and it constitutes the Heritage Council of NSW, conferring on it functions relating to the State's heritage.

The *Heritage Act* (as amended) was enacted to conserve the environmental heritage of NSW. Under section 32, places, buildings, works, relics, movable objects or precincts of heritage significance are protected by means of either Interim Heritage Orders (IHO) or by listing on the NSW State Heritage Register (SHR).

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes the framework for heritage values to be formally assessed in land use planning and environmental impact assessment processes. The EP&A Act requires that environmental impacts are considered prior to land development, and the level of significance of the impact assessed. This includes impacts on cultural heritage items and places, and archaeological sites and deposits.

Items and places of national heritage significance, as well as heritage places owned by the Australian Government, are managed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act provides for the identification, registration, and protection of items of national heritage significance. National heritage is one of the nine matters of national environmental significance protected by the EPBC Act.

The Heritage Act and the EP&A Act enable creation of statutory registers which provide legal protection for heritage items. The State Heritage Register, government agency Heritage and Conservation Registers established under Section 170 of the Heritage Act, and the environmental heritage schedules of LEPs are statutory listings. Places on the National Heritage List and Commonwealth Heritage List are protected under the EPBC Act.

14.2.2 Approach

The objectives of the assessment were to ensure that the design, construction and operation of the Project facilitates the protection, conservation, and management of heritage items within and adjacent to the Project area. The assessment has been undertaken in accordance with the following:

- New South Wales (NSW) Heritage Division documents *Assessing Heritage Significance* (NSW Heritage Office, 2001)
- *Statements of Heritage Impact* (NSW Heritage Office & Department of Urban Affairs & Planning, 2002)
- *The Burra Charter, The Australia International Council on Monuments and Sites (ICOMOS) Charter for Places of Cultural Significance 2013* (ICOMOS (Australia), 2013).

The assessment included:

- Desktop searches of relevant heritage registers
- A review of the Project drawings, concept design reports, and design options
- Definition of a study area for the assessment (within 200 metres of the proposed concourse, car park (key works) and ancillary facilities)
- Understanding of the historical context of the Project area and surrounds, summarised from key documents, including:
 - NSW SHR listings for the Redfern Station, Eveleigh Railway Workshops, Chief Mechanical Engineers Office and adjacent conservation areas
 - *Redfern Station Heritage Assessment, Paul Davies, 2007*
 - *Eveleigh Railway Workshops: Overarching Conservation Management Plan, Otto Cserhalmi & Partners, 2017*
 - *Eveleigh Carriageworks Conservation Management Plan, Otto Cserhalmi & Partners, 2003 (policy revisions)*
 - *Redfern Railway Station – A Guide for Interpretation, Sharp. S, 2013*
 - *Chief Mechanical Engineer’s Building – Conservation Management Plan, Paul Rappoport, 1997*
 - *Heritage Platforms Conservation Management Strategy (CMS), 2015*
- A review and summary of the options analysis undertaken to develop the concept design for the Project
- Assessment of the construction and operation of the Project based on the following documents:
 - Architectural drawings, photomontages, materials and finishes schedules
 - *Redfern Station Upgrade – Draft Heritage Interpretation Strategy, Tonkin Zulaikha Greer Architects, 2019*
- Site inspections undertaken on 12 June, 26 June, 30 September 2019 and 27 February 2020 by AECOM staff, assessing the existing station (both internal and external) along with the existing character of the Project area and surrounding land uses.

14.2.3 Identification, significance and assessment of heritage items

Heritage significance assessment methodology

In accordance with the guideline *Assessing Heritage Significance*, an item would be considered to be of State significance if it meets two or more criteria at a State level, or of local heritage significance if it meets one or more of the criteria outlined in **Table 14-2**. The Heritage Council of NSW requires the summation of the significance assessment into a succinct paragraph, known as a Statement of Significance. The Statement of Significance is the foundation for future management and impact assessment.

Table 14-2 Significance assessment criteria

Criterion	Inclusions/Exclusions
<p>Criterion (a) – an item is important in the course, or pattern, of NSW’s cultural or natural history (or the cultural or natural history of the local area).</p>	<p>The site must show evidence of significant human activity or maintains or shows the continuity of historical process or activity. An item is excluded if it has been so altered that it can no longer provide evidence of association.</p>

Criterion	Inclusions/Exclusions
Criterion (b) – an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local to area).	The site must show evidence of significant human occupation. An item is excluded if it has been so altered that it can no longer provide evidence of association.
Criterion (c) – an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).	An item can be excluded on the grounds that it has lost its design or technical integrity, or its landmark qualities have been more than temporarily degraded.
Criterion (d) – an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.	This criterion does not cover importance for reasons of amenity or retention in preference to a proposed alternative.
Criterion (e) – an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area). Significance under this criterion must have the potential to yield new or further substantial information.	Under the guideline, an item can be excluded if the information would be irrelevant or only contains information available in other sources.
Criterion (f) – an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).	An item is excluded if it is not rare or if it is numerous, but under threat. The item must demonstrate a process, custom or other human activity that is in danger of being lost, is the only example of its type or demonstrates designs or techniques of interest.
Criterion (g) – an item is important in demonstrating the principal characteristics of a class of NSW's (or local area's): <ul style="list-style-type: none"> cultural or natural places cultural or natural environments. 	An item is excluded under this criterion if it is a poor example or has lost the range of characteristics of a type.

Where available the SHR or State Heritage Inventory (SHI) statement of significance and significance assessment has been used within the assessment for listed items. For Redfern Station, the SHR, the significance assessment and the statement of significance specifically prepared for the Project area has been used within the assessment. The significance assessment and statement of significance were updated for Redfern Station in the assessment to reflect analysis undertaken of the changes to the historical and physical evidence over time.

Grading of significant elements

Individual elements of an item can have a different contribution to the item's heritage significance; hence it is useful to define which elements are of significance and which may detract from its significance. The NSW Heritage Division (NSW Heritage Office, 2001:11) uses the grading criteria provided in **Table 14-3**.

Table 14-3 Grading of significance criteria (NSW Heritage Office, 2001:11)

Grading	Justification	Status
Exceptional	Rare or outstanding element directly contributing to an item's local and State significance.	Fulfils criteria for local or State listing.
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alterations do not detract from significance.	Fulfils criteria for local or State listing.

Grading	Justification	Status
Moderate	Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the item.	Fulfils criteria for local or State listing.
Little	Alterations detract from significance. Difficult to interpret.	Does not fulfil criteria for local or State listing.
Intrusive	Damaging to the item's heritage significance.	Does not fulfil criteria for local or State listing.

The significance grading of individual elements within the Project area has been based on previous heritage assessments, and additional analysis undertaken of the historical and physical evidence.

Magnitude of heritage impact

The assessment of potential impacts was based on impacts to the significance of a heritage item and its elements, as follows:

- direct impacts – as a result of the removal/demolition or alteration of fabric of heritage significance
- visual impacts – as a result of changes to the setting or curtilage of heritage items or places, historic streetscapes, or views
- potential direct impacts – as a result of impacts from construction works and/or vibration and removal/demolition of adjoining structures.

The potential impacts to heritage items were then assessed against the *Guidance on Heritage Impact Assessments for Cultural World Heritage properties* (ICOMOS, 2011).

The significance of the effect of change – i.e. the overall impact - on an attribute is a function of the importance of the attribute and the scale of change. This can be summarised for each attribute described using the following descriptors. As change or impacts may be adverse or beneficial, there is a nine-point scale with “neutral” as its centre point:

- Major beneficial - A beneficial change to key historic building elements that contribute to the heritage value such that the resource is totally altered. A beneficial comprehensive change to its setting
- Moderate beneficial - A beneficial change to many key historic building elements, such that the resource is significantly modified. A beneficial change to the setting of an historic building, such that it is significantly modified
- Minor beneficial - A beneficial change to key historic building elements, such that the asset is slightly different. A beneficial change to setting of an historic building, such that it is noticeably changed
- Negligible beneficial - A slight beneficial change to historic building elements or setting that hardly affect it
- Neutral - No change to fabric or setting
- Negligible adverse - A slight adverse change to historic building elements or setting that hardly affect it
- Minor adverse - An adverse change to key historic building elements, such that the asset is slightly different. An adverse change to setting of an historic building, such that it is noticeably changed
- Moderate adverse - An adverse change to many key historic building elements, such that the resource is significantly modified. An adverse change to the setting of an historic building, such that it is significantly modified

- Major adverse - An adverse change to key historic building elements that contribute to the heritage value such that the resource is totally altered. An adverse comprehensive change to its setting.

From a heritage perspective, impacts are only acceptable if sufficient justification is provided, and options to avoid harm have been explored and discounted. Where impacts are identified, the justification for these impacts (including information on the options considered) is provided. Additional information on how the design was developed taking into account impacts to heritage, is summarised in **Chapter 4** of this EIS and in Section 7.2 of **Technical report 5 – Non-Aboriginal heritage**.

14.2.4 Historical archaeology assessment

The potential for a site to contain historical archaeology was assessed by identifying former land uses and associated features through historical research, and evaluating whether subsequent actions (either natural or human) may have impacted evidence for these former land uses. The significance of potential archaeological remains was then assessed using a framework based on the NSW heritage criteria.

The historical archaeological assessment involved:

- reviewing heritage and archaeological site listings
- analysis of historical background and maps
- a site inspection
- understanding previous impacts
- assessment of archaeological significance.

Should subsurface archaeological materials be uncovered during construction, these would be addressed in accordance with TfNSW's *Unexpected Heritage Finds Guideline* (Transport for NSW, 2016). This is discussed further in **Section 14.5**.

14.3 Existing environment

14.3.1 Heritage listed items and conservation areas

Heritage listed items and conservation areas within the study area are shown in **Figure 14-1**.

Items of State significance within the Project area include:

- Redfern Railway Station Group, which is listed on the SHR (#01234) and RailCorp Section 170 Heritage and Conservation Register (#4801095)
- Eveleigh Railway Workshops, which is listed on the SHR (#01140) and RailCorp Section 170 Heritage and Conservation Register (#4801102)
- Eveleigh Chief Mechanical Engineers Office and moveable relics, which is listed on the SHR (#01139) and RailCorp Section 170 Heritage and Conservation Register (#4801126).

Locally listed conservation areas include

- Golden Grove Conservation Area (C18)
- Darlington Heritage Conservation Area (C19).

Locally listed heritage items located within the study area include:

- Terrace House 'Waratah' (#I1322)
- Terrace Group including interiors (#I517)
- Former McMurtrie, Kellerman & Co factory including interiors (The Foundry) (#I2245)
- St Luke's Presbyterian Church including interior (#I352).

The historical context for these items and conservation areas, as relevant to the potential Project impacts, is provided in the following section.

14.3.2 Historical context

Redfern Station

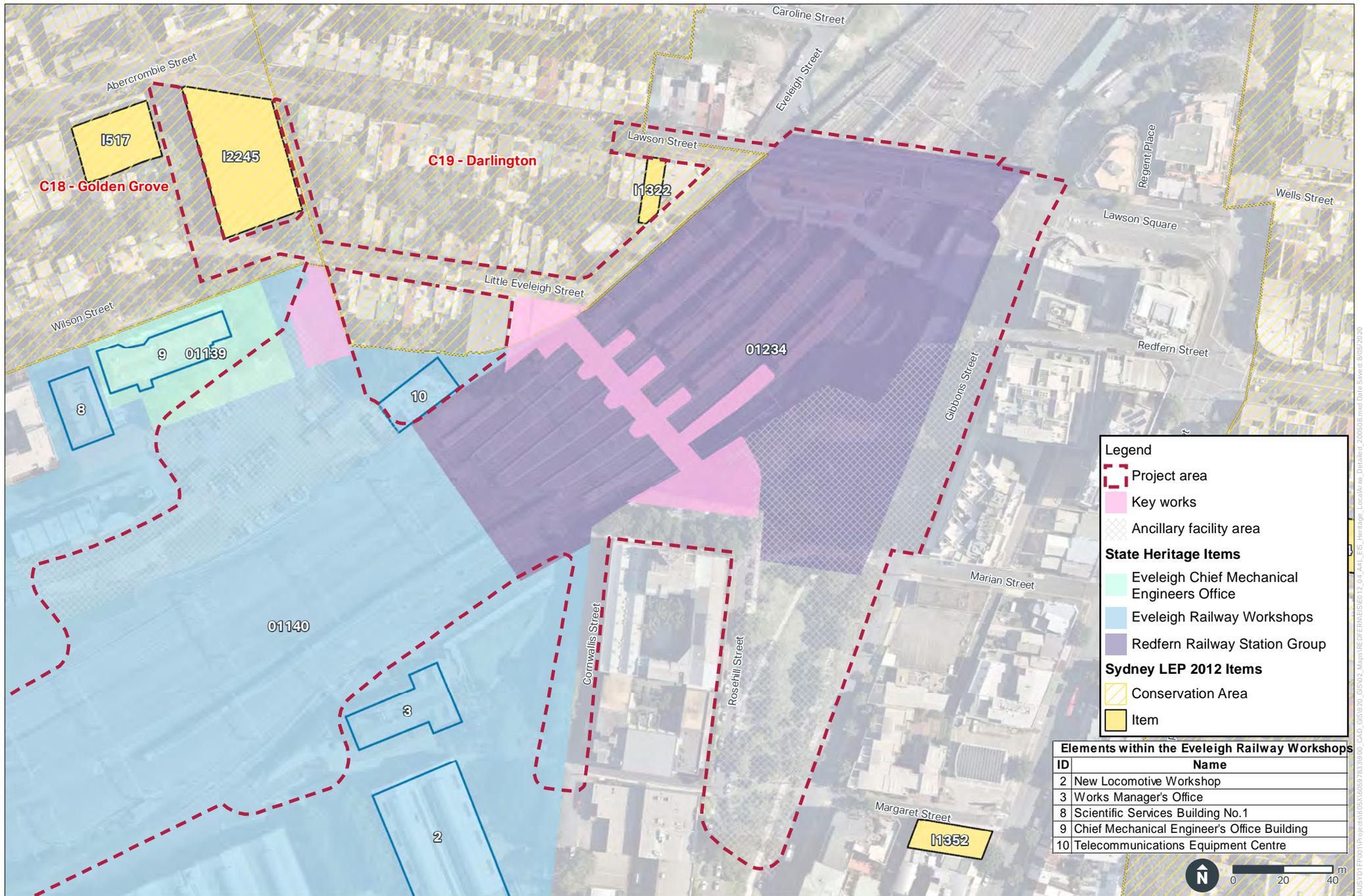
Redfern Station (renamed from 'Eveleigh Station' in 1906) is a major suburban station with historic significance at State level and has a direct association with the development Sydney's railway to the western suburbs. Land was resumed for the station and Eveleigh Railway Workshops in the 1880s with both sites expanding over the subsequent years in response to increasing demands of the railway system.

The physical connection between the Station and Eveleigh Railway Workshops is evident in the planning of the Station with Platform 1 being immediately adjacent to the Workshops. When the station opened in 1884 it was aimed to primarily serve the surrounding suburbs, which had expanded during the Victorian era, provide access to the Eveleigh Railway Workshops employees and provide passenger interchange between the Illawarra line and the main railway line.

In 1884 the layout consisted of four platforms; two side platforms and an island. The station had an overbridge on Wells Street (now Lawson Street) that allowed access to the platforms via stairs. Most of the current Platform 1 structures originate from this period. Over the years the station continued to expand (to the east) with two tracks (Platforms 5/6) added in 1891-1892, Platforms 7/8 in 1912-1915 and, with rail electrification, the addition of Platforms 9/10 (1924-1927).

The connection between the station and the Workshops is also evident with the construction of a southern footbridge in 1914 and its use through until 1996, when it was demolished. The footbridge provided access to Eveleigh Carriageworks (North Eveleigh Precinct), the Locomotives (South Eveleigh Precinct) and Redfern Station. This public footbridge enabled an easier commute between the station and the Eveleigh Railway Workshops and connected the Locomotive and Carriage Works precincts and surrounding residential areas.

In 1927 subsurface lines or 'dives' were constructed for the Illawarra lines (west of the station) and engine dives from the Eveleigh Railway Workshops passing under and across the rail corridor. Construction of the Eastern Suburbs Railway Line (ESR) began in the 1940s and resulted in the installation of underground Platforms 11 and 12. Various modifications to the station have occurred over time aimed at improving circulation and access, including a new entrance at Gibbons Street constructed in the 1990s which has been refurbished recently (2018).



Legend

- Project area
- Key works
- Ancillary facility area

State Heritage Items

- Eveleigh Chief Mechanical Engineers Office
- Eveleigh Railway Workshops
- Redfern Railway Station Group

Sydney LEP 2012 Items

- Conservation Area
- Item

Elements within the Eveleigh Railway Workshops

ID	Name
2	New Locomotive Workshop
3	Works Manager's Office
8	Scientific Services Building No.1
9	Chief Mechanical Engineer's Office Building
10	Telecommunications Equipment Centre



FIGURE 14-1: HERITAGE ITEMS IN THE STUDY AREA

Eveleigh Railway Workshops

The Eveleigh Railway Workshops were planned, and land was resumed for the site by the early 1880s, contemporaneously with the original Station's development, and both sites expanded over the subsequent years in response to the increasing popularity and demands of the railway system. In its first phase of development, Eveleigh Railway Workshops consisted of two main complexes on either side of the main line, the Locomotive Workshops and the Carriage Workshops. The Eveleigh Railway Workshops has seen multiple phases of development during its long history of use, ending in 1989 with the closure of the site (OCP Architects, 2017:48).

Chief Mechanical Engineers Office

The Chief Mechanical Engineer's building was built in 1887 as part of the expansion of the Eveleigh Railway Workshops to accommodate the various engineers and staff who were to supervise the design and construction of the locomotives, carriages, and wagons.

Darlington Heritage Conservation Area

Darlington Heritage Conservation Area is representative of the mid-nineteenth century residential subdivision and mid to late-nineteenth-century working-class housing. There is clear evidence of the influence of the Eveleigh Railway Workshops and the establishment of the railway line in the working-class terraces, workers cottages, light industrial buildings, the topography and street patterns. The Conservation Area also has heritage significance for its association with the Aboriginal community. The Block is located nearby and was purchased for Indigenous housing in 1973 and provided the opportunity for Indigenous Australians moving to Sydney to remain living in a community environment with extended family (NSW Office of Environment & Heritage, SHI, 28 Jul 06).

125-127 Little Eveleigh Street falls within the Darlington Heritage Conservation area. It was constructed c.1930 and exemplifies the warehouse buildings associated with light industries that occupied the area, stimulated by developments at Redfern Station and Eveleigh Railway Workshops. The building was built as a brush factory by Alfred Wyld who began producing brushes in Glebe in the early 1900s developing his business as a family-run enterprise with multiple locations.

The Chief Mechanical Engineer's building also falls within the Darlington Conservation area.

Golden Grove Heritage Conservation Area

Golden Grove Heritage Conservation Area is representative of the late nineteenth-century residential subdivision developed with the influence of the Eveleigh Railway Workshops. The terraces and streetscapes evidence the working and middle-class community in the late Victorian era.

Locally listed items

Terrace House 'Waratah'

Terrace House 'Waratah' is a two storey Victorian Filigree style terrace house representing representative the mid-nineteenth century residential subdivision and mid to late-nineteenth-century working-class housing of the Darlington Heritage Conservation Area. This item is located at 117 Lawson Street, Redfern and is approximately 2 metres away from the Project area.

Terrace Group including interiors

Two-storey Victorian commercial terrace group, associated with the development of the Golden Grove Estate and the expansion of workers housing related to the development of the Eveleigh Railway Workshops in the 1880s and 1890s. This item is located at 254–266 Abercrombie Street, Darlington and is approximately 2 metres away from the Project area.

Former McMurtrie, Kellerman & Co factory including interiors (The Foundry)

Built in approximately 1883 as a boot factory for McMurtrie, Kellermann & Co and later converted to a gas meter manufacturing works for Parkinson and Cowan, this former factory represents the industrial development of Darlington from the late nineteenth century to the mid twentieth century. This item is located at 181 Lawson Street, Darlington and is approximately 2 metres away from the Project area.

St Luke's Presbyterian Church including interior

St Luke's Presbyterian Church is a fine example of a Victorian Gothic Church which makes an important contribution to the streetscape and township of Redfern. It has social significance as a place of worship for the local community. This item is located at 118 Regent Street, Redfern and is approximately 50 metres away from the Project area.

14.3.3 Redfern historical significance

Revised significance assessment and statement

As part of AECOM's assessment, the SHR Significance assessment was reviewed and updated to reflect the analysis of historical and physical evidence. This significance assessment is provided in full in Section 5.2.17 of **Technical report 5 – Non-Aboriginal heritage**.

The Statement of Significance from the SHR listing was also reviewed and updated to reflect the analysis of historical and physical evidence. The revised Statement of Significance is:

The Redfern Railway Station Group is a significant heritage item associated with the growth and development of Redfern as a place, as well as an important element and transportation hub associated with the NSW Railways. Originally designed by John Whitton, engineer-in-chief of NSW Railways (1856-1890), the station's development is associated both with the development of the industrial and residential aspects of Redfern and surrounding suburbs, and also to the importance of the station being associated with the railway workshops at Eveleigh. Redfern Station's location on the western line in proximity to the early iterations of Central Station and the Eveleigh Railway Workshops led to the station becoming a critical junction in Sydney and NSW's rail network, evident by the 1912 and 1925 expansions of the station, expanding from two to 10 platforms, and construction of the Engine Dive to avoid impact to the station layout.

Redfern Station houses a large collection of buildings at the one station demonstrating its evolution as a public transport hub. This includes phases associated with the construction and establishment of the station from 1884, and later expansions in 1912 and 1925, up until the present. These buildings include the Overhead Booking Office building, a rare example of a Queen Anne architectural type, and a landscape focal point as the remainder of the station is located within a cutting. Buildings on Platform 1 are also associated with the initial and early phases of the original station. Platforms 4 to 10 contain a collection of standard design buildings that show the design detail (and evolution of that design over a short period) that was used across the rail network, but uniquely here are located in one suburban station.

The continued expansion of Redfern in the early nineteenth and twentieth century shows the evolving nature of the station as it expanded to keep up with local demand and growth of the railway network. This includes the construction of the Eastern Suburbs Railway. The change to the station highlights the importance of Redfern as a hub for rail commuters, including for commuters who live in the local area. Despite this, the station retains its general layout plan with the focus on the northern entrances and platform structures contrasted with the openness of the southern platforms. The station's location within the cutting also serves to separate the platforms from the main road network, while also drawing the observer to views along the railway, reinforcing the connection with the Eveleigh Rail Yards.

The station as a hub has played an important role in the development of a sense of community and mobility for Aboriginal communities from Redfern and across New South Wales, who also have a strong tradition of working on NSW's rail infrastructure.

The Marian Street car park area has been identified as potentially containing archaeological relics and deposits associated with terrace houses demolished to make way for the expansion of Redfern Station for the creation of Platform 10 in c.1925. These relics and deposits are likely to be of local significance.

Grading of significant elements

The grading of significant elements within the study area is outlined in **Figure 14-2**. The grading is based on the NSW Heritage Division grading criteria provided in **Table 14-3** and has been updated to reflect the analysis of historical and physical evidence. The discussion for the grading of the significant elements is in Section 5 of **Technical report 5 – Non-Aboriginal heritage**.

Note, the legend in **Figure 14-2** describing the heritage structures/elements does not cover over important structures/elements in relation to Project impacts.

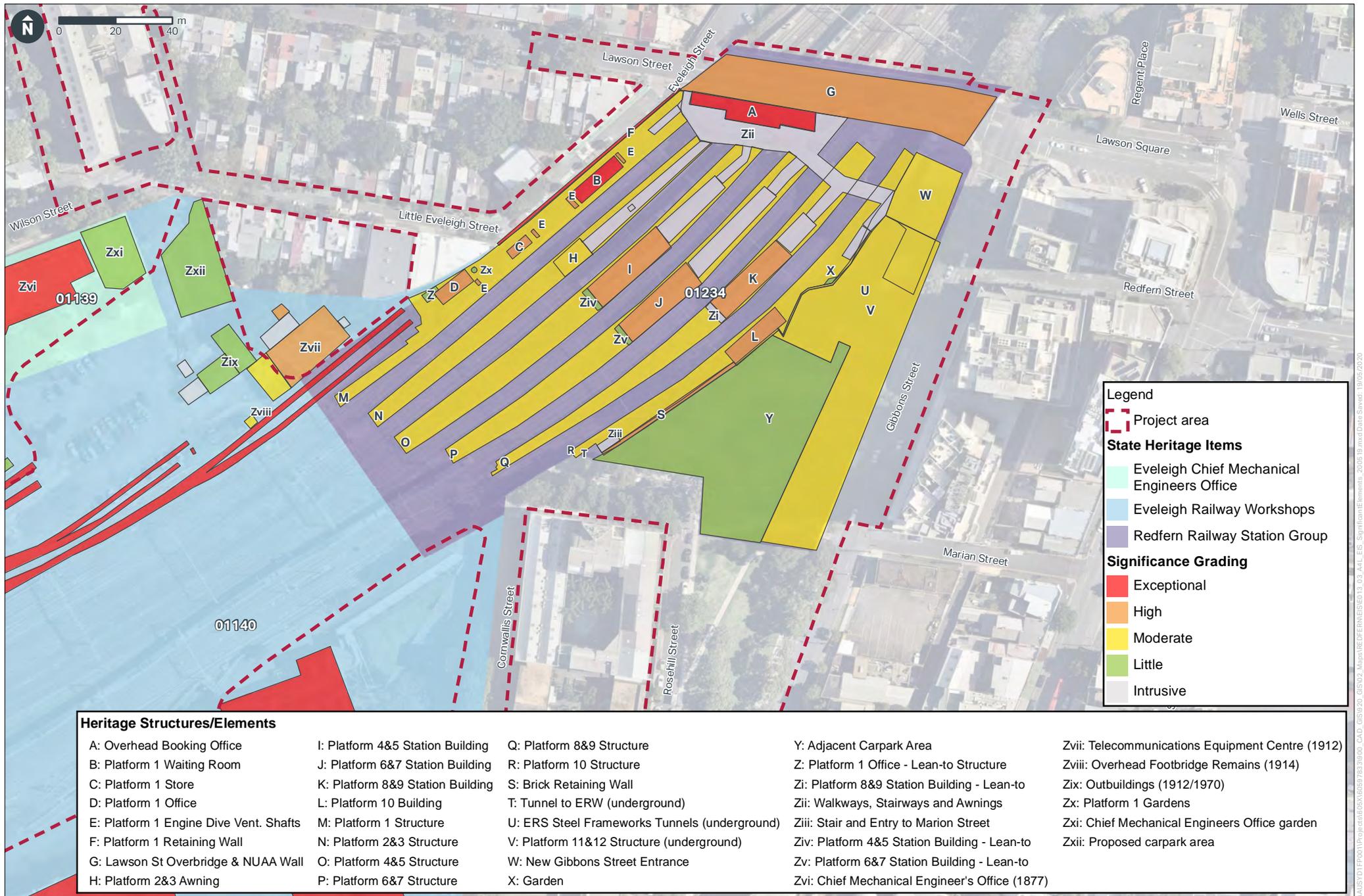


FIGURE 14-2: GRADING OF SIGNIFICANT ELEMENTS WITHIN THE STUDY AREA

14.3.4 Historically significant views and vistas

The significant heritage views identified in previous heritage assessments (Otto Cserhalmi & Partners, 2017 and Otto Cserhalmi & Partners, 2003) have been reviewed to identify the historically significant views relevant to the Project. The historically relevant views include:

- View 1 (from Platform 1 stair) – Demonstrates the historical association of Redfern Station to the Eveleigh Railway Workshops but is obscured by overhead wiring structures
- View 2 is from the corner of Cornwallis and Marian Street looking south east towards the old Water Tower and was ruled out as being a significant view for this assessment
- View 3 (from the rail corridor between the Eveleigh Carriage Workshops and Locomotive Workshops looking north towards Redfern Station) – Demonstrates the connection between the Eveleigh Railway Workshops and Redfern Station and each item's respective history, including their industrial partnership. However, this view is not accessible to the public
- View 4 (from future overbridge of rail lines) – This view would reference similar aspects of the former overbridge. Note that this view has been identified as a heritage opportunity. The Project allows this opportunity to be realised, and has not been assessed further in this chapter
- View 5 (from site entry and Chief Mechanical Engineers Building of site, rail lines and locomotive workshops) – This view demonstrates the connection of the Chief Mechanical Engineers Building to the Eveleigh Railway Workshops
- View 6 (from Platform 2/3 looking north) – This view demonstrates the enclosed environment of the early station configuration
- View 7 (from Platform 2/3 looking south) – This view demonstrates the open character at the end of the platforms in contrast to the view looking north.



Figure 14-3 View 1



Figure 14-4 View 3



Figure 14-5 View 5



Figure 14-6 View 6



Figure 14-7 View 7

14.3.5 Archaeological potential

The archaeological potential of the Project area is shown on **Figure 14-8**.

One area has been identified as having high historical archaeological potential within Redfern Station. This area has been identified as containing potential relating to the c.1850s terrace houses constructed on the site. This area is adjacent to the cut and cover operation associated with the construction of the ESR. Archaeological remains in this area are likely to relate to the former terrace houses constructed on the site between 1855 and the 1880s. The construction of the ESR cleared this area, but no large-scale excavation appeared to have occurred, and the site has been used for Marion Street car park since.

Three areas have been identified as having low archaeological potential, as outlined on **Figure 14-8**. This includes an area off Little Eveleigh Street, an area on Platform 1 and Cornwallis/Marian Street and Rosehill Street.

The section off Little Eveleigh Street was associated with the pre-railway use of the Chisholm Estate. The area on Platform 1 may be the lower course foundation remains of one of the early railway sheds associated with the Eveleigh Workshops on Platform 1. Remains for former road surfaces are expected to also be present under Marian, Cornwallis and Rosehill Street. If present, these remains are considered to be a 'work' and not a relic.

The remainder of the Redfern Station SHR boundary area does not contain areas of archaeological potential. The expansion of the railway cutting for the station was likely excavated to a depth greater than the foundations associated with any terrace houses of other structures, including privies.

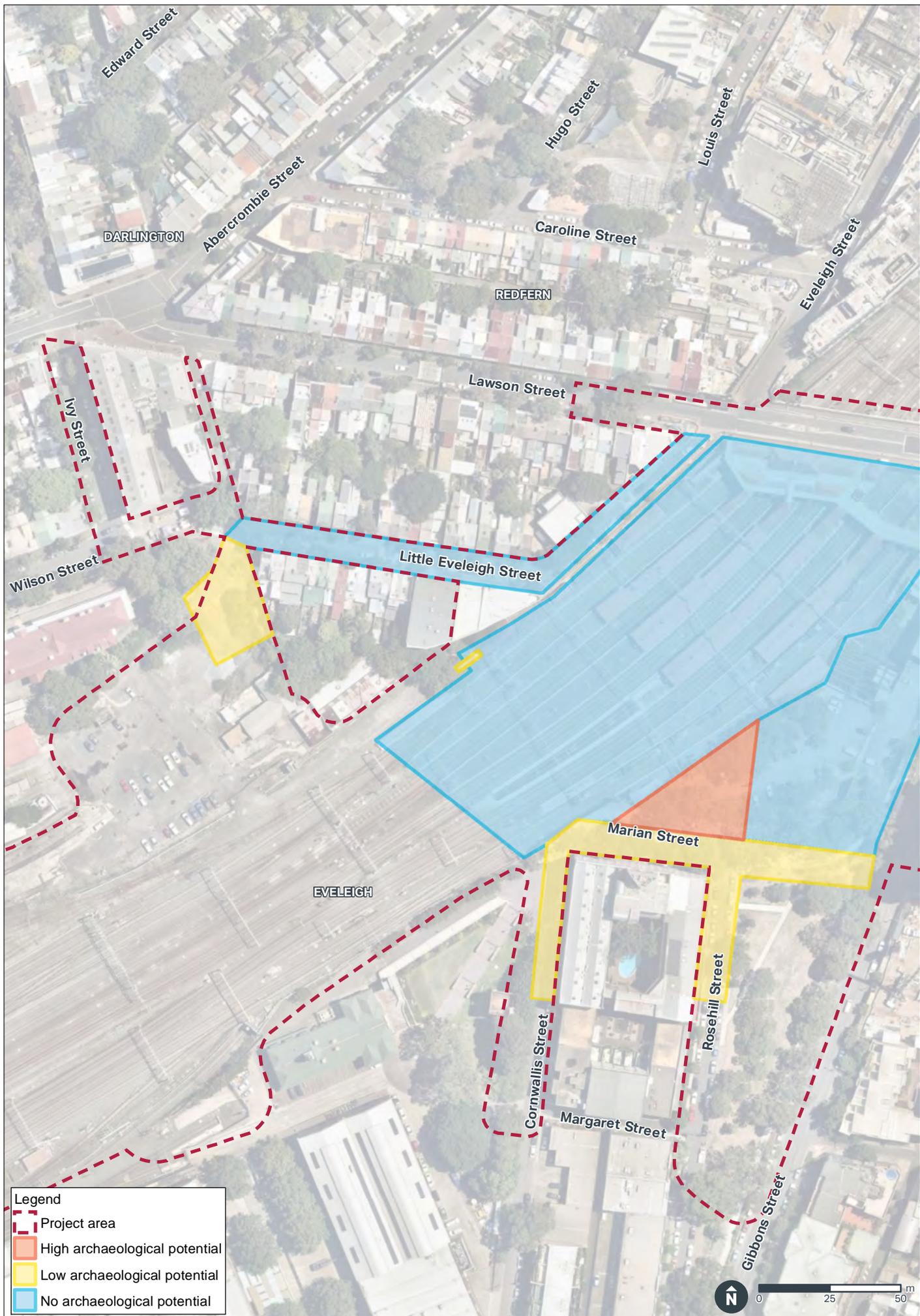


FIGURE 14-8: AREAS OF HISTORICAL ARCHAEOLOGICAL POTENTIAL

14.4 Impact assessment

14.4.1 Overview

The Project area has complex issues including heritage constraints and urban design challenges, as well as physical limitations which include existing underground tunnels.

The Project is not only responding to accessibility issues, but also to future pedestrian traffic requirements from adjacent developments, providing cross corridor connections to access major hubs and celebrating the cultural and built history of the area by implementing heritage interpretation. In aiming to satisfy and solve these issues, the impacts to heritage items are inevitable.

Notwithstanding, heritage considerations have been a key component in the development and assessment of options of the Project, which has included ongoing consultation with heritage specialists throughout the process, community feedback on heritage impacts, and independent review of the design by the TfNSW Design Review Panel (DRP). The extensive optioneering and design process undertaken for the Project is summarised in **Chapter 4** of this EIS and in Section 7.2 of **Technical report 5 – Non-Aboriginal heritage**.

This section provides a summary of the heritage impact assessment for the Project, as presented in full in Section 9.2 of the **Technical report 5 – Non-Aboriginal heritage**.

14.4.2 Impacts to heritage significance

Overview

Impacts to the heritage significance of the Redfern Railway Station Group, the Eveleigh Railway Workshops and the Eveleigh Chief and Mechanical Engineers Office, as well as conservation areas and other local heritage items within the City of Sydney LGA were assessed against the methods of the *Guidance on Heritage Impact Assessments for Cultural World Heritage properties* (ICOMOS, 2011) (refer to **Section 14.2.3**).

Redfern Railway Station Group

A summary of the impact of the Project on the heritage significance SHR criteria for the Redfern Railway Station Group is provided in **Table 14-4**.

Table 14-4 Assessment of impacts to heritage significance of the Redfern Railway Station Group

Proposed works	Overall heritage Impact	Assessment of impact
Historical significance SHR criteria (a)		
Overall Project works including: <ul style="list-style-type: none"> • New concourse, platform canopies, stairs and lifts • New entrance to Marian Street • Platform 1 Office Building modification and relocation • Platform 1 to 10 upgrade works 	Moderate adverse	<p>The Project, in general, retains the key elements that contribute to Redfern Station's historical significance, respecting the station's role as a major suburban station that served Eveleigh Railway Workshops and the surrounding suburbs.</p> <p>These elements include items graded as exceptional significance (Overhead Booking Office, Platform 1 Waiting Room and Platform 1 Retaining Wall). The collection of early station buildings is retained, with the Platform 1 Office Building relocated. There is no impact to the Gibbons Street entrance or the Eastern Suburbs railway infrastructure from the Project. The concourse provides overall station improvements which would ensure the station's longevity, as well as enhancing the historical associations to Eveleigh Railway Workshops.</p> <p>The new concourse would have a moderate adverse impact on this criterion, resulting in a change of historic character.</p>

Proposed works	Overall heritage Impact	Assessment of impact
		The construction of the concourse has a direct impact on the Platform 1 Office Building. The building is proposed to be relocated which has a major adverse impact on the historical significance of the station however this is moderated by retaining the building on the same platform and providing an equally appropriate historical association with Eveleigh Railway Workshops.
Historical association SHR criteria (b)		
Overall Project works	Neutral	Redfern Station has a strong association with John Whitton, the engineer-in-chief of NSW Railways (1856-1890). The design and original development of Redfern Station was overseen towards the end of the Whitton's role with the NSW Railways. The Project would not impact on Redfern Station's association with John Whitton. There are opportunities to interpret this significance as part of the heritage interpretation for the Project.
Aesthetic significance SHR criteria (c)		
Overall Project works including: <ul style="list-style-type: none"> New concourse, platform canopies, stairs and lift access Platform 1 Office Building modification Platform 1 to 10 upgrade works 	Major adverse	<p>The collection of nineteenth and early twentieth century railway buildings are generally retained at the station, including the Overhead Booking Office and Waiting Room. The concourse would have a major adverse impact by altering the setting of the station, by visually connecting to the road network, inhibiting some of the views of the Eveleigh Railway Workshops (refer to view 1 in Figure 14-3, view 3 in Figure 14-4 and view 7 in Figure 14-7), and adding an additional element to the southern end of the station, enclosing the station.</p> <p>A significant view demonstrating the enclosed nature of the early station configuration would be retained (refer to view 6 in Figure 14-6).</p> <p>The relocation Platform 1 Office Building, would have a moderate adverse impact on the collective group of nineteenth century buildings at the station.</p>
Social significance SHR criteria (d)		
Overall Project works	Negligible beneficial	<p>The Project would have a neutral impact on the social significance associated with the indigenous community of Redfern Station.</p> <p>The concourse would reference historic routes and association with Eveleigh Railway Workshops. Proposed heritage interpretation works, especially those relating to the former workers of Eveleigh Railway Workshops, would enhance the community's sense of place and connection to the local history.</p>
Technical/Research significance SHR criteria (e)		
Overall Project works	Negligible adverse	The impact to historical archaeological remains associated with Redfern Station is expected to be negligible, as the archaeological potential is low,

Proposed works	Overall heritage Impact	Assessment of impact
		<p>where Project works are proposed within the Station area.</p> <p>Impact to archaeological remains associated with the former terrace houses anticipated under the proposed Marian Street entrance is expected to be a negligible adverse impact. Archaeological investigations in this area prior to construction would reveal information relating to the early life of people who lived in these terraces houses, but would not offer any information relating to the construction or use of Redfern Station.</p>
Rarity SHR criteria (f)		
<p>Over Project works including:</p> <ul style="list-style-type: none"> • New concourse, platform canopies, stairs and lifts • Platform 1 Office Building modification • Platform 1 to 10 upgrade works 	Moderate adverse	<p>The impact assessment against the rarity criterion - has determined that the overall Project works would have moderate adverse impacts on the rarity values of the station (actions that would have a long-term and substantial impact on the significance of a heritage item). The majority of items identified as rare features within the station have been retained (the proposed works do not affect the Overhead Booking Office or the cast-iron newel post on Platform 1). The brick air vents associated with the Engine Dive are also retained. The air vents on Platform 1 adjacent to the proposed stair would be conserved and protected during proposed works. Views of the overall station from the Overhead Booking Office would also remain. The relocation of Platform 1 Office Building however has a negative impact on the station's intact collection of railway buildings, which has been identified as a rare element.</p>
Representativeness SHR criteria (g)		
Overall Project works	Neutral	<p>Although the relocation of Platform 1 Office Building would alter the setting, the building would still contribute to the collection of nineteenth-century buildings at the station.</p> <p>The Station would continue to serve as a major commuter station on the Sydney network.</p> <p>The Project does not have an impact on the heritage significance under this criterion.</p>

Eveleigh Railway Workshops

An assessment of the potential impact of the Project on the heritage significance for the Eveleigh Railway Workshops is summarised in **Table 14-5**.

Table 14-5 Assessment of impacts to heritage significance of the Eveleigh Railway Workshops

Proposed works	Overall heritage impact	Assessment of impact
Historical significance SHR criteria (a)		
Overall Project works including: <ul style="list-style-type: none"> • New concourse, platform canopies, stairs and lift access • New car park to Little Eveleigh Street 	Neutral	<p>The new concourse, platform canopies, stairs and lifts and the new car park to Little Eveleigh Street would in overall have a neutral impact on the historic values of the Eveleigh Railway Workshops. The proposed car park and landscaping work off Little Eveleigh Street are within the heritage boundary of the Eveleigh Railway Workshops. The proposed direct impacts include excavating vacant land located at the North Eveleigh Precinct, construction of a new car park, associated surface grading and landscaping works. The area has been assessed as being of little significance.</p> <p>The proposed concourse would connect North and South Eveleigh Precincts, which has benefits to the heritage item by reinstating former historical routes (c.1914 footbridge).</p>
Aesthetic significance SHR criteria (c)		
Overall Project works including: <ul style="list-style-type: none"> • New concourse, platform canopies, stairs and lifts • New car park to little Eveleigh Street 	Minor adverse	<p>The new concourse, platform canopies, stairs and lifts and the new car park to Little Eveleigh Street would in overall have a minor adverse impact on the historic values of the Eveleigh Railway Workshops. The materiality of the concourse would have an impact on the industrial character of the Eveleigh Railway Workshops, but the landmark qualities and aesthetics of the original 19th century developments complex would be retained. As Redfern Station is located outside the Eveleigh Railway Workshops heritage boundary the Workshops' industrial character is less relevant outside the Eveleigh Railway Workshops Precinct. Significant views to and from the rail corridor and Eveleigh Railway Workshops are also distant views cluttered by rail infrastructure.</p> <p>The proposed car park would be located within the Eveleigh Railway Workshops curtilage. The Eveleigh Railway Workshops complex has a strong industrial character and the proposed car park is inconsistent with this use. However, the area south of the site and along the rail corridor is occupied by a large car park. In comparison, the proposed car park is a small area and is discretely located. The concourse is also located a long way away from the major built elements of the Eveleigh Railway Workshops</p>
Social significance SHR criteria (d)		
Overall Project works	Minor beneficial	<p>No potential negative impacts associated with the Project have been identified on the social significance of Redfern Station.</p> <p>The Project has benefits to the community through the referencing historic routes between the North and South Eveleigh precincts. Heritage</p>

Proposed works	Overall heritage impact	Assessment of impact
		interpretation on the concourse would enhance the community's sense of place and connection with both Redfern Station and Workshops. The Project would have a minor beneficial impact to the social significance of the Eveleigh Railway Workshops.
Technical/Research significance SHR criteria (e)		
Overall project works including: <ul style="list-style-type: none"> Platform 1 Office Building modification and relocation New car park on Little Eveleigh Street 	Minor adverse	<p>The proposed car park and landscaping works would have an impact on any archaeological remains that may be present relating to the early phase of sheds associated with the Eveleigh railway workshops and is assessed as minor.</p> <p>Archaeological potential may exist below the remains of the floor remains present on the site that are associated with the railway sheds constructed in c.1900. This archaeological potential would relate to the first railway sheds constructed at Eveleigh in 1881. This archaeological potential, however, has been assessed as low as the archaeological potential due to the construction of the c.1900 railway sheds on the site. These later sheds are likely to have levelled the surrounding area prior to their construction.</p> <p>If any archaeological remains of the pre-1900 railway sheds were to remain on site, they would have the potential to yield information regarding the operation of the Yards.</p>
Rarity SHR criteria (f)		
Overall Project works	Neutral	The Project would not impact on the size and quality of the site that is considered rare.

Eveleigh Chief Mechanical Engineer's Office and Moveable Relics

An assessment of the potential impact of the Project on the Eveleigh Chief Mechanical Engineers Office is summarised in **Table 14-6**.

Table 14-6 Assessment of impacts to heritage significance of the Eveleigh Chief Mechanical Engineer's Office and Movable Relics

Proposed works	Overall heritage impact	Assessment of impact
Aesthetic significance SHR criteria (c)		
New car park to Little Eveleigh Street	Neutral	<p>The Project includes the construction of a car park adjacent to the heritage boundary of the Chief Mechanical Engineer' Office. Whilst there are no direct impacts on the aesthetic significance of the item, indirect impacts are foreseen.</p> <p>The Chief Mechanical Engineers Office and associated garden are set on raised ground overlooking the proposed car park area to the east. The works in this area would not impact the principal façade, which is located along Wilson Street. The eastern elevation has been graded as 'exceptional' significance. The proposed car park would be located within the existing driveway and overgrown garden, which has been graded as having little</p>

Proposed works	Overall heritage impact	Assessment of impact
		<p>significance and would be modified to hard landscaping. The proposed car park would have a minor adverse impact on the Chief Mechanical Engineers Office building (resulting in the slight alteration of the setting of a historical item).</p> <p>Fencing installed around the building has removed the connection with the Eveleigh Railway Workshops. Significant views are mainly associated to the north (Wilson's Street) and south (rail corridor and Carriageworks) and not easterly views. The view at the entrance from Little Eveleigh Street (refer to view 5 in Figure 14-5) demonstrates the connection of the Chief Mechanical Engineers Office Building to the Eveleigh Railway Workshops. Currently this view is obscured by the existing driveway security gate but the proposal to open up the area to residents would enhance this view. This is considered a minor beneficial impact.</p>
Rarity SHR criteria (f)		
New car park to Little Eveleigh Street	Neutral	The Project would not impact on the rarity criterion of this item (historical, scientific and social).

Darlington Conservation Area

An assessment of the potential impact of the Project on the Darlington Conservation Area is summarised in **Table 14-7**.

Table 14-7 Assessment of impacts to heritage significance of the Darlington Heritage Conservation Area

Proposed works	Overall heritage impact	Assessment of impact
Historical significance SHR criteria (a)		
Overall Project works including: <ul style="list-style-type: none"> Upgrade to surrounding streets 125 - 127 Little Eveleigh Street 	Minor adverse	The proposed upgrade to surrounding streets and proposed works to 125-127 Little Eveleigh Street have an overall minor adverse impact to the historical significance of the Darlington Heritage Conservation Area.
Historical association SHR criteria (b)		
Overall Project works	Neutral	<p>The Project would not impact on the historical association with working-class settlement, corner store communities associated with the establishment of the railways and small-scale industry.</p> <p>The Project would also not impact on the historical association with 'The Block'.</p>
Aesthetic significance SHR criteria (c)		
Overall Project works including: <ul style="list-style-type: none"> Upgrade to surrounding streets 125 - 127 Little Eveleigh Street 	Minor beneficial	The proposed upgrade to surrounding streets and proposed works to 125-127 Little Eveleigh Street would have an overall minor beneficial impact to the historical significance of the Darlington Heritage Conservation Area.

Proposed works	Overall heritage impact	Assessment of impact
Social significance SHR criteria (d)		
Overall Project works, particularly "The Block"	Neutral	The Project would not have an impact on the social significance of the conservation area associated with 'The Block'.
Rarity SHR criteria (f)		
Overall Project works, particularly "The Block"	Neutral	The Project would not have an impact on the rarity values of the conservation area associated with 'The Block'.
Representativeness SHR criteria (g)		
Overall Project works	Neutral	The early Victorian subdivision is retained and there would be no impact on the representative criteria of the conservation area.

Golden Grove Conservation Area

An assessment of the potential impact on the Project on the Golden Grove Conservation Area is summarised in **Table 14-8**.

Table 14-8 Assessment of impacts to heritage significance of Golden Grove Heritage Conservation Area

Proposed works	Overall heritage impact	Assessment of impact
Historical significance SHR criteria (a)		
Upgrade to surrounding streets	Neutral	The Project would result in the widening of the eastern footpath of Ivy Street. This would have no impact on the heritage streetscape of Ivy Street. The street has been rated 'A' rating as a highly intact streetscape (a street within the key period of significance of the area). Elements that contribute to the historic character of the street are predominantly the buildings, including the former McMurtrie Kellerman and Co Factory and terrace houses. Whilst, the footpath sets the alignment of the street, it is not considered as a contributory element and therefore the impact is considered neutral. The physical and visual alterations to Ivy Street do not impact on the Victorian residential subdivision, which developed with the Eveleigh Railway yards.
Historical association SHR criteria (b)		
Overall Project works	Neutral	The Project would not impact on the historical association with working-class settlement, corner store communities associated with the establishment of the railways and small-scale industry.
Aesthetic significance SHR criteria (c)		
Overall Project works including: <ul style="list-style-type: none"> New car park to Little Eveleigh Street Upgrade to surrounding streets 	Neutral	The proposed car park on Little Eveleigh Street and upgrade to surrounding streets within the Golden Grove Heritage Conservation Area would have a neutral impact on the aesthetic values of the HCA.

Proposed works	Overall heritage impact	Assessment of impact
Technical Research significance SHR criteria (e)		
Works to Ivy Street	Neutral	There is the potential for remains of former road surfaces to be exposed during any road repair or trenching works. These remains are considered to be works and are not rare or unusual. If encountered, these remains would be recorded prior to their removal. There are not expected to be any other archaeological remains present within the exiting road reserve.
Representativeness SHR criteria (g)		
Overall Project works	Neutral	The Project would not have an impact on the heritage significance associated with the conservation area under this criterion. The area would remain representative of the Victorian subdivision and terrace house development.

Locally listed items

Terrace House 'Waratah'

This item is located outside of the Project area and as such the Project would have no direct impact on the item. Indirect impacts would result from the Project as the building is in the sightlines of the Project. The concourse is located more than 50m from the building and the visual impacts would be a negligible adverse impact. Modifications to the streetscape of Little Eveleigh Street would also have negligible adverse impact on the heritage item. The new development is sympathetic to the heritage item as the Project would not visually dominate the item as the key feature (the concourse) is located substantially away from the item.

Terrace Group including interiors

There are no direct impacts to this item as the building is located outside of the Project area. The terrace is not located within the visual sightlines of the key works (the concourse) as it is screened from the Project by the Eveleigh Chief Mechanical Engineers Office, so there would be no adverse indirect impacts as a result of the Project.

Former McMurtrie, Kellerman & Co factory including interiors (The Foundry)

This item is located less than one metre from the Project including the proposed modifications to Ivy Street. Direct impacts to the building have been minimised by ensuring that street works are limited to the footpath and would not affect the building. The proposed upgrade to Ivy Street would have a negligible adverse indirect impact to the item.

St Luke's Presbyterian Church including interior

The Project would not result in direct or indirect impacts to this item as it is located over 50m from the Project area, and there are direct sightlines from this item to the proposed concourse and station entrances.

Archaeological potential and impacts

As outlined in **Section 14.3.5**, there is one area of high archaeological potential and three areas of low archaeological potential within the Project area. These areas overlap with the works associated with the Project which would involve ground disturbance including:

- the construction of the Little Eveleigh Street car park
- the relocation of the Platform 1 Office Building and OHW works
- the construction of the Marian Street entrance
- the construction of a shared zone on Marian Street/Cornwallis Street and Rosehill Street.

Measures would be required to be put in place to manage the potential to discover archaeology in these locations, as discussed in **Section 14.5**.

14.4.3 Construction impacts

Construction of ancillary facilities and hoardings would be temporary and involve minimal ground disturbance. These areas would either be reinstated, or form part of the permanent operational Project. Therefore, no additional direct or indirect impacts are expected from the ancillary facilities or hoardings.

Vibration arising from construction or excavation work has the potential to impact on the fabric of heritage items, potentially causing subsidence, or affecting structural integrity. In locations where heritage items are adjacent to demolition, construction, or excavation works, an assessment of the potential impact of vibration was undertaken as part of the noise and vibration assessment for the Project (refer to **Technical report 4 – Noise and vibration assessment** and **Chapter 13** of this EIS).

As part of the Construction Environmental Management Plan (CEMP), a Heritage Management Sub-Plan would be prepared including appropriate protective measures to ensure that the heritage fabric is preserved and protected during preliminary works through to Practical completion of Project. Measures may include monitoring impacts from noise and vibration, undertaking a condition survey and if maximum vibration levels have exceeded or are predicted to exceed those set as standard as well as consideration of alternative construction methods.

14.4.4 Conservation policies and strategies

Managing change to items of cultural significance is set out in a Conservation Management Plan (CMP). Presently a CMP does not exist for Redfern Station. Section 9.3 of **Technical report 5 – Non-Aboriginal heritage** provides a consistency assessment of the Project against relevant conservation policies and strategies. Overall, the Project has demonstrated a general compliance with the conservation policies and strategies. Where the Project has been assessed to be non-compliant with the policy/strategy, relevant measures have been provided to avoid and minimise potential impacts in accordance with the policy/strategy.

14.4.5 Statement of heritage impact

The objective of a Statement of Heritage Impact is to evaluate and explain how the proposed development, rehabilitation or land use change would affect the heritage value of the site and/or place. **Technical report 5 – Non-Aboriginal heritage** has been prepared in accordance with the NSW Heritage Office & Department of Urban Affairs and Planning *NSW Heritage Manual* (NSW Heritage Office & NSW Department of Urban Affairs and Planning, 1996) and NSW Heritage Office *Statements of Heritage Impact* (NSW Heritage Office & Department of Urban Affairs & Planning, 2002).

The proposed concourse, platform canopies, stairs and lifts, have been sited at the southern end of the Redfern Station and away from significant historic structures, allowing for the majority of heritage elements at the Station to be retained. However, a major adverse impact to the aesthetic significance of Redfern Station Railway Group is expected from the construction of the Project. Moderate adverse impacts to the historic, aesthetic and rarity values of the Redfern Station Railway Group are expected from the relocation of Platform 1 Office Building. Mitigation measures have been integrated into the Project.

Direct impacts to key heritage features have been avoided including the Overhead Booking Office, Platform 1 Waiting Room and Platform 1 Retaining Wall. However, relocation of the Platform 1 Office Building is necessary to construct the new concourse. Options for retention of the Platform 1 Office Building were considered and relocation was determined as the sole practical means of ensuring its survival, avoiding demolition. Adverse impacts of the relocation have been mitigated by relocating the building to the same platform and providing an equally appropriate setting in association with the Eveleigh Railway Workshops.

The Project also has the potential to have a minor adverse impact on both the aesthetic and technical values of the Eveleigh Railway Workshops resulting from the construction of the concourse and Platform 1 Office Building relocation and proposed car park. The proposed concourse would also result in indirect impacts on the aesthetic values of the station.

The Project has the potential to have a neutral impact to the Eveleigh Chief Mechanical Engineers Office and Golden Grove Heritage Conservation Area.

The proposed works to 125-127 Little Eveleigh Street has the potential for minor adverse impact on the Darlington Heritage Conservation Area. However, the impacts would be mitigated by the conservation works to the building which would improve the building's presentation and have a positive impact on the aesthetic significance of the Conservation Area.

Relocation of the Platform 1 Office Building is necessary to gain direct access to Little Eveleigh Street from the proposed concourse. The adverse impacts of the relocation are mitigated by retaining and adapting the warehouse at 125-127 Little Eveleigh Street (a contributory item in Darlington Conservation Area) and ensuring minimal impacts to the heritage streetscape of Little Eveleigh Street. The relocation ensures that an equally appropriate historical setting is provided for the Platform 1 Office Building, relating its function to the Eveleigh Railway Workshops. The relocation has also avoided potential demolition of the building.

Furthermore, the construction of the concourse, lifts and stairs would respect and/or enhance the heritage significance by:

- future-proofing the station's commuter demand to at least 2036, which ensures the longevity of the heritage listed station as a tangible link to the construction of the line and as a major suburban station that served the Eveleigh Railway Workshops and the surrounding suburbs
- providing references to historic views lost when the former footbridge was demolished and creating new vantage points that provide extensive high-level views to the station, the rail corridor and Eveleigh Railway Workshops beyond
- providing opportunities for heritage interpretation connecting the station to Eveleigh Railway Workshops
- acting as a gateway and landmark feature to rail commuters entering the city and to the urban renewal precincts such as the Eveleigh Carriageworks (North Eveleigh Precinct) and the Locomotives (South Eveleigh Precinct)
- allowing sensitive urban renewal and activation of Little Eveleigh Street, respecting the existing heritage character of the HCA
- removing intrusive elements such as the Platform 10 stairs to Marian Street.

14.5 Mitigation and management

14.5.1 Overview

A CEMF (**Appendix D** of the EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the Construction Environmental Management Plan (CEMP), sub-plans, and other supporting documentation for each specific environmental aspect.

A Heritage Management Sub-Plan (HMP) would be developed for the Project as identified in Section 6.3 of the CEMF.

A compilation of the performance outcomes as well as mitigation measures, including those that would be included in this plan is provided below.

14.5.2 Performance outcomes

The heritage performance outcomes for the Project are as follows:

- The Project has considered the following heritage opportunities:
 - transparency of the concourse is maximised
 - the bulk and scale of the concourse is minimised
 - the reflectivity of proposed materials of the concourse is minimised
 - separation between heritage fabric and new elements is incorporated

ID	Mitigation measure	Applicable location(s)
	<ul style="list-style-type: none"> - maintaining perforations in aluminium panels to be large as possible noting the limitations imposed by the ASA standard ESB 003. The proposed perforations are 25 x 25 mm. The intent is for the perforations to increase gradually to form large openings in succession from the lower portion to the roof of the concourse. Each horizontal section should be assessed for compliance to achieve the maximum opening size i.e. greater than 25 x 25 mm. Where compliance cannot be achieved, dispensation and/or alternative solutions should be exhausted. - installing roof canopies only where necessary and detailing these to be of a slim profile. - incorporating clear glazing on the concourse as much as possible; including the proposed framed views across the rail corridors. The size of these clear glazed elements should be as large as possible - incorporating clear glazed elements into the proposed lifts and ensuring the required structures for lifts and glazing are consolidated to achieve minimal bulk and maximum transparency. • reducing the bulk and scale of the proposed concourse: <ul style="list-style-type: none"> - detail design should aim for steel framing and supports to be as slim as possible - the height of the concourse should be analysed during detailed design to ensure that overall structural and architectural elements are kept to a minimum profile to achieve an overall reduced height. • assessing perforated aluminium panels for reflectivity to ensure that glare is reduced • ensuring that a separation between heritage fabric and new elements is retained such as the incorporation of glazing or voids at the junction of the concourse and 125-127 Little Eveleigh Street • avoiding inserting advertising on the concourse that would reduce the transparency and disrupt views • ensuring that materiality of new elements at the Marian Street entry is in keeping with the public domain design • ensuring that the design incorporating the independent TfNSW DRP comments is presented to the TfNSW DRP for further review and comment during detailed design. 	Marian Street Entrance Concourse
NAH2	A heritage architect would be engaged to provide ongoing heritage and conservation advice throughout detailed design and construction and any subsequent relevant design modifications.	General
NAH3	A specialist tradesperson, well versed in working with heritage fabric, would be engaged during the construction stage of the Project.	General

ID	Mitigation measure	Applicable location(s)
NAH4	<p>A historical record of areas modified would be prepared for future reference. Archival recording should be completed prior to the commencement of construction and at completion of construction. The following elements would be included:</p> <ul style="list-style-type: none"> • identified significant views • Platform 1 Office Building and surrounding area • Platform 4/5, 6/7 and 8/9 buildings • retaining walls on Platform 1 and 10 • examples of various platform facings • 125-127 Little Eveleigh Street • Little Eveleigh Street streetscape. 	General
NAH5	<p>A Heritage Management Sub-Plan would be included in the CEMP. This would include the following measures:</p> <ul style="list-style-type: none"> • protecting heritage items from adjacent construction works by: <ul style="list-style-type: none"> - prioritising protection of heritage elements as part of the early works - monitoring impacts from noise and vibration. If maximum vibration levels are exceeded, or are predicted to exceed applicable standards, consider alternative construction methods to minimise damage to heritage elements • undertaking a dilapidation survey of the area adjacent to the Chief Mechanical Engineers Office Building driveway prior to carrying out the works associated with the new car park and upon completion making good all affected areas • compiling a program of salvageable heritage fabric and a reuse plan, approved by the heritage architect prior to commencing works • avoiding potential damage to heritage items from negligence during construction by implementing a heritage induction to all on-site staff and contractors. The induction should clearly describe the heritage constraints of the site. 	<p>General</p> <p>At various heritage elements</p>
NAH6	<p>The heritage elements of the Platform 1 Office Building would be conserved and protected by:</p> <ul style="list-style-type: none"> • undertaking a dilapidation survey • prior to relocating, the windows and door would be secured and boarded up, using a reversible methodology • undertaking investigative work to avoid disturbance of fabric • maintaining the same alignment when relocating the Building • protecting and conserving Elston's Sidings during the works • avoiding installing a concrete finished floor to the Building • ensuring that relocation works are closely supervised by the heritage architect and specialist tradesperson • ensuring the following steps are undertaken during or post building relocation, if damage to the building is sustained: <ul style="list-style-type: none"> - the nominated Project architect would be contacted immediately - all damage to elements would be recorded - a heritage architect and specialist tradesperson would supervise and undertake required repairs • conserving and retaining the existing path from Platform 1 to the Telecommunications Equipment Centre. 	Platform 1 Office Building and surrounding heritage elements

ID	Mitigation measure	Applicable location(s)
NAH7	<p>Ensuring that the heritage elements on Platform 4/5, 6/7 and 8/9 buildings be conserved and protected by:</p> <ul style="list-style-type: none"> • using traditional repair and conservation methods for detailing proposed works • ensuring the demolition of the extension to the Platform 8/9 building would not damage the surrounding fabric • retaining original features of the building and their conservation and restoration if feasible • incorporating new sympathetic fabric in accordance with the guidelines of the Burra Charter. 	Platform 4/5, 6/7 and 8/9 buildings
NAH8	<p>Ensuring that the warehouse character of 125-127 Little Eveleigh Street would be retained by:</p> <ul style="list-style-type: none"> • retaining external building elements: Masonry walls, parapet line of the roof, fenestration, patina (including painted signs) of the brickwork (including remnant painted signs) • internal building elements: Original timber columns, original exposed timber framing to floors and ceilings (subject to detailed structural review) • designing new entry canopies to be a slim profile, sympathetic to the colours and material of the existing building <ul style="list-style-type: none"> - modifying the external openings, where appropriate, to make reference to the existing fenestration pattern of the building - undertaking conservation works and repair works to the exterior of the building - designing the new Colorbond roof to be sympathetic to the existing colour palette of the building - avoiding anti-graffiti paint to the exterior of the brickwork. 	125-127 Little Eveleigh Street
NAH9	<p>Reducing the aesthetic impacts associated with the insertion of the proposed car park through landscaping treatments by:</p> <ul style="list-style-type: none"> • undertaking a holistic approach when selecting materials and finishes in areas that are located within or adjacent to the Eveleigh Railway Workshops including boundary fencing, planning layouts, signage, materials, and plantings • updating the Urban Design and Public Domain Plan prior to finalisation of detailed design that incorporates a coherent presentation and linkage with the Eveleigh Railway Workshops. Retaining and protecting existing trees • introducing minimal soft landscaping to retain the existing industrial character of the rail yard. 	Eveleigh Railway Workshops
NAH10	<p>The existing SHR curtilage of the Eveleigh Chief Mechanical Engineer's Office would be protected by:</p> <ul style="list-style-type: none"> • retaining and protecting the existing trees • protecting and retaining the existing garden within the heritage boundary of the building and minimising impacts of the proposed works - physically or visually. 	Eveleigh Chief Mechanical Engineer's Office
NAH11	<p>The building fabric of the McMurtrie, Kellerman & Co factory at 181 Lawson Street would be protected during construction in particular adjacent to basement windows.</p>	Ivy Street and McMurtrie, Kellerman & Co factory, 181 Lawson Street (I2245)

ID	Mitigation measure	Applicable location(s)
NAH12	Designing new infrastructure such as OHW as simple clean structures with consolidated service runs to reduce the cluttered look of existing infrastructure at the station.	Ivy Street and McMurtrie, Kellerman & Co factory, 181 Lawson Street (I2245)
NAH13	Inspection of the following areas would be undertaken to identify movable heritage items: <ul style="list-style-type: none"> • Platform 1 Office Building • Platforms 4-9 buildings • 125-127 Little Eveleigh Street. If movable heritage items are found: <ul style="list-style-type: none"> • tag and record items • storage of moveable heritage should be coordinated with the Eveleigh Railway Workshop Collection. 	Platform 1 Office Building, Platforms 4-9 buildings, 125-127 Little Eveleigh Street
NAH14	Protecting and managing the potential archaeology on site by undertaking the following: <ul style="list-style-type: none"> • archaeological test excavation and salvage on the northern side of Marian Street, proposed car park off Little Eveleigh Street and area of relocation of the Platform 1 Office Building, prior to the commencement of bulk excavation works. A Historical Archaeological Research Design (HARD) would be prepared in accordance with the relevant Heritage, DPC guidelines • archaeological monitoring for excavation works in the area of the proposed new car park on Little Eveleigh Street. The methodology for undertaking this archaeological monitoring would be included in the HARD • archaeological monitoring for any excavation works along Marian Street, Rosehill Street and Cornwallis Street to record remains of earlier road surfaces. Once recorded, these road surfaces can be removed. The archaeological monitoring methodology would be included in the HARD • stop-work procedures would be implemented should unexpected finds be uncovered in accordance with TfNSW's Unexpected Heritage Finds Guidelines. 	Marion Street Entrance Little Eveleigh Street Car park Marian Street, Rosehill Street and Cornwallis Street General
NAH15	Communicate the heritage value of the Project by the following: <ul style="list-style-type: none"> • implementing the heritage interpretation strategy for the Project • Considering guidelines provided in <i>Sydney Trains Heritage Interpretation Guidelines</i>, and the City of Sydney council signage policies • undertaking further community consultation as part of the Heritage Interpretation Strategy • developing a Signage Plan to ensure that the design is contemporary, of high design quality, and reflects traditional patterns • interpreting the current position of the Platform 1 Office Building after the building is relocated • interpreting the association of Redfern Station with the Aboriginal community of Redfern • interpreting the historic gardens on the platforms at Redfern Station 	General

ID	Mitigation measure	Applicable location(s)
	<ul style="list-style-type: none"> interpreting the story of the former footbridge (1914-1996) at the proposed car park entry. 	
NAH16	Consulting with the City of Sydney with regard to refining detailed design in the following areas: <ul style="list-style-type: none"> 125-127 Little Eveleigh Street streetscape works. 	125-127 Little Eveleigh Street, Darlington and Golden Grove Heritage Conservation Areas
Operation		
NAH17	Updating the SHR, SHI, s170 listing description for Redfern Railway Station Group and Eveleigh Railway Workshops to reflect the upgrades from the Project, following completion of works.	General

Following the implementation of the management measure above, there would be residual impacts from the Project including:

- the Project would result in a major adverse impact to the aesthetic significance of Redfern Station Railway Group
- the Project would result in a moderate adverse impact to the historic and rarity values of the Redfern Station Railway Group (including the relocation of the Platform 1 Office Building which would have a moderate adverse impact on the station's intact collection of railway buildings, which has been identified as a rare element)
- the Project would have a minor adverse impact on both the aesthetic and technical values of the Eveleigh Railway Workshops
- the proposed works to 125-127 Little Eveleigh Street have the potential for minor adverse impact on the Darlington Heritage Conservation Area.

Potential cumulative impacts are addressed in **Chapter 23** of this EIS.

15 Aboriginal heritage

This chapter provides a summary of the Aboriginal heritage assessment undertaken for the Project. A full copy of the assessment report is provided as **Technical report 6 – Aboriginal heritage**.

15.1 Introduction

This chapter responds to the SEARs as relevant to Aboriginal heritage. Reference to where the SEARs have been addressed are provided in **Table 15-1** and the results of the assessment are summarised in this chapter.

Table 15-1 SEARs

SEARs	Where addressed in the EIS
Heritage	
<p>The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of:</p> <ol style="list-style-type: none"> Aboriginal places and objects, as defined under the <i>National Parks and Wildlife Act 1974</i> and in accordance with the principles and methods of assessment identified in the current guidelines; Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan; environmental heritage, as defined under the <i>Heritage Act 1977</i>; items listed on State, National and World Heritage lists; heritage items and conservation areas identified in environmental planning instruments applicable to the Project area. 	<p>Section 15.3 and Section 15.4. Those items related to Non-Aboriginal heritage are addressed in Chapter 14 of this EIS.</p>
<p>Where impacts to Aboriginal objects and/or places are proposed, consultation must be undertaken with Aboriginal people in accordance with the current guidelines.</p>	<p>Refer Section 15.4</p>

15.2 Method of assessment

15.2.1 Approach and methodology

The purpose of the Aboriginal heritage assessment is to identify potential Aboriginal heritage impacts that could occur during construction and operation of the Project, based on the locations of previously recorded Aboriginal heritage sites and the archaeological potential of the study area.

The study area for this Aboriginal heritage assessment comprises an approximate four kilometre buffer around the Project area, as shown in **Figure 15-1**. This buffer was applied to provide regional environmental and archaeological context.

The methodology adopted for the Aboriginal assessment was developed in accordance with the requirements of the NSW Office of Environment and Heritage's (OEH) (now Heritage NSW, Department of Premier and Cabinet) (DPC) *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW, 2010c). The assessment methodology included:

- a review of the landscape context of the Project area and surrounds
- a review of existing Aboriginal Heritage Information Management System (AHIMS) data for land within the Project area, obtained from Heritage NSW, DPC (formerly OEH) on 14 October 2019 (AHIMS search #456278)
- a search of other relevant lists and registers, including State, National and World Heritage lists and any relevant LEPs
- a review of the findings of past Aboriginal archaeological investigations within the local area

- a visual inspection of the Project area on 7 October 2019 by AECOM Senior Heritage Specialist Luke Wolfe
- preparation of a report with management advice for any identified/potential Aboriginal heritage constraints (refer **Technical report 6 – Aboriginal heritage**).

Potential Aboriginal cultural and social impacts of the Project are assessed in **Chapter 11** of this EIS.

15.2.2 Statutory context

The relevant legislation relating to the protection of Aboriginal sites, places and objects in NSW that have been considered during the preparation of the assessment include:

- Commonwealth legislation including the EPBC Act and the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- NSW state-based legislation including the EP&A Act and the *NPW Act*
- *Sydney Local Environmental Plan 2012* (the Project area lies within the City of Sydney LGA).

It is also noted that the Project area lies within the Redfern-Waterloo Authority sites listed in the *State Environmental Planning Policy (State Significant Precincts) 2005*. However no places of Aboriginal heritage significance or Aboriginal heritage items are identified on the heritage map for the Redfern-Waterloo Authority sites contained within the SEPP. It is also noted that as discussed in **Section 3.1.1**, provisions of the SEPP do not apply to State Significant Infrastructure (unless they apply to the declaration of State Significant Infrastructure or are required to enable development to be carried out), and therefore the Project does not require consent under the *State Environmental Planning Policy (State Significant Precincts) 2005*.

Further information on the relevant requirements of each of the above are provided in **Technical Report 6 – Aboriginal Heritage**.

15.3 Existing environment

15.3.1 Historical background

Redfern Station and surrounds are located within the traditional lands of the Gadigal (also 'Cadigal') Aboriginal people, a member of the Eora language group (Horton, 1994). Estimates suggest that over half of the pre-European contact populations in the region were wiped out by 1790 by the likes of ongoing dispossession of land and resources and the effects of smallpox (Attenbrow, 2010; OCP Architects, 2017; Otto Cserhalmi & Partners, 2002). While these factors initiated widespread disconnection and breakdown of traditional cultural practices across Australia, the early development of Redfern and surrounding suburbs encouraged the growth of Aboriginal communities (Hinkson, 2010). During the late nineteenth and twentieth centuries, many Aboriginal people found employment in factories in Redfern (as well as Chippendale, Waterloo and Alexandria), though Aboriginal associations with Redfern became more pronounced in the 1970s when the Aboriginal Housing Company purchased properties there (Environment, Energy and Science Group, 2020). To the present date Redfern Station has important ties to the local Redfern Aboriginal community. Further information on the historical context of Redfern Station is provided in Appendix A of **Technical report 5 – Non-Aboriginal heritage**.

15.3.2 AHIMS database

The AHIMS database is administered by the DPC in accordance with Section 89A of the NPW Act. It contains information about Aboriginal places, which have been declared by the Minister to have special significance with respect to Aboriginal culture. Previously recorded Aboriginal objects and declared Aboriginal places are known as 'Aboriginal sites'.

A search of the AHIMS database undertaken on 14 October 2019 (AHIMS search #456278) within the four kilometre buffer applied to the Project area (i.e. the study area), returned 25 site entries. Of these, two sites were recorded as 'not a site' in their respective AHIMS site cards (AHIMS ID #45-6-3152 and #45-6-3552), resulting in 23 valid site entries. As shown in **Table 15-2**, areas of Potential Archaeological Deposit (PAD) were the most common site type represented, accounting for 48% (n = 11) of known sites. Open artefact sites (comprising one or more artefacts) were also common,

accounting for 40% (n = 9) of the results. Other, less common site types included one Aboriginal ceremony and Dreaming site, one resource and gathering site and one midden site, comprising shell material and artefacts (refer to **Figure 15-1**).

Table 15-2 AHIMS data for Aboriginal sites within the Project area

Site type	Count (n)	Percentage of total
PAD	11	48%
Open Artefact Site	9	40%
Aboriginal Ceremony and Dreaming	1	4%
Resource and Gathering	1	4%
Midden	1	4%
Total	23	100%

A single Aboriginal site, 'Wynyard St Midden' (AHIMS ID #45-6-2597), recorded in 1997, was reported within the Project area. Review of the AHIMS site card for Aboriginal site 45-6-2597 describes the site as a midden observed within a park '100 m south of Redfern Station...on west side of street'. Initial review of AHIMS spatial data indicates that the site is located on Cope Street, Redfern, approximately 140 metres east of the Project area. On review, the site is erroneously described as lying on 'Wynyard Street', interpreted as Wyndham Street (Gibbons Street). While the mapping included in the site card provides insufficient detail to accurately ascertain the site's location, reference to contemporary mapping and interpolation of data suggests that the park in which the midden's shell material was observed, is likely to be the Gibbons Street Reserve. Following review of historical aerial photography and mapping for the area, it was also noted that the footprint of the contemporary Gibbons Street Reserve was bulk excavated in the 1960s during the construction of an access portal associated with the Eastern Suburbs Railway (**Figure 15-2**). Excavation associated with construction of the Eastern Suburbs Railway is also shown in **Figure 15-3**. It follows that no natural ground surfaces would have remained after the construction activities in this area. Noting the small quantities of shell material reported, it is likely that any shell material observed was included in the fill material that had been used to reinstate the Gibbons Street Reserve and therefore would not be of cultural origin (typically, shell material that is cultural (i.e. derived from a midden) would be bleached and/or burnt, contain charcoal and other secondary evidence (i.e. artefacts or bone fragments), none of which were described in the site card).

TfNSW has contacted the Metropolitan Local Aboriginal Land Council (MLALC) regarding this potential AHIMS site, however no response has been received to date.



FIGURE 15-1: ABORIGINAL SITES (NOTE THAT THE APPROXIMATE POSITION OF ABORIGINAL SITE #45-6-2597 IS SHOWN AS DESCRIBED IN SECTION 15.3.2)



Figure 15-2 Location of the Gibbons Street Reserve during construction of the Eastern Suburbs Railway (blue line). The approximate position of Aboriginal site 45-6-2597 (orange dotted lines) shown in location as interpreted from the site card description. Image source: Land and Property Information 2019

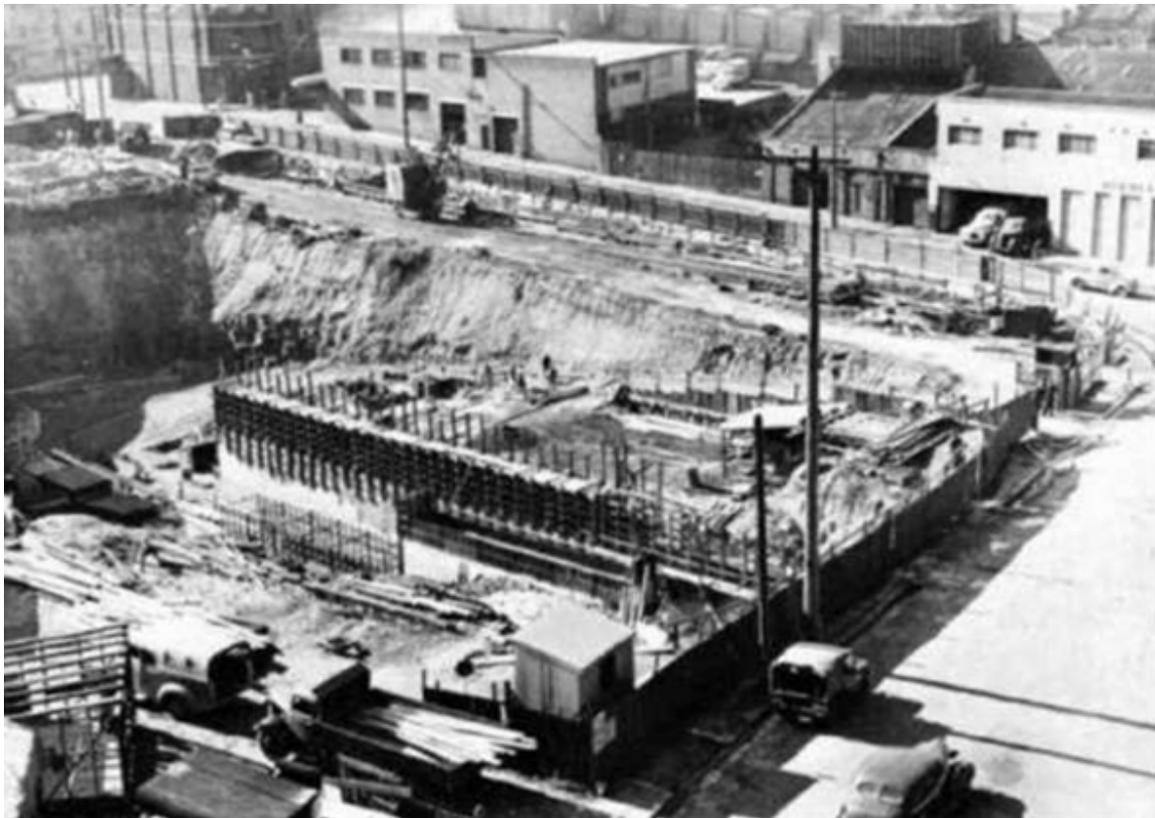


Figure 15-3 Historic photo showing excavation associated with the Eastern Suburbs Railway. The photo is looking north-east from the bend in the road on Marian Street and Gibbon Street is the road along the length of the photo. The road at the bottom right of the image is Marian Street

15.3.3 Other listings

The World Heritage list is a database administered by the United Nations Educational, Scientific and Cultural Organization (UNESCO). It lists sites which have special cultural or physical significance. Likewise, the National Heritage List is Australia's list of natural, historic and Indigenous places of outstanding significance to the nation.

A search of the both databases was undertaken on 14 October 2019 for the Project area. No natural, historic or Indigenous places are currently listed on either database.

A search of the National Native Title Register and Register of Native Title Claims administered by the National Native Title Tribunal was undertaken for the relevant LGA (City of Sydney), inclusive of land within and surrounding the Project area. No current Native Title listings or claims were identified.

15.3.4 Previous Aboriginal heritage investigations

Existing AHIMS data indicates that a significant number of Aboriginal archaeological investigations have been carried out in the Greater Sydney region (inclusive of the Project area) over the past 40 years. The majority of these have occurred within the Cumberland Plain, located in the western portion of the Greater Sydney region. Key observations drawn from a review of the local and regional cultural heritage and archaeological context of the Project area include:

- no targeted historical or archaeological research has been undertaken for Aboriginal occupation of the Project area. Notwithstanding, the Redfern area holds great significance for the Aboriginal people and other communities who identify with its political symbolism and recent history (refer to **Section 15.3.1** and **Chapter 11** of the EIS)
- an archaeological and heritage assessment undertaken for the North Eveleigh Railway Carriage Workshops by Archaeological & Heritage Management Solutions Pty Ltd (2008) identified two areas of Aboriginal archaeological potential along Wilson Street, one of which bounds the Project area. The assessment identified that garden beds surrounding the Chief Mechanical Engineer's office had not been historically subject to bulk excavation during the railway period or later occupation of the area, suggesting that soils with potential to contain Aboriginal objects could potentially survive there. It was recommended that an Aboriginal heritage impact assessment for the small area of land adjacent to Wilson Street be undertaken should any project impacts be anticipated in the area. The current assessment identified that these garden beds lie outside the boundary of the Project area and would not be impacted (**Figure 15-4**). No other analogous undisturbed areas or areas of Aboriginal archaeological sensitivity were observed within the Project area
- available radiometric dates indicate that Aboriginal people have occupied the greater Sydney area for at least 36,000 years
- areas of PAD are the most common site types within the region. Artefact scatters and isolated artefacts, collectively referred to as open artefact sites, are the second most common site type in the area. Recorded stone artefact assemblages consist principally of flake and non-flake debitage (i.e. flakes (complete and broken), flake shatter fragments and flaked pieces), with cores, retouched tools and groundstone implements comparatively poorly represented
- Aboriginal site distribution within the Greater Sydney region has been linked to a variety of environmental factors, with proximity to water, stream order, landform and geology variously highlighted as key determinants
- most surface sites will occur on landform elements within 200 metres of watercourses, with larger, more complex artefact assemblages associated with higher order streams
- existing AHIMS data for the area surrounding the Project area suggest that areas of PAD and open artefact sites (i.e. artefact scatters and isolated artefacts) are the dominant site types for this area
- local stone artefact assemblages attest to an emphasis on the procurement and reduction of silcrete. Other, less commonly exploited raw materials include chert, tuff, quartz, quartzite, petrified wood and igneous materials.

15.3.5 Visual inspection

A visual inspection of the Project area was undertaken by AECOM Senior Heritage Specialist Luke Wolfe on 7 October 2019. The primary aim of the inspection was to identify and record any existing surface evidence of past Aboriginal occupation within the Project area. The following key observations were made during the visual inspection (refer **Figure 15-5** to **Figure 15-10**):

- ground surface visibility was variable, owing to the landscape conditions within the Project area. Generally, ground surface visibility was poor, attributed to localised ground disturbance and areas of hardstand
- ground integrity was generally assessed as low, owing to the instances of bulk earthworks and construction activities (rail) within the Project area
- stone suitable for the manufacture of tools was not observed within the Project area
- no new Aboriginal sites were identified within the Project area during the visual inspection. The existing Aboriginal site 'Wynyard St Midden' (AHIMS ID #45-6-2597) was inspected to identify the nature and current condition of the site. No surface evidence of Aboriginal occupation, as described on the site card, was noted during the inspection. The area appeared landscaped and was generally grass-covered with poor ground surface exposure
- Aboriginal archaeological sensitivity of the majority of the Project area was generally assessed as negligible within the inspected areas.



FIGURE 15-4: AREAS OF ABORIGINAL ARCHAEOLOGICAL SENSITIVITY



Figure 15-5 Wilson Street car park entrance, adjacent to Chief Engineers Building (visible right of image) (Image source: AECOM, 2019)



Figure 15-6 Wilson Street car park entrance, looking south (Image source: AECOM, 2019)



Figure 15-7 Wilson Street car park entrance, rear of residential buildings, looking east (Image source: AECOM, 2019)



Figure 15-8 Eveleigh Railyard area, view to gravel tockpiles, looking north (Image source: AECOM, 2019)



Figure 15-9 Alternative view of Eveleigh Railyard area, gravel stockpiles on left of image. Redfern Station beyond, right of image. Looking north (Image source: AECOM, 2019)



Figure 15-10 View to train line and Redfern Station beyond, right of image (Image source: AECOM, 2019)

15.4 Impact assessment

15.4.1 Construction

A single Aboriginal site has been identified as being located within the Project area. The assessment (refer to **Section 15.3.2**) has not identified evidence of the presence of this site, and past historical activities have resulted in bulk excavation of the area, resulting in this site likely being invalid. Consultation with MLALC and DPC would be required to amend the status of the site on the AHIMS register. . No additional Aboriginal sites or areas of Aboriginal archaeological sensitivity are located within the Project area, therefore there would be no impacts to Aboriginal sites during construction.

Prior to the commencement of works, all construction personnel will undergo an Aboriginal heritage induction which identifies the general nature of Aboriginal sites and objects, personnel responsibilities, safeguards to be implemented to protect and avoid impacts to Aboriginal sites and the procedure for unexpected finds. Mitigation measures have been identified in **Section 15.5.3** in the unlikely event of an unexpected find.

15.4.2 Operation

As no valid Aboriginal sites or areas of sensitivity are located within the Project area (noting that AHIMS site #45-6-2597 would be managed as described in **Section 15.4.1**), there would be no impacts to Aboriginal sites during operational activities.

15.5 Management and mitigation

15.5.1 Overview

A CEMF (**Appendix D** of the EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

A Heritage Management Sub-Plan would be developed for the Project as identified by Section 6.3 of the CEMF.

This chapter includes a compilation of the performance outcomes as well as mitigation measures, including those that would be included in the Heritage Management Sub-Plan.

15.5.2 Performance outcomes

The performance outcome for the Project in relation to Aboriginal heritage is as follows:

- no impacts to Aboriginal sites, objects and places identified in the assessment during construction
- if an unexpected find is encountered during construction, relevant procedures under TfNSW's *Unexpected Heritage Finds Guideline* (Transport for NSW, 2019e) are followed.

As there are no potential impacts to Aboriginal sites or objects during operations, no operation performance outcomes are required.

The Project would be designed, constructed and operated to achieve this performance outcomes.

15.5.3 Mitigation measures

A list of mitigation measures which would be implemented during the construction of the Project are provided in **Table 15-3**.

Table 15-3 Mitigation measures

ID	Mitigation measure	Applicable location (s)
Ab1	Consultation with MLALC and DPC would be undertaken in relation to the status of the Wynyard St Midden' (AHIMS ID #45-6-2597) to amend the status of the site on the AHIMS register.	Recorded site of AHIMS site ID #45-6-2597

ID	Mitigation measure	Applicable location (s)
Ab2	<p>A Heritage Management Sub-Plan for construction of the Project would include the following mitigation measures:</p> <ul style="list-style-type: none"> • all relevant contractors and TfNSW personnel should be made aware of the nature and location of previously identified areas of Potential Archaeological Deposits (PADs) located immediately adjacent to the Project area and avoid impact to these areas. Contractors and TfNSW personnel should also be made aware of TfNSW's legal responsibilities under the NPW Act and the <i>Heritage Act 1977</i> and the need to avoid impacts to sites (including heritage interpretation and relevant information in the site induction. • in the unlikely event that a site or objects (as defined by the NPW Act) are identified during the Project, the procedure outlined in TfNSW's <i>Unexpected Heritage Finds Guideline</i> (Transport for NSW, 2019e) should be followed. Works should immediately cease at the location and the find should be immediately reported to appropriate TfNSW personnel, and the regulator in accordance with legislation. No work should commence in the vicinity of the find until any required approvals have been issued by the regulator. 	Project area

Following the implementation of the management measures above, there would be no residual impacts from the Project on Aboriginal heritage. Therefore there are no cumulative impacts on Aboriginal heritage expected. Further consideration of cumulative impacts with regard to other environmental aspects of the Project is discussed in **Chapter 23** of the EIS.

16 Biodiversity

This chapter assesses the potential biodiversity impacts arising from the construction and operation of the Project, outlines the outcomes for biodiversity, and proposes measures to avoid, reduce, mitigate or offset adverse impacts identified. A biodiversity development assessment report (BDAR) waiver was granted for the Project on 19 November 2019 (refer **Appendix F** of this EIS), and as such, a BDAR has not been prepared for the Project (refer **Section 16.2** for further information). The Project is however subject to TfNSW's vegetation offset policy.

16.1 Introduction

Biodiversity is listed under 'Other issues' in the SEARS, and includes reference to the commitments in the Scoping Report (TfNSW, 2019d) for the Project. **Table 16-1** sets out the SEARs and Scoping Report commitments relevant to biodiversity and identifies where the requirements have been addressed in this chapter.

Table 16-1 SEARs

SEARs	Where addressed in this EIS
Other Issues	
(Address) <i>the following issues in accordance with the commitments made in Chapter 9 of the Scoping Report:</i>	
(a) <i>biodiversity</i>	
The Scoping Report (TfNSW, 2019d) makes the following commitments: A biodiversity assessment will be prepared as a chapter of the EIS. This will be supported by a site inspection to confirm the presence or absence of sensitive flora or fauna. This inspection will not include detailed biometric vegetation plots, though it will identify vegetation to genus level at a minimum and assess the habitat potential present. The biodiversity assessment will include:	
<ul style="list-style-type: none"> desktop searches of relevant databases such as BioNet and the Commonwealth Protected Matters Search Tool. Vegetation mapping will also be reviewed 	Section 16.2 and Section 16.3
<ul style="list-style-type: none"> site inspection and ground truthing to identify and describe flora and fauna, habitat, populations and ecological communities 	Section 16.3
<ul style="list-style-type: none"> assessment of the direct and indirect impacts of the Project on flora and fauna species, habitat, populations and ecological communities 	Section 16.4
<ul style="list-style-type: none"> assessment of the significance of the impacts of the Project on species, ecological communities and groundwater dependent ecosystems listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) and the <i>Biodiversity Conservation Act 2016</i> (BC Act) that occur or are considered likely to occur 	Section 16.4.1
<ul style="list-style-type: none"> identification of measures to avoid or mitigate identified potential impacts, and offsets required according to the Transport for New South Wales <i>Vegetation Offset Guide 2019</i>, if residual impacts occur. 	Section 16.4.2 and Section 16.5

16.2 Method of assessment

The methodology for the biodiversity assessment included:

- desktop searches of relevant databases, aerial photography and sources of information, including the following:

- NSW BioNet database within a 10 kilometre x 10 kilometre area centred on the Project area (NSW Office of Environment and Heritage, 2019a)
- EPBC Act Protected Matters Search Tool, which documents Matters of National Environmental Significance (MNES) within a one kilometre radius of the Project area. MNES include threatened species, communities and migratory species which are listed under the EPBC Act (Department of Agriculture, Water and Environment, 2020)
- NSW Flora Online Search, Rare or Threatened Australian Plants (ROTAP) species (National Herbarium of NSW, 2019)
- NSW BioNet Vegetation Classification Database (Department of Planning Industry and Environment, 2019)
- NSW Threatened Species Profile Database (NSW Office of Environment and Heritage, 2019b)
- NSW Department of Primary Industries WeedWise Priority Weeds List (NSW Department of Primary Industries, 2019)
- Office of Environmental and Heritage (OEH) guidelines *Threatened Species Survey and Assessment: Guidelines for Developments and Activities (working draft)* (Department of Environment and Conservation, 2004), used to develop survey methods
- Bureau of Meteorology (BoM) Atlas of Groundwater Dependent Ecosystems (GDEs) database (Bureau of Meteorology, 2020)
- *The Native Vegetation of the Sydney Metropolitan Area, VIS 4489*
- site inspection and ground truthing on 16 June and 14 September 2019 to identify and describe any flora and fauna, habitat and ecological communities present within the Project area, including a micro-bat survey
- assessments of significance under the BC Act and EPBC Act for the listed threatened species *Eucalyptus scoparia* (which was identified to the east of Platform 10 within the periphery of the existing staff car park)
- ecological assessment of the direct and indirect impacts of the Project and implementation of appropriate measures to avoid or mitigate identified potential impacts.

It should be noted that, with the exception of a microbat survey, detailed fauna surveys were not undertaken. This was due to the highly urbanised nature of the Project area and the very low potential for the area to comprise important habitat for threatened species.

As explained in **Chapter 3** of this EIS, under Section 7.9 of the BC Act an application for State Significant Infrastructure (SSI) must be accompanied by a BDAR unless the Planning Agency Head and the Environment Agency Head (or delegates) determine that the proposed development is not likely to have any significant impact on biodiversity values. A BDAR waiver was granted for the Project on 19 November 2019 (refer **Appendix F** of this EIS). As such, a BDAR has not been prepared for the Project.

16.3 Existing environment

16.3.1 Flora

The majority of the Project area has been heavily modified by past and ongoing disturbances associated with urban development and the active rail corridor. These activities have resulted in the full removal of all remnant vegetation communities.

All vegetation currently present in and around the Project area comprises planted and regenerated native and exotic species occurring on highly modified soils and landforms. The flora is further influenced by the presence of the surrounding built environment, including shading, urban stormwater runoff and air emissions. **Figure 16-1** indicates the extent of vegetation (in the form of tree canopy coverage) within and surrounding the Project area.

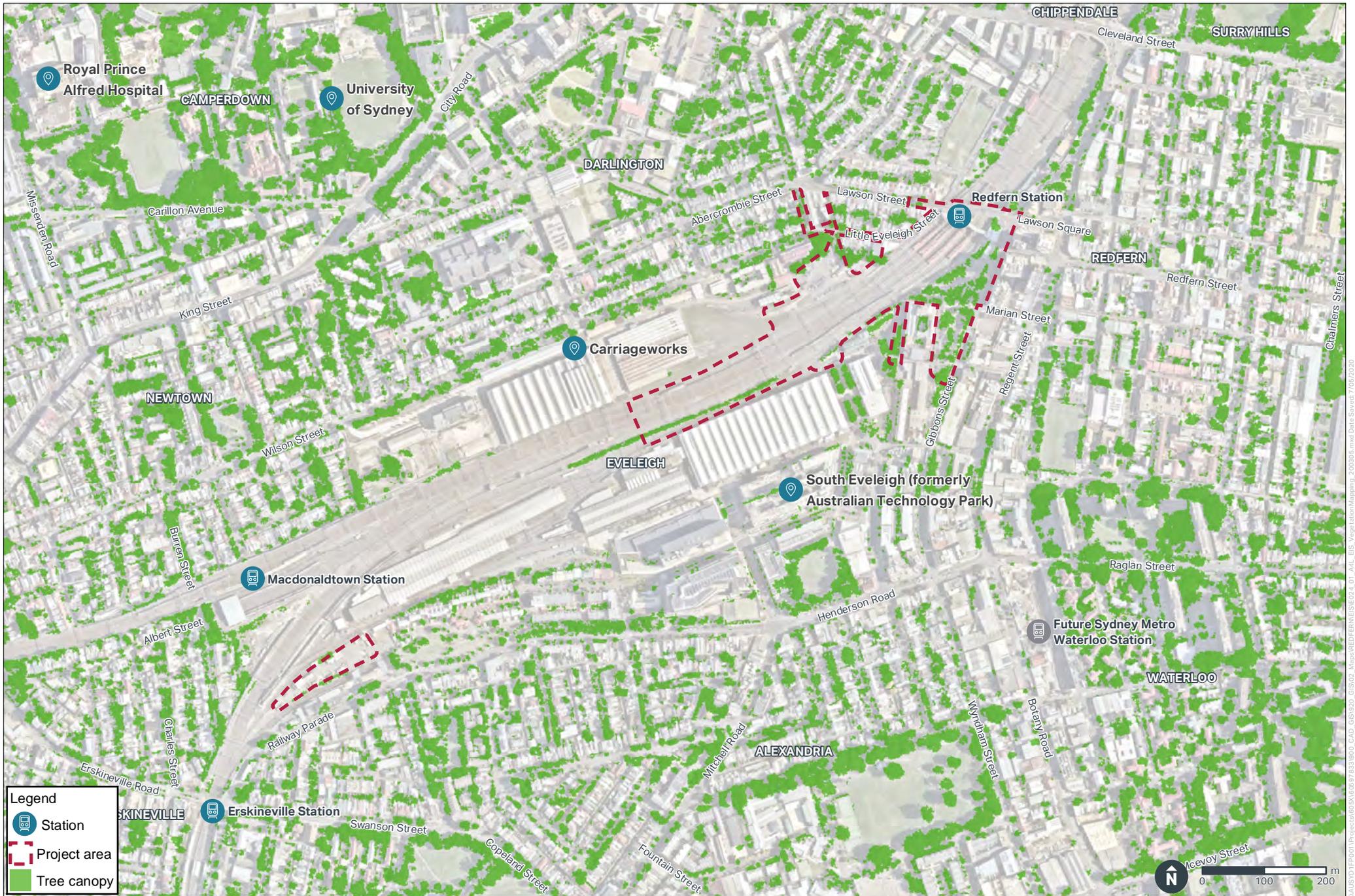


FIGURE 16-1: EXTENT OF VEGETATION (TREE CANOPY COVERAGE) WITHIN AND SURROUNDING THE PROJECT AREA

Source: Imagery © Nearmap, 2019.

Database searches

A search of the NSW BioNet database was undertaken on 3 October 2019. This search identified 18 threatened flora species and 27 threatened ecological communities within a 10 kilometre x 10 kilometre area centred on the Project area.

A search of the EPBC Act Protected Matters Search Tool identified 16 threatened flora species and six threatened ecological communities within a five kilometre radius centred on the Project area.

The above searches resulted in a large number of records, some stretching over 100 years. Given this, and the large diversity of habitats captured by the original search areas, the database results were refined to those within a one kilometre buffer of the Project area. Based on this refinement, records of the following species were returned and therefore have the potential to occur in the area, based on the presence of suitable habitat:

- Magenta Lilly Pilly (*Syzygium paniculatum*)
- Thick Lip Spider Orchid (*Caladenia tessellate*).

These species records are identified in **Figure 16-2**.

Site inspection results

The site inspection undertaken identified the following species along Little Eveleigh Street and platform 1 of the Station:

- Magnolia (*Magnolia* sp.)
- Water Gum (*Tristaniopsis laurina*)
- Hills Fig (*Ficus microcarpa* var. *hillii*)
- Sweet Pittosporum (*Pittosporum undulatum*)
- Chinese elm (*Ulmus parviflora*)
- *Mirabilis jalapa*.

Inspection of the proposed Little Eveleigh Street car park area indicated that the majority of vegetation was a mixture of planted and naturally propagated exotic and native vegetation. None of the vegetation identified in this area included threatened species.

Along with a large area of exotic perennial grasses in the Gibbons Street Reserve, species located in the vicinity of the Marian Street entrance included:

- Smooth Barked Apple (*Angophora costata*)
- Wallangarra White Gum (*Eucalyptus scoparia*)
- Flooded gum (*Eucalyptus grandis*)
- Blackbutt (*Eucalyptus pilularis*)
- *Callistemon citrinus*
- Tuckeroo (*Cupaniopsis anacardioides*)
- Sweet Pittosporum (*Pittosporum undulatum*)
- Date Palm (*Phoenix dactylifera*)*
- Narrow-leaved Bottlebrush (*Melaleuca linearis*)
- *Cotoneaster glaucophyllus**
- *Nandina domestica**
- *Lomandra longifolia*
- Hackberry (*Celtis occidentalis*)*
- *Philodendron xanadu**
- Spotted Gum (*Corymbia maculata*)
- Sydney Blue Gum (*Eucalyptus saligna*)
- London Plane (*Platanus x acerifolia*)*
- Giant White Bird of Paradise (*Strelitzia nicolai*)*.

* denotes exotic species

With the exception of *Eucalyptus scoparia* (see below), the remainder of the species identified within the Project area are not listed as threatened.

Threatened flora species

The site inspection identified seven individuals of *Eucalyptus scoparia* located within the Project area, near the existing Marian Street station entrance (refer **Figure 16-4**). This species is listed as endangered under the BC Act and vulnerable under the EPBC Act. The natural range for this species in NSW is between Glen Innes, NSW and the Queensland border. The two identified individuals have clearly been planted as part of a landscaping effort and are not part of a naturally occurring population. It is noted that this species was a commonly planted street tree in Sydney throughout the 20th century.

No further listed threatened flora was recorded within or surrounding the Project area. At present the Project area does not provide any known suitable threatened flora habitat.

Vegetation communities

The Native Vegetation of the Sydney Metropolitan Area (VIS 4489) mapping shows vegetation within the study area as 'Urban/exotic/native'. No remnant native vegetation was located within the study area. The two planted *Eucalyptus scoparia* individuals are not part of any naturally occurring population.

Priority weeds

Priority weeds are plants classified under the *Biosecurity Act 2015* as presenting a biosecurity risk to the State or a particular region. No priority weeds were recorded within the Project area during the site inspection.

Groundwater Dependent Ecosystems (GDE)

The BoM Atlas of GDEs database provides a national dataset of GDEs, whereby aquatic, terrestrial and subterranean ecosystems are mapped to inform groundwater planning and management. A search of this dataset found that there was no terrestrial GDEs mapped within or surrounding the Project area. GDEs have therefore not been further assessed.

16.3.2 Fauna

As outlined above, detailed fauna assessment was not undertaken for most species, primarily given the highly degraded nature of the Project area. A high level habitat search was however undertaken for microbats within and around 125-127 Little Eveleigh Street.

Database searches

The NSW BioNet database search returned records for 73 threatened fauna species and two endangered populations within a 10 kilometre x 10 kilometre radius centred on the Project area.

Similarly, the search of the EPBC Act Protected Matters Search Tool returned records for 19 threatened fauna species within a five kilometre radius centred on the Project area.

Similar to flora, the searches resulted in a large number of records, some dating over 100 years. Given this, and the large diversity of habitats captured by the original search areas, the database results for fauna were also refined to those within a one kilometre buffer of the Project area. Based on this search, records of the following species were returned and therefore have the potential to occur in the area:

- Red Goshawk (*Erythrotriorchis radiatus*)
- Bush Stone-curlew (*Burhinus grallarius*)
- Glossy Black-Cockatoo (*Calyptorhynchus lathamii*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Powerful Owl (*Ninox strenua*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)

These species records are shown in **Figure 16-2**.

Microbat Survey

A survey of 125-127 Little Eveleigh Street was undertaken on 14 September 2019 to assess the potential for it to provide habitat for threatened microbats. The survey used a handheld bat detector (Anabat II) and commenced at 9:00 am with the survey lasting about two hours. During the survey an additional visual inspection of the internal and external façade of the building was also undertaken for signs of habitation, such as urine stains, droppings, remains, and bat fly casings.

A number of holes, cracks and crevices were examined in the external façade, however no signs of habitation were identified, as these were likely either too narrow or too shallow to comprise suitable habitat for microbats. No further signs of habitation by any threatened microbat, megabat or other native mammals was detected during the survey.

The handheld Anabat device carried throughout the survey did not detect any ultrasonic noise that could be attributed to microbats.

Fauna habitat

There is a general lack of suitable habitat for native fauna within the Project area owing to the highly urbanised nature of the environment. Elements that contribute to the small degree of habitat that is present within and surrounding the Project area are outlined in **Table 16-2** below.

In general, it is noted that the trees present within the Project area (i.e. all planted and regenerated native and exotic species) would provide a limited degree of habitat connectivity with other surrounding urban vegetation.

Table 16-2 Fauna habitat within and surrounding the Project area

Habitat	Characteristics
Vegetation within and surrounding the Project area	Vegetation within the Project area is restricted to cultivated landscaping vegetation and naturally propagated weeds. Landscaping vegetation within the Project area includes a range of native and exotic vegetation including Acacia species, Eucalypt species and Date Palms. None of the mature trees were observed to contain hollows.
125-127 Little Eveleigh Street	125-127 Little Eveleigh Street contains a number of holes, cracks and crevices that were initially considered to have potential to provide suitable habitat for microbats, however the site inspection undertaken did not detect any signs of habitation by these species, and it was concluded that these features were likely to be too narrow or shallow to provide suitable habitat.

Site inspection results

The site inspection did not identify any features that would be considered important habitat such as trees with hollows of more than five centimetres, fallen logs or coarse woody debris. Several bird species were identified in the vicinity of the Project area including the Noisy Miner (*Manorina melanocephala*), Rainbow Lorikeet (*Trichoglossus moluccanus*) and Indian Myna (*Acridotheres tristis*), however these are common urban inhabitants within and around Sydney.

Threatened fauna species

Several records of Grey-headed Flying-fox are present around the Project area, though none of these records are within the Project area itself. This species typically makes use of fruit-bearing trees in urban environments, particularly fig trees. As no such fruit-bearing vegetation would be removed as part of the Project, any impact upon this species is expected to be negligible.

No further listed threatened fauna species were identified in the Project area.

16.4 Impact assessment

This section assesses potential direct and indirect impacts to biodiversity associated with construction and operation of the Project, and potential changes to the biodiversity values of the Project area.

16.4.1 Construction

Vegetation impacts

Construction of the Project would require the removal and trimming of a portion of the vegetation within each of the indicative areas shown in **Figure 16-3**. The specific vegetation impacts within each of these areas are described in **Table 16-3**. Where possible trees would be retained and branches trimmed or temporarily tied back to facilitate construction activities.

Stockpiling of equipment/materials and vehicle/machinery movements also has the potential to affect vegetation if these activities occur over the root zones of trees. To manage this impact tree protection zones would be established for any trees within the Project area that are not identified for removal.

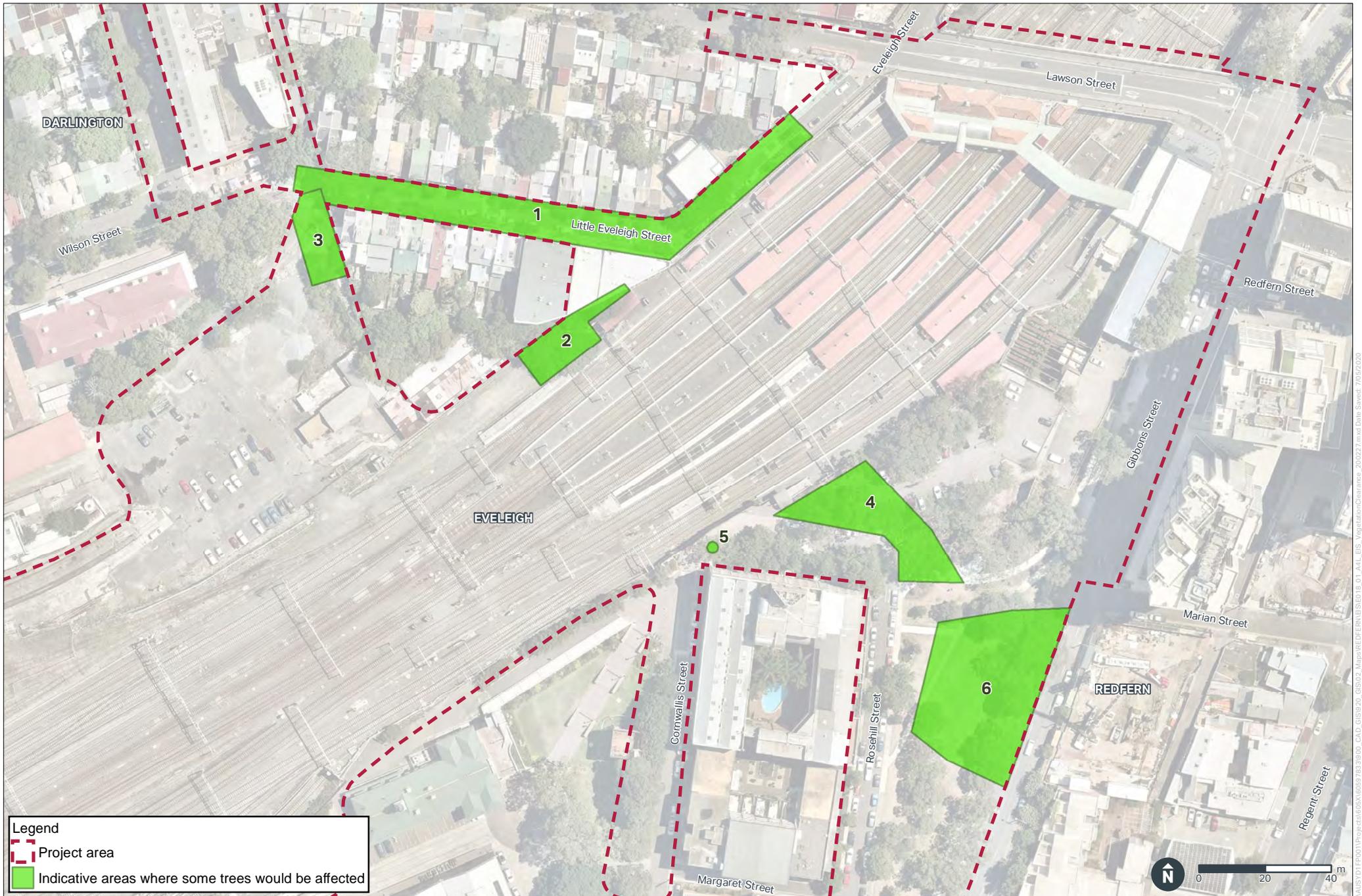


FIGURE 16-3: INDICATIVE AREAS WHERE SOME TREES WOULD BE AFFECTED



FIGURE 16-4: EUCALYPTUS SCOPARIA IDENTIFIED WITHIN THE PROJECT AREA

Table 16-3 Vegetation removal areas

Tree impact area	Justification	Extent of clearing
1 - Little Eveleigh Street	Some tree removal and trimming would be required for the reconfiguration of Little Eveleigh Street as a shared zone including works to footpaths and kerbs.	Two trees in Little Eveleigh Street would require removal, and trimming of some branches on other trees may be required.
2 - Adjacent to 125-127 Little Eveleigh Street	Existing trees adjacent to the rear of the building at 125-127 Little Eveleigh Street would require removal to facilitate the proposed station entrance and relocation of the Platform 1 building.	Removal of approximately seven trees and trimming back of tree branches.
3 - Proposed new car park area	Trees within this area would require removal to enable construction of the new car park.	Approximately 18 trees would be removed and/or trimmed.
4 and 5 - Marian Street	Existing landscaped area is directly within the proposed footprint for the new station entrance at Marian Street, and removal and trimming of several trees would be required.	Approximately 17 trees would require removal consisting of a variety of planted native and exotic vegetation. Further trimming of other trees would also be required in this location. This includes the removal of two individuals of <i>Eucalyptus scoparia</i> (refer to Figure 16-4) near the existing Marian Street station entrance. Five other individuals of this species would not be affected.
6 - Gibbons Street Reserve	Area is required for construction ancillary facility including laydown and staging areas.	Up to two mature trees may be removed. Trimming of tree branches would also be undertaken (specifically trees facing Gibbons Street). Exotic perennial grasses would also be disturbed when Gibbons Street Reserve is levelled for use as a construction ancillary facility.
Lawson Street	Trimming may be required to accommodate works along Lawson Street (i.e. establishment of the new kiss and ride, bus zone and associated footpath upgrades).	No trees would be removed however branches would be trimmed.

Threatened flora species

Two *Eucalyptus scoparia* individuals would be removed to facilitate the Project. As a result, Assessments of Significance under the BC Act and EPBC Act have been undertaken and are documented in the BDAR waiver, which is provided in **Appendix F** of this EIS. Assessments under both acts concluded that, since both individuals are common planted street trees throughout Sydney, they do not form part of any naturally occurring population or community. As such the Project would not result in a significant impact upon this species or their habitat such that they would be placed at risk of local extinction or other significant decline. Further assessment and referral to the Commonwealth Minister for the Environment is therefore not required.

Fauna habitat impact

As outlined above, the vegetation to be removed is located within an extensively modified and urbanised area and would provide limited habitat and habitat connectivity for native fauna. It is unlikely that threatened fauna species or any fauna populations would rely on the habitat resources within the Project area for critical foraging or roosting resources, or habitat connectivity, and therefore a significant impact upon these species is considered unlikely.

As outlined in **Section 16.3.2**, the site inspection showed no signs of habitation by any threatened microbat, megabat or other native mammal. There were no signs of any urine stains or guano within or around any openings, with the majority being covered with cobwebs. On this basis, it is concluded that the building does not currently accommodate microbats, threatened or otherwise.

Indirect impacts

Potential indirect impacts during construction would include:

- the use of machinery and other equipment increasing the risk of accidental spills of fuels, lubricants or paint which could cause harm to the surrounding ecosystems and waterways
- machinery, vehicles and personnel dispersing weeds throughout the Project area and surrounding areas, as well as during the removal of spoil to offsite locations
- increased light and noise, causing disturbance to nocturnal, mobile or roosting species
- movement of plant and machinery causing accidental fauna strike
- increased movement of dust and soil leading to disturbance to vegetation and associated habitat.

The potential impacts to biodiversity identified above are expected to be minor with the adequate implementation of mitigation measures prescribed in **Section 16.5**.

16.4.2 Operation

There would be no residual or ongoing impacts to vegetation during operation given the current and proposed urban nature of the Project area. Revegetation and street planting would be undertaken along the Little Eveleigh Street shared zone and as part of the Marian Street/Cornwallis Street/Rosehill Street shared zone upgrade with plant species selected and located to comply with safety in design principles. In addition, landscape design would ensure entry to residences is not blocked, and that space for residential wheelie bins is allowed for adjacent to each residence. This landscaping planting would provide some degree of replacement habitat for that lost as part of the Project (refer also to **Chapter 8** of this EIS).

Fauna species present within the Project area are likely to be habituated to urban areas, including areas with high noise, light and other human activity. The operation of the upgraded elements of the station would not substantially alter the general nature of the area in terms of flora and fauna habitat, and as such any ongoing impacts are considered to be negligible.

Vegetation offsets and/or landscaping would be undertaken in accordance with the *Vegetation Offset Guide* (TfNSW, 2019b). As per the *Vegetation Offset Guide*, all vegetation cleared would be offset with replacement tree planting. **Table 16-4** provides guidance for the number of trees to be planted as an offset for individual tree removal. The specific species type and location of vegetation offsets would be confirmed during detailed design, with consideration to creating habitat connectivity where possible.

Table 16-4 Offsetting ratio required under the TfNSW *Vegetation Offset Guide*

Tree type	Offset required per tree removed
Large tree (Diameter Breast Height (DBH) greater than 60 cm)	Plant minimum eight trees
Medium tree (DBH greater than 15 cm, but less than 60 cm)	Plant minimum four trees
Small young tree (DBH less than 15 cm)	Plant minimum two trees

16.4.3 Impacts on relevant key threatening processes

Key threatening process associated with the Project are outlined in **Table 16-5**.

Table 16-5 Key threatening processes

Key Threatening Processes		
BC Act	EPBC Act	Relevance
Clearing of native vegetation	Land clearance	Native vegetation would be removed as part of the Project (refer Figure 16-3). However, this would be limited to landscaped/planted vegetation and weed species. Weed control and management would reduce the potential for the spread of weeds.
Invasion of native plant communities by exotic perennial grasses	N/A	Exotic perennial grasses were recorded within and surrounding the Project area and can benefit from disturbance to natural vegetation. Weed management and landscaping activities generally would help prevent these exotic species from spreading.
Anthropogenic climate change	Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases	The use of machinery and plant equipment would contribute to emissions of greenhouse gases through fuel combustion. The implementation of specified work hours and plant management measures during periods when not in use would manage emissions produced (refer Chapter 19 of this EIS).

16.5 Management and mitigation

16.5.1 Overview

A CEMF would be implemented for the Project (refer **Appendix D** of this EIS). The CEMF describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

A Flora and Fauna Management Sub-Plan to the CEMP would be developed in line with Section 6.8 of the CEMF.

This section includes a compilation of the performance outcomes as well as mitigation measures, including those that would be included in the Flora and Fauna Management Sub-Plan.

16.5.2 Performance outcomes

The performance outcomes for the Project in relation to biodiversity are as follows:

- impacts are avoided to flora and fauna not already identified in this EIS
- flora and fauna habitat is retained/impacts avoided, or enhanced where possible
- impacts to threatened ecological communities or endangered species are offset in accordance with the requirements of the TfNSW *Vegetation Offset Guide* (TfNSW, 2019b)
- weeds and plant pathogens are managed in accordance with TfNSW's *Weed Management and Disposal Guideline* (TfNSW, 2019f) and the *Biosecurity Act 2015*.

The Project would be designed, constructed and operated to achieve these performance outcomes.

16.5.3 Mitigation measures

A list of mitigation measures which would be implemented during the construction of the Project are provided in **Table 16-6**. It should be noted that mitigation measures contained in other chapters of this EIS would also assist in mitigating indirect impacts to flora and fauna (e.g. in relation to management of sedimentation, stormwater runoff, dust and noise). The Flora and Fauna Sub-Plan would be developed with consideration to this.

Table 16-6 Mitigation measures

ID	Mitigation measure	Applicable location(s)
Construction		
B1	A Flora and Fauna Management Sub-Plan would be prepared and implemented as part of the CEMP.	Project area
B2	Should the detailed design determine the need to remove or trim additional trees not identified in this EIS, the construction contractor would be required to complete the TfNSW Tree Removal Application Form and submit it to TfNSW for approval.	Project area
B3	Disturbance of vegetation would be limited to the minimum necessary to construct the Project. Trees nominated to be removed would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal.	Project area
B4	A qualified and experienced fauna spotter/ecologist would be engaged to inspect trees prior to and during removal and trimming to relocate any fauna that may be present in each tree. This process should be documented (including photos) for record keeping.	Project area
B5	Where space restrictions allow, Tree Protection Zones (TPZs) would be established around trees to be retained, using an appropriate physical demarcation. Tree protection would be undertaken in line with AS 4970-2009 Protection of Trees on Development Sites and would include exclusion fencing of TPZs. Where TPZs are not feasible, alternative measures would be implemented including branch and trunk protection. An arborist would be consulted if necessary.	Project area
B6	All workers involved in tree removal/trimming would be provided with a specific induction relevant to this task prior to commencing work.	Project area
B7	Equipment would be stored, stockpiled and refuelled within the identified construction ancillary facilities.	Project area
B8	Vegetation offsets and/or landscaping would be undertaken in accordance with the <i>Vegetation Offset Guide</i> (TfNSW, 2019b).	Project area
B9	Plant equipment would be turned off when not in use to avoid noise and air impacts to nearby fauna.	Project area

ID	Mitigation measure	Applicable location(s)
Construction		
B10	Weed control measures, consistent with TfNSW's <i>Weed Management and Disposal Guideline</i> (TfNSW, 2019f), would be developed and implemented as part of the Flora and Fauna Management Sub-Plan to manage the potential dispersal and establishment of weeds during the construction phase of the Project. This would include the management and disposal of weeds in accordance with the <i>Biosecurity Act 2015</i> .	Project area
B11	Works must be stopped if any previously undiscovered threatened flora or fauna species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained before proceeding.	Project area
B12	WIRES should be consulted if any injured fauna are encountered, or any fauna is otherwise found within the construction areas and is impeding work.	Project area
B13	Inspections would be undertaken at least every three months for weed infestations and to assess the need for control measures. Any weeds identified would be managed in accordance with the relevant guidelines.	Project area

Following the implementation of the above mitigation and management measures, the Project is expected to have no residual impact on biodiversity, noting that trees to be removed during construction would be offset in the surrounding area under the TfNSW *Vegetation Offset Guide* (TfNSW, 2019b). Therefore, there are no cumulative impacts on biodiversity expected. Further consideration of cumulative impacts with regard to other environmental aspects of the Project are addressed in **Chapter 23** of this EIS.

17 Soils, geology, groundwater and contamination

This chapter assesses the potential impacts on soils, geology, groundwater and of contamination associated with the Project.

17.1 Introduction

Table 17-1 sets out the SEARs relevant to soils, geology, groundwater and contamination and identifies where the requirements have been addressed in this EIS. These issues are listed under 'Other issues' in the SEARS, and includes reference to the commitments in the Scoping Report (TfNSW, 2019d) for the Project.

Table 17-1 SEARs

SEARs	Where addressed in this EIS
Other Issues	
(Address) <i>the following issues in accordance with the commitments made in Chapter 9 of the Scoping Report:</i>	
<i>(b) soils, geology, groundwater and contamination</i>	
The Scoping Report (TfNSW, 2019d) makes the following commitments: A desktop contamination, soils and groundwater assessment will be prepared as part of the EIS and will include:	Section 17.3
<ul style="list-style-type: none"> a review of previous assessments or assessments undertaken as part of the design development 	
<ul style="list-style-type: none"> a review of historical aerial photography of the Project area (to identify potential contamination sources in the area) 	Section 17.3
<ul style="list-style-type: none"> a review of publicly available data (web-based information sources) 	Section 17.3
<ul style="list-style-type: none"> identification of potential receiving groundwater aquifers 	Section 17.3.5
<ul style="list-style-type: none"> qualitative assessment of potential soil and groundwater impacts during construction and operation 	Section 17.4
<ul style="list-style-type: none"> appropriate mitigation measures for managing soils, groundwater and contamination. 	Section 17.5.3
The following guidelines will be considered during the preparation of the assessment:	Section 17.4 and Section 17.5
<ul style="list-style-type: none"> <i>Acid Sulfate Soils Assessment Guidelines</i> (Acid Sulfate Soil Management Advisory Committee, 1998) <i>Managing Urban Stormwater – Soils and Construction</i> (Landcom, 2004) (referred to as the Blue Book). 	

17.2 Method of assessment

17.2.1 Legislation, guidelines and policies

Legislation, guidelines and policies relevant to this assessment include:

- Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and the Environment Protection Authority, 1998)
- Acid Sulfate Soils Assessment Guidelines* (ASSMAC, 1998)
- Australian Standard AS4482:2005 Guide to the investigation and sampling of sites with potentially contaminated soil*
- Guidelines for Consultants Reporting on Contaminated Sites* (Office of Environment and Heritage, 2011)

- *Contaminated Land Management Act 1997* (NSW)
- *National Environment Protection (Assessment of Site Contamination) Amendment Measure (No. 1)* (National Environment Protection Council (NEPC), 2013)
- *Waste Classification Guidelines* (EPA, 2014a)
- *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA, 2015a)
- *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) (referred to as the Blue Book) and *Managing Urban Stormwater: Soils and Construction Volume 2A* (DECC, 2008) (referred to as the Blue Book)
- *TfNSW Chemical Storage and Spill Response Guideline* (TfNSW, 2015a)
- *TfNSW Concrete Washout Guideline* (TfNSW, 2015b)
- *TfNSW Water Discharge and Reuse Guideline* (TfNSW, 2015c)
- *TfNSW Water Sensitive Urban Design Guideline* (TfNSW, 2017b).

17.2.2 Methodology

This assessment has used the following approach to understand the existing ground conditions within the Project area:

- a review of the report: *Redfern Station Investigation Works – Contamination Investigation Report* (Jacobs, 2018a) (refer to **Appendix G** of this EIS)
- a review of the report: *Redfern Station Investigation Works – Geotechnical Investigation Report* (Jacobs, 2018b) (refer to **Appendix G** of this EIS)
- a review of the memorandum: *Memorandum - Redfern Station Upgrade Geotechnical Investigation Report*, dated 08 January 2020 (Aurecon, 2020) (refer to **Appendix G** of this EIS)
- a review of other publicly and readily available data (web-based information sources), including historic photographs.

The reports above provide a summary of the soils, geology and contamination at the Project area. They provide a summary of previous investigations at and around Redfern Station, and include findings from ground investigations within the Project area. The investigations of the Project area were completed between 7 and 28 November 2017 (for the contamination and geotechnical investigation reports), and 14 March, 4-5 April, 20 July and 7-8 December in 2019 (for the memorandum).

The key objectives of the *Contamination Investigation Report* were to “Assess and describe the nature and extent of contamination (if present) at the site in context of a commercial/industrial land use” and to “Provide recommendations for the management of contamination risk (if present) at the site”. The information in these reports has formed the basis for understanding the existing ground conditions for the Project.

The information in these reports has also been used to complete a qualitative assessment of potential soil and groundwater impacts that could occur during construction and operation of the Project. This qualitative assessment has been used to help identify appropriate mitigation measures for managing potential impacts related to soils, groundwater and contamination.

17.3 Existing environment

17.3.1 Site history

The Project area has been part of, or next to, an active railway corridor since the opening of Eveleigh Station in 1884. The Station was opened to serve the new Eveleigh railway workshops as well as the inner-city residential and industrial suburb of Redfern. Given the historical use of Project area as both a station and a rail corridor, as well as surrounding industrial uses, there is potential for contaminants of potential concern to be present within the soils.

17.3.2 Topography

The current ground level at Redfern Station ranges from 24 to 30 metres AHD (Australian Height Datum). Redfern Station is located on a ridgeline which extends generally in an east to west direction with the Main Suburban railway line crossing the ridgeline in a roughly north to south direction. The railway corridor has been cut into the ridgeline creating a low point for the Project area at around 24 metres AHD. This is up to five metres below the natural ground level either side of the railway corridor which is around 28 to 30 metres AHD.

The ridgeline on which Redfern Station is located forms part of the natural boundary between the Blackwattle Bay drainage catchment (which forms part of the Sydney Harbour catchment) to the north, and Alexandra Channel drainage catchment (which forms part of the Botany Bay catchment) to the south. The topography of the wider area generally falls north towards Sydney Harbour to the north of the Project area and south-west towards Botany Bay to the south of the Project area.

17.3.3 Geology

The *1:100,000 Geological Map of Sydney* indicates that the Project area is underlain by the Ashfield Shale unit which is a sequence of the Wianamatta Group. The Ashfield Shale sequence in the area typically comprises interbedded black to dark grey shales, laminites and fine to medium grained sandstones. These materials typically weather to form a residual profile of one to three metres of medium to high plasticity clays (Jacobs, 2018b).

As a part of the contamination investigation (Jacobs, 2018a) and geotechnical investigation (Jacobs, 2018b), six boreholes (Boreholes BH1 to BH6 as shown in **Figure 17-1**) were drilled to depths of between 8.5 metres and 10.4 metres below ground level. An additional four boreholes were also drilled to depths of between 13.61 and 18.72 metres as part of further geotechnical investigations (Aurecon, 2020). The borehole investigations performed across the Project area provide clarity around the underlying subsurface profile. **Table 17-2** specifies the five geotechnical units encountered, in order of increasing depth.

Table 17-2 – Subsurface profile summary (Jacobs, 2018b)

Unit	Origin	Material description	Relevant boreholes
1	Fill	Variable, gravelly/silty clay and gravelly sand, gravel is fine to coarse, sub-angular to angular, clay is medium to high plasticity.	All
2	Residual Soils	Silty clay: typically, very stiff to hard, dry to moist, pale grey and red-brown with ironstone gravel.	All
3A	Shale Bedrock (Class V) ¹	Shale/Interlaminated Siltstone & Sandstone: typically, extremely to very low strength, extremely to highly weathered, highly fractured, grey-brown.	BH3, BH6
3B	Shale Bedrock (Class IV) ¹	Interlaminated Siltstone & Sandstone: typically, low strength, moderately weathered, moderately fractured, grey and dark grey.	BH1, BH2, BH3, BH4, BH5
3C	Shale Bedrock (Class III) ¹	Interlaminated Siltstone & Sandstone: typically, medium to high strength, moderately to slightly weathered, dark grey and pale grey.	BH4, BH5, BH6

Notes:

¹ A classification rock mass undertaken in accordance with the guidelines presented in *Foundations on Sandstone and Shale in the Sydney Basin* (Pells et al, 1998)

17.3.4 Soils

Soil conditions

The soil landscape at the Project area is mapped as being within the Blacktown soil landscape (eSPADE, 2019). The landscape is characterised by gentle undulating rises (slopes less than five per cent) on Wianamatta Group shales and Hawkesbury Sandstone, with local reliefs of up to 30 metres. The soils local to the Project area are mapped as either:

- red and brown residual podzolic soils, shallow to moderately deep (up to 100 centimetres) located on crests, upper slopes and well drained areas
- yellow podzolic soils and soloths, deep (between 150 to 300 centimetres) located on lower slopes and in areas of poor drainage.

Soil samples were collected from each of the boreholes shown in **Figure 17-1** until contact with natural soils and/or bedrock was made, or where there was evidence of potential contamination. Borehole depths for soil samples varied from 0.0 metres to 3.0 metres below ground level. Borehole BH1 was drilled near the end of Platform 1, behind 125-127 Little Eveleigh Street. Boreholes BH2, BH3 and BH4 were drilled within the south west extents of Platforms 3, 4 and 9, respectively. Borehole BH5 was drilled to around five metres to the west of the existing entrance stairs at the northern end of Platform 10. Borehole BH6 was drilled to around 40 metres south east of the Platform 10 building. BH02B was drilled adjacent to the southern side of the tracks (near the proposed Marian Street entrance), and BH03B was drilled adjacent to the northern side of the tracks. BH04B was drilled within the south west extent of Platforms 8 and 9, and BH05 was drilled within the south west extent of Platforms 2 and 3 (both of these were drilled near the proposed alignment of the concourse).



FIGURE 17-1: LOCATION OF THE BOREHOLES BH1 – BH6 (SOURCE: JACOBS, 2018A) AND BH02B – BH05B (SOURCE: AURECON, 2020)

Soil material identified at each borehole is presented in **Table 17-3** and **Table 17-4**.

Table 17-3 Summary of soil material identified within Boreholes BH1 – BH6 (Source: Jacobs, 2018a)

Sample ID	Depth (metres below ground level)	Material description
BH1	0.0 - 0.1	FILL: Gravelly CLAY: Brown, medium plasticity, gravel is fine to coarse, subangular to angular, with a trace of root fibres.
BH1	0.3 - 0.4	FILL: Silty SAND: Brown, fine to medium grained, with a trace of clay and gravel.
BH2	0.8 - 0.9	FILL: Clayey SAND: Brown, fine to medium grained with some medium to coarse, subangular to subrounded gravel.
BH2	1.0 - 1.1	FILL: Clayey SAND: Brown, fine to medium grained with some medium to coarse, subangular to subrounded gravel.
BH2 (Standard Penetration Test (SPT)/3.0)	3.0	Silty CLAY: Grey mottled red-brown, high plasticity with trace of ironstone gravel.
BH3	0.6 - 0.7	FILL: Silty CLAY: Orange-brown and red-brown, high plasticity with trace of sand and fine subangular gravel. At 0.6 metres, buried pavement, around 100 millimetres thick, including asphalt over bricks.
BH3	1.1 - 1.2	FILL: Silty CLAY: Orange-brown and red-brown, high plasticity with a trace of sand and fine subangular gravel.
BH4	0.4	FILL: Gravelly CLAY: Brown, medium plasticity, gravel is fine to coarse, subangular to angular.
BH4	1.5	Silty CLAY: Grey and red-brown, high plasticity with ironstone gravel.
BH5	0.0 - 0.1	FILL: Sandy Gravelly CLAY: Brown and red-brown, low to medium plasticity, gravel is fine to medium.
BH5	0.5 - 0.95	FILL: Sandy Gravelly CLAY: Brown and red-brown, low to medium plasticity, gravel is fine to medium. From 0.5 m, coal layer (100 millimetres). FILL: Silty Sandy CLAY: Brown and red-brown, medium to high plasticity, sand is fine to coarse grained, with a trace of siltstone lenses.
BH6	0.6	FILL: Sandy Clayey GRAVEL: Dark grey and brown, fine to coarse, subangular to subrounded. At 0.4 metres, some broken bricks. At 0.6 metres, some shale cobbles and boulders up to 300 millimetres.

Table 17-4 Summary of soil material identified within Boreholes BH02B – BH05B (Source: Aurecon, 2020)

Sample ID	Depth (metres below ground level)	Material description
BH02B	0 - 3.0	FILL: SAND: Fine to medium grained, orange.
BH03B	0 – 1.5	FILL: Silty CLAY: medium plasticity, Brown mottled grey, with sand, trace roots.

Sample ID	Depth (metres below ground level)	Material description
BH04B	0.05 – 1.2	FILL: Silty CLAY: medium plasticity, red yellow brown.
BH05B	0 – 1.5	FILL: Sandy CLAY: low to medium plasticity, brown, fine to coarse sand, trace medium to coarse gravel.

Acid Sulfate Soils

Acid Sulfate Soils (ASS) contain sulphides, predominantly iron sulfide. If these soils are exposed to oxygen, the iron sulfides react with the oxygen to form sulfuric acid. These types of soils are common in the coastal areas of NSW. The acid within these soils can cause metals in the soil such as iron to mobilise at toxic levels.

The classification of land under the *Sydney Local Environmental Plan 2012* presents an indication of the likelihood of ASS being encountered. While the majority of the Project area is mapped as not containing ASS (under the *Sydney Local Environmental Plan 2012*), some areas are mapped as Class 5 ASS. These areas include Marian Street and Rosehill Street to the south east of Redfern Station and Little Eveleigh Street up to the boundary of the railway corridor to the north west of Redfern Station. Class 1 areas have the greatest likelihood of occurrence, while Class 5 has the least likelihood of occurrence. ASS are not typically found in Class 5 areas, but certain works in these areas may affect groundwater levels in nearby areas with a higher ASS risk. This is discussed further in **Section 17.4**.

17.3.5 Groundwater

No groundwater was observed within any of the boreholes drilled to depths ranged between 8.50 metres and 18.72 metres. The boreholes were backfilled immediately following drilling and sampling which precluded any longer-term monitoring or observation of groundwater levels.

Real-time water data mapping data is available from WaterNSW. The three closest bores to the Project area that discovered groundwater were located 675 metres north, 715 metres east and 980 metres north west. The distance between these bores and the Project area means that the groundwater levels at these bores are unlikely to be of relevance to the Project.

17.3.6 Contamination

A search of the Contaminated Sites Register and Record of Notices under Section 58 of the *Contaminated Land Management Act 1997* (CLM Act) was undertaken on 15 October 2019. The search identified two registered sites within one kilometre of the Project area that were either regulated or had been notified to the NSW EPA. The location of each of the sites are is described in **Table 17-5**.

Table 17-5 NSW EPA Contaminated Sites Register and Record of Notices

Suburb	Notified site address	Notified site activity	Location in relation to the Project area
Chippendale	33 Wellington Street 77-81 Regent Street	Former site for chemical manufacturing	586 metres north west of the Project area
Alexandria	10-20 Botany Road	Formerly service station (fully redeveloped into residential apartment as of September 2016)	271 metres south east of the Project area

The *Australian Standard AS 4482.1-2005 – Guide to the investigation and sampling of sites with potentially contaminated soil – Non-volatile and semi-volatile compounds* lists the chemicals used by specific industries. This Standard lists the following chemicals that are commonly associated with railway tracks and may be present at Redfern Station:

- hydrocarbons
- arsenic

- phenolics
- heavy metals
- nitrates and ammonia.

The results of the ground investigations detailed in the *Contamination Investigation Report* (Jacobs, 2018a) did not identify contamination which would constrain the current and proposed use of the Project area (i.e. railway station – commercial/industrial land use).

Selected heavy metals and benzo(a)pyrene were detected in a number of samples at concentrations exceeding ecological investigation levels or ecological screening levels (EILs or ESLs) but not health investigation levels (HILs). Copper exceeded EILs at Borehole BH1 and Zinc exceeded EILs at Boreholes BH1 and BH4. Benzo(a)pyrene in BH1/0.0-0.1 (0.87 mg/kg) marginally exceeded the ESL of 0.7 mg/kg.

No potential asbestos containing materials, odorous or discoloured materials were identified in the material recovered from the boreholes. However, due to the historical use of the Project area, the age of structures such as the building at 125-127 Little Eveleigh Street and the presence of fill in a number of locations, it is likely that contaminated material, including asbestos and lead paint, could be present.

17.4 Impact assessment

17.4.1 Construction

The Project would require excavation work and piling for foundations (to a maximum depth of 18 metres). These works would be required to accommodate site establishment and enabling works, demolition/modification works, utility relocations/adjustments, main construction works and roadworks at Little Eveleigh Street and Marian Street. The total estimated volume of spoil to be excavated as part of this process is around 7,090 tonnes. Descriptions of the specific excavation or piling activities that would be undertaken are provided in **Chapter 5** of this EIS, and a further breakdown of the spoil volumes is provided in **Chapter 21** of this EIS.

Potential impacts as they relate to soils, groundwater and contamination are considered below. Potential water quality impacts, including impacts caused by increased sediment loads, are considered in **Chapter 18** of this EIS, air quality (dust) impacts are considered in **Chapter 19** of this EIS, and health and safety risks, including as a result of contamination and hazardous materials, are considered in **Chapter 20** of this EIS.

Soil disturbance, erosion and sedimentation

Construction works, as described in **Chapter 5** of this EIS, would involve the following earthworks:

- piling for foundations to a maximum depth of 18 metres (e.g. for pedestrian bridge works), and to shallower depths for other rail corridor works and overhead wiring footings
- excavation for roadworks at Little Eveleigh Street, Ivy Street, Marian Street and Rosehill Street roadworks (to a depth of around 2.5 metres)
- excavation for proposed car park (to a depth of around two metres)
- excavation for service relocations (to a depth of around three metres).

Excavation and other earthworks, if not adequately managed, could result in the following impacts:

- erosion of exposed soil
- dust generation from excavation and vehicle movements over exposed soil
- cross-contamination of clean spoil
- increase in sediment loads entering the stormwater systems and/or local runoff.

Construction of the Project would also temporarily expose the natural ground surface and sub-surface through activities such as the removal of vegetation, demolition of structures including overhead wiring structures, excavation for footpaths, structures and foundations. The temporary exposure of soil to water runoff and wind could result in increased soil erosion. The construction works may also require

the stockpiling of soils and other materials, which if not managed correctly could also result in the erosion of soils (and other construction materials) by wind or surface water flows, or clean spoil being affected by contaminated material. There is the potential that exposed soils and other unconsolidated materials, (spoil, sand, aggregates etc.), could be transported from the construction sites into surrounding waterways via stormwater runoff.

Given the relatively small areas of surface disturbance anticipated during construction and the overall topography of the Project area, it is expected that soil erosion and runoff could be adequately managed in accordance with the management approaches presented in *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2* (Department of Environment and Climate Change, 2008a) (refer to **Section 17.5**). As such significant impacts related to the management of soils and the potential for these impacts to adversely affect soils and groundwater receptors are considered unlikely. Note that potential impacts from soil contamination are addressed further below.

Acid sulfate soils

ASS are unlikely to occur within the Project area and as such the Project is unlikely to impact or be impacted by ASS. Some parts of the Project area are mapped as Class 5 ASS under the *Sydney Local Environmental Plan 2012*, however ASS are not typically found in Class 5 areas. As noted in the *Acid Sulfate Soils Assessment Guidelines* (Acid Sulfate Soil Management Advisory Committee, 1998), areas classified as Class 5 are located within 500 metres of nearby Class 1, 2, 3 or 4 land. Works in a Class 5 area that are likely to lower the water table (typically below one metre AHD) on nearby Class 1, 2, 3 or 4 land may require management.

The limited amount of excavation related to the construction of the Project, the distance from the Project Area to nearby Class 1, 2, 3 or 4 land, and the general absence of groundwater at the Project area, means that it is unlikely that construction of the Project would lower the groundwater table to such an extent that nearby Class 1, 2, 3 or 4 land may be affected.

As such no specific ASS mitigation and management measures are proposed and an acid sulphate soil management plan is not required.

Groundwater

Groundwater was not identified during the ground investigations undertaken, and as such it is not considered a key issue for construction of the Project. Whilst it is unlikely groundwater could be encountered during excavation works or could accumulate in open excavations, measures to manage the dewatering of excavations would be included in the CEMP and are accounted for in **Section 17.5**.

Groundwater could also be impacted by liquid or construction material spills or leaks. Spills or leaks could contaminate both soil and groundwater. Standard construction measures are available to manage this risk, and described in **Section 17.5**.

Contamination

Several ground investigations across the Project area have identified relatively low levels of contamination in the soil and fill materials present. Where contamination is present, the risks associated with most contaminants is low except for Copper, Zinc and benzo(a)pyrene which were all identified in discreet locations exceeding EILs for the heavy metals or the ESL for benzo(a)pyrene. In addition, the historic land use of the Project area, the age of certain buildings requiring modification and the presence of fill means that additional contamination (e.g. asbestos) may be present.

Risks associated with the identified and potential contaminants of concern include:

- direct contact and/or inhalation by site workers, users, neighbours and visitors
- impacts to surrounding environmental receivers (including surrounding ecosystems and flora and fauna, where present)
- mobilisation and migration of surface and subsurface contaminants via runoff and/or subsurface flow, impacting nearby soils (including clean spoil), surface water, and groundwater.

Given the urban context of the Project area and its surrounds it is unlikely that the exceedances of the EILs for Copper, Zinc and ESL for benzo(a)pyrene would result in adverse ecological impacts as a

pathway from these materials to a sensitive ecosystem would be unlikely. Equally as no human health criteria were exceeded it is unlikely that the presence and management of this contamination would result in adverse impacts to on-site workers.

The scale of the Project construction works and the level of contamination identified to date suggests that the risks noted above would be able to be managed and would be acceptable. Measures to test for and contain contaminated materials from the ground and in the buildings are available and widely used. As recommended by the *Contamination Investigation Report* (Jacobs, 2018a), further site investigations would be completed prior to the Project construction works commencing, to confirm the risks present and to develop site specific management responses.

It is likely that where contaminated material is present that this material would be contained and disposed offsite at an appropriately licenced facility by a suitable qualified and/or licenced contractor/s. Measures to excavate, store or contain contaminated material prior to removal from the Project area would be developed depending on the risks posed by the material.

In addition to the risk of encountering insitu contamination, construction of the Project also has the potential to contaminate soils due to accidental spills and leaks of fuel, oils or other hazardous substances used for construction. This risk would be addressed through standard construction mitigation measures. Mitigation and management is discussed further in **Section 17.5**.

17.4.2 Operation

Contamination

The potential for contamination as a result of general maintenance activities is considered to be low, based on the number of vehicles and equipment which would likely be used during maintenance. This impact would be minimised by implementing procedures to manage spills in line with existing Sydney Trains/TfNSW operations.

The risk of contamination of runoff from new hardstand/impervious surfaces introduced by the Project (such as the new car park area at Little Eveleigh Street and concourse roof) is assessed in **Section 18.4.2**.

17.5 Management and mitigation

17.5.1 Overview

A CEMF (refer **Appendix D** of this EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

A Soils and Water Management Sub-Plan would be developed for the Project as identified by Section 6.5 of the CEMF.

The performance outcome as well as mitigation measures, including those that would be included in the Soils and Water Management Sub-Plan, are detailed below.

17.5.2 Performance outcomes

The performance outcome for the Project in relation to soils and water includes:

- Risks to human health and ecological receivers are minimised through effective management of soil and contaminated materials.

The Project would be designed, constructed and operated to achieve this performance outcome.

17.5.3 Mitigation measures

A list of mitigation measures which would be implemented during the construction of the Project are provided in **Table 17-6**.

Table 17-6 Mitigation measures

ID	Mitigation measure	Applicable location(s)
Construction		
SC1	A Soils and Water Management Sub-Plan would be developed to manage the soil and water issues relevant to the construction of the Project. This sub-plan would be part of the CEMP. The sub-plan would include detailed erosion and sediment control plans for each work site and would outline which erosion and sediment control measures would be implemented at each location or for specific works. These control measures would align with the management approaches outlined in <i>Managing Urban Stormwater: Soils and Construction Volume 1</i> (Landcom, 2004), <i>Managing Urban Stormwater: Soils and Construction Volume 2A</i> (DECC, 2008) (referred to as the Blue Book), the <i>Water Discharge and Reuse Guideline</i> (TfNSW, 2015c), <i>Concrete Washout Guideline</i> (TfNSW, 2015b), <i>Water Sensitive Urban Design Guideline</i> (TfNSW, 2017b) and <i>Chemical Storage and Spill Response Guideline</i> (TfNSW, 2015a).	Project area
SC2	Prior to construction commencing a detailed contamination assessment would be undertaken within the Project area to confirm whether additional contamination risks are present and to develop site and/or location specific management responses if necessary. Where remediation options are required, they would be identified and selected using a sustainability hierarchy.	Project area
SC3	Hazardous materials surveys would be undertaken during detailed design for all proposed demolition activities, and for utility adjustments as required.	Project area
SC4	Should asbestos be identified (in the hazardous material surveys or otherwise) within excavation areas or in buildings requiring demolition, an Asbestos Management Plan (AMP) would be developed and implemented for the relevant works. The AMP would be prepared by a suitably qualified practitioner and in accordance with relevant guidelines.	Project area
SC5	In the event a remediation action plan is required, it would be developed in accordance with <i>Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land</i> (Department of Urban Affairs and Planning and Environment Protection Authority, 1998), and a suitably qualified and experienced contamination advisor would be engaged to audit the works.	Project area
SC6	In the event that indicators of contamination or acid sulfate soils are encountered during construction (such as odours, visually contaminated materials etc.), work in the immediate area would cease, and the finds would be managed in accordance with the unexpected contamination finds procedure.	Project area
SC7	The NSW EPA would be notified in writing of any contamination identified within the Project area, in accordance with the requirements of Section 60 of the <i>Contaminated Land Management Act 1997</i> .	Project area

Following the implementation of the management measure above, there would be negligible residual impacts from the Project on soils, geology, groundwater and contamination, and the Project is not expected to contribute to cumulative impacts. Further consideration of cumulative impacts with regard to other environmental aspects of the Project are addressed in **Chapter 23** of this EIS.

18 Flooding, hydrology and water quality

This chapter summarises the flooding, hydrology and water quality assessment undertaken for the Project. A full copy of the assessment report is provided in **Technical Report 7 – Flooding, hydrology and water quality**.

18.1 Introduction

Flooding, hydrology and water quality is listed under 'Other issues' in the SEARS, and includes reference to the commitments in the Scoping Report (TfNSW, 2019d) for the Project. **Table 18-1** sets out the SEARs and Scoping Report requirements relevant to flooding, hydrology and water quality, and identifies where the requirements have been addressed in this chapter.

Table 18-1 SEARs

SEARs	Where addressed in this EIS
Other Issues	
(Address) the following issues in accordance with the commitments made in Chapter 9 of the Scoping Report: <i>(c) flooding, hydrology and water quality</i> The Scoping Report (TfNSW, 2019d) makes the following commitments: The EIS will include an assessment of potential impacts to hydrology, flooding and water quality during construction and operation of the Project. The assessment of potential flooding, hydrology and water quality impacts will include:	
<ul style="list-style-type: none"> desktop searches and background data review 	Section 18.3
<ul style="list-style-type: none"> development of a detailed description of the existing hydrological environment including identification of potential receiving waters and flow paths 	Section 18.3
<ul style="list-style-type: none"> an assessment of the potential impact of the Project on flood behaviour, local hydrologic systems and water quality during construction and operation 	Section 18.4
<ul style="list-style-type: none"> identification of appropriate mitigation and management measures. 	Section 18.5

18.2 Method of assessment

18.2.1 Relevant policy and guidelines

Key guidelines referenced in the assessment include:

- *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom, 2004) and *Volumes 2A, 2B, 2C, 2D and 2E* (Department of Environment and Climate Change, 2008) (the 'Blue Book')
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council, 2000) (the ANZECC guidelines)
- *Australian Rainfall and Runoff* (Commonwealth of Australia, 2019)
- *Australian Rainfall and Runoff* (Engineers Australia, 1987)
- *Floodplain Development Manual* (Department of Infrastructure, Planning and Natural Resources, 2005)
- *Sydney Streets Technical Specifications* (City of Sydney, 2019)
- *TfNSW Water Discharge and Reuse Guideline* (TfNSW, 2015c).

18.2.2 Assessment methodology

The method for the assessment included:

- a desktop review and analysis of existing information to characterise the existing environment, identify surface water receptors, existing flood behaviours and drainage infrastructure, and identify potential issues
- consideration of the location of the Project area in the context of surrounding catchment areas and potential sensitivity and influence on downstream waterways (the Project area is shown in **Figure 18-1**)
- identification of key topographical features such as likely overland flow paths and low/sag points around the Project area
- assessment of potential construction and operational impacts relating to flooding, drainage and surface water, including drainage modelling
- identification of appropriate mitigation measures to manage potential impacts on the environment.

The assessment was informed by a stormwater drainage assessment undertaken by Novo Rail Alliance (*Drainage assessment*, refer Appendix A of **Technical Report 7 – Flooding, hydrology and water quality**). The *Drainage assessment* included consideration of available data and information from previous studies on surface water within the area. The key studies considered included:

- *Blackwattle Bay Catchment Floodplain Risk Management Plan* (WMA, 2015)
- *Alexandra Canal Floodplain Risk Management Study and Plan* (Cardno, 2014).

The *Drainage assessment* included results of stormwater drainage modelling undertaken (with DRAINS software) for the Little Eveleigh Street area, as the Project is expected to result in additional flow in this area as a result of the proposed pedestrian concourse. The modelling results were compared against relevant City of Sydney requirements for drainage design parameters and are included in this assessment.

Increased flooding as a result of climate change has also been assessed for the Project. This is discussed in **Section 18.4.2** and in the climate change risk assessment in **Chapter 22** of this EIS.

18.2.3 Study area

The Blackwattle Bay and Alexandra Canal catchments form the study area for this assessment and are shown in **Figure 18-1**.

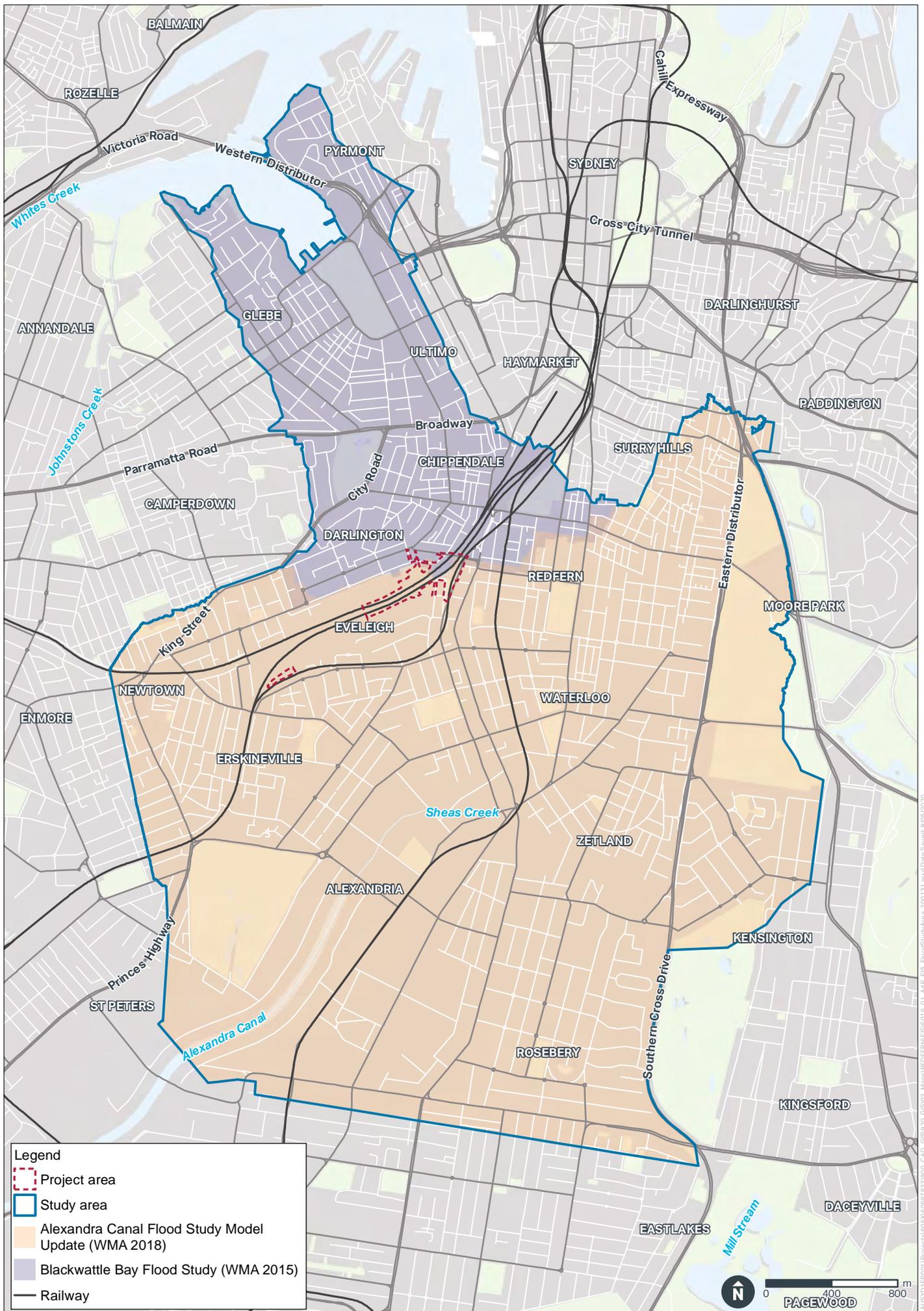


FIGURE 18-1: STUDY AREA

18.3 Existing environment

18.3.1 Regional drainage and local topography

The Project area is mostly impervious with limited pervious areas of parks and landscaped areas. It has been highly modified from its natural state by various forms of urban development and transport infrastructure.

The Project area sits at the ridge of the Blackwattle Bay catchment (which forms part of the Sydney Harbour catchment) to the north, and the Alexandra Canal catchment (which forms part of the Botany Bay catchment) to the south.

The Blackwattle Bay catchment is about 315 hectares in area, with extensive urban land use, servicing medium to high density housing with some commercial and industrial developments. The catchment is serviced by Sydney Water's major trunk drainage system which directs flows from the upper regions of the catchment down to Blackwattle Bay. Blackwattle Bay is about 1.8 kilometres from the Project area.

The Alexandra Canal catchment comprises an area of around 2,300 hectares. The catchment is heavily altered, predominantly characterised by commercial, industrial and residential development, with a small amount of parkland such as Sydney Park and Moore Park. Alexandra Canal is about 2.1 kilometres from the Project area.

The current ground level at Redfern Station is around 25 metres Australian Height Datum (AHD) and is located on the ridgeline of the two catchments, which extends in a roughly east to west direction.

Overall topography within Little Eveleigh Street is relatively flat, with the catchment of the street being split by a traffic calming device (raised threshold) in front of properties 135 and 137 Little Eveleigh Street. East of the raised threshold towards Redfern Station, there is a localised sag depression. West of the raised threshold, away from Redfern Station towards Ivy Lane, the surface slopes at 4.1 per cent with a localised sag depression. South of Redfern Station, Marian Street sits at 30 metres AHD, with surface slopes of two per cent down Cornwallis Street and Rosehill Street. Construction Ancillary Facility 1 sits at approximately 16 metres AHD, Construction Ancillary Facility 2 at 25 metres AHD and Construction Ancillary Facility 3 at 27 metres AHD.

18.3.2 Regional flooding

The one per cent and five per cent Annual Exceedance Probability (AEP) design flood mapping for the Blackwattle Bay catchment and Alexandra Canal catchment are derived from the *Blackwattle Bay Flood Study* (WMA, 2015) and *Alexandra Canal Flood Study Update* (WMA, 2018) and are shown in **Figure 18-2** and **Figure 18-3** respectively.

Redfern Station is located below surrounding ground surface levels which results in ponding during flood events greater than the natural track drainage capacity. One per cent AEP flood behaviour relevant to the location of proposed key elements of the Project includes:

- no flooding within the footprint of the proposed concourse, station entrances (at Little Eveleigh Street and Marian Street), or new car parking area
- no flooding within the footprint areas of Ivy Lane, Ivy Street, Cornwallis Street or Rosehill Street
- some localised ponding along the train tracks of the station area of up to 0.2 metres in depth between Platforms 1 and 2, and up to 0.3 metres between Platforms 3 and 4
- ponding of up to 0.5 metres in depth at the Construction Ancillary Facility 1 north of Railway Parade (Ancillary Facility 1 is shown in **Figure 18-2**).

Flooding patterns are also apparent in these areas under five per cent AEP flood mapping.

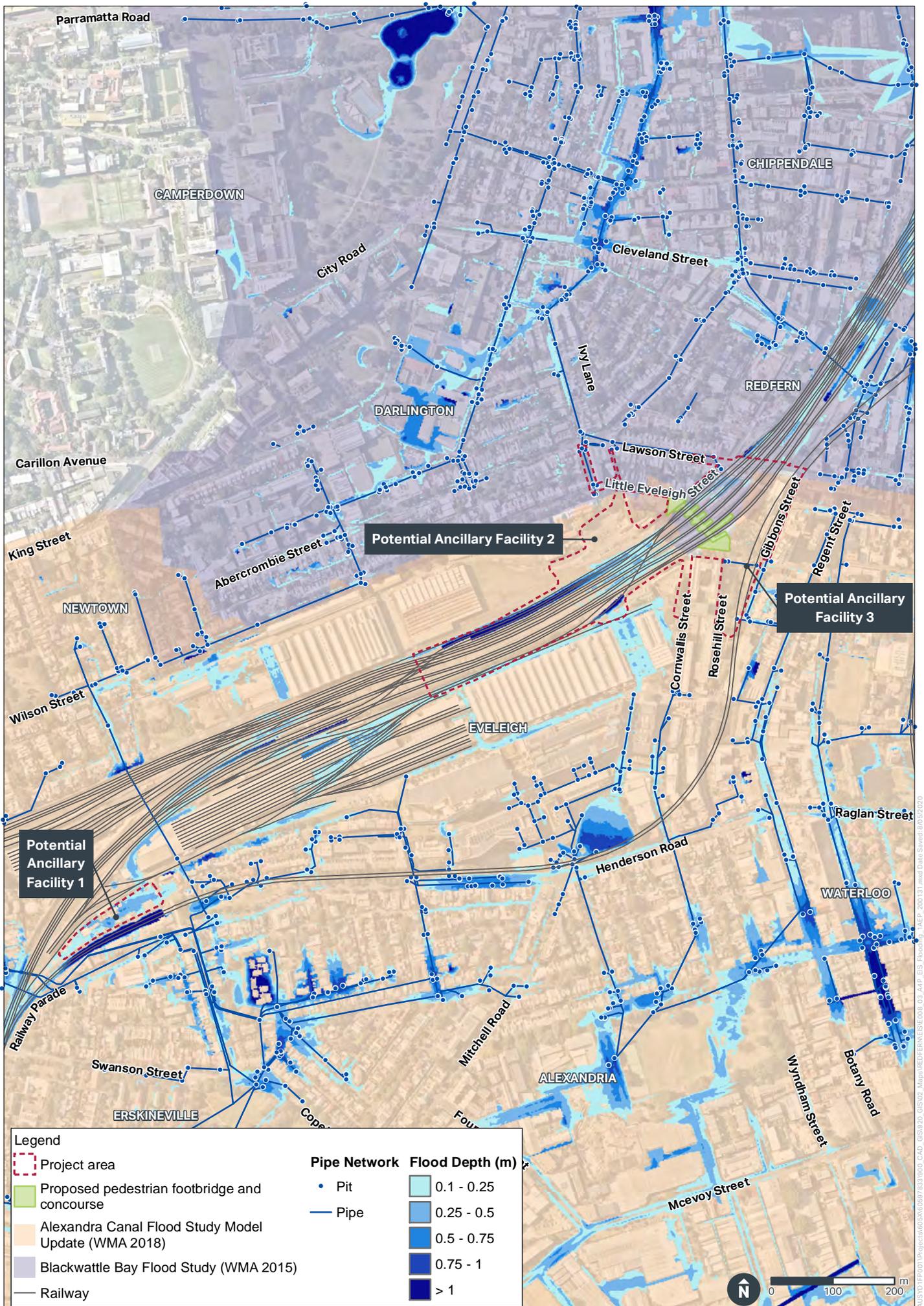


FIGURE 18-2: ONE PER CENT AEP DESIGN FLOOD DEPTHS

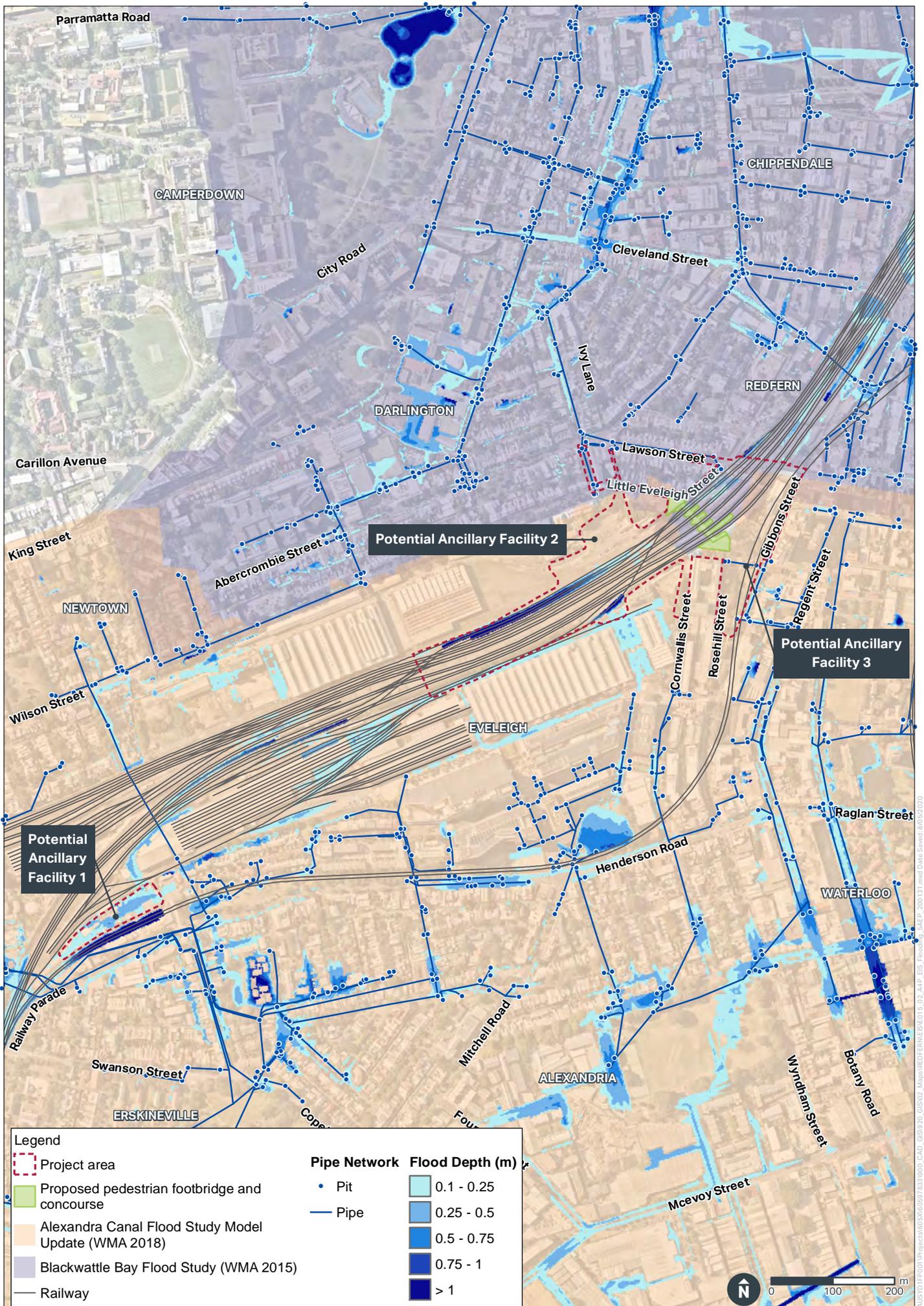


FIGURE 18-3: FIVE PER CENT AEP DESIGN FLOOD DEPTHS

18.3.3 Local flood and drainage

The topography surrounding the station slopes away from the station in all directions. Stormwater in the Project area is currently conveyed as overland flow and collected in established stormwater networks. Drainage infrastructure within the Project area is owned and operated by City of Sydney Council and Sydney Water, and drainage infrastructure within the rail corridor by Sydney Trains.

Local flooding usually occurs where the design capacity of drainage system infrastructure is exceeded and where limited downstream inlet capacity exists. Drainage systems in the City of Sydney are generally designed to accommodate a five per cent AEP flood event, however the *Blackwattle Bay Catchment Floodplain Risk Management Plan* notes that minor drainage systems within the catchment are exceeded during 20 per cent AEP flood events (WMA, 2015).

The *Drainage assessment* modelled local drainage in Little Eveleigh Street, which is split into two catchments as shown in **Figure 18-4**. The results were compared against City of Sydney design criteria and are provided in **Table 18-2**. The results show that the maximum depth-velocity product for both catchments complies with the Council design criterion, however the maximum flow width of each catchment exceeds the Council design criteria.

Table 18-2 Local drainage modelling results – One per cent AEP

	Maximum pre development flow (m ³ /s)	Maximum depth x velocity (m ² /s)	Maximum flow width (m)
City of Sydney Design Criteria	N/A	0.4	1.5
Catchment 1	0.29	0.23	3.39 ¹
Catchment 2	0.33	0.12	3.79 ¹

¹Greyed cells indicate flow width exceedances

Source: Novo Rail Alliance, 2019



FIGURE 18-4: LOCAL CATCHMENT AREAS MODELLED

18.3.4 Water quality

The quality of stormwater runoff in the Project area could be influenced by surface pollutants typical of urban catchments, including oils and hydrocarbons, heavy metals, chemicals (from spills, localised pesticide/herbicide application or inappropriate waste disposal), sediments and gross pollutants such as litter and other debris. With the exception of drainage grills and grates to block gross pollutants, no existing water quality treatment measures were identified within the Project area.

The catchments of Blackwattle Bay and Alexandra Canal form part of the Sydney Harbour and Cooks River catchments respectively. The water quality of these receiving waterways is influenced by the widespread urbanisation of the upstream catchments and is considered to be poor against locally derived environmental and ecological guideline values and ANZECC Water Quality guideline levels (Bugnot et al, 2016, Cooks River Alliance 2017, Roads and Maritime Services, 2017).

Water quality within Alexandra Canal is generally considered to be poor and unfit for contact by humans. Sediment-laden, nutrient enriched urban stormwater entering the waterways have caused elevated turbidity and excessive algal growth (Cooks River Alliance, 2017). Samples collected near Blackwattle Bay (in the adjacent Rozelle Bay), indicated elevated concentrations of heavy metals (copper, chromium, lead and zinc), nitrate, nitrogen and oxides of nitrogen, phosphorous, ammonia and chlorophyll. On some occasions the pH level is outside guideline levels and the turbidity exceeds ANZECC Water Quality guideline levels (Bugnot et al, 2016 and Roads and Maritime Services, 2017).

18.4 Impact assessment

18.4.1 Construction

18.4.1.1 Regional flooding

During construction there is the potential for inundation of the Project area in locations close to or within flood prone areas. According to the flood mapping, this includes areas within the railway corridor on the train tracks, and at the location of Ancillary Facility 1 (refer **Section 18.3.2**). There are no proposed construction works within the train tracks themselves, and it is anticipated that a track drainage upgrade being undertaken separately by Sydney Trains at Redfern Station will have been completed prior to operation of the Project.

Ancillary Facility 1, which would be primarily used for an administration centre for the Project (comprised of site offices and car parking areas) is prone to flooding to depths of up to 0.5 metres.

Flooding within and around both of these areas (within the rail corridor and Ancillary Facility 1) could present a safety hazard to construction personnel, cause damage or loss of materials and equipment, and could potentially lead to materials being washed offsite and into waterways downstream, resulting in environmental impacts. As Ancillary Facility 1 is located within the five per cent AEP flood extent, no stockpiles would be located within this area. Where possible, stockpiling within the one per cent flood extent would also be avoided.

There is no potential for regional flooding impacts within the remainder of the Project area according to the flood mapping.

Construction activities associated with the Project also have the potential to change flood behaviour and impact on the surrounding environment if they are not mitigated. These include:

- utilities adjustments, ancillary facility establishment, and demolition works
- modification or replacement of road surfaces and construction of the new pedestrian concourse
- implementation of environmental management and pollution control facilities for the Project.

Potential impacts would be adequately managed through the mitigation measures identified in **Section 18.5**.

18.4.1.2 Local flooding and drainage

Construction works required for the Project have the potential to impact local overland flow paths and existing minor drainage paths (including constructed drainage systems), by causing a minor redistribution of some stormwater flows. This could occur as a result of:

- disruption of existing drainage networks during upgrade or replacement of drainage pits and pipes
- excavations which capture stormwater
- establishment of construction ancillary facilities, including storage/stockpiling of materials
- sediment released from site entering existing drainage assets/systems and causing blockages
- overloading the capacity of the local drainage system.

However, any redistribution of flows during construction would not significantly affect the performance of downstream drainage infrastructure, due to the small size of the Project area in the context of the wider catchment. Potential impacts would be addressed by the mitigation measures described in **Section 18.5**.

18.4.1.3 Water quality

Potential impacts to the quality of stormwater runoff during construction could occur as a result of:

- earthworks or movement of soil resulting in sediment laden stormwater runoff and sedimentation, as well as the release of any insitu contaminated material within the soils
- contamination from accidental spillages of fuel, lubricants, effluent and other chemicals and materials used during construction
- dewatering open excavations following periods of rainfall, which may contain sediments and other pollutants mobilised by the rainfall.

Where sediments from construction areas enter receiving waterways, there is the potential to adversely impact water quality (e.g. by increasing turbidity, lowering dissolved oxygen levels, increasing nutrients and introducing pollutants).

Potential impacts to the quality of receiving watercourses are considered to be negligible with the implementation of the mitigation measures described in **Section 18.5**.

18.4.2 Operation

Regional flooding

The Project would be located outside the one per cent AEP flood extent once constructed. Increases to surface water runoff as a result of increased imperviousness resulting from the Project would be negligible in the context of regional flooding, due to the relatively small increase in contribution to the Blackwattle Bay and Alexandra Canal catchments.

Impacts of climate change on flood behaviour were considered in the flood studies prepared for Blackwattle Bay and Alexandra Canal (WMA, 2015 and WMA, 2018 respectively), in accordance with the *Floodplain Development Manual* (Department of Infrastructure, Planning and Natural Resources, 2005). This included climate change modelling which investigated the impacts of sea level rise and increases in design rainfall events. The flood studies found an increase in flood levels across the study area (corresponding with an increase in design rainfall events), including a maximum of 0.2 metres for the Blackwattle Bay catchment and 0.3 metres for the Alexandra Canal catchment. However, these increases were more likely to be experienced in the flatter parts of the catchment and not near the upper reaches where the Project area is located. Similarly, the impacts of sea level rise are largely confined to the low lying areas of the catchment outside the Project area.

Local flooding and drainage

Operation of the Project has the potential to impact local flooding and drainage. The *Drainage Assessment* (Novo Rail Alliance, 2019) found that the distribution of local flows at Little Eveleigh Street is expected to change as a result of the Project. Rainfall that would previously land on the rail tracks would now fall on the roof of the new concourse and be directed via a pipe network to kerb and gutter at Little Eveleigh Street. Local flooding would be unlikely to impact on pedestrian access points.

The design of the drainage system upgrade proposed along Little Eveleigh Street as part of the Project would address a predicted increase in runoff in this area (i.e. increased flow rates and maximum flow width) as a result of the Project. With adequate engineering of this proposed drainage

upgrade, it is expected that the Project would not result in any adverse impacts to local flooding or drainage in Little Eveleigh Street. Localised flooding between the tracks would also be reduced.

The new platform and stair canopies introduced by the Project would also capture and distribute additional stormwater runoff to the track drainage system within the rail corridor. This is expected to be adequately managed by the track drainage system (which is also subject to an upgrade by Sydney Trains separately to this Project).

Elsewhere in the Project area, the new carpark would also introduce a new impervious area which would capture stormwater. This carpark area would be connected to the local stormwater drainage system, which would be upgraded accordingly as part of the works along Little Eveleigh Street. Increases in impervious areas would contribute to an increase in peak flows during rain/flood events. To manage peak flows, water sensitive urban design measures are proposed to be installed as part of the Project (e.g. detention basin or bioretention basin/s). With these measures in place, the peak stormwater flow for rainfall events of up to a 1.5 year ARI event is not expected to be increased.

Where works are proposed to road surfaces (i.e. Marian Street/Cornwallis Street/Rosehill Street, Gibbons Street and Lawson Street) there would be a negligible change in stormwater runoff, as there would be minimal change to the imperviousness of the catchment and no change in contributing catchments. Overall, additional stormwater captured by new or changed impervious areas introduced by the Project is expected to be adequately managed by existing and upgraded stormwater drainage systems as part of the Project (upgrades would be designed to accommodate additional runoff). In other areas of the Project area there are expected to be minimal changes to local flooding and drainage regimes. As such no mitigation measures are recommended.

Water quality

Changes or additions to impervious surfaces within the Project area could potentially impact stormwater runoff quality during the operation of the Project. The introduction of the new concourse roof has the potential to contain deposited air emission particulates after periods of no rain, which could runoff into the drainage system in Little Eveleigh Street. Similarly, the new platform and stair canopies could also introduce additional pollutants into the track drainage system.

The proposed carpark would also introduce a new impervious area, preventing stormwater runoff from infiltrating into the ground. Stormwater runoff from this area would have the potential to collect contaminants and litter before it enters the drainage system and subsequent receiving waterways downstream. A stormwater treatment device would be designed and implemented to mitigate against increased pollutants from new impervious surfaces such as the carpark. The type and size of treatment device required (e.g. bioretention basin/s) would be confirmed during detailed design. Mitigation measures to address these risks are described in **Section 18.5.3**.

The remaining Project elements would result in minimal changes to the existing land use and existing impervious areas within the Project area and would therefore have a negligible impact to water quality.

18.5 Management and mitigation

18.5.1 Overview

A CEMF (refer **Appendix D** of this EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

A Soil and Water Management Sub-Plan would be developed for the Project as identified in Section 6.5 of the CEMF.

The chapter includes a compilation of the performance outcomes as well as mitigation measures, including those that would be included in the Soil and Water Management Sub-Plan.

18.5.2 Performance outcomes

The performance outcomes for the Project in relation to flooding, hydrology and water quality include:

- stormwater drainage within the Project area is maintained during construction so as not to cause localised flooding or drainage issues as a result of Project works
- adverse impacts to stormwater quality during construction are avoided
- adverse impacts to stormwater quality during operation are avoided
- adverse impacts to local drainage during operation are avoided.

The Project would be designed, constructed and operated to achieve this performance outcome.

18.5.3 Mitigation measures

A list of mitigation measures which would be implemented during construction and operation of the Project are provided in **Table 18-3**.

Table 18-3 Mitigation measures

ID	Mitigation measure	Applicable location(s)
Construction		
SW1	Temporary drainage or drainage diversions would be installed so that stormwater function is not impeded during construction.	Project area
SW2	Stockpiles and storage areas would be located outside of the five per cent AEP flood extent and ideally outside of the one per cent AEP flood extent where possible, particularly any loose materials with the potential to wash away.	Ancillary Facility 1
SW3	Works would cease in flood prone areas when a severe weather warning is issued for the immediate area, and work sites would be secured accordingly.	Project area
SW4	A Soils and Water Management Sub-Plan would be developed to manage the soil and water issues relevant to the construction of the Project. This sub-plan would be part of the CEMP. The sub-plan would include detailed erosion and sediment control plans for each work site and would outline which erosion and sediment control measures would be implemented at each location or for specific works. These control measures would align with the management approaches outlined in <i>Managing Urban Stormwater: Soils and Construction Volume 1</i> (Landcom, 2004), <i>Managing Urban Stormwater: Soils and Construction Volume 2A</i> (DECC, 2008) (referred to as the Blue Book), the <i>Water Discharge and Reuse Guideline</i> (TfNSW, 2015c), <i>Concrete Washout Guideline</i> (TfNSW, 2015b), <i>Water Sensitive Urban Design Guideline</i> (TfNSW, 2017b) and <i>Chemical Storage and Spill Response Guideline</i> (TfNSW, 2015a).	Project area
SW5	Undertake consultation with City of Sydney Council and/or Sydney Water (as relevant) prior to connecting to existing stormwater drainage system/s.	Project area
Operation		
SW6	A 300 millimetre wide 'Heel Safe' trench grated drain would be installed either side of Little Eveleigh Street connecting to existing downstream stormwater drainage systems.	Little Eveleigh Street
SW7	The existing localised sag depression would be regraded at Little Eveleigh Street.	Little Eveleigh Street
SW8	A treatment device would be installed to treat the first flush of rainfall from the new concourse.	New concourse

ID	Mitigation measure	Applicable location(s)
SW9	Stormwater treatment device/s/water sensitive urban design features would be installed in the new car park at Little Eveleigh Street (which may include a vegetated bioretention basin or similar).	At or near proposed car park, Little Eveleigh Street

Following the implementation of the management measure above, there would be negligible residual impacts from the Project on flooding and water quality, and minor residual impacts to drainage. Minor impacts to drainage are expected to be managed by drainage systems upgrades and are not expected to contribute to cumulative impacts. Further consideration of cumulative impacts with regard to other environmental aspects of the Project are addressed in **Chapter 23** of this EIS.

19 Air quality

This chapter assesses the potential impacts on air quality associated with the Project.

19.1 Introduction

Air quality is listed under 'Other issues' in the SEARS, and includes reference to the commitments in the Scoping Report (TfNSW, 2019d) for the Project. **Table 19-1** presents the SEARs relevant to air quality and identifies where the requirements have been addressed in this Chapter.

Table 19-1 SEARs – Air quality

SEARs	Where addressed in this EIS
Other issues	
<i>(Address) The following issues in accordance with the commitments made in Chapter 9 of the Scoping Report:</i>	
<i>(d) air quality.</i>	
The Scoping Report (TfNSW, 2019d) makes the following commitments:	
The EIS will include an air quality assessment which will assess the impacts of the Project on air quality. The assessment will:	
<ul style="list-style-type: none"> identify and describe the background air quality environment based on a desktop review 	Section 19.3.2
<ul style="list-style-type: none"> identify potential sensitive receivers likely to be impacted by sources of air emissions 	Section 19.3.3, Section 19.4.1
<ul style="list-style-type: none"> identify potential sources of air emissions during construction and operation of the Project and qualitatively assess them 	Section 19.4
<ul style="list-style-type: none"> identify appropriate mitigation and management measures. 	Section 19.5

19.2 Method of assessment

A qualitative air quality impact assessment was completed and involved:

- a desktop review of the background air quality environment based on 2015, 2016 and 2017 data, which was sourced from the NSW Government Environment, Energy and Science Group's (former Office of Environment and Heritage's) air quality monitoring station at Rozelle (i.e. the closest air quality monitoring station to the Project area with data available; note that the Cook and Phillip monitoring station in the Sydney CBD is the closest monitoring station, however as it was only commissioned in 2019 long term monitoring data is not yet available)
- a desktop review of the Commonwealth Department of Agriculture, Water and the Environment's National Pollutant Inventory data to identify projects or facilities that may be contributing to local air quality conditions
- the identification of air quality sensitive receivers with the potential to be adversely affected by the Project
- a review of construction and operational aspects of the Project with the potential to generate air pollutant emissions (including dust and exhaust emissions)
- a qualitative assessment of potential air quality impacts at surrounding sensitive receivers
- the identification of mitigation measures to address potential air quality impacts.

19.3 Existing environment

Ambient air quality throughout the Sydney Basin is influenced by a number of factors, including topography, prevailing meteorological conditions (such as wind and temperature, which vary seasonally) and local and regional air pollution sources (such as motor vehicles, aircraft, industrial facilities and bushfires). Consequently, air quality in the Sydney Basin can be highly variable and impacted by events occurring a significant distance away.

19.3.1 Local emission sources

A search of the Commonwealth Department of Agriculture, Water and the Environment's National Pollutant Inventory (2019) and a desktop review of nearby land uses identified air emission sources which are likely to influence local air quality around the Project area. These sources include:

- industrial facilities at Camperdown, Leichardt, Alexandria and Roseberry that reported air emissions under the National Pollutant Inventory reporting program during the 2016-2017 reporting period. These facilities include:
 - Malt Shovel Brewery (Camperdown)
 - Origin LNG Pipelines (Leichardt)
 - Australian Refined Alloys (Alexandria)
 - Monroe Springs Alexandria (Alexandria)
 - Alexandria Asphalt Plant (Alexandria)
 - Spotless Facility Services Rosebery (Roseberry)
- vehicle exhaust emissions from road and rail networks
- commercial businesses, such as service stations and smash repairs
- domestic activities, such as wood-fired home heaters and lawn mowing
- other construction projects.

19.3.2 Background air quality

Air quality data sourced from the monitoring station at Rozelle is summarised in **Table 19-2**. The data shows that the concentrations of air pollutants were generally below the applicable air quality criteria during the 2015, 2016 and 2017 reporting periods, with the exception of occasional days when the maximum 24-hour average concentration of particulate matter with an aerodynamic diameter less than 10 microns (PM₁₀) exceeded the applicable criterion of 50 micrograms per cubic metre. These occurrences are generally the result of natural events including dust storms, bushfires and sea spray arising from on-shore winds.

Table 19-2 Background air quality data

Pollutant	Averaging period	Rozelle 2015	Rozelle 2016	Rozelle 2017
PM ₁₀ (g/m ³)	Maximum 24 hour	16.7	16.8	18.1
Carbon monoxide - CO (g/m ³)	Maximum 1 hour	0.3	0.2	0.2
Nitrogen dioxide - NO ₂ (g/m ³)	Maximum 1 hour	1.1	1.1	1.1
Sulfur dioxide - SO ₂ (g/m ³)	Maximum 1 hour	0.1	0.1	0.1

19.3.3 Sensitive receivers

The Project is located within a well-established urban environment that contains a wide range of sensitive receivers including residential properties, community facilities (such as educational facilities

and medical facilities), recreational areas and commercial and retail premises. A number of these receivers (in particular residential properties), are located next to the Project area boundary. The nearest hospital is the Royal Prince Alfred located around 1.35 kilometres from the Project area.

A detailed description of the existing land use patterns and sensitive receivers close to the Project is provided in **Chapter 10** and **Chapter 11** of this EIS.

19.4 Impact assessment

19.4.1 Construction

Construction of the Project would require the excavation and the management of soils and other materials. The excavation, handling and management of soils, and certain other construction materials (e.g. loose material) could potentially create dust and odour which in turn could adversely affect people and property in the local area. The use of construction plant, machinery and equipment would release exhaust emissions.

Dust

The main potential air quality impacts during construction would be associated with the generation of dust, which would include total suspended particulates (TSP) and particulate matter with an aerodynamic diameter of 10 microns or less (PM₁₀), and 2.5 microns or less (PM_{2.5}).

Construction activities with the greatest potential to generate dust would include:

- excavation, handling, stockpiling, loading and unloading, and transport of soil, spoil and fill, including imported fill and other construction materials
- demolition/modification to parts of buildings and other structures, and the handling, stockpiling and transport of demolition material
- creation of exposed surfaces through the clearing of vegetation, stripping of topsoil and other overlying structures (such as road and footpath pavements), which would increase the potential generation of dust emissions by wind erosion.

In addition, dust arising from construction of the Project could also contain contaminants of potential concern. As discussed in **Chapter 17** of this EIS, contamination investigations have indicated that contamination in the Project area is limited. However, concentrations of copper and zinc above Ecological Investigation Levels (EILs) and benzo(a)pyrene above Ecological Screening Levels (ESLs) were identified at discrete locations within the Project area. No contaminants were identified at levels above a human health investigation level. If soils containing these contaminants are managed poorly then there is potential risk that dust containing contamination could leave the site, although it is unlikely to affect ecological values given the distance to nearby sensitive ecological receptors.

Given the historical context of the Project area and the age of some of the buildings being demolished, it is possible that other contaminants and hazardous materials could also be present, such as asbestos, lead and biological material. For these contaminants of potential concern, the release of dust from the Project area during demolition potentially creates a pathway for these contaminants to adversely affect onsite or offsite receptors.

Without the implementation of adequate mitigation measures, dust emissions from the above activities would result in reduced local air quality and dust deposition at nearby sensitive receivers due to the close proximity of these receivers to the construction works in the Project area.

The volume of dust generated during a typical work day would vary depending on the types of activities occurring and prevailing weather conditions (for example, dry windy conditions increase the potential for wind erosion) and the controls that are implemented to reduce these emissions.

Sensitive receivers with the greatest potential to be adversely affected by dust from the Project area (due to their location and magnitude of dust-generating activities) are identified in **Section 19.3.3**. The close proximity of residential receivers around the Project area means that there would be a high sensitivity to potential dust impacts from the Project. The scale of the works (involving demolition, excavation of fill and soils and construction) when compared to the sensitivity of the receivers around

the Project area means that, unmitigated, there is a high risk of dust adversely affecting the local community.

Overall however dust emissions would be comparable to other similar infrastructure projects and the risk of dust impacting on receivers would be readily manageable through standard mitigation measures, such as wetting stockpiles and exposed surfaces, and minimising dust-generating works during adverse weather conditions. Specific measures to manage contaminants of potential concern are also available and have been successfully used to control the movement of these materials. Appropriate mitigation and management measures are discussed further **Section 19.5**.

Odour

Total petroleum hydrocarbons and BTEXN compounds were not identified above the limit of reporting in the contamination assessment (refer **Appendix G** of this EIS). As such no potential impacts relating to odour are likely from exposure of contaminated soils.

Odours from paint and adhesive applications would be released during construction (e.g. during concourse and building fit out works), which may pose a hazard to construction workers and potentially adjacent sensitive receivers.

Exhaust and other emissions

Exhaust emissions during construction would generally be restricted to minor localised emissions of carbon monoxide, oxides of nitrogen, sulfur dioxide and volatile organic compounds. These pollutants would be generated during the combustion of fuel in construction plant, machinery and equipment, as well as from the handling and/or on-site storage of fuel and other chemicals. Welding activities would also release welding fume emissions.

Given the existing air quality around the Project area, the minor emissions of carbon monoxide, oxides of nitrogen, oxides of sulfur, volatile organic compounds and welding fume from construction plant, machinery and equipment would be unlikely to significantly affect local air quality at the nearest sensitive receivers. Mitigation and management measures are available to manage this potential impact as described in **Section 19.5**.

19.4.2 Operation

Overall impacts to air quality during the operation of the Project would be negligible to minor, as apart from various gas emissions released during normal operation (and testing) of the padmount transformers, no changes to existing land uses are proposed, and additional mechanical plant proposed to be operated (e.g. new services building and facilities at 125-127 Little Eveleigh Street) would not involve fuel burning equipment or release of air emissions under normal operating conditions. It is noted that a diesel pump for a fire hydrant would be utilised during emergencies only. As the Project would improve the customer experience by providing improved access to station facilities and increased capacity of the Station, the Project may contribute to a transport mode shift from private vehicles to public transport, which would reduce emissions in the long-term.

19.5 Management and mitigation

19.5.1 Overview

A CEMF (refer **Appendix D** of this EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMF, sub-plans, and other supporting documentation for each specific environmental aspect.

An Air Quality Management Sub-Plan would be developed for the Project as identified by Section 6.7 of the CEMF.

The chapter includes a compilation of the performance outcomes as well as mitigation measures, including those that would be included in the Air Quality Management Sub-Plan.

19.5.2 Performance outcomes

The performance outcomes for the Project in relation to air quality are as follows:

- during construction, dust is managed to minimise the release beyond the site boundaries so that dust complaints are avoided
- during construction, tracking or spilling of soil/spoil from the Project onto offsite areas is minimised, and offsite road surfaces are cleaned at the end of each day so that they are free of visible, loose soil/spoil material (which may be washed away in runoff or otherwise cause complaints)
- dust impacts from soil waste stockpiles are prevented by removing these stockpiles as soon as practicable by an appropriately licenced contractor.

As there are no potential impacts to air quality during operations, no operation performance outcomes are required.

The Project would be designed and constructed to achieve these performance outcomes.

19.5.3 Mitigation measures

A list of mitigation measures which would be implemented during the construction of the Project are provided in **Table 19-3**. Note that mitigation measures for the management of potential contaminants and hazardous materials during construction (such as asbestos fibres and lead dust) is addressed in **Chapter 17** and **Chapter 20** of this EIS.

Table 19-3 Mitigation measures

ID	Mitigation measure	Applicable location(s)
Construction		
AQ1	An Air Quality Management Sub-Plan would be developed to manage the potential air quality impacts relevant to the construction of the Project. This sub-plan would be part of the CEMP. The sub-plan would identify potential dust and exhaust emission sources and outline appropriate mitigation measures to ensure that the performance objectives noted in the EIS are achieved. Locations within the Project area with contaminants of potential concern at unacceptable levels would be identified within the Air Quality Management Sub-Plan and specific measure put in place to manage risks associated with this material.	Project area
AQ2	The Air Quality Management Sub-Plan would include contingency measures to address air quality complaints if received.	Project area
AQ3	Work activities would be reviewed if the air quality management measures are ineffective in minimising dust or other emissions.	Project area
AQ4	The Air Quality Management Sub-Plan would include measures to manage dust emissions. These would include the following: <ul style="list-style-type: none"> • when using machinery to handle dusty/dust-generating materials, minimise the distance between where the material is stored and its final location • vehicles carrying loose or potentially dusty material to or from the Project area would be adequately covered • water would be sprayed on unsealed access roads and open areas during conditions conducive to dust generation • a wheel cleaning/washing system would be established for vehicles entering and leaving the Site • on-site vehicle speed limits would be established and enforced to prevent dust emissions • water-assisted dust sweepers would be used on internal access tracks and local roads, to remove material tracked out of the Project area • stockpiled material would be appropriately managed and shaped to reduce wind erosion and covered as appropriate 	Project area

ID	Mitigation measure	Applicable location(s)
	<ul style="list-style-type: none"> • stockpiles containing contaminated material would be banded and covered when not being actively managed, and removed from site as soon as possible in accordance with contaminated waste procedures • during extreme weather events where dust generation cannot be effectively minimised (such as high winds), dust generating works would cease until adequate controls can be implemented or until adverse weather conditions subside • demolition of buildings and structures would be carried out using techniques and practices that minimise dust generation. This may include soft stripping inside buildings before demolition. 	
AQ5	<p>Measures to manage exhaust emissions would include the following:</p> <ul style="list-style-type: none"> • plant, machinery and vehicles would be turned off while not in use, where safe to do so • equipment (including all internal combustion engines) would be properly maintained and would run efficiently to ensure exhaust emissions are minimised, where practicable • construction plant, machinery or vehicles producing excessive visual exhaust would be turned off, tagged 'out of order' and not used • all emission controls used on vehicle and equipment would comply with standards listed in Schedule 4 of the <i>Protection of the Environment Operations (Clean Air) Regulation 2010</i> • emissions from plant would be considered as part of pre-acceptance checks. 	Project area
AQ6	Construction site layout and placement of plant would consider air quality impacts to nearby receivers.	Project area
AQ7	In the event that odour emissions are generated, work would cease until the source and nature of the odour can be determined and an appropriate course of action carried out. This may include further assessment to determine potential impacts on the nearest sensitive receptors.	Project area

Provided recommended mitigation measures are implemented, residual air quality impacts as a result of the construction of the Project are unlikely. Nevertheless, they have been considered in the cumulative assessment in **Chapter 23** of the EIS.

20 Hazards and risk

This chapter provides an assessment of potential hazards that could arise during construction and operation of the Project related to the storage, management or transport of hazardous or dangerous goods, as well as other hazards within the Project area (such as the presence of services/utilities, hazards associated with the rail corridor, and movement of vehicles). Where potential issues are identified or where appropriate precautionary measures could be employed, these have been included as part of this assessment as management measures.

20.1 Introduction

'Hazard and risk' is listed under 'Other issues' in the SEARS, and includes reference to the commitments in the Scoping Report (TfNSW, 2019d) for the Project. **Table 20-1** presents the SEARs relevant to hazard and risk and identifies where these requirements have been addressed in this Chapter.

Table 20-1 SEARs

SEARs	Where addressed in this EIS
Other Issues	
(Address) the following issues in accordance with the commitments made in Chapter 9 of the Scoping Report: (c) <i>hazard and risk</i> The Scoping Report (TfNSW, 2019d) makes the following commitments:	
A high level, desktop hazard and risk assessment will be undertaken for the Project and appropriate management measures will be proposed.	Section 20.4 and Section 20.5
The following government guidelines will be considered as relevant during the preparation of the hazard and risk assessment: <ul style="list-style-type: none"> • <i>International Standard (ISO/IEC 31010) – Risk Assessment Technique</i> • <i>Australian Code for the Transport of Dangerous Goods by Road and Rail (Edition 7.5) (National Transport Commission, 2017)</i> • <i>Code of Practice for the Safe Removal of Asbestos 2nd Edition (National Occupational Health and Safety Commission, 2005)</i> • <i>Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005).</i> 	Section 20.2

The Redfern Station Upgrade works are not classified as 'industry' and therefore the provisions of *State Environmental Planning Policy 33 - Hazardous and Offensive Development* (SEPP 33) do not apply. Similarly, as the Project is also declared to be State Significant Infrastructure, SEPP 33 does not apply to the Project by reason of section 5.22 of the EP&A Act. Notwithstanding, the provisions of SEPP 33 have been considered as a reference guide for the assessment.

The works would involve the construction of a new services building at the Marian Street entrance. The new services building would contain two new padmount transformers, a condenser room (i.e. air-conditioning units), a store room, staff toilets, a communications room (containing computers/IT equipment) and a switch room. Diesel would also be stored in the services building. Dangerous goods would be used or handled during various activities in the services building.

There would also be a store room, condenser (air-conditioning) units, scrubber (i.e. pollution control device) and a communications room at the Little Eveleigh Street entrance. Given the limited storage, handling and use of dangerous goods and hazardous materials, and other hazards associated with the Project, a high level hazard assessment has been provided below.

20.2 Method of assessment

A qualitative desktop assessment was undertaken, which included:

- reviewing the relevant regulatory framework and applicable guidelines
- identifying construction and operational activities with the potential to cause risks to health and safety
- identifying and assessing the hazards that could be encountered during construction and operation (including hazardous materials and dangerous goods)
- identifying storage and transport screening thresholds for hazardous materials and dangerous goods that may be required during construction and operation
- qualitatively identifying and assessing potential impacts to public health and safety related to the presence of hazardous materials and dangerous goods
- providing mitigation and management measures.

The assessment focused on potential hazards with consideration of the following relevant legislation and guidelines:

- *Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace* (NSW Government, 2019b) (note that the *Storage and Handling of Dangerous Goods Code of Practice* referenced in the Scoping Report is now noted by WorkCover NSW as a former code of practice within the document itself)
- *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (Department of Planning 2011) (Applying SEPP 33)
- *Dangerous Goods (Road and Rail Transport) Act 2008* (NSW)
- *Australian Code for the Transport of Dangerous Goods by Road and Rail* (Edition 7.5) (National Transport Commission, 2018).

The assessment focuses on those construction and operational activities with the potential to result in impacts related to the management or storage of hazardous or dangerous goods at the Project area on surrounding communities, land uses, and the environment. The assessment does not address potential health and safety risks to on-site workers associated with normal construction operations, as these are regulated by workplace health and safety legislation (including the *Work Health and Safety Act 2011* (NSW) (WHS Act)). Construction management would be the responsibility of the construction contractor/s, who would be required (under the WHS Act and applicable regulations) to manage the works in accordance with relevant regulatory requirements.

20.3 Existing environment

The urban setting of the Project means that there is the potential for the community to be impacted if construction and operation activities are not properly managed. A description of existing land use patterns and sensitive receivers surrounding the Project area is provided in **Chapter 10** of this EIS. Other sensitive receivers include members of the community travelling or moving in close proximity to work areas and operational areas.

Redfern Station is subject to Sydney Trains policy and requirements set out in its Safety and Environment Management System, which includes that any hazardous materials identified (or existing materials damaged so that they pose a risk) are managed, and then removed from the Station using competent and licenced contractors. Currently, no dangerous goods are stored at the Station, including diesel or transformer oil.

20.4 Impact assessment

20.4.1 Construction

On-site storage, use and transport of dangerous goods and hazardous substances

The incorrect storage, handling and transport of dangerous goods and hazardous materials has the potential to impact the Project area, the surrounding community and environment if leaks, spills or other releases occur.

An indicative list of the types of potentially hazardous materials anticipated to be used, stored and transported during construction of the Project is provided in **Table 20-2**, along with the relevant storage and transport thresholds established under Applying SEPP 33. These thresholds represent the maximum amounts of dangerous goods that can be stored or transported to and from a construction site without causing a significant risk to off-site receptors. In general, low volumes of dangerous goods would be stored at the construction ancillary facilities. The quantity of goods stored would be commensurate with the anticipated rates of consumption, with deliveries of dangerous goods coordinated to match consumption rates, so that excess goods do not unnecessarily increase the risk associated with the Project.

Construction site planning would ensure hazardous materials are stored appropriately and at a suitable distance from sensitive receivers, in accordance with the thresholds established under Applying SEPP 33. Should the minimum buffers be unable to be maintained, either due to space constraints, proximity of sensitive receivers, or a requirement to store volumes of hazardous materials in excess of storage thresholds, a risk management strategy would be developed on a case-by-case basis and accounted for in the CEMP.

Hazards and risks associated with the on-site storage, use and transport of chemicals, fuels and materials would be managed through standard mitigation measures to be developed as part of the construction environmental management documentation (refer to **Chapter 24** of this EIS). These measures would include the storage and management of all hazardous substances in accordance with the Work Health and Safety Act 2011, the Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace (NSW Government, 2019b), and Applying SEPP 33 (Department of Planning, 2011) (or updated equivalent publications).

All transport of dangerous goods to and from the Project area would be undertaken by licensed contractors, who would be responsible for operating in accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (Edition 7.5) (National Transport Commission, 2017) (or updated equivalent).

Table 20-2 Dangerous goods volumes and thresholds for construction

Material	Australian Dangerous Goods Code Class	Storage method	Applying SEPP 33 thresholds		
			Storage volume	Minimum storage distance from sensitive receivers	Transport (weekly)
Diesel	C11, 3 PG III ²	Construction: 5 x 20 litre drums/carry cans	Greater than 5 tonnes, if stored with other Class 3 flammable liquids	5 metres	Not applicable if not transported with Class 3 dangerous goods
Petrol	C11, 3 PG III ²	Up to 3 x 20 litre drums stored for refuelling activities	Greater than 5 tonnes, if stored with other Class 3 flammable liquids	5 metres	Not applicable if not transported with Class 3 dangerous goods

Material	Australian Dangerous Goods Code Class	Storage method	Applying SEPP 33 thresholds		
			Storage volume	Minimum storage distance from sensitive receivers	Transport (weekly)
Lubricating and hydraulic oils and greases	C2	1 x 20 litre drum	N/A	N/A	Not applicable if not transported with Class 3 dangerous goods
Industrial grade oxygen	2.2	2 x 55 kilogram bottles in rack	N/A	N/A	Not subject to Applying SEPP 33 transport thresholds
Acetylene	2.1	2 x 55 kilogram bottles in rack	Greater than 0.1 tonnes (100 kilograms)	15 metres	2 tonnes; 30 times per week
Concrete curing compounds	3 PG III	1 x 20 litre drum	N/A	N/A	Not subject to Applying SEPP 33 transport thresholds
Concrete retardant	3 PG II	1 x 20 litre drum	Greater than 5 tonnes	5 metres	10 tonnes; 60 times per week
Epoxy glue	3 PG III	2 x 10 litre cans	Greater than 5 tonnes	5 metres	10 tonnes; 60 times per week
Acids	8 PG III	1 x 20 litre drum	Greater than 25 tonnes	N/A	2 tonnes; 30 times per week
Bases	8 PG III	1 x 20 litre drum	Greater than 25 tonnes	N/A	2 tonnes; 30 times per week
Disinfectant	8 PG III	2 x 20 litre drums	Greater than 50 tonnes	N/A	2 tonnes; 30 times per week
Paint	N/A	4 x 20 litre drums	N/A	N/A	SEPP 33 transport thresholds

Notes:

¹ Classified as C1 if not stored with other Class 3 flammable liquids

² Classified as 3PGIII if stored with other Class 3 flammable liquids.

Utilities

As described in **Chapter 5** of this EIS, a number of utilities would need to be adjusted, relocated, and/or protected to enable construction. The potential rupture of underground utilities during excavation or collision of plant and equipment with aboveground services could pose risks to public safety. Rupture or contact with services during works could also result in releases and/or short-term outages, as could relocation of utilities and services.

If inadequately managed, works in the vicinity of utilities which are not protected or relocated (such as high voltage electricity transmission lines or gas pipelines) could result in increased risks to the workforce and/or surrounding environment/community.

Specifically, risks associated with these hazards would be minimised by carrying out utility checks (such as 'dial before you dig' searches and non-destructive digging), consulting with relevant utility providers and, if required, relocating and/or protecting utilities in and around the Project prior to construction. Consultation with utility providers would commence during detailed design and continue during construction to mitigate the risk of unplanned and unexpected disturbance of utilities (refer to **Section 20.5**).

Removal of buildings and structures

The Project requires the removal of structures at and around Redfern Station including the relocation of the building on Platform 1 and modification of 125-127 Little Eveleigh Street. Hazards associated with building demolition include:

- unplanned structure collapse
- falls from one level to another
- falling objects
- the location of above and underground services
- exposure to hazardous chemicals and materials (such as asbestos fibres, lead dust, and biological material)
- noise from plant used during demolition work
- proximity of the building or structure being demolished to other buildings or structures.

To minimise exposure to these hazards, a risk assessment would be carried out prior to works commencing. The risk assessment would include:

- an assessment of the structural integrity of the structure to be demolished
- an assessment of the method of demolition, including sequencing, scheduling, plant and equipment to be used, and the layout of work areas
- a hazardous material survey for those buildings and structures suspected of containing hazardous materials (including asbestos, lead paint and polychlorinated biphenyl containing materials (e.g. in electrical equipment)).

Demolition would be carried out by licensed demolition contractors, in accordance with relevant regulatory requirements (refer to **Section 20.5**).

Potential contamination

Contaminants of potential concern that could be exposed during excavation, demolition and clear out of the structures and buildings include hydrocarbons, heavy metals, herbicides, and asbestos. Exposure to these contaminants could cause health and safety impacts to the community through inhalation and/or direct contact or impacts to the environment due to contamination of land.

Demolition waste which could contain contaminated material would be classified in accordance with the *Waste Classification Guidelines* (EPA, 2014a), handled by licensed operators and directed to a waste management facility that is lawfully permitted to accept contaminated material. Asbestos removal would be undertaken by qualified and licensed asbestos removalists in accordance with the *Work Health and Safety Act 2011* and supporting *Work Health and Safety Regulations 2014*, and relevant SafeWork NSW and SafeWork Australia guidelines/codes of practice.

Health and safety impacts associated with potential exposure to contaminated and hazardous materials would be minimised through implementation of an unexpected finds protocol and waste management plan. Further information on contamination and waste, and associated mitigation measures is provided in **Chapter 17** and **Chapter 21** of this EIS.

Risk of subsidence

As described in **Chapter 17**, the potential for changes to groundwater levels as a result of construction is low, due to the lack of groundwater and generally shallow depth and limited extent of excavation. The Project would also not involve the excavation of any tunnels or other subsurface cavities. Based on the nature of the works being undertaken and the existing environment, the risk of subsidence as a result of construction is considered negligible.

Other health and safety risks

Other construction activities could result in impacts to the health and safety of site workers, users, visitors, and the local community if improperly managed. These include:

- working within an operating rail environment
- the operation of vehicles and construction equipment within the Project area
- the transportation of equipment, excavated spoil, and material to and from the Project area
- construction failures or incidents resulting in flooding, inundation, or excavation collapse.

In addition to the above, there is the potential for risks to pedestrians/public safety resulting from unauthorised access to construction work areas.

NSW workplace safety laws require construction sites to have adequate site security, which includes appropriate fencing. All construction work would be isolated from the general public. The construction contractor/s would need to ensure that construction sites are secure at all times, and take all possible actions to prevent entry by unauthorised persons.

Health and safety risks during construction would be managed by the implementation of standard workplace health and safety requirements. A work health and safety management plan, and safe work method statements would be developed in accordance with regulatory requirements. The management approach outlined in **Section 20.5** would be implemented to minimise and avoid the potential for health and safety impacts during construction.

There are also interactions between the mitigation and management measures for the hazards and safety matters discussed in this Chapter, and traffic and transport, noise and vibration, flooding, hydrology and water quality, air quality, soils and contamination and waste impacts. **Chapter 24** of this EIS provides a consolidated list of environmental mitigation measures for the Project. Together, these measures would serve to minimise the potential community and environment impacts that could arise from the hazards identified above.

20.4.2 Operation

Storage, handling and transport of dangerous goods and hazardous materials

The volumes of hazardous materials and dangerous goods that would be used for maintenance activities during operation would be much smaller than the volumes required during construction. However, the incorrect storage and handling of dangerous goods and hazardous materials has the potential to impact the Project area, the surrounding community and environment if leaks, spills or other releases occur.

An indicative list of the types of potentially hazardous materials anticipated to be used, stored and transported during operation of the Project is provided in **Table 20-3**, along with the relevant storage and transport thresholds established under Applying SEPP 33. These thresholds represent the maximum amounts of dangerous goods that can be stored or transported to and from the Project area without causing a significant risk to off-site receptors. In general, low volumes of dangerous goods would be stored during operation. The quantity of goods stored would be commensurate with the anticipated rates of consumption, with deliveries of dangerous goods coordinated to match consumption rates, so that excess goods are not unnecessary increasing the risk associated with a potential hazard.

Hazards and risks associated with the on-site storage, use and transport of chemicals, fuels and materials would be managed through standard mitigation measures to be developed as part of the construction environmental management documentation (refer to **Chapter 24** of this EIS). These measures would include the storage and management of all hazardous substances in accordance with

the *Work Health and Safety Act 2011*, the *Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace* (NSW Government, 2019b) and Applying SEPP 33 (Department of Planning, 2011) (or updated equivalent publications). All transport of dangerous goods to and from the Project area would be undertaken by licensed contractors, who would be responsible for operating in accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail (Edition 7.5)* (National Transport Commission, 2017) (or updated equivalent).

Table 20-3 Dangerous goods volumes and thresholds for operation

Material	Australian Dangerous Goods Code Class	Storage method	Applying SEPP 33 thresholds		
			Storage volume	Minimum storage distance from sensitive receivers	Transport (weekly)
Diesel	C1 ¹ , 3 PG III ²	Operation: up to 100 litres stored for the diesel pump (in case of emergency)	Greater than 5 tonnes, if stored with other Class 3 flammable liquids	5 metres	Not applicable if not transported with Class 3 dangerous goods

Notes:

¹ Classified as C1 if not stored with other Class 3 flammable liquids

² Classified as 3PGIII if stored with other Class 3 flammable liquids.

Electro-magnetic fields

The Project includes the augmentation of existing power supplies, including transformers feeders and overhead wiring. The possibility of adverse health effects due to the electro-magnetic fields associated with electrical equipment, including has been the subject of considerable worldwide research, however to date, the current evidence does not confirm the existence of any health consequences from exposure to low level EMF, and further research is required (WHO, 2020).

It is considered that a precautionary approach continues to be the most appropriate response to minimise EMF impacts. The design, construction, and operation of the Project's power supply would therefore be undertaken in accordance with relevant industry guidelines and standards/codes of practice, including the International Commission on Non-Ionizing Radiation Protection's (ICNIRP) *Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1Hz – 100kHz)* (which have been adopted by the Australian Radiation Protection and Nuclear Safety Agency). This would result in conductive and semi-conductive materials effectively shielding electrical fields.

The Project would be designed to comply with appropriate Australian and international standards, to minimise the risk associated with electro-magnetic field exposure.

Other health and safety risks

Potential impacts to the health and safety of the community and customers during operation include:

- safety risks (e.g. unauthorised access)
- general worker health and safety issues for drivers and maintenance staff.

These risks would be mitigated through the design process which would include an appropriate emphasis on safety according to relevant design standards and requirements. The Project has been designed to incorporate features which would ensure sufficient levels of safety specific to train and railway station operations, for example security fencing, CCTV. Further information is provided in **Chapter 5** of this EIS.

Maintenance activities and other works within the rail corridor would be undertaken in accordance with TfNSW standing operating procedures, reducing the potential for impacts to the health and safety of workers, visitors, and customers.

20.5 Management and mitigation

20.5.1 Overview

A CEMF (**Appendix D** of this EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect, including 'hazard and risk' aspects.

The chapter includes a compilation of the performance outcomes as well as mitigation measures, including those that would be included in the CEMP for issues related to 'hazard and risk'.

20.5.2 Performance outcomes

The performance outcome for the Project in relation to hazard and risk is as follows:

- during construction and operation, dangerous goods in the Project area are stored at least the minimum storage distance from sensitive receivers as defined by Applying SEPP 33.

The Project would be designed, constructed and operated to achieve this performance outcome.

20.5.3 Mitigation measures

The mitigation measures that would be implemented to minimise the hazards identified in this assessment are listed in **Table 20-4**.

Table 20-4 Mitigation measures

ID	Mitigation measure	Applicable location(s)
Construction		
HRS1	A hazard analysis would be undertaken during the detailed design stage to identify risks to public safety from the project, and how these can be mitigated through safety in design (with reference to the <i>International Standard (ISO/IEC 31010) - Risk Assessment Technique and Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace</i> (NSW Government, 2019b) (or updated equivalent) where relevant).	Project area
HRS2	Relevant standards and guidelines will be applied during detailed design to ensure that EMF emissions comply with relevant limits for all receivers (including the International Commission on Non-Ionizing Radiation Protection's (ICNIRP) <i>Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1Hz – 100kHz)</i> , as adopted by the Australian Radiation Protection and Nuclear Safety Agency.	Project area (and area of potential EMF emission exposure)
HRS3	All hazardous substances that may be required for construction and operation would be stored and managed in accordance with the <i>Work Health and Safety Act 2011, Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace</i> (NSW Government, 2019b) and the <i>Hazardous and Offensive Development Application Guidelines: Applying SEPP 33</i> (Department of Planning, 2011) (or updated equivalent publications).	Project area
HRS4	The CEMP would include emergency and incident response procedures, as specified by the CEMF. The procedures would specify: <ul style="list-style-type: none"> • roles and responsibilities • notification and reporting protocols • action and investigation requirements • training programs to ensure that all staff are familiar with the plan • design and management measures to address the potential environmental impacts of an emergency situation. 	Project area

ID	Mitigation measure	Applicable location(s)
HRS5	<p>To minimise hazards related to the demolition or removal of buildings and structures, a risk assessment would be carried out prior to these works commencing. The risk assessment would include:</p> <ul style="list-style-type: none"> • an assessment of the structural integrity of the structure to be demolished • an assessment of the method of demolition, including sequencing, scheduling, plant and equipment, and the layout of work areas • a hazardous material survey for those buildings and structures suspected of containing hazardous materials (particularly asbestos). <p>Demolition would be carried out by licensed demolition contractors.</p> <p>Asbestos removal would be undertaken by qualified and licensed asbestos removalists in accordance with the <i>Work Health and Safety Act 2011</i> and supporting <i>Work Health and Safety Regulations 2014</i>, and relevant SafeWork NSW and SafeWork Australia guidelines/codes of practice.</p>	Project area
HRS6	'Dial before you dig' searches would be carried prior to excavation work taking place.	Project area

Following the implementation of the standard management measure above, residual impacts from the Project in relation to Hazard and Risk would be limited to dangerous goods storage, accidental utility strike, demolition noise and potential health and safety issues (e.g. from construction traffic generated) during construction; and diesel storage and production of EMF emissions during operation. These potential impacts are not expected to contribute to cumulative impacts, except in the case of noise and traffic, which are addressed in **Chapter 23** of this EIS. Therefore, there are no cumulative impacts are expected. Further consideration of cumulative impacts with regard to other environmental aspects of the Project is discussed in **Chapter 23** of this EIS.

21 Waste and resources

This chapter assesses the predicted waste generation during construction and operation of the Project, and provides a description of how waste would be managed.

21.1 Introduction

Waste and resources is listed under 'Other issues' in the SEARs, and includes reference to the commitments in the Scoping Report (TfNSW, 2019d) for the Project. **Table 21-1** sets out the SEARs relevant to waste and resources and identifies where the requirements have been addressed in this Chapter.

Table 21-1 SEARs

SEARs	Where addressed in this EIS
Other issues	
(Address) the following issues in accordance with the commitments made in Chapter 9 of the Scoping Report: <i>(f) waste and resources.</i> The Scoping Report (TfNSW, 2019d) makes the following commitments: A desktop waste and resource assessment will be undertaken as part of the EIS and will include:	
<ul style="list-style-type: none"> a review of the likely waste streams and approximate volumes during construction and operation of the Project 	Section 21.4.1
<ul style="list-style-type: none"> a review of the likely resources required during construction and operation of the Project 	Section 21.4.1
<ul style="list-style-type: none"> development of management strategies to adequately address waste and resource use during construction and operation. 	Section 21.5
The following legislation and guidelines will be considered as relevant during the preparation of the waste and resource assessment: <ul style="list-style-type: none"> <i>Waste Avoidance and Recovery Act 2001</i>, specifically focusing on the management of construction waste through the waste management hierarchy established under this Act <i>Waste Classification Guidelines</i> (NSW EPA, 2014a). 	Section 21.2

21.2 Method of assessment

21.2.1 Legislative and policy context

The main legislation relevant to the management of waste are the *Protection of the Environment Operations Act 1997* (POEO Act), the *Protection of the Environment Operations (Waste) Regulation 2014* (the Waste Regulation), and the *Waste Avoidance and Resource Recovery Act 2007* (the WARR Act). The POEO Act establishes the procedures for environmental control, and for issuing environmental protection licences covering issues such as waste. Schedule 5 of the POEO Act defines waste as:

- any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment
- any discarded, rejected, unwanted, surplus or abandoned substance

- c. *any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, processing, recovery or purification by a separate operation from that which produced the substance*
- d. *any processed, recycled, reused or recovered substance produced wholly or partly from waste that is applied to land, or used as fuel, but only in the circumstances prescribed by the regulations*
- e. *any substance prescribed by the regulations to be waste.*

The Waste Regulation regulates matters such as the obligations of consignors (producers and agents), transporters, and receivers of waste, in relation to waste transport licensing and tracking requirements.

The movement of controlled waste is also regulated by the *National Environment Protection (Movement of Controlled Waste between States and Territories) Measure 1998*, made under the *National Environment Protection Council Act 1994* (Commonwealth).

In NSW, waste is classified in accordance with the *Waste Classification Guidelines 2014* (NSW EPA, 2014a) (the 'Waste Classification Guidelines'). Waste classification helps those involved in the generation, treatment and disposal of waste, ensure the environmental and human health risks associated with their waste is appropriately managed in accordance with the POEO Act and its associated regulations. Part 1 of the Waste Classification Guidelines provides advice and directions on classifying waste so that appropriate management of all waste types is achieved. Many waste types are pre-classified under the POEO Act and do not require testing. However, if a waste is not pre-classified, it may need to be tested to determine its classification. Waste material generated from the Project would be classified in accordance with these guidelines. The following waste classifications are relevant to the Project:

- special waste
- liquid waste
- pre-classified waste, including:
 - general solid waste (putrescible)
 - general solid waste (non-putrescible)
 - restricted solid waste
 - hazardous waste.

The WARR Act aims to ensure that waste management options are considered against the following waste management hierarchy:

1. avoidance of unnecessary resource consumption
2. resource recovery (including reuse, reprocessing, recycling and energy recovery)
3. disposal.

To support the waste management hierarchy, the *NSW Waste Avoidance and Resource Recovery Strategy 2014 -21* (NSW EPA, 2014b) provides a framework and targets for waste management and recycling in NSW. Targets established under this strategy include:

- avoiding and reducing the amount of waste generated per person in NSW
- increasing recycling rates to 70 per cent for municipal solid waste, 70 per cent for commercial and industrial waste, and 80 per cent for construction and demolition waste
- increasing waste diverted from landfill to 75 per cent
- managing problem wastes better, and establishing 86 drop-off facilities and services across NSW.

TfNSW, as a NSW Government agency, has a general responsibility to support these targets by implementing complementary policies and programs, including sustainable procurement incorporating resource recovery and waste reduction objectives into its operations complying with relevant regulations.

To support the waste management hierarchy, the NSW EPA have also made several Resource Recovery Orders and Resource Recovery Exemptions under the Protection of the Environment Operations (Waste) Regulation 2014. Resource Recovery Orders and Exemptions contain specific conditions and allow some wastes to be beneficially and safely re-used independent of the usual NSW laws that control applying waste to land, using waste as a fuel, or using waste in connection with a process of thermal treatment.

21.2.2 Approach and methodology

A qualitative desktop assessment was carried out to estimate waste types and quantities and to identify potential impacts and management approach. This involved:

- reviewing the regulatory framework for waste management
- identifying potential waste generating activities during construction and operation
- estimating the likely waste streams and volumes, including wastewater and demolition materials
- identifying the likely classification of waste streams in accordance with relevant legislation and guidelines
- estimating the quantities of bulk earthworks and spoil balance to be generated through the construction of the Project
- describing proposed management and handling techniques for key wastes streams
- identifying lawful disposal or recycling locations.

The waste types and quantities estimated in this Chapter are indicative and have been identified for the purpose of determining potential waste management options. Although the quantities of waste actually generated by the Project may differ from the estimates made, the identified waste management options are likely to be appropriate to the final waste quantities.

Potential impacts of transport during construction (which includes the transport of construction waste) are considered in **Chapter 12**. The management of contaminated soils and hazardous materials are considered in **Chapter 17** and **Chapter 20** of this EIS.

21.3 Existing environment

Currently Redfern Station (and associated car parks) contains general waste bins and special waste bins (i.e. sharps bins), which are serviced regularly by waste contractors. General waste bins are collected daily, and sharps bins less frequently or on request. Waste is removed from site by licenced waste contractors and disposed of at licenced waste facilities.

Waste (i.e. wheelie bins) from residential streets within the Project area is collected regularly by waste contractors organised by City of Sydney Council.

21.4 Impact assessment

21.4.1 Construction

Waste generation

The main construction activities anticipated to generate waste are listed in **Table 21-2** together with the materials that may be produced, potential NSW EPA Resource Recovery Orders that may be applicable and likely waste classifications. Where a NSW EPA Resource Recovery Order exists for a specific waste material the opportunity to re-use the waste under that order should be considered prior to disposal.

Table 21-2 Indicative types of waste generated during construction

Activity	Waste streams that may be produced	NSW EPA Resource Recovery Order which may apply	Likely classification of waste stream
Excavation and general earthworks including: <ul style="list-style-type: none"> piling to a maximum depth of 18 metres (e.g. for pedestrian bridge works), and excavation to shallower depths for the services building, overhead wiring footings and other rail corridor works temporary levelling of part of the Gibbons Street Reserve to provide a safe work area for the proposed ancillary facility excavation for roadworks at Little Eveleigh Street, Ivy Street and Marian Street roadworks (to a depth of approximately 2.5 metres) excavation for proposed car park (to a depth of approximately two metres) excavation for utility route changes (to a depth of approximately three metres). 	Spoil comprising virgin excavated natural material (uncontaminated soil and crushed rock), including aggregate, fines and road material	Excavated natural material order, recovered railway ballast order, recovered aggregate order, recovered fines order, reclaimed asphalt pavement order, and excavated public road material order	General solid waste (non-putrescible)
	Contaminated materials	N/A	Hazardous waste, restricted solid waste or special waste (including asbestos contaminated waste (non-friable))
Modification of buildings/building components including: <ul style="list-style-type: none"> 125-127 Little Eveleigh Street: clear out and backfill of basement, partial removal of internal building Platform 1 office building – partial removal of internal fabric Marian Street entrance: demolition of existing stairway and existing car park other infrastructure such as OHW, brick walls and privacy screens. 	Concrete, asphalt, bricks, timber, tiles, metals, plasterboard, carpets, electrical and plumbing fittings and furnishings (such as doors and windows)	Plasterboard order, cement fibreboard order, recovered aggregate order, recovered fines order, reclaimed asphalt pavement order, and excavated public road material order	General solid waste (non-putrescible)
	Asbestos	N/A	Special waste
	Hazardous materials (walls with lead paint, polychlorinated biphenyls (PCB) containing materials from capacitors for fluorescent light ballasts and/or mercury from	N/A	Hazardous or restricted solid waste

Activity	Waste streams that may be produced	NSW EPA Resource Recovery Order which may apply	Likely classification of waste stream
	fluorescent and compact fluorescent tubes)		
Dust suppression, wash down of plant and equipment, and staff amenities at construction sites (such as toilets)	Sediment-laden and/or potentially contaminated wastewater, sewage and grey water	N/A	Liquid waste
Station fit-out and general construction activities and resource use	Concrete waste, timber formwork, scrap metal, steel, plasterboard, cable and packaging material	Plasterboard order, and cement fibreboard order	General solid waste (non-putrescible)
Maintenance of construction plant, vehicles and equipment	Adhesives, lubricants, waste fuels and oils, engine coolant, batteries, hoses	N/A	Hazardous or restricted waste (non-putrescible)
	Tyres	Recovered tyres order	Special waste
Activities at offices and crib rooms	Putrescibles	N/A	General solid waste (putrescible)
	Paper, cardboard, plastics, glass and printer cartridges	N/A	General solid waste (non-putrescible)
Clearing and grubbing of vegetation, landscaped and/or turfed areas	Green waste, and potentially sharps (i.e. used syringes etc.)	Compost order, and mulch order	General solid waste (non-putrescible), and special waste (i.e. clinical and related waste)

The types and quantities of construction waste generated by the Project would vary throughout construction. The quantities and classifications of all waste streams would be confirmed following finalisation of the detailed design.

With respect to waste generation, the estimated spoil/waste volumes that may be generated by the Project are shown in **Table 21-3**.

Table 21-3 Estimated spoil and waste volumes

Component	Spoil/waste volumes (approximate)
Site establishment and enabling works	200 tonnes (Gibbons Street Reserve)
Utility and overhead wiring relocations/ adjustments	150 tonnes
Main construction works	250 tonnes from demolition and 1920 tonnes from piling and foundations (including 125-127 Little Eveleigh Street) 1,200 tonnes (Marian Street entrance) 320 tonnes (drainage works)
Little Eveleigh Street and Ivy Street works	2,500 tonnes
Marian Street roadworks	550 tonnes
Estimated total spoil/waste volume	7,090 tonnes

Waste management

The waste types discussed in **Table 21-2** above are listed in **Table 21-4** below alongside the likely waste management approaches. All waste generated would be regularly removed from site as required by licensed contractors, in order to avoid potential issues associated with odour generation, decreased visual amenity and creating environments that attract animals/pest species (e.g. rats and mice).

Table 21-4 Construction waste management

Waste type	Management
Spoil	<p>Spoil comprising virgin excavated natural material (uncontaminated soil and crushed rock) would be managed in accordance with the waste management hierarchy (described in Section 21.2). As a worst case, all spoil generated would be disposed of at a licensed waste facility (e.g. landfill). However, where possible, spoil would be reused onsite as part of the Project (as backfill, etc.), or reused on other project site/s or at a re-purposing facility, including in accordance with NSW EPA Resource Recovery Order/s that may apply (where feasible).</p> <p>The suitability of spoil to be reused onsite (or on alternate project site/s or at a re-purposing facility) would be confirmed during detailed design (e.g. through further contamination investigations and identification of other viable sites). Note that spoil may be stockpiled onsite (e.g. within the ancillary facility areas) prior to reuse or disposal.</p>
Contaminated soil and contaminated fill	<p>In situ testing of soils in areas of potential contamination concern would be undertaken to determine the appropriate waste classification. Contaminated materials would be sampled and tested before being either being appropriately contained and disposed of at a suitably licenced offsite location or managed in situ where there is no unacceptable risk to human health or ecological values.</p>

Waste type	Management
Demolition waste (concrete, asphalt, bricks tiles, timber, metals, plasterboard, carpets, electrical and plumbing fittings and furnishing) including Hazardous waste Restricted waste or General solid waste (non-putrescible)	<p>Demolition waste would be managed in accordance with the waste management hierarchy outlined in Section 21.2. Where feasible, materials would be re-used under a NSW EPA Resource Recovery Order.</p> <p>Otherwise construction and demolition waste would be segregated and sorted at a Materials Processing Facility or Materials Recycling Facility.</p> <p>Electrical waste would be stored for collection by an authorised contractor for recycling offsite, where feasible, or disposal at an appropriately licenced facility.</p> <p>All demolition waste would be classified in accordance with the Waste Classification Guidelines (NSW EPA, 2014a) and where it cannot be re-used, directed to a waste management facility that is lawfully permitted to accept that type of waste.</p>
Asbestos (Special waste)	<p>The disturbance, movement, storage, handling, and transport of asbestos containing materials must be conducted by a NSW EPA licenced contractor and the materials must be disposed of at an appropriately licenced facility. These activities would be conducted in accordance with the <i>Work Health and Safety Act 2011</i> and supporting <i>Work Health and Safety Regulations 2014</i>, and relevant SafeWork NSW and SafeWork Australia guidelines/codes of practice.</p>
Liquid waste	<p>Wastewater, sewage, and grey water would be disposed to sewer (where lawfully permitted), or otherwise transported to an appropriately licenced liquid waste treatment facility.</p>
Adhesives, lubricants, waste fuels and oils, engine coolant, tyres, gas cylinders/bottles and other gas items (cartridges)	<p>Waste from construction vehicle and plant maintenance activities would be collected and stored in designated waste storage areas for collection by an authorised contractor for offsite disposal. Where feasible, containers holding oil, grease, and lubricants would be washed prior to disposal, or stored separately for disposal as hazardous waste.</p> <p>Waste oil and oil filters would be stored in recycling bins and collected by an authorised contractor, and recycled offsite, where feasible.</p> <p>Tyres would be re-used under the Recovered Tyres Resource Recovery Order where feasible or otherwise collected by an authorised contractor for recycling or disposal offsite at an appropriately licenced facility.</p> <p>Gas cylinders/bottles and other gas items would be separated from other waste streams and removed from site to a facility authorised to receive empty gas cylinders/bottles and other items.</p>
Office waste including kitchen waste, paper, cardboard, plastics, glass	<p>Recyclable materials such as paper, cardboard, plastics, glass, ferrous, and non-ferrous containers would be stored at recycling bins for collection by an authorised contractor and recycled offsite.</p> <p>Where recycling is not feasible, waste would be collected and stored in designated waste storage areas for collection by an authorised contractor for offsite disposal at a licenced waste facility.</p>

Waste type	Management
Green waste	As far as practicable, green waste would be chipped, mulched and reused for vegetation management (including in accordance with a NSW EPA Resource Recovery Order where feasible), or collected by an authorised contractor and recycled offsite. Noxious weeds would be disposed of in accordance with relevant guidelines/requirements.
General solid waste (putrescible)	General waste would be collected on-site in designated waste collection bins. No recyclable or contaminated materials would be placed in these bins. A waste contractor would pick up the bin(s) and take them off-site as required to a licensed landfill for disposal.

21.4.2 Operation

Waste generation

The main types of activities with the potential to generate waste during operation are listed in **Table 21-5**, together with the likely waste materials and classifications.

Table 21-5 Indicative types of waste generated during operation

Activity	Waste streams that may be produced	Likely classification of waste stream
Disposal of general rubbish in Station bins	General non-recyclable and putrescible waste (such as food waste from Station rubbish bins)	General solid waste (putrescible)
	Recyclable wastes such as plastics and aluminium cans, glass, office waste including paper and plastics	General solid waste (non-putrescible)
Disposal of sharps bins at the Station	Sharps such as needles or other sharp items	Special waste
Infrastructure maintenance	Cable and conduit off-cuts from maintenance of electrical infrastructure	General solid waste (non-putrescible)
	Solvents, paints, adhesives, cleaning fluids, greases, acids and alkali materials, and spent spill kit absorbent materials used to clean up accidental spills during maintenance	Hazardous waste and/or special waste
	Waste oil from transformers	Hazardous waste
	Used light bulbs/LED tubes and used light fixtures	Hazardous waste
	Bioretention basin sediment/sludge	General solid waste (non-putrescible)
Use of Station customer facilities (such as toilets)	Sewage and grey water	Liquid waste

The volumes of wastes generated during operation would be managed alongside the existing waste streams from Redfern Station. Wastes would be managed by the implementation of standard waste management strategies (provided in **Table 21-6**).

Waste management

Waste handling and management approaches are provided in **Table 21-6**, based on the waste management hierarchy for the identified types of waste likely to be produced during operation.

Waste would be managed in line with the existing Sydney Trains maintenance protocols as outlined in **Table 21-6**.

Table 21-6 Management of operational waste

Waste type	Management
General rubbish and Station waste such as food waste, paper, cardboard, plastics, glass	Bins would be provided for collection by an authorised contractor for off-site recycling or disposal at a licenced waste facility.
Sharps waste	Bins would be provided for collection by an authorised contractor for off-site disposal at a licensed waste facility.
Adhesives, lubricants, waste fuels and oils, engine coolant, tyres	<p>Waste from maintenance activities would be collected and stored in designated waste storage areas, for collection by an authorised contractor for off-site disposal.</p> <p>Where feasible, containers holding oil, grease, and lubricants would be washed prior to disposal or stored separately for disposal as hazardous waste.</p> <p>Waste oil and oil filters would be stored in recycling bins, collected by an authorised contractor, and recycled offsite, where feasible.</p>
Liquid waste	Wastewater, sewage and grey water would be disposed to sewer or transported to an appropriately licenced liquid waste treatment facility.
Other general solid waste	Note that as noted in Chapter 18 , detention basins or bio-retention basins may be incorporated into the Project during detailed design (for water treatment). These may require periodic cleaning resulting in waste material requiring disposal.

21.4.3 Recycling and disposal locations

There are a number of options for recycling and disposal of construction and operation waste generated by the Project. Waste facilities in Sydney licensed to accept general solid waste (putrescible) include (but are not limited to):

- Clyde Transfer Terminal
- Eastern Creek Resource Recovery Park
- Kemps Creek Advanced Resource Recovery Park
- Lucas Heights Resource Recovery Park
- a number of waste transfer stations.

A larger number of licenced facilities in Sydney accept general solid (non-putrescible) waste and vegetation/green waste.

A number of waste facilities in Sydney are licenced to accept asbestos, including:

- Elizabeth Drive Landfill, Kemps Creek
- Eastern Creek Resource Recovery Park
- Genesis Xero Waste – Landfill and Recycling
- Horsley Park Waste Management Facility
- Jacks Gully Waste and Recycling Centre
- Kimbriki Recycling and Waste Disposal Centre
- Lucas Heights Resource Recovery Park
- Wetherill Park Resource Recovery Facility.

Recyclables such as containers (plastics, glass, cans, etc), paper and cardboard would be collected by an authorised contractor for off-site recycling. There are a number of materials recovery facilities in Sydney. The recycling facility would be determined by the contractor engaged to collect the material.

Specific facilities and collection contractors would be selected during the later stages of the Project and documented in the CEMP.

21.5 Management and mitigation

21.5.1 Overview

A CEMF (**Appendix D** of this EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

A Waste Management Sub-Plan would be developed for the Project as identified by Section 6.9 of the CEMF.

The performance outcomes for waste management as well as mitigation measures to be included in the Waste Management Sub-Plan are detailed below.

21.5.2 Performance outcomes

The performance outcomes for the Project in relation to waste are as follows:

- waste from construction and operation of the Project is classified in accordance with the Waste Classification Guidelines (NSW EPA, 2014a)
- waste types once classified are reviewed against appropriate guidelines to manage waste appropriately
- at least 80 percent (by volume) of non-contaminated spoil excavated during construction would be diverted from landfill, either by re-using suitable material on site or identifying other sites/re-purposing facilities where suitable material may be re-used
- contaminated and asbestos contaminated wastes are safely disposed of in accordance with their relevant waste classification.

The Project would be designed, constructed and operated to achieve these performance outcomes.

21.5.3 Mitigation measures

The mitigation measures that would be implemented to manage waste are listed in **Table 21-7**. Note that mitigation measures related to contamination and hazardous materials are contained in **Chapter 17** and **Chapter 20** of this EIS respectively.

Table 21-7 Mitigation measures

ID	Mitigation measure	Applicable location(s)
Construction		
WM1	<p>A Waste Management Sub-Plan would be prepared as part of the CEMP. The Sub-Plan would:</p> <ul style="list-style-type: none"> • identify requirements consistent with the waste and resource management hierarchy and cleaner production initiatives • include relevant measures from the <i>National Waste Policy: Less Waste, More Resources</i> (Department of Agriculture, Water and the Environment, 2018) • ensure resource efficiency is delivered through the design and construction practices • provide consistent clear direction on waste and resource handling, storage, stockpiling, use and reuse management measures 	Project area

ID	Mitigation measure	Applicable location(s)
Construction		
	<ul style="list-style-type: none"> • outline procedures for stockpiling of wastes (refer to mitigation measure WM2) • set out processes for disposal, including on-site transfer, management and the necessary associated approvals/permits. All waste generated would be regularly removed from site as required by licensed contractors, in order to avoid potential issues associated with odour, visual amenity and attracting animals/pest species • outline that waste generated within the Project area would be segregated at source and suitably stored in designated waste management areas within the Project area • include material tracking measures to track waste and recyclables generated from the Project and removed from the Project area. Material tracking records would include types, volumes and management measures for waste and resources arising from/used for the Project • outline an unexpected finds protocol to manage the potential for unexpected finds during construction of the Project (i.e. asbestos or other hazardous materials) • include a process for auditing, monitoring and reporting. 	
WM2	<p>Stockpiled wastes would be:</p> <ul style="list-style-type: none"> • appropriately segregated to avoid mixing and contamination • appropriately labelled • appropriately stored to minimise risk of erosion • less than three metres in height with an appropriate height to length batter ratio (e.g. 1:3) • located as far away as practical from sensitive receivers, ecological areas and watercourses. 	Project area
WM3	<p>Where a NSW EPA Resource Recovery Order exists for a specific waste material the opportunity to re-use the waste under that order should be considered prior to disposal. Current orders (and exemptions) are found on the NSW EPA website:</p> <p>https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/resource-recovery-framework/current-orders-and-exemption</p> <p>The current orders should be periodically reviewed during construction for applicability.</p>	Project area
WM4	<p>All waste would be assessed, classified, managed and disposed of (where they cannot be re-used) in accordance with the <i>Waste Classification Guidelines</i> (NSW EPA, 2014a).</p>	Project area
WM5	<p>Waste segregation bins would be located at various locations within the Project area, if space permits, to facilitate segregation and prevent cross contamination.</p>	Project area

Provided recommended mitigation measures are implemented, residual environmental impacts as a result of waste and resource use from construction of the Project are unlikely, except for any contributions of waste from the Project to offsite landfill. Operation of the Project would also contribute minor ongoing waste streams, which would be dealt with at offsite licensed waste facilities, including landfill in some cases, in line with existing Sydney Trains maintenance protocols.

22 Sustainability and climate change

This chapter describes and presents the approach to sustainability and climate change on the Project and how specific objectives, initiatives and considerations are being incorporated into the Project development.

22.1 Introduction

Sustainability is considered a key issue in the SEARS, whereas climate change is listed under 'Other issues' and refers to the Scoping Report (TfNSW, 2019d) for the Project. The climate change risk assessment and response to sustainability in this chapter will serve both to address the SEARs as well as consider the requirements outlined in the Infrastructure Sustainability Council of Australia (ISCA) Infrastructure Sustainability (IS) Rating Tool.

Table 22-1 sets out the relevant SEARs and Scoping Report requirements relevant to sustainability and climate change and identifies where these requirements have been addressed within this chapter.

Table 22-1 SEARs

SEARs	Where addressed in the EIS
Sustainability	
The Proponent must assess the sustainability of the project in accordance with the Infrastructure Sustainability Council of Australia (ISCA) Infrastructure Sustainability Rating Tool, or equivalent, and recommend an appropriate target rating for the project.	TfNSW has made a commitment to pursue a formal IS Rating level of Excellent under Version 1.2 of the IS Rating Tool. This is discussed further in Section 22.2.4
The Proponent must assess the project against the current guidelines including targets and strategies to improve Government efficiency in use of water, energy and transport.	Section 22.2.2
Other Issues	
<i>(Address) the following issues in accordance with the commitments made in Chapter 9 of the Scoping Report:</i> <i>(g) climate change</i> The Scoping Report (TfNSW, 2019) makes the following commitments: A sustainability assessment will be included in the EIS which would address the following:	-
<ul style="list-style-type: none"> an assessment of the Project against the current guidelines including targets and strategies that address sustainability themes e.g. water, energy and transport 	Section 22.2.2
<ul style="list-style-type: none"> an assessment of potential impacts of climate change on the Project, taking into account the climate change scenarios already considered within the design 	Section 22.3
<ul style="list-style-type: none"> a high level assessment of sustainability risks and opportunities for improved sustainability outcomes during design, construction and operation 	Section 22.2.3
<ul style="list-style-type: none"> consideration of how the Project would demonstrate a best practice level of performance using ISCA IS Rating Tool Version 1.2 during design, construction and operation. 	Section 22.2.4

22.2 Sustainability

22.2.1 Overview

Sustainability for the Project would be guided by a Sustainability Management Plan (SMP), which would address sustainability initiatives for the Project and consider a range of frameworks, goals, objectives and principles. The SMP would weave the principles of ecologically sustainable development (ESD) and other core drivers with TfNSW to help support government policies and legislation. The SMP would provide a detailed description of sustainability risks and opportunities for improved sustainability outcomes during design, construction and operation.

The following sections address the requirements of the SEARS including an assessment of the Project against current sustainability guidelines and the ISCA Rating Tool.

22.2.2 Assessment against current sustainability guidelines

An assessment of the Project against current guidelines including targets and strategies to improve Government efficiency in use of water, energy and transport, is provided below including:

- The NSW Government sustainability commitments
- United Nations Sustainable Development Goals
- ISCA – Infrastructure Sustainability (IS) Rating Tool
- TfNSW sustainability commitments, policies, frameworks and guidelines
- Ecologically sustainable development.

NSW Government sustainability commitments

At the state level, there are a range of policies and legislative mechanisms to improve the sustainability and resilience of government including providing for energy efficiency and resource use. The sustainability initiatives and targets developed for this Project as described in **Section 22.2.3** would serve to support a number of key policies including:

- the NSW *Climate Change Policy Framework* – which aims to set out the NSW Government's role in reducing carbon emissions and addressing the risks posed by climate change. Aspirational objectives of this Framework are to achieve net-zero emissions by 2050 and to help NSW become more resilient to a changing climate
- the NSW Government's *Government Resource Efficiency Policy* (GREP) – which aims to reduce operating costs and increase the efficiency of the resources used across government. The Policy addresses key challenges including rising costs of energy, water usage, improving air quality and waste management and driving resource-efficient technology and services through purchasing power
- the *NSW State Infrastructure Strategy 2018-2038* – which sets out the NSW Government's priorities for sustainable growth over the next 20-years including a commitment to improve infrastructure resilience to shocks and stressors including natural hazards such as floods, bushfires, and storms.

United Nations Sustainable Development Goals

At the outset of the Project, a sustainability visioning workshop was held in early 2019 to brainstorm key sustainability strategies and initiatives that could be implemented on the Project to help compliance with ISCA and NSW Government targets. Using the United Nations Sustainable Development Goals (SDG) as a framework, outcomes and strategies were discussed during this workshop which would in turn inform the development of the Project specific SMP. In particular, the SMP would include measures aimed at addressing certain key SDGs such as:

- SDG 4: Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- SDG 7: Affordable and Clean Energy – Ensure access to affordable, reliable, sustainable energy for all

- SDG 8: Decent Work and Economic Growth – Promote sustained, inclusive and sustainable economic growth, full of productive employment and decent work for all
- SDG 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation
- SDG 11: Sustainable Cities and Communities – Make cities and human settlements inclusive, safe, resilient and sustainable
- SDG 12: Responsible Consumption and Production – Ensure sustainable consumption and production patterns
- SDG 13: Climate Action – Take urgent action to combat climate change and its impacts
- SDG 17: Partnerships – Strengthen the means of implementation and revitalise the global partnership for sustainable development.

As TfNSW have committed to adhering to the UN SDGs, incorporating these key measures will further demonstrate this commitment and result in the Project achieving improved sustainability outcomes for the community.

ISCA – Infrastructure Sustainability (IS) Rating Tool

The IS Rating Tool Version 1.2 seeks to embed sustainability into the design, delivery and operations of infrastructure projects. The IS Rating Tool has been designed to help infrastructure meet its full sustainability potential across all project stages, and ISCA offers ratings across the full life cycle of an infrastructure asset.

TfNSW has made a commitment to pursue a formal IS Design and As-Built Rating level of Excellent under Version 1.2 of the IS Rating Tool. This level requires between 50 and 74 verified points to be achieved from a possible 100. The IS Rating Tool awards points towards the overall score against fifteen categories grouped into six themes. This is discussed further in **Section 22.2.4**. Note that at this stage an ISCA IS Operations rating is not currently being pursued for the Project. An Operations rating is based on 12 months of infrastructure operation and can often be sought after the design and as-built ratings, as the final design of the project can influence the operational rating.

TfNSW sustainability commitments and guideline

TfNSW Environment and Sustainability Policy

The TfNSW *Environment and Sustainability Policy* (TfNSW, 2015d) (refer to **Appendix D**) guides projects and services to be delivered in a manner that balances the economic, social and environmental issues to provide a sustainable transport system for NSW. Key objectives from the policy that apply to the Project include:

- minimise impacts on the environment, whether through transport operations, infrastructure delivery, maintenance or corporate activities
- procure, deliver and promote sustainable transport options that promote value for money
- comply with relevant legislations
- develop, expand and manage the transport network in a sustainable and climate change resilient way.

Through the delivery of both the EIS and a formal IS Rating, the Project would address and support the objectives outlined in this policy.

TfNSW Sustainable Design Guidelines

The TfNSW *Sustainability Design Guidelines* version 4 (TfNSW SDGs) (TfNSW, 2017c) seek to deliver sustainable development practices by embedding sustainability initiatives into the planning, design, construction, operations and maintenance of transport infrastructure projects. The guidelines cover a range of sustainability initiatives and include the following key aims:

- minimising impacts on the environment, whether through transport operations, infrastructure delivery or maintenance

- procuring, delivering and promoting sustainable transport options that achieve value for money and reduced lifecycle costs
- developing, expanding and managing the transport network to be sustainable and climate resilient.

The Project is seeking an ISCA rating under the IS Rating Tool, which is a widely recognised national benchmark, and designed to achieve a similar aim to the TfNSW SDGs of embedding sustainability into projects and assisting projects to reach their full potential in terms of sustainability. As the Project is seeking a rating under ISCA, a rating under the TfNSW SDGs has not been obtained.

Redfern Station Upgrade Project Sustainability Policy

As part of meeting the requirements of achieving an Excellent rating under the ISCA IS Rating Tool, a project-specific Sustainability Policy (Novo Rail, 2019b) has been prepared in conjunction with the SMP. Policy initiatives have been identified across six key categories. These are summarised in **Table 22-2**. Note that the initiatives described below are subject to change during finalisation of the Sustainability Policy. The SMP outlines the roles and responsibilities for how the potential initiatives would be addressed and delivered.

Table 22-2 Sustainability Policy categories and potential initiatives

Category	Potential initiative
Leadership	<ul style="list-style-type: none"> • visible leadership and drive from all Project personnel involved in the delivery of the asset – we all have a valuable role to play • strive and implement sustainability goals through shared values and beliefs • deliver social outcomes through workforce planning measures in assisting people experiencing barriers or discrimination in the workforce • dedicated resourcing in Project personnel, equipment, innovative technologies and applications in realising sustainability outcomes.
Compliance	<ul style="list-style-type: none"> • compliance with the requirements of the contractor's agreement with TfNSW, relevant legislation, codes and standards, as applicable to the Project • implementation of robust risk management tools in embracing beneficial sustainability opportunities and proactively mitigating risk in avoiding and minimising pollutants to our local environment, conservation of heritage and the protection and preservation of local biodiversity • implementation of local Project systems in managing local sustainability opportunities and issues in accordance with the Environmental Management System relating to the Project • implementation of the Project's SMP in alignment with the Redfern Station Upgrade Project Sustainability Strategy.
Sustainability performance and reporting	<ul style="list-style-type: none"> • facilitate and implement sustainability targets under the Project's CEMP and SMP • consistent delivery of works that meets or exceeds defined 'Key Result Areas' for the Project • measure and contribute to NSW carbon emission targets through reducing construction and operation energy use and material use • establishment of open and transparent systems in the proactive reporting of sustainability outcomes including resource savings – material, carbon and water and applicable near-misses and hazards • embedding of sustainability requirements and innovations through all stages of the Project's asset cycle.
Stakeholder engagement, knowledge sharing and transparency	<ul style="list-style-type: none"> • fostering a knowledge sharing culture through collaboration and engagement of relevant stakeholders • engaging with all our internal and external stakeholders including communicating this Policy to all those working within the Project or affected by the Project.

Category	Potential initiative
Internalisation of project supply chain	<ul style="list-style-type: none"> early internalisation of environmental and social procurement requirements and Project expectations through the supply chain sustainability training realising sustainability knowledge transfer beyond construction contractor ongoing collaboration within the supply chain in realising sustainability performance outcomes.
Innovative and learning culture	<ul style="list-style-type: none"> train our Project team, including suppliers, in sound environmental practice, sustainability requirements and good practice in social procurement fostering a working environment that encourages and promotes innovation within the sustainability sphere and throughout the Project implementing a process for achieving continual improvement including the use of lessons learned identifying good practice and sharing this within the Alliance Normal Operating Procedures and TfNSW.

Ecologically sustainable development

Ecologically sustainable development (ESD) refers to 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future can be increased' (Commonwealth of Australia, 1992). Four principles have been identified to assist in achieving ESD which are defined in the *Environmental Planning and Assessment Regulation 2000* (NSW) (Part 3 of Schedule 2) and in the *Protection of the Environment Administration Act 1991*(NSW), these are provided in **Table 22-3**.

Table 22-3 Ecologically sustainable development principles and climate response

ESD Principle	Response
The precautionary principle – where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for not implementing mitigation measures or strategies to avoid potential impacts.	Uncertainty around future changes to the climate have been addressed through the review and selection of future climate scenarios. Mitigation measures and strategies (adaptation actions) to respond to climate change (e.g. increased design temperature ratings) have not been avoided as a result of the existing uncertainty around future changes, but rather provided in response to these changes.
Inter-generational equity – the present generation should ensure that the health, diversity and productivity of the environment are equal to or better for the future generations.	By considering future changes in climate within the design, the Project would provide a climate-responsive station for future generations. Furthermore, facilitating access for a broader range of customers (e.g. those with mobility challenges) would encourage non-private vehicle modes of transport – further reducing carbon emissions.
Conservation of biological diversity and ecological integrity – ecosystems, species and genetic diversity within species should be maintained.	The selection of plant species for landscaping has included provision for future changes in the climate (e.g. drought-tolerant). This consideration would help maintain the existing biological diversity and ecological integrity for the areas surrounding the Project into the future.
Improved valuation and pricing of environmental resources – economic values for services provided by the natural environment should be determined, such as the atmosphere's ability to receive gaseous emissions; cultural values; and visual amenity.	Sustainability is considered as part of the full project lifecycle and includes the impacts of the use of materials and resources. Appropriate pricing and economic value of these materials includes reducing demand on fossil fuels and greenhouse gas emissions.

ESD Principle	Response
	The Project is committed to implementing the energy hierarchy principals which include avoidance of energy use, increases in energy efficiency, investigations into the use of renewable energy generation, lower emissions energy sources and offsets, where appropriate.

An assessment of the Project against the principles of ESD for other environmental matters is provided in Section 25.8.5 of **Chapter 25** of this EIS.

22.2.3 Assessment of sustainability risks and opportunities

Table 22-4 provides a summary of sustainability risks and opportunities which would be developed as part the Project SMP to deliver improved sustainability outcomes during the design, construction and operation of the Project. These opportunities have been developed in alignment with the sustainability guidelines and ISCA IS target for the Project as well as in response to the identified sustainability risks.

Table 22-4 Assessment of sustainability risks and opportunities – summary of sustainability initiatives

Category	Sustainability risks	Sustainability initiatives for the Project
Management systems	<ul style="list-style-type: none"> adequate management plans/systems are not in place to manage sustainability appropriately, resulting in poor sustainability outcomes. 	<ul style="list-style-type: none"> an SMP would be developed for the Project, which would identify measures such as knowledge sharing opportunities.
Procurement and purchasing	<ul style="list-style-type: none"> the Project uses non-sustainable materials and products, or misses opportunities to deal with suppliers that have sustainability objectives as part of their business plan. 	<ul style="list-style-type: none"> the Project would integrate sustainability into procurement and purchasing practices such as sustainability supply chain training and identification of sustainability objectives with suppliers.
Climate change adaptation	<ul style="list-style-type: none"> the Project is susceptible to climate change risks such as higher temperatures and increased extreme rainfall events. 	<ul style="list-style-type: none"> development and implementation of climate change adaptation measures (refer also Section 22.3.6).
Energy and carbon	<ul style="list-style-type: none"> the Project results in excess emissions being released that could have been avoided. 	<ul style="list-style-type: none"> the SMP would identify energy and carbon reduction targets for the Project.
Water	<ul style="list-style-type: none"> the Project uses more water than is required. 	<ul style="list-style-type: none"> use of non-potable water would be maximised during construction. The SMP would identify water reduction targets for the Project
Materials	<ul style="list-style-type: none"> the whole life cycle of materials is not considered in the Project, resulting in unsustainable material/product choices. 	<ul style="list-style-type: none"> 'whole of life' costing methodologies would inform selection of materials during design and construction of the Project. The SMP would identify material lifecycle impact reduction targets for the Project. Material reuse would be maximised.

Category	Sustainability risks	Sustainability initiatives for the Project
Discharges to air, land and water	<ul style="list-style-type: none"> the Project results in environmental impacts (e.g. to air, land and water) that could have been avoided. 	<ul style="list-style-type: none"> the SMP would identify targets to reduce air, land and water impacts for the Project.
Waste	<ul style="list-style-type: none"> the Project produces waste that could have been avoided. 	<ul style="list-style-type: none"> the SMP would identify waste reduction targets for the Project. Soil reuse would be undertaken.
Ecology	<ul style="list-style-type: none"> the Project results in impacts to ecological values associated with the site that could have been avoided. 	<ul style="list-style-type: none"> the ecological value of the Project site has been assessed (refer Chapter 16). Landscaping would consider ecological value and habitat connectivity (note that landscaping is considered in Chapter 8, Chapter 9 and Chapter 16)
Community, health, wellbeing and safety	<ul style="list-style-type: none"> the Project is detrimental to community welfare. 	<ul style="list-style-type: none"> the SMP would identify measures to support community health, wellbeing and safety throughout the Project, such as information provided at community events, supporting local enterprise and integration of shading.
Heritage	<ul style="list-style-type: none"> opportunities to conserve or facilitate appreciation of heritage values are not released, or heritage values are otherwise diminished (for both Aboriginal and non-Aboriginal heritage). 	<ul style="list-style-type: none"> the Project would integrate celebration of Aboriginal and European heritage through appropriate design measures (note that Aboriginal heritage and non-Aboriginal heritage are assessed in Chapter 15 and Chapter 14 respectively, and that heritage installations are proposed as a part of the Project as described in Chapter 5).
Stakeholder participation	<ul style="list-style-type: none"> Project stakeholders aren't adequately identified or engaged with. 	<ul style="list-style-type: none"> the Project would engage with community members during design, including the use of innovative visual aids (note that stakeholder and community engagement for the Project is described in Chapter 6).

22.2.4 Infrastructure Sustainability Council of Australia Infrastructure Sustainability Rating Tool

In support of TfNSW's commitment to pursue an IS Design and As-Built Rating level of Excellent under Version 1.2 of the ISCA IS Rating Tool, **Table 22-5** describes the Project alignment to the ISCA IS Rating Tool credit categories. The objectives, targets and initiatives align with credit requirements under ISCA IS v1.2 and aim to balance economic, environment and social issues.

These initiatives and targets would be further refined as part of the design process and committed to in an SMP and included in the contract documents for all detailed design, construction and operations contracts.

Table 22-5 notes where further detail/evidence of how these targets would be integrated into the Project have been addressed in the EIS.

Table 22-5 ISCA credits and potential indicators/targets

Credit category	Indicators/targets	Where addressed in the EIS
Climate Change (Cli-1 and Cli-2)	<ul style="list-style-type: none"> identification of key risks and adaptation measures from completed Climate Risk Assessment. 	<p>Chapter 22 (this chapter) - describes climate risks and adaptation measures.</p> <p>Section 8.4.2 identifies measures developed based on the NSW Government's '<i>Better Placed</i>' guidelines and TfNSW's policy document '<i>Around the Tracks – urban design for heavy and light rail</i>' which consider climate risks.</p>
Water Use (Wat-1, Wat-2)	<ul style="list-style-type: none"> applications for rainwater harvesting are identified water balance study is undertaken with demonstrated reduction in water usage during construction and operation identification of potable water replacements. 	Rainwater would be harvested for use in toilets, for cleaning and for irrigation as discussed in Section 8.4.2 .
Water Quality (Dis-1)	<ul style="list-style-type: none"> identification of water environmental values management measures. 	<p>Section 18.3 discusses the water quality in the Project area and applicable catchment areas.</p> <p>Section 18.5.3 describes performance outcomes and mitigation during construction and operation.</p>
Noise (Dis-2)	<ul style="list-style-type: none"> identification of baselines management measures. 	<p>Section 13.3 identifies sensitive receivers surrounding the Project area and existing background noise levels.</p> <p>Section 13.5.3 defines measures to mitigate noise and vibration during design, construction and operation.</p>
Vibration (Dis-3)	<ul style="list-style-type: none"> identification of baselines/limits management measures consideration of human comfort and use of British Standard <i>BS7385 Evaluation and Measurement of Vibration in Buildings</i>, and German Standard <i>DIN4150 Vibration in Buildings - Effects on Structures</i>. 	<p>Section 13.3 identifies sensitive receivers surrounding the Project area.</p> <p>Section 13.5.3 defines measures to mitigate noise and vibration during design, construction and operation.</p> <p>Section 13.2.4 considers human comfort against BS7385, and vibration against DIN4150.</p>
Air Quality (Dis-4)	<ul style="list-style-type: none"> identification of baselines setting of goals and limits (e.g. PM₁₀) management measures 	<p>Section 19.3 outlines the existing air quality.</p> <p>Section 19.5 identifies performance outcomes and defines measures to mitigate air quality during construction.</p>

Credit category	Indicators/targets	Where addressed in the EIS
Light Pollution (Dis-5)	<ul style="list-style-type: none"> identification of light spill prevention measures management measures. 	<p>Appendix C of the EIS describes how light spill has been considered during the design process.</p> <p>Section 9.5 describes performance outcomes and mitigation in relation to light spill during construction and operation.</p>
Conservation of On-site Resources (Lan-2)	<ul style="list-style-type: none"> topsoil to remain productive through management in design and a Soil Management Plan. 	<p>Section 17.5 and Appendix D describe soil management and desired performance outcomes for the Project, including erosion measures.</p>
Contamination and Remediation (Lan-3)	<ul style="list-style-type: none"> site assessment follows the <i>National Environment Protection (Assessment of Site Contamination) Measure, Schedule A: 'Recommended general process for assessment of site contamination'</i> remediation options are identified and selected using a sustainability hierarchy. 	<p>Section 17.2 outlines the assessment methodology/guidelines used.</p> <p>Section 17.5 outlines the approach to management of contamination and a commitment to soil re-use where appropriate.</p>
Flooding (Lan-4)	<ul style="list-style-type: none"> flood risk is assessed and measures to mitigate flooding to up and downstream environment during construction and operation are defined flooding is not worsened as a result of the Project resilience measures are included (in design). 	<p>Section 18.2.1 identifies the key guidelines and policies used in the assessment of flooding impacts.</p> <p>Section 18.3 identifies the regional and local drainage and flooding and applicable catchment areas.</p> <p>Section 18.5.3 describes performance outcomes and mitigation during construction and operation.</p> <p>Section 18.4.2 shows that the operation of the Project would have a negligible impact on regional flooding and is not expected to have an adverse impact on local flood conditions. Climate change impacts on flood behaviour were also considered.</p>
Waste (Was-1)	<ul style="list-style-type: none"> measures to reduce waste during construction and operation are identified prediction of waste quantities and types management measures. 	<p>Section 21.4 includes measures to reduce waste during construction and operation</p> <p>Section 21.4 identifies the waste types likely to be produced during construction and operation, and provides estimated quantities of spoil that would be produced (note that quantities of other waste types would be confirmed during detailed design)</p> <p>Section 21.5 describes performance outcomes and mitigation in relation to waste reduction during construction and operation.</p>

Credit category	Indicators/targets	Where addressed in the EIS
Ecology (Eco-1 and Eco-2)	<ul style="list-style-type: none"> assessment of ecological values and habitat connectivity. 	<p>Section 16.3 identifies the ecological values, including habitat connectivity, present within the locality of the Project.</p> <p>Section 16.5.3 describes performance outcomes and mitigation to prevent ecological impacts during construction and operation.</p>
Heritage (Her-1, Her-2)	<ul style="list-style-type: none"> community heritage values to be identified through consultation and integration into studies measures to minimise impacts to heritage identified community and key stakeholders participate in studies. 	<p>Section 4 and 5 of Technical report – Non-Aboriginal heritage, and Section 6.4 of the EIS describes heritage values identified by the community and stakeholders and how this feedback is being addressed in the Project and the EIS process.</p> <p>Section 14.5 describes mitigation measures to minimise impacts to heritage</p> <p>Chapter 6 describes the community and stakeholder engagement undertaken and proposed for the Project and the EIS process, and how the results of this engagement are being be considered.</p>
Community Health, Wellbeing and Safety (Hea-1, Hea-2)	<ul style="list-style-type: none"> measures to positively contribute to community health and wellbeing for one priority issue has been identified and implemented likelihood of crime has been reduced through implementing appropriate Crime Prevention through Environmental Design guidelines. 	<p>Section 6.4 provides measures incorporated into the design to positively contribute to community health and wellbeing.</p> <p>Section 8.4.2 and Appendix C describes how safety has been improved through the provision of Crime Prevention Through Environmental Design (CPTED) techniques.</p>
Stakeholder Engagement (Sta-1, Sta-2, Sta-3, Sta-4)	<ul style="list-style-type: none"> completion of a Stakeholder Engagement Strategy consultation with and participation from stakeholders community feedback on effectiveness and satisfaction of communication. 	<p>Chapter 6 describes the engagement strategy, lists stakeholders consulted and details the activities undertaken to solicit feedback.</p> <p>Section 6.4 provides the results of consultation including feedback from the community and other stakeholders.</p> <p>Section 6.4.4 describes the specific feedback that has been incorporated into the design as a result of community consultation and engagement.</p>
Urban and Landscape Design (Urb-1, Urb-2)	<ul style="list-style-type: none"> an urban and landscape design plan is developed and implemented (for both construction and ongoing management). 	<p>Chapter 8 and Appendix C describes how the Project would consist of a well-designed built form and how landscaping would be implemented and managed across the Project.</p>

22.3 Climate change and adaptation

22.3.1 Method of assessment

A climate change risk assessment was undertaken for the Project, which follows the approach detailed within the *Climate Risk Assessment Guidelines* version 3.2 (TfNSW, 2019g). This guideline provides the method of assessment which includes:

- review of the Project definition and local climate context
- identification of risks based on reliable climate data sources and projections, addressing the climate change scenarios already considered within the design phase of the Project
- a climate risk analysis and evaluation of the design
- implementation of adaptation actions to mitigate climate risks
- a review process and gap analysis to further address climate risks.

In addition to the TfNSW *Climate Risk Assessment Guidelines*, the climate change risk assessment has been conducted in line with the following relevant standards and guidelines.

- Australian Standard 5334:2013 *Climate change adaptation for settlements and infrastructure- A risk-based approach*
- TfNSW *Climate Risk Pre-Screening Summary Report Template* DMS-FT-412/1.2 (TfNSW, 2019h)
- AS/NZS ISO 31000:2018 *Risk management – Principles and guidelines*.

These additional documents serve to support the requirements outlined within the ISCA Rating Tool v1.2 (ISCA, 2018) climate change risk assessment (Cli-1) and adaptation options (Cli-2) credits. The tool outlines adaptation measures to address climate change vulnerability and can include both structural and non- structural measures. Structural measures include physical changes to the infrastructure to achieve or facilitate adaptation. Non-structural measures include changes to contracts or implementing an emergency management plan. Credits are applied to provide a specific aspect of sustainability performance within the category such as mitigation measures.

22.3.2 Existing climate trends

The *State of the Climate 2018* report prepared by the CSIRO (CSIRO, 2018) provides an overview of past and current climate trends in Australia. Key points from this report include:

- Australia's climate has warmed by just over one degree Celsius since 1910, causing an increase in the frequency of extreme heat events
- oceans around Australia have warmed by around one degree Celsius since 1910, causing longer and more frequent marine heatwaves
- the oceans around Australia are acidifying (pH is decreasing)
- rainfall during April to October has decreased by 11% since the late 1990s
- extreme fire weather and the length of the fire season have both experienced a long-term increase.

Recent events have highlighted the exposure of Sydney to extreme events and provide an insight to the potential severity of these events to key infrastructure, including the Project. A list of events within the past two years around the Project can be found in **Table 22-6**.

Table 22-6 Recent climate events

Event type	Key impacts
2020	
Bushfire	The 2019 bushfires continued to affect Sydney, NSW and many parts of Australia in January and February 2020. 12.6 million hectares were burnt, with 5.4 million hectares burnt in NSW (ABC, 2020). The conditions that caused these bushfires were 30% more likely to occur due to climate change (Time, 2020).
Storms (East Coast low pressure system)	Approximately 134,000 NSW households suffered power outages in early February 2020, with 50,000 experiencing week-long outages (news.com.au, 2020).
2019	
Bushfire	Some of the worst bushfires in Sydney's history including Australia's highest national annual accumulated Forest Fire Danger Index. These events have resulted in an increase of about 35% of asthma and breathing problems compared to a year earlier (Sydney Morning Herald, 2019a).
Elevated temperatures	Temperatures in Sydney were eight degrees above the average maximum for May, and autumn was significantly warmer than the long-term average, by 1.5 degrees Celsius (The Guardian, 2019a).
Severe storm with hail event	Thunderstorms across most of Sydney with reports of hailstones, severe winds and heavy rain, with 40 flights cancelled due to this weather event (Sydney Morning Herald, 2019b).
Severe winds and dust storm	Severe winds caused more than 17,000 homes and businesses in Sydney's North Shore to lose power SBS News, 2019).
Heat wave	Hottest summer on record for Australia, first season to exceed two degrees Celsius above the long-term average. Rainfall was about 30% below average (ABC News, 2019).
Dust storm	Cool change blew clouds of fine particles in Sydney causing a sharp drop in air quality in the month of February. Air quality warnings were issued for south-west and north-west Sydney. The air quality index was listed as very poor (The Guardian, 2019b).
2018	
Heat wave	Heatwave experienced post-Christmas caused NSW Health to issue an air quality warning for Sydney as ozone levels rose with the extreme heat. Temperatures experienced were 10 degrees Celsius above average (ABC News, 2018).
Severe storm	Storm with significant rainfall, 124 domestic flights cancelled, and 46,000 NSW households had their power supply interrupted in a single weather event dated December 14 (Sydney Morning Herald, 2018a).
Flash flooding	Heaviest November rain in 34 years, flash flooding and close to 100 millimetres of rain in two hours. Widespread transport delays including road closures, cancellation of light rail services, flight delays, train cancellations and delays (Sydney Morning Herald, 2018b).
Severe storm	July wild weather event, with destructive winds of up to 145 kilometres per hour across the Sydney region (news.com.au, 2018).
Severe storm	Thunderstorms in Sydney caused the loss of power to thousands of homes after approximately 22,000 lightning strikes hit the city in a single weather event dated January 9 (The Daily Telegraph, 2018).

22.3.3 Climate variables

A range of climate variables relevant to the Project are listed below in **Table 22-7**.

Table 22-7 Primary and secondary effects from climate variables

Primary climate effect ¹	Secondary climate effect ²
Mean surface temperature	Extreme temperature and heatwaves
Average annual rainfall	Bushfire weather
Solar radiation	Flood and flash flood events
Extreme rainfall	Drought
-	Storm events and wind speed
-	Evapotranspiration and humidity

Table notes:

¹ Primary effects: are those climate variables that are directly influenced or changed as a result of global warming or climate change. These include air and sea surface temperature, precipitation, wind and solar radiation.

² Secondary effects: are those variables that are derived from primary effects which are still influenced by a changing climate. These include matters such as increased risk of bush fire weather and drought.

22.3.4 Climate projections

Climate change risks to the Project have been assessed with reference to current climate science and climate change projections for climate variables relevant to the Project. The climate risk assessment undertaken for the Project has used two data sources for climate projections:

- NSW and ACT Regional Climate Modelling (NARClIM) (NSW Office of Environment and Heritage, 2014) which provides projections at the ten-kilometre resolution for regions across NSW and the ACT
 - based on the location of the Project, the Metropolitan Sydney Region snapshot has been used to obtain projections
- CSIRO and BoM Climate Futures (CSIRO and BoM, 2015) – presented through the Climate Futures tool, which supplements the information available from the NARClIM projections for a number of key climate variables
 - based on the location of the Project, the East Coast – South Cluster Report has been used to inform the assessment.

Modelling based on the Intergovernmental Panel on Climate Change's Fifth Assessment Report (AR5) provided for a range of scenarios known as Representative Concentration Pathways (RCPs), which were used to define the different projections. The RCPs describe a possible future greenhouse gas emissions trajectory and subsequent radiative forcing. Radiative forcing is a measure of the energy absorbed and retained in the lower atmosphere. Four RCPs are modelled to cover a range of emission scenarios with and without climate mitigation policies. For example, RCP 8.5 is based on minimal effort to reduce emissions; RCP 2.6 requires strong mitigation efforts, with early participation from all emitters followed by active removal of atmospheric carbon dioxide. RCP 2.6 represents a drastic reduction in greenhouse gas emissions and RCP 8.5 represents minimal efforts to reduce global emissions.

For the purposes of this assessment, RCP 8.5 was used to represent the worst-case scenario, and reflects current trends in observed emissions and climate change. Climate projections for RCP 8.5 relevant for the Project can be found in **Table 22-8**.

Understanding the previous events that have impacted the Project area and surrounding, it is likely that future events will become more intense and more frequent. Identified key future climate trends relevant to the Project are likely to influence the risk profile of the Project and include:

- continued increase in temperatures
- more hot days and heatwaves
- increased intensity of extreme rainfall (and ultimately flash flooding)
- harsher fire-weather climate.

Table 22-8 Climate projections –Metropolitan Sydney Region and East Coast – South Cluster

Climate projections	Baseline	Year 2030 Representative Concentration Pathway 8.5	Year 2070 Representative Concentration Pathway 8.5
Mean maximum daily temperature (°C) ¹	22.5 °C	+1 °C (Range of 0.7 °C to 1.3 °C)	+3.1 °C (Range of 2.7 °C to 3.5 °C)
Mean minimum daily temperature (°C) ¹	13.8°C	+1 °C (Range of 0.7 °C to 1.2 °C)	+2.8 °C (Range of 2.1 °C to 3.4 °C)
Mean number of days above 35°C ¹	3.2 days/year	+4 days	+11 days
Frequency of heatwaves (3 consecutive days over 40°C) ²	2 events/year	+1 to +1.5 additional events per year	+2.5 to +4.5 additional events per year
Drought ³	3 per decade	+2 to +5 additional events per year	+1 to +9 additional events per year
Soil moisture (%) ²	Not available	-4.1% (Range of -9.9% to +2.5%)	-8.7% (Range of -15.4% to +2.4%)
Mean annual rainfall (mm) ²	1,094 mm	-4.5% (Range of -16.1% to +6.5%)	-8.1% (Range of -21% to +11.8%)
Wettest day (24 hour rainfall total) ²	327.6 mm (from 1986)	+17.9% above baseline	+38.1% above baseline
Hail ⁴	89 hail events (between 1990-2007)	No projections available	+6 additional days per year

Notes: Measures are given as an average followed by the predicted range.

¹ CSIRO and BOM – East Coast Cluster Report & Projections

² AdaptNSW – Sydney Snapshot and NARClIM Data Projections

³ CSIRO Marine & Atmospheric Research

⁴ NSW Department of Environment, Climate Change and Water

22.3.5 Time scales

To support a comprehensive risk assessment process, the Project's key assets and components were categorised based on their design life. For the purposes of this assessment, the following design lives have been sourced from the Australian Standards and Asset Standards Authority (ASA) Standards and are being applied to the Project:

- signalling – Design life of 20 years
- control, electrical and mechanical infrastructure and systems (e.g. substations), building fixtures (e.g. glazing, cladding, artwork, signage) and landscaping – Design life of less than 30 years
- overhead wiring – Design life of 30 years
- pavement surfaces, buildings and structures (e.g. stairs and concourse), lift shaft, drainage and platform components (e.g. canopy, retaining structures) – Design life of 50 years.

Due to the variance of these design life projections, the projections for the years 2030 and 2070 were selected as the time series to be used to model the Project's climate risk. These years represent short and long-term scenarios, which capture the design life of most of the assets.

22.3.6 Impact assessment

A preliminary risk assessment in accordance with the TfNSW *Climate Risk Assessment Guidelines* was undertaken and subsequently refined and updated based on feedback provided in workshops held on 21 May 2019, 21 June 2019 and 19 February 2020 with multi-disciplinary groups of key stakeholders and Project team members. Risks were rated according to the TfNSW risk matrix in the *Climate Risk Assessment Guidelines*.

There were 34 climate risks identified as part of the risk assessment process for the Project and each risk was assigned a risk rating of low, medium, high or extreme. Risks were grouped by the following climate variables:

- extreme rainfall – 12 risks
- extreme heat – 11 risks
- drought – 7 risks
- severe storms – 4 risks.

Risks were then assigned a rating of low, medium, high or very high, which each have their own tolerance and acceptability in accordance with the *Climate Risk Assessment Guidelines*. This tolerance and response is detailed in **Table 22-9**.

Table 22-9 Risk tolerance and response

Risk rating		Response	Review frequency
A	Extreme - Generally intolerable	Extreme risks are generally intolerable and should be avoided except in extraordinary circumstances. Where the risk has health, safety or environmental consequences the activity must not be undertaken without the explicit approval of the Secretary for TfNSW. An alternative solution must be found and all necessary steps must be taken to reduce the risk below this level without delay.	Monthly
B	High - Undesirable	High risks are undesirable. They can only be tolerated if it is not reasonably practicable to reduce the risk further. Where the risk has health, safety or environmental consequences the activity must not be undertaken without the explicit approval of the relevant Direct Report to the Secretary for TfNSW who is to verify that all reasonably practicable treatments have been implemented. High risks are considered to be on the verge of being unacceptable and must be given immediate priority.	Monthly
C	Medium - Tolerable	Medium risks are tolerable if it is not reasonably practicable to reduce the risk further. Where a risk has health, safety or environmental consequences the activity should be reviewed to determine if the risk can be reduced further and whether all reasonable and practicable controls have been considered and/or applied. Additional treatment measures should be sought if significant benefit can be demonstrated and/or there is an additional treatment measure which is recognized as good practice in other like environments.	Two-monthly
D	Low - Broadly acceptable	Low risks are broadly acceptable. Where the risk has health, safety or environmental consequences control measures should be effective, reliable and subject to appropriate monitoring. If options for further risk reduction exist and costs are proportionate to the benefits, then implementation of such measures should be considered. The risk and its treatments should be subject to appropriate degrees and forms of monitoring to ensure that it remains at this level.	Quarterly

In summary, the risk assessment identified eight Low and 26 Moderate risks (no High or Extreme risks) for the year 2030 projection, and two Low, 26 Moderate and six High (no Extreme) risks for the year 2070 projection.

Table 22-10 presents the medium risks (excluding low risks) identified for the operational phase of the Project for the year 2030 projection. In accordance with the TfNSW *Climate Risk Assessment Guidelines*, low risks have been excluded as they do not require the same level of consideration as the medium, high and very high risks. In addition, in accordance with both the SEARs and ISCA, **Table 22-10** has detailed a number of current and proposed risk treatments (or adaptation actions) that have been identified to help reduce the exposure, likelihood or consequence of the identified medium risks. These treatments may be subject to change (in consultation with external stakeholders) as the Project progresses through detailed design, however risks would be reassessed should any changes be made to the treatments with consideration to the residual risks.

The full risk register is available including all risk ratings and risk treatments for both the years 2030 and 2070 in the *Climate Risk and Adaptation Report: TAP04 Redfern Station Upgrade* (Novo Rail, 2020).

Table 22-10 Climate change risks to Project operation (2030) prior to mitigation and after mitigation

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
003	High heat days may be exacerbated by the 'urban heat island' effects in rail environments, which predominantly comprise of urban pavement and infrastructure and reduced greenery. Extreme heat, prolonged exposure to direct sunlight and high heat days have the potential to cause heat stress in customers and staff, resulting in risks to health. Heat stress in staff members may further lead to deficient performance and consequently, safety concerns. Extreme heat exacerbates dehydration, particularly in the young and elderly.	C - Tolerable	<p>The design includes roofing structures in as many locations as possible to increase shading including above the concourse and accessways (stairs/lifts).</p> <p>Glazing of façades on structures and the lifts would be treated to reduce radiation impacts. Glazing would be designed with a low emissivity rating.</p> <p>Programming of active mechanical thermostat for ventilation within lifts would be included in design to achieve thermal comfort.</p> <p>Opportunities to include water stations at Little Eveleigh Street and Marian Street have been identified and would be confirmed during design development. The provision of water stations would minimise risk of dehydration amongst passengers and staff.</p>	D – Broadly acceptable
004	Higher temperatures have the potential to elicit heat stress responses from vegetation. This may be expressed as wilting, leaf fall or death of the plant.	C - Tolerable	Irrigation systems would not be used in landscaping, however drought resistant and drought tolerant species would be selected for landscaping where appropriate.	D – Broadly acceptable
005	Higher temperatures have the potential to compromise the integrity of external façades and buildings fixtures including handrails and roofing material leading to quicker deterioration and cracking. This increases maintenance costs for these assets.	C - Tolerable	<p>Perforated aluminium for façade and additional materials selection to be heat resistant.</p> <p>Material specifications and detailed design would account for material movement. Specification of materials would consider environmental conditions.</p> <p>During detailed design, opportunities to include light coloured fixtures and fitting would be explored to reduce wear and tear over time.</p>	C - Tolerable

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
006	Electrical systems at platform level (cabling and wiring, lighting, switchboards, communications, transformers, fire systems) can be affected by increased heat, resulting in failure of installation of the system or degradation of the operation of electronics and reduced running life of equipment.	C - Tolerable	Electrical systems would be protected from external elements, located under canopy shading or in temperature-controlled rooms. Design would be in accordance with applicable Asset Standards Authority standards. Transformers to be installed would be designed for outdoor installation.	D – Broadly acceptable
007	Increasing and extreme temperatures cause reduced reliability and functionality of forced ventilation/cooling systems in the back of house areas, resulting in reduced thermal comfort for staff and failure to adhere to standards on thermal conditions for plant and equipment which could lead to system failures.	C - Tolerable	Mechanical ventilation/cooling would be specified to deal with the predicted extremes within the operational lifespan of the equipment as per applicable Australian Standards. Increased mechanical capacity would accommodate the potential for extreme heat days.	D – Broadly acceptable
008	Increasing and extreme temperatures in ambient environment cause sagging of overhead wiring resulting in speed restrictions and operational delays.	C - Tolerable	Where impacted, overhead wiring would be designed to ASA Standards T HR EL 08011 ST and EP 08 00 00 01 SP or equivalent which accommodates for the future temperature increases.	D – Broadly acceptable
009	Thermal lag from paving and adjacent buildings may cause increased heat at station entrances in semi-enclosed areas (under canopies, lifts and stairways).	C - Tolerable	The design would include passive solar measures including inclusion of lighter coloured materials. Where applicable, the concourse and stairways would be naturally ventilated. Soffit insulation for canopy (to be confirmed, subject to design development).	D – Broadly acceptable
010	High voltage equipment affected by increased ambient temperature, resulting in degradation of performance and reduced operating life of high voltage equipment.	C - Tolerable	Design has considered worst case ambient temperature criteria for high voltage equipment operation according to applicable Australian Standards. The high voltage equipment would be in outdoor pad mounted kiosks designed to Australian Standards.	D – Broadly acceptable

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
011	High voltage cables within cable containment including trenching, cable ladder and enclosed troughing affected by increased ambient temperature, resulting in reduced carrying capacity performance of high voltage cables and reduced operating life.	C - Tolerable	<p>For above ground installations, the high voltage cables have been designed to allow for 1000 Watts per square metre constant sun radiant heat at 40 degrees Celsius ambient temperature.</p> <p>For indoor installations, the high voltage cables are within a shaded environment and have been designed to operate at 40 degrees Celsius ambient temperature.</p> <p>For underground installation, the high voltage cables have been designed to operate at 25 degrees Celsius surrounding soil temperature.</p> <p>Design has considered worst case ambient temperature criteria for high voltage equipment operation according to RailCorp's Engineering Standard <i>EP 00 00 00 13 SP Electrical Power Equipment – Design Ranges of Ambient Conditions</i>.</p> <p>The cable containment system would allow for a minimum of 30% spare capacity which allows for heat dissipation. When the design life for cable has ended, design assessment and upsizing in cables can be undertaken if climate related design criteria is changed.</p>	D – Broadly acceptable

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
012	Extreme rainfall events have the potential to create flows of water which exceed the capacity of drainage and storm water systems which could become stressed and fail. This may result in localised flash flooding and spills to natural waterways.	C - Tolerable	<p>Hydraulic and drainage design would accommodate the additional drainage requirements from new canopy structures and would connect to existing systems.</p> <p>The design would accommodate the 1% Annual Exceedance Probability (AEP) event¹ plus a 10% increase to account for climate change. Hydraulic modelling would be used to influence design control and incorporate water sensitive urban design.</p> <p>An underground rainwater tank would be considered in the design of the Project near the Marian Street entrance adjacent to the services building. The tank would be connected to hydraulics to service the family accessible toilets, hose taps for cleaning the concourse and footbridge surface and any potential landscaping.</p> <p>Design of rainwater tanks would include overflow removal. Rain guards and filters would be included in hydraulic design so that drainage doesn't get clogged during storm events.</p> <p>An Urban Design and Public Domain Plan would be implemented to provide for rainwater harvesting/water storage (e.g. water sensitive urban design) (refer Appendix C of this EIS).</p>	D – Broadly acceptable
015	Hail event containing fine hail and occurring over a long period of time leads to hail clumps forming into larger blocks of ice, resulting in blockage of drainage channels.	C - Tolerable	<p>Gutters would be designed to have overflow allowance and a path of egress to allow water to discharge out.</p> <p>Hail guards would be designed for gutters.</p>	D – Broadly acceptable
016	Hail causes damage to platform canopies, glass lifts, facades and (potential) solar PV installations.	C - Tolerable	<p>Roof materials would be selected to withstand damage and reduce the likelihood of localised damage and corrosion. Glass would be selected of similar quality to withstand damage for safety reasons.</p>	D – Broadly acceptable

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
017	Increased rainfall and extreme events can affect customer egress and entrances to the station interchange and precincts.	C - Tolerable	The proposed drainage infrastructure associated with the station, concourse and station entrances would accommodate the 1% AEP event ¹ including a 10% increase to account for climate change.	D – Broadly acceptable
018	Inadequate drainage during extreme rainfall events has the potential to cause and increase flooding onto nearby streets damaging roads and infrastructure including houses and commercial buildings, impacting businesses.	C - Tolerable	The drainage and hydraulics included in the design would accommodate the 1% AEP event ¹ including a 10% increase to account for climate change.	D – Broadly acceptable
019	Extreme rainfall events have the potential to cause flooding and restricted access or overcrowding on platforms which increases human health and safety risks.	C - Tolerable	The design would incorporate maximum cover where feasible above new infrastructure elements including the concourse and entrance ways including additional canopies.	D – Broadly acceptable
020	Extreme rainfall events have the potential to restrict access to the lifts which impacts disabled customers and those carrying prams.	C - Tolerable	Lift entrances would be located above flooding levels. Canopy would provide shelter between lift entrances and the proposed concourse.	D – Broadly acceptable
023	Extreme rainfall causes water ingress in high voltage cable pit and conduits resulting in high voltage cable operating under water and build-up of water within cable insulation leading to reduced operating life or damage to high voltage cable.	C - Tolerable	High voltage cables selected have Polyvinyl Chloride (PVC) sheath which would provide a level of protection from water ingress into cable pits and conduits. High voltage cable pits have been designed with proper drainage to prevent water from over land flow entering cable ingress into pits. The pit lids and conduit joints have been designed with water sealing function to prevent water ingress. High voltage system has been designed to allow for redundancies in the event of feeder failure.	D – Broadly acceptable
025	Extended drought conditions can damage or kill vegetation species and can make it difficult to establish new plantings.	C - Tolerable	Appropriate native vegetation would be selected for landscaping with consideration to drought tolerant species.	D – Broadly acceptable

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
026	Increased drought conditions have the potential to cause an increase in the severity or occurrence of dust storms which can impact the mechanics in lift systems causing them to shut down and not operate.	C - Tolerable	Maintenance activities would be scheduled following events to clean or minimise ongoing build-up of dust on machine parts including filters.	D – Broadly acceptable
027	Increased drought conditions have the potential to cause an increase in the severity or occurrence of dust storms which can accumulate on canopies requiring increased maintenance.	C - Tolerable	Maintenance and cleaning of canopies would occur following extreme events to minimise impacts from accumulation of dust on canopies.	D – Broadly acceptable
028	Dust from storms can accumulate on the overhead wiring which inhibits insulation and can create live wires. Service shutdowns or delays would be required for maintenance.	C - Tolerable	Where impacted, overhead wiring would be designed to ASA Standards T HR EL 08011 ST and EP 08 00 00 01 SP or applicable which accommodates for the future temperature increases.	D – Broadly acceptable
029	Dust storms, when combined with extreme weather events such as rain or storms can create mud and slurries which result in slipping hazards for pedestrians, customers and staff.	C - Tolerable	Maintenance and cleaning of stairs and surfaces would occur following extreme events to minimise impacts from accumulation of dust and slurries causing slipping. Stair treads would be designed to ASA standards for safety during in extreme events.	D – Broadly acceptable
030	High voltage cables within cable trenching affected by increased soil thermal resistivity resulting in reduction of the current carrying capacity performance of high voltage cables and reduced operating life.	C - Tolerable	For underground installation, the high voltage cables have been de-rated at 1.2K.m/W soil thermal resistivity. Designs for high voltage cables would be in accordance with RailCorp's Engineering Standard <i>EP 00 00 00 13 SP Electrical Power Equipment – Design Ranges of Ambient Conditions</i> . Cable containment system would allow for a minimum 30% spare capacity which allows for heat dissipation. When design life for cable is ended, assessment and upsizing in cables can be done if climate related design criteria is changed.	D – Broadly acceptable

Risk ID	Risk description	Risk rating - 2030	Risk treatments	Mitigated risk rating - 2030
031	Severe wind and storms pose a human health risk to customers and staff who will attempt to seek shelter and be at risk in bottle necks as people seeking shelter on the bridge or platforms could cause congestion and customers may hurt themselves or loose belongings in the process.	C - Tolerable	Design would provide shelter on platforms (where impacted), entry and exit points and the new concourse. Shelter from severe storms would include linking canopies to provide undercover space.	C - Tolerable
033	Severe storms causing wind, lightning, rail and hail could cause increased deterioration of the concourse.	C - Tolerable	Roof materials would be designed to provide endurance from extreme wind.	D – Broadly acceptable
034	Rain and hail could cause slip and fall hazards on surfaces such as pathways, walkways, stairs, etc. causing health incidents to customers and staff.	C - Tolerable	Maintenance and cleaning of stairs and surfaces would occur following extreme events to minimise impacts from accumulation of water causing slipping. Stair treads would be designed to ASA standards for safety during in extreme events.	D – Broadly acceptable

Notes:

¹ The majority of the Project area is not affected by 1% AEP flood event levels – refer **Chapter 18** Flooding hydrology and water quality of this EIS.

22.3.7 Residual risk assessment

A residual risk assessment for the Project was undertaken to apply the relevant risk treatments identified in the above section for all moderate risks (noting that there were no very high or high risks). Risk treatments have been specifically identified and incorporated in the design to address particular climate change risks, which satisfies the SEARs. As a result, the risk treatments have reduced the overall risk ratings from eight low and 26 moderate risks in the year 2030 to a revised rating of 32 low and two moderate risks. It is noted that there are no residual very high or high risk ratings remaining for the year 2070 projection.

The two remaining moderate (i.e. “Tolerable”) risks would be reviewed during detailed design to determine if the risk can be reduced further and whether all reasonable and practicable controls have been considered and/or applied.

22.4 Management and mitigation

22.4.1 Overview

A CEMF (**Appendix D** of the EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect.

The requirement for the contractor to develop an SMP is outlined in Section 3.2 of the CEMF.

The chapter includes a compilation of the performance outcomes as well as mitigation measures to be included in this plan.

22.4.2 Performance outcomes

The performance outcomes for the Project in relation to climate change and sustainability include:

- the Project reduces the NSW Government’s operating costs and ensures the effective and efficient use of resources
- conservation of natural resources is maximised
- the Project is designed, constructed and operated to be resilient to the future impacts of climate change.

The Project would be designed, constructed and operated to achieve these performance outcomes.

22.4.3 Mitigation measures

A list of mitigation measures which would be implemented during the construction and operation of the Project are provided in **Table 22-11**.

The identified sustainability initiatives for the Project would be implemented through the SMP. The sustainability initiatives would align with targeting an IS Rating of Excellent.

Table 22-11 Mitigation measures

Reference	Mitigation measure	Applicable location(s)
Construction		
SCC1	Sustainability initiatives would be incorporated into the detailed design and construction of the Project to support the achievement of the Project sustainability objectives and would be detailed in the SMP.	All
SCC2	A rating level of ‘Excellent’ would be targeted under version 1.2 of the IS Rating Tool.	All
SCC3	A workforce development and industry participation strategy would be developed and implemented during construction.	All

Reference	Mitigation measure	Applicable location(s)
SCC4	Adaptation measures, as outlined in the TfNSW <i>Climate Risk Assessment Guidelines</i> , would be further assessed during detailed design and where practicable incorporated into the detailed design and construction of the Project.	All
Operation		
SCC5	Sustainability initiatives would be incorporated into the operation of the Project to support the achievement of the Project sustainability objectives and would be detailed in the SMP.	All
SCC6	Adaptation measures, as outlined in the TfNSW <i>Climate Risk Assessment Guidelines</i> , would be further assessed during detailed design and where practicable incorporated into the operation of the Project.	All
SCC7	Periodic review of climate change risks would be undertaken during operations to ensure ongoing resilience to the impacts of climate change.	All

23 Cumulative impacts

This chapter provides an assessment of the potential cumulative impacts of the Project with other projects in the surrounding area, in accordance with the SEARs.

23.1 Introduction

Impacts from a project may be considered minor when considered in isolation, however when impacts from multiple developments/activities are considered together, the impacts may be more substantial. These are referred to as cumulative impacts. For example, where more than one project is occurring in an area, this could result in cumulative construction traffic impacts on the local road network or cumulative construction noise impacts on a sensitive receptor.

Table 23-1 provides the SEARs relating to cumulative impacts and where these requirements are addressed in this chapter.

Table 23-1 SEARs

SEARs	Where addressed in the EIS
Environmental impact statement	
The EIS must include, but not necessarily be limited to, the following: (n) an assessment of the cumulative impacts of the project taking into account other projects that have been approved but where construction has not commenced, projects that have commenced construction, and projects that have recently been completed, consistent with the commitments made in Chapter 10 of the Scoping Report.	Section 23.2 and Section 23.3

In line with the SEARs, potential cumulative impacts can be determined by an assessment of developments in the surrounding area that have been approved (but not yet under construction), those that have commenced construction, and/or those that would be constructed or operating at the same time as the planning, construction or operation of the Project.

Impacts can be either adverse or beneficial. Mitigation and/or management measures would be implemented to avoid or reduce identified adverse impacts. This chapter has been informed by the environmental assessments undertaken for the Project as presented in Chapters 8 to 22 of this EIS. This chapter assumes that specific mitigation and management measures proposed for the Project (as summarised in **Chapter 23**) will be applied and therefore focuses on strategic measures that may be implemented in coordination with other relevant developments.

23.2 Method of assessment

The following tasks were undertaken to assess the potential for cumulative impacts:

- identifying existing projects (approved or under construction) and proposed projects in the vicinity of the Project, based on information available in the public domain. Searches included:
 - a review of the DPIE Major Projects website (<http://majorprojects.planning.nsw.gov.au>)
 - a review of other government agency websites (such as Department of Health and Sydney Water)
 - a search of City of Sydney Council's development application register (<https://www.cityofsydney.nsw.gov.au/development/development-applications>)
 - a search and review of media releases relating to major projects
- screening identified projects for their potential to interact with the Project. If an identified development was not assessed as a result of the screening, it was excluded from further consideration in the cumulative impact assessment. The approach to screening is described in **Section 23.2.1**

- identifying and assessing the significance of potential cumulative impacts by:
 - considering project-specific impacts from the projects with the potential for cumulative impacts (when combined with the construction and/or operation of the Project)
 - undertaking an issue-specific cumulative assessment for the key environmental issues listed in the SEARs, taking into account major projects being undertaken close to the Project area.

23.2.1 Screening of identified surrounding projects

The approach to screening was based on understanding the residual impacts of the Project (i.e. those that exist after application of management and mitigation measures), which are summarised at the conclusion to each assessment chapter (refer Chapters 8 to 22 of the EIS). Projects in the surrounding area that may affect the same receptors where residual impacts have been identified for the Project and/or have an impact on the effectiveness of the other projects' mitigation and management measures were then identified. This was achieved by taking into account the following:

- the project location – projects in proximity to the Project area where there is potential for impacts to spatially overlap (e.g. shared use of roads for construction access) (note that this includes consideration of the 'study areas' identified for the environmental issues assessed for the Project, which can be wider than the Project area itself)
- the project timeframe and planning approval – only projects likely to be built concurrently with the Project were assessed. This includes projects currently under construction and/or projects that have received planning approval (as at the time of preparing this EIS). Projects at a conceptual or pre-approval stage were generally not able to be considered due to an absence of project and/or environmental impact details or development timeframes
- the project scale/size – projects requiring consideration are typically larger scale projects identified on the DPIE's Major Projects website and City of Sydney Council's development application register.

A list of projects within the surrounding area and an initial screening in line with the SEARs is provided in **Table 23-2**. A rationale for why the project was included or excluded in the assessment, is also outlined.

Table 23-2 Screening of other projects within the vicinity of the Project

Proponent	Project	Project details	Approximate distance to the Project area	Construction timeframe (known or proposed)	Initial screening
Mirvac Projects Pty Ltd	South Eveleigh (formerly the Australian Technology Park) (SSD-7317)	Large-scale commercial development at South Eveleigh that would consist of nine commercial buildings surrounded by shared public spaces and a mix of retailers including a supermarket, hairdresser, gym and cafes. It will be home to 18,000 workers.	Approximately 80metres south of the Project area; bounded by the suburbs of Darlington, Redfern, Alexandria, Erskineville and Newtown.	Construction scheduled to be completed in 2020.	The South Eveleigh project is due to be completed by 2020 and has the potential to contribute to cumulative impacts.
Mirvac Projects Pty Ltd	Australian Technology Park (ATP) South Eveleigh Locomotive Workshop (Bays 1 - 4a) (SSD-8517)	Locomotive workshop refurbishment and reuse.	Located at 2 Locomotive Street, South Eveleigh, Eveleigh, adjacent to the Project area.	Approved by DPIE on 22 February 2019, and subsequently modified. Works commenced in 2019 and are proposed to be completed by early 2021.	Construction is underway and therefore has potential to contribute to cumulative impacts in conjunction with the Project.
Mirvac Projects Pty Ltd	ATP South Eveleigh Locomotive Workshop (Bays 5 - 15) (SSD-8449)	Locomotive workshop refurbishment and reuse.	Located at 2 Locomotive Street, South Eveleigh, Eveleigh, adjacent to the Project area.	Approved by DPIE on 22 February 2019, and subsequently modified. Works commenced in early 2019 and are proposed to be completed by early 2021.	Construction is underway and therefore has potential to contribute to cumulative impacts in conjunction with the Project.

Proponent	Project	Project details	Approximate distance to the Project area	Construction timeframe (known or proposed)	Initial screening
Sydney Metro	Sydney Metro City & Southwest: Waterloo Over Station Development (SSD-9393)	Construction of an over station development comprising mixed use buildings integrated with the future Waterloo Station. Waterloo Station is part of the new standalone Sydney Metro rail network.	Approximately 310 metres south-east of the Project area; bounded by Raglan Street, Cope Street, Wellington Street and Botany Road in Waterloo (excluding the church at 105 Botany Road).	<p>Concept development application was approved by DPIE on 10 December 2019. Construction of the Sydney Metro City & Southwest: Waterloo Over Station Development would be subject to a separate SSD approval.</p> <p>Current timing is for construction to be completed close to when Sydney Metro services commence in 2024. The NSW Government intends for the residential development to be finished by about 2025.</p>	Concept approval has been granted, and although the development is subject to future approval applications (with reference to condition A5 of the development consent), this development has been considered for potential cumulative impacts based on the proposed timeframe of construction finishing in 2024.

Proponent	Project	Project details	Approximate distance to the Project area	Construction timeframe (known or proposed)	Initial screening
Aboriginal Housing Company	Pemulwuy Student Accommodation (SSD-8135)	Mixed-use site will include affordable housing for 62 Aboriginal and Torres Strait Islander families, a gymnasium, commercial and retail space, a gallery, student accommodation, and childcare centre.	Approximately adjacent to the Project area; located at Eveleigh Street/Vine Street/Louis Street/Caroline Street and Lawson Street in Redfern.	Construction commenced in March 2019. Construction on the Pemulwuy Project is expected to be completed by 2021, with the student accommodation expected to be opened in 2022.	Construction is underway and therefore has potential to contribute to cumulative impacts in conjunction with the Project.
Wee Hur Capital Pty Ltd	90-102 Regent Street, Redfern - Student Accommodation (SSD-10382)	Proposed mixed use development (18-storey building) comprising retail premises and student accommodation with ancillary facilities and works at 90-102 Regent Street, Redfern.	Located at 90-102 Regent Street in Redfern and is within 60 metres east of the Project area.	SEARs were issued on 27 November 2019, and the applicant is currently preparing an EIS. Construction timing unknown.	The student accommodation development is not approved and therefore not assessed in accordance with the SEARs.

Proponent	Project	Project details	Approximate distance to the Project area	Construction timeframe (known or proposed)	Initial screening
TP HOLDINGS Pty Ltd	The Regent Hotel, 56-58 Regent Street, Redfern (SSD-9516)	Redevelopment of the site to build a 21-storey hotel.	Located at 56-58 Regent Street, Redfern, and is approximately 50 metres east of the Project area.	SEARs issued 29 August 2018, and the applicant is currently preparing an EIS.	This development is not yet approved and therefore not assessed in accordance with the SEARs.
Lawson Square Pty Ltd	Alterations and additions to the existing commercial towers at 1 Lawson Square, Redfern (SSD-5249-Mod-9)	Alterations and additions to two existing commercial towers at 1 Lawson Square, Redfern. The application has been through several modifications with the latest application (Mod 9) under assessment by DPIE to amend the existing mixed use Tower 1 on the site, including minor adjustments to the commercial floorplates, enhancements to apartment layouts on Levels 15 to 18, and the provision of new private open space for Tower 1.	Located at 1 Lawson Square, Redfern, and is located adjacent to the Project area.	Currently under construction. Construction is proposed to be completed around 2022.	Construction is underway and therefore has potential to contribute to cumulative impacts in conjunction with the Project.

Proponent	Project	Project details	Approximate distance to the Project area	Construction timeframe (known or proposed)	Initial screening
Surry Hills Project Pty Ltd	Integrated mixed use development at 2-38 Baptist Street and 397-399 Cleveland Street, Redfern (D/2018/1128)	Redevelopment of the site, including the adaptive reuse of the heritage listed former Bank of NSW building (397-399 Cleveland Street) for retail purposes, demolition of all other existing structures on site, site remediation, excavation and construction of a mixed use development (157 residential units, retail and commercial) comprising eight buildings in total, with a public through-site link from Baptist Street to Marriott Street, a public park with associated landscaping and public domain works.	Located at 2-38 Baptist Street and 397-399 Cleveland Street, Redfern, and is over one kilometre east of the Project area.	Development application approved by City of Sydney Council on 14 November 2019. Construction works are expected to commence in August 2020 and finish in mid-2023.	This development has been approved and the construction works are likely to coincide with the Project. Therefore, this development has potential to contribute to cumulative impacts in conjunction with the Project.
St George Community Housing	Social housing, 11 Gibbons Street, Redfern (SSD-7749)	The proposed development is for an 18-storey building comprising: <ul style="list-style-type: none"> • demolition of existing buildings and fill • 160 social and affordable housing units • retail/commercial space including office space • communal open space area • bicycle parking • public domain works • signage • lot consolidation. 	Located at 11 Gibbons Street, Redfern, and is adjacent to the Project area (on the opposite side of Gibbons Street).	Development application was approved by DPIE on 10 September 2019. It is under construction and scheduled for completion by mid-2021.	Construction is underway and this housing development has potential to contribute to cumulative impacts in conjunction with the Project.

Proponent	Project	Project details	Approximate distance to the Project area	Construction timeframe (known or proposed)	Initial screening
Austringer/ Seeca Partnership	Mixed use development (including retail and residential) at No. 48 Regent Street, Redfern	The proposed development is for a six-storey building with retail on the ground floor and 27 boarding rooms, including one bedroom for a boarding house manager, and communal living areas.	Located at 48 Regent Street, Redfern, and is approximately 50 metres east of the Project area.	The development application has been through modifications with the latest application (Reference: D/2013/121/C) approved 21 March 2019 to include enlargement of the basement level. Currently under construction.	This mixed use development is currently being constructed and is anticipated to be complete prior to the construction of the Project. As such, no cumulative impacts are anticipated.
Milestone (Aust) Pty Ltd	Craft brewery at 158 Regent Street, Redfern (D/2019/645/B)	Change of use and fit-out of the existing building as a craft brewery with associated licensed restaurant and bar areas with external facade alterations.	Located at 158 Regent Street, Redfern, and is approximately 100 metres south-east of the Project area.	Approved by City of Sydney Council on 08 November 2019. Construction has commenced and is anticipated to finish in 2020.	This development is approved, and construction has commenced. Construction of this development is unlikely to overlap with the Project.
Private residence	Alterations and additions to a single dwelling at 124 Little Eveleigh Street, Redfern (D/2019/101)	Alterations and additions to existing dwelling house including demolition of rear ground floor area, internal walls, stair, and rear structures, and construction of a new two storey rear addition and associated landscaping, tree removal and tree pruning.	Located at 124 Little Eveleigh Street, Redfern, and is adjacent to the Project area.	Approved by City of Sydney Council on 07 August 2019. No Construction Certificate issued for the development application to date.	This development is approved and therefore has potential to contribute to cumulative impacts in conjunction with the Project.

Proponent	Project	Project details	Approximate distance to the Project area	Construction timeframe (known or proposed)	Initial screening
Iglu No. 209 Pty Ltd	Student accommodation at 80-88 Regent Street, Redfern (SSD-9275)	Demolition of existing structures and construction of an 18-storey mixed-use student accommodation building comprising 265 student accommodation beds within 185 units, ground level retail and business premises.	Located at 80-88 Regent Street, Redfern, and is approximately 60 metres east of the Project area.	Approved by DPIE on 4 October 2019. Construction has commenced and is anticipated to finish in early 2021.	Construction is underway and therefore has potential to contribute to cumulative impacts in conjunction with the Project.
CW Strategic Planning Services	13-23 Gibbons Street Redfern student accommodation (SSD-9194)	Demolition of existing structures and construction of an 18-storey mixed-use student accommodation development with basement, comprising 488 student accommodation rooms and ground level retail.	Located along Gibbons Street, adjacent to the Project area (on the opposite side of Gibbons Street).	DPIE has requested further information from the applicant for this development.	This development is not yet approved and therefore not assessed in accordance with the SEARs.
Pearce & Co. Constructions Pty Ltd	Mixed use development at 172 Redfern Street, Redfern (D/2020/51)	Partial demolition of existing buildings, and construction of a four- storey mixed use development with basement parking, ground floor retail space and 13 residential dwellings.	Located at 172 Redfern Street, Redfern, and is approximately 140 metres east of the Project area.	The proposal was lodged with the City of Sydney Council on 23 January 2020. The exhibition of this application concluded 06 March 2020.	This development is not yet approved and therefore not assessed in accordance with the SEARs.
Suncom Property Developments Pty Ltd	5-11 Botany Road Waterloo (D/2019/1201)	Demolition of existing structures on site and construction of a new five storey boarding house (138 rooms), ground floor retail tenancy and basement car parking.	Located at 5-11 Botany Road, Waterloo and is approximately 160 metres south-east of the Project area.	The proposal was lodged with the City of Sydney Council on 20 October 2019. The exhibition of this application concluded 6 December 2019.	This development is not yet approved and therefore not assessed in accordance with the SEARs.

It is noted that there are a number of masterplans and strategic plans in various stages surrounding the Project area including:

- the Redfern and North Eveleigh Precinct and the wider Sydney Innovation and Technology Precinct (described further in **Chapter 2** of this EIS)
- Redevelopment of the Waterloo Estate – a masterplan is to be developed over the next 15-20 years to provide more social housing, delivering affordable housing as well as private housing to create a new mixed community.

These plans are likely to facilitate individual projects in future, that when approved, could contribute to a higher population, increased population density and other effects (e.g. increased traffic). These masterplans are in various stages of development, and as such have not been considered in the cumulative assessment for the Project. When projects within these precincts are going through the planning approval process, they will need to consider the Project as part of their cumulative assessment, if relevant.

23.3 Potential for cumulative impacts

23.3.1 Overview

Of the projects identified in **Table 23-2**, there were 11 projects that were considered to have potential to result in cumulative impacts with the Project. These projects are listed in **Table 23-3**.

Table 23-3 Surrounding projects with the potential to result in cumulative impacts

Proponent	Project
Mirvac Projects Pty Ltd	South Eveleigh (formerly the Australian Technology Park) (SSD-7317)
Mirvac Projects Pty Ltd	South Eveleigh Locomotive Workshop (Bays 1-4a)
Mirvac Projects Pty Ltd	South Eveleigh Locomotive Workshop (Bays 5-15)
Sydney Metro	Sydney Metro City & Southwest: Waterloo Over Station Development
Aboriginal Housing Company	Pemulwuy Student Accommodation
Lawson Square Pty Ltd	Alterations and additions to the existing commercial towers at 1 Lawson Square, Redfern
Surry Hills Project Pty Ltd	Integrated mixed use development at 2-38 Baptist Street and 397-399 Cleveland Street, Redfern
St George Community Housing	Social housing development at 11 Gibbons Street, Redfern
Milestone (Aust) Pty Ltd	Craft brewery at 158 Regent Street, Redfern
Private owner	Alterations and additions to a single dwelling at 124 Little Eveleigh Street, Redfern
Iglu Pty Ltd	Student accommodation at 80-88 Regent Street, Redfern

These projects were considered to have the potential to contribute to cumulative impacts in conjunction with the Project given their approval status, distance to the Project area, their size (e.g. most are commercial developments) and/or construction timeframe.

The consideration of cumulative impacts is based on the residual impacts identified for the Project for both construction and operation. Residual impacts are described in the assessment chapters (refer Chapters 8 to 22 of the EIS) and are summarised in Table 25-3 in **Chapter 25** of the EIS. Where the assessment of an environmental issue found that there were no residual impacts, it is concluded that

the Project would not contribute to any potential cumulative impacts for that issue, and these environmental issues have not been considered in the following sections.

23.3.2 Construction

It is anticipated that the Project would be undertaken over an approximate period of 18 months commencing late 2020/early 2021, once all necessary approvals are obtained. **Table 23-4** provides the indicative construction period for the Project as well as the projects identified to have potential cumulative impacts.

Table 23-4 Indicative construction timeframe for the Project against projects identified with the potential to contribute to cumulative impacts

Project	Construction timeframe (known or proposed)						
	2018	2019	2020	2021	2022	2023	2024
Redfern Station Upgrade - New Southern Concourse (the Project)							
South Eveleigh (formerly the Australian Technology Park) (SSD-7317)							
South Eveleigh Locomotive Workshop (Bays 1-4a)							
South Eveleigh Locomotive Workshop (Bays 5-15)							
Sydney Metro City & Southwest: Waterloo Over Station Development							
Pemulwuy Student Accommodation							
Alterations and additions to the existing commercial towers at 1 Lawson Square, Redfern							
Integrated mixed use development at 2-38 Baptist Street and 397-399 Cleveland Street, Redfern							
Social housing development at 11 Gibbons Street, Redfern							
Mixed use development at 48 Regent Street, Redfern							
Alterations and additions to a single dwelling at 124 Little Eveleigh Street, Redfern Construction timing unknown. No Construction Certificate issued for the development application to date	-	-	Un-known	Un-known	Un-known	Un-known	Un-known
Student accommodation at 80-88 Regent Street, Redfern							

Potential cumulative impacts during construction of the Project that may arise in conjunction with the other projects identified are summarised below.

Landscape character and visual amenity

During construction of the Project, visual impacts can result from the presence of construction works, plant, and disturbance. Construction of other projects in close proximity (e.g. Pemulwuy Student Accommodation, construction at 1 Lawson Square, Social housing development at 11 Gibbons Street)

could potentially result in cumulative visual impacts for the area. The impacts from the Project would be primarily low or moderate, although high in the case of the area immediately surrounding the rail corridor/Station (refer Section 9.4.1 of **Chapter 9**). However, their temporary nature and spatial extent (limited to within the Project area) would limit the degree of cumulative visual amenity impact where other construction works are occurring adjacent or near to them. The Project is therefore not expected to cause significant cumulative visual impacts.

Land use and property

Construction of the Project would require the temporary (and permanent) use of NSW Government owned land, including 125-127 Little Eveleigh Street. Consultation with the current tenants is underway and they would be required to relocate prior to construction commencing. The use of this NSW Government owned property is not expected to contribute to any potential cumulative impacts to land use or property in the area during construction of the Project.

Some areas of land would need to be temporarily occupied for construction ancillary facilities and other construction work sites within the Project area (including Gibbons Street Reserve). This would result in a reduction in available public space and on-street parking. If other projects in the vicinity also use public space and on-street areas, there is the potential for a cumulative temporary loss of these types of land uses. However, due to the temporary nature of these activities and their locations mostly being within Government owned land and road reserves, the Project is not expected to cause significant cumulative impacts. Gibbons Street reserve would be returned to its existing land use after its use as a construction ancillary facility for the Project.

Traffic, transport and access

Cumulative impacts on the existing pedestrian, cycle, public transport and surrounding road networks could occur during construction of the Project. Specifically, this could involve the following:

- increased construction traffic could potentially increase congestion and delays on the local road network, however as the Project would generate a relatively small number of construction vehicles (up to 20 heavy vehicles and 40 light vehicles per day), its contribution towards cumulative impacts is expected to be minimal
- the presence of work sites within/adjacent to roads could contribute to traffic/pedestrian/cyclist delays and/or detours as a result of lane/road closures and movement of construction vehicles. The risk to the safety of pedestrians, cyclists and other motorists may also increase as a result. Coordination with other project proponents would need to occur to manage potential impacts from construction activities on other projects within or adjacent to the Project area
- the loss of street parking during construction of the Project along with other projects could contribute to a greater demand for parking in the surrounding area. In the context of existing known parking available in the wider area, the Project's contribution to this potential cumulative impact is also expected to be small.

Noise and vibration

Construction of the Project in combination with the construction of other project(s) could result in noise sensitive receiver/s experiencing higher noise levels than those predicted in **Chapter 13** of this EIS. The noise and vibration assessment provided in **Technical report 4 – Noise and vibration** found that if the noisiest stages of other construction projects were to coincide with the construction of this Project, the greatest increase in noise levels from either project would be a maximum of 3 dB(A). This finding is based upon the levels presented in **Chapter 13**, where this Project is the dominant source of construction noise.

Where receivers are impacted to a greater extent by other construction projects, then overall construction noise levels at any receiver could be increased by as much as 3 dB(A) from another projects' noise levels. In the case of construction traffic, a maximum noise level increase of 3 dB(A) is also predicted. For context, an increase in noise levels of around 3dB(A) is low (barely noticeable). The decibel scale is explained further in the Definitions section of **Technical Report 4 – Noise and Vibration**.

The Project has the potential to combine with noise emissions from the projects identified in **Table 23-4** where the construction periods crossover. The Project stages with the largest number of

predicted exceedances above applicable criteria, were Stage 5 – Roadworks, Stage 4 – Main Construction works and Stage 3 – Utility and overhead wiring relocations/adjustments, which are proposed to be carried out during Period 2 OOHW (i.e. Weekdays 10:00 pm to 7:00 am, Saturday 10:00 pm to 8:00 am and Sunday/Public holiday 6:00 pm to 7:00 am).

Management of the timing of these stages are particularly critical in managing potential cumulative impacts. In consultation with other project proponents, the potential noise contributions from overlapping projects would be reviewed during detailed design of the Project, and the construction program and scheduling of activities for the Project would be amended where practicable to avoid and/or minimise cumulative noise impacts identified. Otherwise the applicable mitigation measure/s at relevant receivers would be reviewed for appropriateness, in line with the *Interim Construction Noise Guideline* (DECC, 2009) (refer **Chapter 13** of this EIS for noise mitigation measures).

Social impacts

As outlined in **Table 23-4**, there are a number of other projects whose construction would coincide with the construction of the Project. These include the South Eveleigh Locomotive Workshop, Sydney Metro City & Southwest at Waterloo, Pemulwuy Student Accommodation and the development at 1 Lawson Square, Redfern. There is the potential that these concurrent construction activities may lead to cumulative social impacts on the local and regional community. These impacts may arise through direct amenity factors such as cumulative noise, air quality, traffic or visual impacts, or from cumulative changes to business operations (e.g. visibility, passing trade, access) or community connectivity (e.g. accessibility of social infrastructure).

It is also recognised that these collective changes may affect less tangible social factors such as levels of stress and anxiety, the community's sense of place, cultural identity or community cohesiveness.

Noting the differing scales of other projects proposed nearby, and their separation from this Project, the potential for cumulative impacts to arise, directly or indirectly is considered to be low. This is reinforced by the relatively local scale of the Project and the suite of measures proposed to manage impacts upon the social environment.

However, in addition to these impacts there is the possibility that the Project may induce a degree of construction fatigue and/or consultation fatigue within the community.

Construction fatigue refers to the cumulative impact of direct impacts, such as noise, arising from concurrent or consecutive (i.e. 'back-to-back') construction activities from multiple projects over an extended period. Construction fatigue can be experienced by local receivers where construction impacts overlap, where people move between areas subject to project impacts, and/or where receivers have minimal respite between activities.

In the case of the Project, there are a number of nearby developments that commence construction earlier or complete construction later than the Project. These include the South Eveleigh project (commenced in 2019), and the Sydney Metro City & Southwest (due to commence in 2021 and be completed by 2025). Construction fatigue is less likely to be an issue for this latter project based upon the physical separation from the Project, though the South Eveleigh Project may result in construction fatigue impacts for some receptors on the northern side of the rail line. In this case construction fatigue impacts are likely to relate to issues such as noise, traffic and visual impact, with the potential for follow on impacts to community identity or community cohesiveness. Community connectivity is not expected to be substantially affected.

Transport would seek to undertake coordination with other nearby projects to understand their construction schedules and avoid construction fatigue where possible.

Consultation fatigue refers to a decline in community engagement over time due to people being overwhelmed with requests to consult or discuss individual or multiple projects. This disengagement may lead to people missing relevant details of a proposed project, or missing the opportunity to have their say on an important aspect of the development.

It is recognised that the relatively large number of nearby projects has the potential to result in consultation fatigue for local residents. This has been managed in this Project through judicious timing and design of consultation activities, with view to balancing the desire to obtain community feedback on the Project with potentially 'overloading' consultees.

Overall, TfNSW would seek to minimise cumulative social impacts arising from the Project through the coordination of construction and consultation with other major projects nearby.

23.3.3 Operation

Potential cumulative impacts during operation of the Project that may arise in conjunction with the other projects identified are summarised below.

Land use and property

The Project would result in the permanent use of 125-127 Little Eveleigh Street. As this is NSW Government owned land, and the existing tenant would be relocated prior to construction of the Project, this permanent use is not anticipated to contribute to any potential cumulative impacts to land use or property in the area during operation of the Project.

Social impacts

The cumulative benefit of the Project with other projects during operation is anticipated to result in a net benefit for the community. Considered together with these other projects, the Project would provide:

- improved accessibility and safety at Redfern Station and connectivity with the public transport network overall
- improved access to employment areas and housing in the surrounding area
- a potential increase in economic activity, businesses and employment opportunities, particularly around Redfern Station.

This Project and others currently occurring in Sydney are anticipated to complement strategic urban development and renewal opportunities being undertaken and investigated in the surrounding area. The Project would support new development in the area and enable further opportunities for renewal by providing improved public transport and efficient pedestrian linkages to surrounding areas. The Project would support population growth and increases to the supply of housing along the corridor, promoting transit-oriented development.

The construction activity at and immediately surrounding Redfern Station would result in residual (negative) social construction impacts, post mitigation. However, these changes would be temporary. Following the implementation of the mitigation measures, there would be a moderate (positive) level of residual social operational impacts from the Project, such as changes to community values, including changes to the existing amenity and character.

Traffic, transport and access

Residual impacts during operation of the Project include the relocation of 20 car parking spaces from Little Eveleigh Street to a new car parking area. Although this would represent a change in the parking arrangement along Little Eveleigh Street, it would be replaced 'like for like' and is not expected to contribute to cumulative impacts in the area. The Project would also result in a loss of existing street parking on Marian Street/Cornwallis Street/Rosehill Street, Lawson Street and Gibbons Street. There is potential for this loss of parking to contribute to a cumulative impact in parking demand where other projects either temporarily or permanently use or remove parking spaces. In the context of the available street parking in the area surrounding the Project area, the Project is not expected to contribute to a significant loss of parking in the area.

The Project would also introduce a shared zone on Little Eveleigh Street and upgrades to the shared zone on Marian Street/Cornwallis Street/Rosehill Street, including an associated reduction in the speed limit of the shared zones to 10 kilometres per hour, and potentially higher pedestrian/cyclist interactions. Overall however, the Station entrances and shared zones are expected to bring about positive benefits for the Station (refer Section 12.4.2 of **Chapter 12** of this EIS) and interact positively with the other projects proposed in the area.

The Mitigation Measures identified in Chapter 12 of this EIS are considered adequate to mitigate these residual impacts.

Non-Aboriginal heritage

Overall there would be adverse residual impacts as a result of the Project on Non-Aboriginal heritage. These residual impacts include:

- the Project would result in a major adverse impact to the aesthetic significance of Redfern Station Railway Group
- the Project would result in a moderate adverse impact to the historic, aesthetic and rarity values of the Redfern Station Railway Group (including the relocation of Platform 1 Office Building which would have a moderate adverse impact on the station's intact collection of railway buildings, which has been identified as rare element)
- the Project would have a minor adverse impact on both the aesthetic and technical values of the Eveleigh Railway Workshops
- the proposed works to 125-127 Little Eveleigh Street have the potential for minor adverse impact on the Darlington Heritage Conservation Area.

In regard to the residual impacts of the Project on the Railway station group, the Pemulwuy Project also has the potential to have an indirect impact on the Redfern Railway Station Group. The assessment (NBRS&Partners, 2017) notes 'Views to the item would change but significant views would not be unacceptably and adversely impacted upon'. It is considered that this conclusion means there is the potential for a minor adverse impact of this project on the aesthetic significance of the Redfern Station Group, as such a minor cumulative impact from the interaction of the two projects is considered likely.

With regard to the residual impacts of the Project on the aesthetic and technical values of the Eveleigh Railway workshops, the projects at South Eveleigh have the potential to result in a cumulative impact with the Project. The heritage assessments for South Eveleigh do not identify impacts to the aesthetic and technical values of the Eveleigh Railway workshops) (Curio Projects, 2015, Curio Projects 2017a, Curio Projects, 2017b). View loss 'reducing the readability of the heritage fabric of ATP (South Eveleigh) from the streetscape' was identified but not considered a major heritage impact. It is considered that this conclusion means there is the potential for a minor adverse impact of this project on the aesthetic significance of the Eveleigh Railway Workshops, as such a minor cumulative impact from the interaction of the two projects is considered likely.

Taking into account the residual impacts of the project on the Darlington and Golden Grove Heritage Conservation Areas, it is considered none of the identified projects have the potential to result in a cumulative impact with the Project.

The mitigation measures identified in **Chapter 14** of this EIS are considered adequate to mitigate these residual impacts.

23.4 Management and mitigation

23.4.1 Overview

A CEMF (**Appendix D** of this EIS) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the CEMP and other supporting documentation.

This chapter describes the performance outcomes and mitigation measures related to cumulative impacts, including those that would be included in the CEMP.

23.4.2 Performance outcomes

The performance outcome for the Project in relation to cumulative impacts is:

- the Project is coordinated with other projects being constructed in the area to minimise cumulative impacts.

Opportunities to further minimise construction impacts from the Project beyond those considered in this EIS would be undertaken during detailed design and construction planning, through the

application of appropriate management and mitigation measures and through consultation with affected stakeholders.

23.4.3 Mitigation measures

The management and mitigation measures that would be implemented to minimise potential cumulative impacts resulting from the Project are listed in **Table 23-5**.

Table 23-5 Environmental management measures

ID	Mitigation measure	Applicable location(s)
Construction		
CI1	<p>TfNSW would co-ordinate with other project developers with projects under construction at the same time in regard to potential cumulative impacts (including potential cumulative noise and traffic impacts). Co-ordination and consultation with relevant stakeholders would also occur when necessary (e.g. DPIE, Sydney Trains, State Transit Authority, City of Sydney Council, utility providers, emergency service providers).</p> <p>These stakeholders would be kept informed of construction progress and scheduling, in an effort to minimise community impacts. Co-ordination and consultation with these stakeholders would also include development of mitigation strategies to manage conflicts such as adjustments to the construction program and work activities, co-ordination of traffic management arrangements between projects and coordination of consultation activities to minimise the potential for consultation fatigue.</p>	All
CI2	<p>Noise mitigation measures (refer Chapter 13 of the EIS) would be reviewed for their appropriateness in line with the <i>Interim Construction Noise Guideline</i> (DECC, 2009) where cumulative noise impacts on a receiver are expected and the Project is the dominant source.</p>	All

24 Environmental management

This chapter outlines the environmental management approach for the Project during construction and operation. The environmental management approach for the Project has been informed by a number of multi-disciplinary workshops to ensure that key Project personnel are aware of the environmental performance outcomes.

24.1 Overview

The following environmental management approach has been adopted for the Project during construction:

- The Environmental Impact Statement provides an overview of how environmental impacts would be managed during construction and includes the:
 - Construction Environmental Management Framework (CEMF) (**Appendix D**)
 - Construction Noise and Vibration Strategy (CNVS) (**Appendix E**)
 - Performance outcomes and mitigation measures (**Section 24.4**).
- Construction environmental management documentation to be prepared in line with the CEMF and this EIS includes the:
 - Construction Environmental Management Plan (CEMP)
 - CEMP Sub-Plans
 - Performance and compliance reports.

This approach is illustrated in **Figure 24-1** and has been developed to be consistent with legislative and regulatory requirements. The key piece of legislation that will govern environmental management for the Project is the EP&A Act. A range of other legislation is also applicable to the construction of the Project as identified in Section 2 of the CEMF (**Appendix D**).

During operation, the Project would be operated in accordance with Sydney Trains Safety and Environmental Management System.

The Project would need to be delivered in accordance with any conditions of approval issued under the EP&A Act, as well as any other permits or licences required.

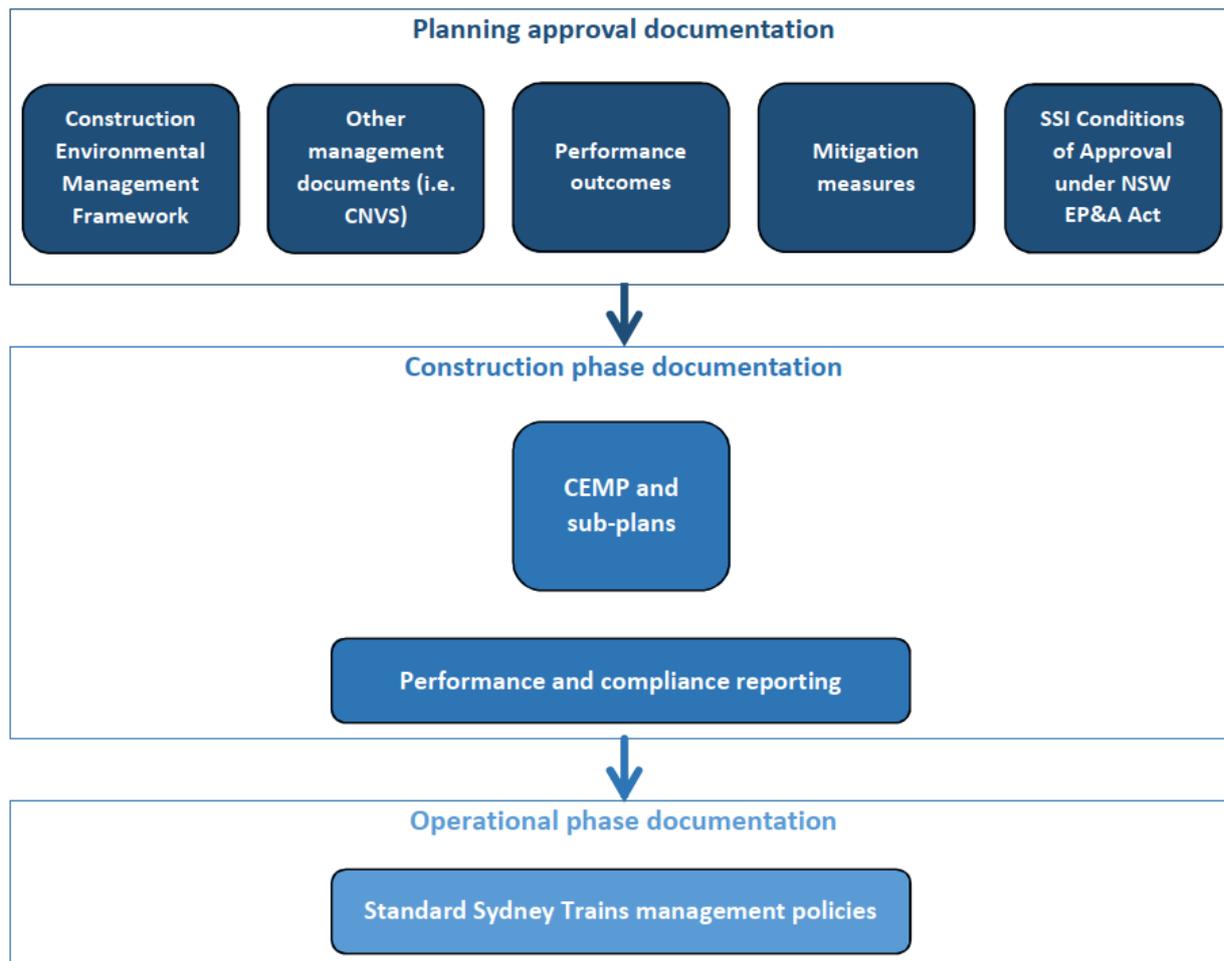


Figure 24-1 Construction and operation environmental management approach

24.2 Construction Environmental Management Approach

24.2.1 Construction Environmental Management Framework

The CEMF is the primary document that will drive the environmental management approach during construction (**Appendix D**). The CEMF provides a whole-of-construction life-cycle approach to construction environmental management and includes a range of commitments including the preparation of specific environmental management plans and sub-plans. The early engagement of a construction contractor has enabled TfNSW to prepare the CEMF tailored to the construction contractors' systems.

The CEMF identifies the environmental, stakeholder, and community management systems and processes that would be applied during each stage of construction. Specifically, it lists the requirements to be addressed in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect. The CEMF also identifies protocols for approvals, environmental monitoring, inspections, auditing, reporting and review.

24.2.2 Construction Noise and Vibration Strategy

The TfNSW CNVS (refer to **Appendix E**) defines how construction noise and vibration impacts would be managed for the Project.

The strategy identifies the requirements and methodology to develop construction noise and vibration impact statements. These would be prepared prior to specific construction activities, based on a more detailed understanding of construction methods, including the size and type of construction equipment.

The strategy is based on the following strategic objectives:

- a risk-based approach to implementing a hierarchy of controls at each stage of the Project lifecycle to minimise potential impacts
- active collaboration with internal and external stakeholders in building the approach to reducing potential noise and vibration impacts at each stage of the Project lifecycle
- development of a clear understanding of potential noise and vibration impacts and the application of best-practice management techniques
- community engagement that is sensitive to the needs and expectations of local communities and businesses
- commitment to the continuous improvement of noise and vibration management.

24.2.3 Construction Environmental Management Plan and sub-plans

A CEMP would be prepared for the Project. The CEMP would address the relevant requirements of CEMF and CNVS and include performance outcomes, mitigation measures and applicable conditions of approval.

The CEMP would include relevant sub-plans for the management of potential environmental impacts and opportunities in relation to specific environmental issues such as air quality, biodiversity, etc. The CEMP would also include the following:

- a description of applicable activities to be undertaken during construction
- an environmental risk and opportunities methodology
- a matrix of the relevant Conditions of Approval or Consent referencing where each requirement is addressed
- outline the objectives and targets, in defined performance outcomes
- environmental accountabilities or responsibilities
- induction and training requirements
- management strategies for reviewing the effectiveness of mitigation measures
- processes and methodologies for surveillance and monitoring, auditing and review, and reporting on environmental and sustainability performance including compliance tracking
- procedures for emergency and incident management, non-compliance management, and corrective and preventative action
- procedures for the control of environmental records.

This is described in further detail in Section 3.3 of the CEMF.

24.2.4 Construction performance and compliance reporting

The CEMP would include a range of construction performance and compliance reporting requirements to ensure the SSI conditions of approval and performance outcomes (refer to Section 25.5.1) are met. A compliance monitoring and reporting program would be implemented to ensure non-compliances, corrective and preventative actions are properly identified, managed and documented.

24.3 Operational environmental management

The Project has been designed to minimise environmental impacts during operation.

The approach to environmental management during operation involves:

- performance outcomes and mitigation measures for the Project (refer to **Section 24.4**)
- operational environmental management and maintenance would be undertaken in line with the Sydney Trains and Safety Environmental Management System. These standard policies include incident and emergency management procedures.

24.4 Performance outcomes and mitigation measures

24.4.1 Performance outcomes

Performance outcomes for the Project have been developed, and included in technical chapters throughout the EIS, consistent with the requirements of the SEARs. The performance outcomes for the Project are summarised in Section 25.7 of **Chapter 25** of this EIS and identify measurable, performance-based standards for environmental management.

24.4.2 Mitigation measures

As outlined above, a framework for the development of a CEMP and its sub-plans to manage potential environmental impacts are included in the CEMF and CNVS.

Project specific mitigation measures have been developed through the preparation of this EIS to mitigate and manage the potential impacts of the Project. These are summarised in Section 25.6 of **Chapter 25** of this EIS. These project specific mitigation measures would also be included within the CEMP and its sub-plans.

The mitigation measures may be revised in response to submissions raised during public exhibition and/or any design changes made following exhibition. The revised list of mitigation measures would be provided in the Response to Submissions.

25 Synthesis of the Environmental Impact Statement

25.1 Introduction

This chapter provides a synthesis of the findings of this EIS.

25.1.1 Secretary's environmental assessment requirements

Table 25-1 sets out the SEARs relating to a synthesis of the EIS and where these requirements have been addressed in this chapter.

Table 25-1 Project synthesis SEARs

Secretary's environmental assessment requirements	Where addressed in this EIS
Environmental Impact Statement	
The EIS must include but not necessarily be limited to the following:	
(p) a chapter that synthesises the environmental impact assessment and provides:	
• a succinct but full description of the Project for which approval is sought;	Section 25.2
• a description of any uncertainties that still exist around design, construction methodologies and/or operational methodologies and how these will be resolved in the next stages of the Project;	Section 25.3
• a compilation of the impacts that have not been avoided;	Section 25.4
• a compilation of the proposed measures associated with each impact to avoid, minimise (through design refinements or ongoing management during construction and operation) or offset these impacts;	Section 25.5 and Section 25.6
• a compilation of the outcome(s) the proponent commits to achieving; and	Section 25.7
• the reasons justifying carrying out the Project as proposed, having regard to the biophysical, economic and social considerations, including ecologically sustainable development and cumulative impacts.	Section 25.8 and Section 25.9

25.2 Description of the Project for which approval is sought

This section provides a description of the Project for which approval is sought under Section 5.14 of the EP&A Act (refer **Chapter 3** of this EIS for further information on the planning and approval process).

25.2.1 Project features

The Project involves the construction of a pedestrian concourse to the south of the existing Lawson Street concourse providing both lift and stair access to Platforms 1-10. The new pedestrian concourse would provide a new connection across the railway corridor, extending between Little Eveleigh Street and Marian Street in the suburbs of Redfern and Eveleigh and include associated interchange upgrades.

The Project is proposed to be undertaken within the Project area shown in Figure 5-1 of **Chapter 5** of the EIS. The key Project features are shown on Figure 5-2 in **Section 5** of the EIS and include the following:

- a six metre wide concourse between Little Eveleigh Street and Marian Street
- new stair and lift access from the concourse to Platforms 1 to 10
- an upgraded station entrance at Marian Street including station services and customer amenities

- a new station entrance at Little Eveleigh Street including station services and customer amenities, requiring the permanent use of 125-127 Little Eveleigh Street (owned by the NSW Government)
- formalisation of a shared zone on Little Eveleigh Street, including:
 - safety improvements to vehicle, cyclist and pedestrian interactions
 - improvements to streetscape such as landscaping, lighting, drainage and pavements
 - relocation of around 20 parking spaces (including 18 resident/restricted parking spaces, one accessible parking space and one car share scheme parking space)
 - utility adjustments
 - bicycle parking spaces
 - heritage interpretation and/or art.
- upgrade of Marian Street/Cornwallis Street/Rosehill Street area, including:
 - extension of existing shared zone including part of Rosehill Street
 - safety improvements to vehicle, cyclist and pedestrian interactions including footpath widening
 - improvements to streetscape such as lighting, drainage, landscaping and pavements as well as utility adjustments
 - changes to street parking arrangements including removal of around 16 parking spaces (including relocation of one car share scheme parking space)
 - bicycle parking spaces
 - changes to street parking arrangements including removal of approximately 16 parking spaces (including relocation of one car share scheme parking space)
 - services building
 - heritage interpretation and/or public art
- operation of the Project.

Other components of the Project include:

- relocation of the shuttle bus zone from Little Eveleigh Street to Lawson Street
- kiss and ride on Lawson Street, and associated footpath upgrade
- kiss and ride on Gibbons Street, and associated footpath upgrade
- footpath widening on Ivy Street
- relocation of a building on Platform 1 to accommodate the concourse
- repurposing, relocation and alteration to platform building features and other platform features, including privacy walls, doors, screens and roofing, platform seats and electrical equipment
- addition of platform canopies
- platform resurfacing on all platforms and associated drainage alterations
- installation of station operational components and infrastructure including:
 - wayfinding and signage
 - tactile ground surface indicators (TGSI)
 - rubbish bins
 - CCTV
 - passenger information system (e.g. passenger information display, public address and hearing loops)

- emergency equipment (e.g. for fire and life safety)
- service relocations and upgrades including:
- relocation of overhead wiring structures
- installation of a new rail signal between Platforms 1 and 2
- removal and trimming of trees.

25.2.2 Construction

Construction of the Project would commence once all necessary approvals (as relevant) are obtained (anticipated to be in late 2020/early 2021) and continue for around 18 months.

Construction of the Project would broadly involve the following key stages:

1. site establishment and enabling works
2. building modification works
3. overhead wiring relocations/adjustments
4. main construction works, including platform preparation works, installation of the concourse and station entrances
5. Little Eveleigh Street/Ivy Street, Marian Street/Cornwallis Street/Rosehill Street, Lawson Street and Gibbons Street road works.

Construction would be undertaken within standard construction hours (i.e. Monday to Friday 7:00 am to 6:00 pm; Saturday 8:00 am to 1:00 pm; and no work on Sundays or public holidays). Work outside of the above hours (including 24 hours per day in some cases) is also proposed in some instances for the safety of workers and to minimise disruptions to customers, pedestrians and motorists. Some of the works would also need to be undertaken during rail possession periods (when trains are not running) to minimise disruption to rail operations and risk to rail worker safety. Examples of works that would be required in possessions and may occur inside or outside standard construction hours include overhead wiring works, provision of cabling for required services, concourse and lift installation and some work on platforms.

It is anticipated that the works would be undertaken over around 20 scheduled rail possession periods with continual work from Friday to Sunday night/Monday morning. Approximately two additional non-scheduled rail possession periods are proposed including a possession across the 2020 Christmas period. There is also the potential for mid-week night work to be required throughout various stages of the Project depending on the activity required.

Construction would include three construction ancillary facility areas, which are shown in Figure 5-4 and included within the Project area depicted in Figure 5-1 of **Chapter 5** of the EIS. The construction ancillary facilities are:

Construction ancillary facility 1

The Eveleigh Maintenance Centre would be utilised as site offices, a waste storage facility, designated stockpile area (outside flood extents), designated area for fabrication activities and an administration centre for the Project. This would include the establishment of several site sheds, car parking facilities and stockpile area.

Construction ancillary facility 2

This area is currently owned by Sydney Trains and would be partially utilised as a construction laydown area and temporary waste storage facility. This laydown area would be accessed from either Carriageworks Way or Little Eveleigh Street and would provide construction parking facilities and rail corridor access. It is anticipated that some components of the concourse would be assembled here prior to installation within the rail corridor.

Construction ancillary facility 3

Part of Gibbons Street Reserve would be used as a laydown area for construction equipment and infrastructure, a temporary waste storage facility and a designated area for fabrication activities. The

facility would be accessed from Gibbons Street. Due to the existing slope of the reserve, it may be necessary to temporarily level part of the Reserve to provide a safe work area. This temporary levelling works would require approximately 200 tonnes of spoil to be removed.

Following completion of works at Redfern Station, the Gibbons Street Reserve would be returned to passive recreational use for the community in consultation with City of Sydney Council.

The existing Sydney Trains car park on Marian Street would be utilised for a site office compound and an administration centre for the Project. This would include the erection of several site sheds and car parking facilities. The Project would also utilise a storage area underneath the existing car park on Marian Street for site facilities and the storage of construction equipment and materials.

Temporary hoarding

Erection of site hoarding and fencing would be required to provide temporary enclosure of work sites and work areas to safely separate the public from the construction works and to facilitate the delivery of plant and materials. Hoarding/fencing would be required in areas of heavy pedestrian usage such as along Gibbons Street, Marian Street and Little Eveleigh Street, including the temporary closure and/or diversion of pedestrian thoroughfares as well as management of pedestrians around work sites and past work site access points. Hoarding/fencing may also be erected to protect buildings or structures and to provide protection from dust, debris and noise generated during construction.

Construction of the Project would require the temporary use of land owned by NSW Government and City of Sydney Council.

25.2.3 Operation

Following construction of the Project, Redfern Station would continue to operate as a major transportation hub with trains arriving and departing throughout the day and night. Key operational components of the Project directly related to customer experience include the following elements:

- covered concourse
- six lifts and stairways providing access to Platforms 1-10
- family accessible toilet and public toilets
- passenger information systems
- kiss and rides
- Opal card readers and top up machines
- bicycle spaces
- Little Eveleigh Street station entrance
- Marian Street station entrance
- formalisation of a shared zone along Little Eveleigh Street, and extension of the shared zone at Marian Street.

Once commissioned, the proposed services building at the Marian Street station entrance would become an integral part of the Station where most of the electrical, mechanical and communications, and wastewater management infrastructure would be controlled and managed. Periodic maintenance including inspections and repairs would take place inside and outside of the building to ensure continuous operation of the Station. The services building would also house cleaning and storage areas for station staff.

During operation, ongoing maintenance would be required for key operational components of the Station. This would be undertaken by Sydney Trains in line with standard maintenance policies. These standard policies would also include incident and emergency management procedures.

25.3 Project uncertainties and approach to design refinements

25.3.1 Project uncertainties

The Project design and construction methodology would continue to evolve through detailed design. A construction contractor for the Project has been engaged by TfNSW, which has assisted in reducing uncertainties for the Project during the preparation of the EIS. However, some uncertainties still remain given that the Project is yet to progress to the detailed design and detailed construction planning phases. In addition, future/ongoing community and stakeholder engagement for the Project would likely identify further opportunities to refine and improve the Project design and construction methodology.

To achieve a level of flexibility without compromising the level of impact assessment, the approach adopted for the purposes of the EIS has been to assess a 'realistic worst case' impact for particular Project elements where there is a reasonable potential for design refinements/changes to occur.

A summary of the Project uncertainties that have the potential to impact on the environment, and how these would be resolved, is provided in **Table 25-2**.

Table 25-2 Project uncertainties

Category of impact	Uncertainty	How the uncertainty will be resolved
Transport, traffic and access	Possession strategy	A number of possession options are being considered for use during construction. The preferred possession option would be developed taking into consideration the final design, and construction planning undertaken by the construction contractor.
Construction noise	Construction methodology	The construction stages and equipment described in the EIS would be confirmed by the construction contractor during detailed construction planning and prior to construction commencing, and further assessment would be undertaken if required.
Noise mitigation	Final noise mitigation requirements	Feasible and reasonable mitigation measures would continue to be considered and developed for the Project during detailed design.
Biodiversity	Extent of tree clearing (removal and trimming), and the specific species and location of vegetation offsets	The extent of tree removal and trimming required during construction is to be confirmed during detailed design. An arborist would be engaged to inform this process. Vegetation offsets and/or landscaping would be undertaken in accordance with the <i>Vegetation Offset Guide</i> (TfNSW, 2019b). As per the <i>Vegetation Offset Guide</i> , all native vegetation cleared would be offset with replacement tree planting.
Non-Aboriginal heritage	Type/nature of artwork/heritage interpretation	The type/nature of the heritage interpretation/artwork to be installed would be confirmed during detailed design.
Aboriginal heritage	Type/nature of artwork/heritage interpretation	The type/nature of the heritage interpretation/artwork to be installed would be confirmed during detailed design.

Category of impact	Uncertainty	How the uncertainty will be resolved
Waste and resources	Final quantities and classifications of waste streams	<p>The Project would be designed, constructed and operated to achieve the following performance outcomes:</p> <ul style="list-style-type: none"> waste from the Project is classified in accordance with the <i>NSW Waste Classification Guidelines 2014</i> (NSW EPA, 2014a) waste types are reviewed against appropriate guidelines to manage waste appropriately where possible excavated soils suitable for reuse are utilised within the Project area contaminated and asbestos contaminated wastes are safely managed in accordance with stated protocols.
Construction noise/soils and contamination/heritage/hydrology and water quality/air quality/waste and resources	Locations and extent of relocations, protections and adjustments to utilities	Utility investigations are ongoing and will be completed during detailed design, to validate current assessments, and confirm relocation/protection requirements. To minimise potential impacts to utilities and the community, utilities would be managed in accordance with the CEMF (Appendix D).
Construction noise/traffic, transport and access/visual/non-Aboriginal heritage	Location of ancillary facilities	The final arrangement and locations of ancillary facilities and site office compound may be subject to refinement as part of the confirmation of the construction methodology. The impacts of any such refinements would be subject to further assessment as part of the planning approvals process.
Traffic, transport and access/construction and operational noise/social	Location of permanent car park	The location of the new car park is within the Redfern North Eveleigh precinct. Planning for the urban renewal of this precinct is underway, and the car park location may therefore be an interim measure. In the event that the car park would be affected by this process, any proposed reconfiguration or relocation of the offset parking arrangements would be undertaken in consultation with relevant stakeholders, and in a manner which ensures that the principle of offset parking is provided in perpetuity, and remains within reasonable walking distance of Little Eveleigh Street.

25.3.2 Approach to design refinements

The design as described in the EIS would be subject to ongoing refinements during the detailed design phase. Refinements may be made to:

- avoid services that present significant construction difficulties in terms of logistics, time and/or cost

- reduce the construction timeframe
- avoid areas of environmental or heritage sensitivity identified following approval
- reduce impacts on the community
- improve operation without increasing the potential environmental impacts.

Such refinements may include, for example:

- changes to the location or extent of construction ancillary facilities
- minor refinement or reorientation of the Project area boundaries
- minor changes to the features of key Project components
- utility relocations outside the existing Project area.

For design refinements, a screening assessment would be undertaken to consider whether the refinement would:

- result in any of the conditions of approval not being met
- be consistent with the objectives and operation of the Project as described in the EIS
- result in a significant change to the approved Project description
- result in any potential environmental or social impacts of a greater scale or impact on previously unaffected receivers than that considered by the EIS.

If any refinements, post approval, are not consistent with the approval issued by the Minister for Planning and Public Spaces, and constitute a modification, an approval would be sought from the Minister for any such modifications in accordance with the requirements of Part 5 Division 5.2 of the EP&A Act.

25.4 Compilation of adverse residual impacts

25.4.1 Impacts that have not been avoided

Chapter 8 to **Chapter 23** of this EIS provide an assessment of the potential impacts of the Project during construction and operation. These would be addressed through the implementation of the mitigation and management measures described throughout the EIS and summarised in **Section 25.6**. These measures relate to performance outcomes which have also been developed for the Project (refer **Section 25.7**). Residual impacts are those impacts identified for either construction or operation that would remain post-implementation of these measures. The key potential adverse residual impacts following the implementation of mitigation and management measures are summarised in **Table 25-3**. The operational residual benefits (positive impacts) of the Project are summarised in **Section 25.8.2**.

The residual impacts would continue to be considered through the development of adaptive managements plans in line with the CEMF. Implementation of the mitigation and management measures proposed would lessen the degree of some of the residual impacts, however other impacts (such as loss of existing parking spaces and commuter noise) would represent a permanent change. Achievement of the performance outcomes would also assist in managing the residual impacts identified. The environmental management approach for the Project is described in **Section 25.5**.

Table 25-3 Summary of key potential residual impacts

Issue	Key potential adverse residual impacts
Landscape character and visual impact	<ul style="list-style-type: none"> • visual impacts as a result of the presence of construction works, equipment, vehicles and plant, and disturbance.

Issue	Key potential adverse residual impacts
Land use and property	<ul style="list-style-type: none"> • relocation of the offices of the existing tenant of 125-127 Little Eveleigh Street prior to construction • some areas of land would need to be temporarily occupied for construction compounds and other work sites during construction (including Gibbons Street Reserve).
Social	<ul style="list-style-type: none"> • access and connectivity surrounding Redfern Station resulting in impediments to vulnerable community members and changes to businesses passing trade • amenity impacts associated with construction activities at and immediately surrounding Redfern Station • heritage and character impacts during construction • amenity impacts to residents on Little Eveleigh Street and Marian Street during operation.
Traffic, transport and access	<ul style="list-style-type: none"> • cumulative impacts with surrounding projects on the existing pedestrian, cycle, public transport and surrounding road networks during construction • operational residual impacts including: <ul style="list-style-type: none"> - the relocation of 20 car parking spaces from Little Eveleigh Street to a new car parking area - the loss of about 16 car parking spaces (as a result of the Marian Street/Cornwallis Street/Rosehill Street shared zone upgrade) - relocation of the existing shuttle bus zone on Little Eveleigh Street to Lawson Street (within an existing restricted parking area) - the loss of about three car parking spaces on Lawson Street, and the loss of about three car parking spaces on Gibbons Street (as a result of the new kiss and rides and bus zone relocation) - formalisation of a shared zone on Little Eveleigh Street and upgrade to the shared zone on Marian Street/Cornwallis Street/Rosehill Street, including an associated reduction in the speed limit of the shared zones to 10 kilometres per hour, and potentially higher pedestrian/cyclist interactions - permanent use of 125-127 Little Eveleigh Street for the new station entrance.
Noise and vibration	<ul style="list-style-type: none"> • exceedances of construction noise criteria after the application of standard noise reducing mitigation measures • cumulative noise impacts from concurrent construction stages of the Project, and potentially from other projects in the surrounding area resulting in an increase in the overall noise level by up to 3dB(A) • noise associated with the commuter use of the new station entrances and surrounding shared zones would be noticeable to the closest residential receivers, however, is unlikely to be considered 'offensive' as defined in the <i>Protection of the Environment Operations Act 1997</i>. The Project would investigate further opportunities to minimise noise impacts to residents through the ongoing design development of the Little Eveleigh Street and Marian Street shared zones, as described in Chapter 13 of this EIS.

Issue	Key potential adverse residual impacts
Non-Aboriginal heritage	<ul style="list-style-type: none"> the Project would have a major adverse impact to the aesthetic significance of Redfern Station Railway Group the Project would result in Moderate adverse impacts to the historic, and rarity values of the Redfern Station Railway Group as a result of the relocation of Platform 1 Office Building the Project would have a minor adverse impact on both the aesthetic and technical values of the Eveleigh Railway Workshops the proposed works to 125-127 Little Eveleigh Street have the potential for minor adverse impact on the Darlington Heritage Conservation Area.
Biodiversity	<ul style="list-style-type: none"> removal of trees during construction, which would subsequently be offset in accordance with TfNSW's <i>Vegetation Offset Guide</i>, however not necessarily within the same locations as those removed.

25.5 Approach to environmental management

25.5.1 Environmental management during construction

As outlined in **Chapter 24** of this EIS, the approach to environmental management during construction involves implementation of the Construction Environmental Management Framework (CEMF) and Construction Noise and Vibration Strategy (CNVS), together with a suite of mitigation measures for each environmental aspect assessed. Importantly mitigation is focussed on delivery of a range of performance outcomes for the Project, set out in **Section 25.7**, which are designed to drive a high level of environmental management during construction.

A Construction Environmental Management Plan (CEMP) would be developed for the Project in accordance with the CEMF and CNVS. The CEMP would contain the performance outcomes and associated mitigation measures for the Project.

Construction Environmental Management Framework

The CEMF is the primary document that will drive the environmental management approach during construction (**Appendix D** of this EIS). The CEMF provides a whole-of-construction life-cycle approach to construction environmental management and includes a range of commitments including the preparation of specific environmental management plans and sub-plans. The early engagement of a construction contractor has enabled TfNSW to prepare the CEMF tailored to the construction contractors systems.

The CEMF identifies the environmental, stakeholder, and community management systems and processes that would be applied during each stage of construction. Specifically, it lists the requirements to be addressed in developing the CEMP, sub-plans, and other supporting documentation for each specific environmental aspect. The CEMF also identifies protocols for approvals, environmental monitoring, inspections, auditing, reporting and review.

Construction Noise and Vibration Strategy

The CNVS (provided in **Appendix E**) defines how construction noise and vibration would be managed for the Project. The strategy identifies the requirements and methodology to develop construction noise impact statements. These would be prepared prior to specific construction activities, based on a more detailed understanding of construction methods, including the size and type of construction equipment.

25.5.2 Environmental management during operation

During operation, the Project would be operated in accordance with Sydney Trains Safety and Environmental Management System. Ongoing maintenance would be required for key operational components, which would be undertaken by Sydney Trains in line with standard maintenance policies under their Safety and Environmental Management System. These standard policies include incident and emergency management procedures.

25.6 Compilation of mitigation and management measures

Table 25-4 provides a compilation of the measures proposed to mitigate and manage the potential impacts of the Project, as provided in Chapters 8 to 23 of this EIS. The measures described in the chapters and compiled in this table were developed based on the findings of all the assessments undertaken for the EIS.

The mitigation measures compiled in **Table 25-4**, together with the approach to environmental management described in **Section 25.5**, provide TfNSW's commitments for the Project. The mitigation measures may be revised in response to submissions raised during public exhibition and/or design changes made following exhibition. The final list of mitigation measures would be provided in the submissions/preferred infrastructure report. If the Project is approved, the conditions of approval, which would include reference to the final mitigation measures, would guide subsequent phases of the Project. The Project would be undertaken in accordance with the conditions of approval and the final list of mitigation measures.

Table 25-4 Compilation of Project specific mitigation and management measures

ID	Management and mitigation measures	Applicable location (s)
Urban design		
Construction		
UD1	Tree retention and planting would continue to be a key priority in informing design decisions throughout detailed design.	Project area
Operation		
UD2	A maintenance plan would be prepared in consultation with City of Sydney and TfNSW outlining the maintenance responsibilities of each entity with a particular focus on the transition areas between the public domain and the Station.	Project area
Landscape and visual		
Construction		
LV1	Provide well-presented and maintained construction hoarding and site fencing with shade cloth (or similar material) (where necessary) to minimise visual impacts on key viewpoints during construction. The construction ancillary facilities would be designed to limit or deter graffiti. Hoardings, site and acoustic fencing would be removed following construction completion.	Project area
LV2	Provide cut-off or directed lighting within the construction areas, with lighting location and direction considered to ensure glare and light spill is minimised.	Project area
LV3	Construction personnel to keep the construction areas clean and tidy, including refuse placed in appropriate waste bins.	Project area
LV4	Implement measures to minimise tracking of dirt and mud into public roads and other public spaces.	Project area
LV5	Limit disturbance of vegetation to the minimum amount necessary to construct the Project, particularly within the streetscapes affected by the Project.	Project area
LV6	Consider measures to limit or deter graffiti within ancillary facilities.	Ancillary facilities
Operation		
LV7	Community artwork opportunities would be investigated in keeping with existing cultural artwork in Redfern surrounding the station.	Pedestrian concourse
LV8	Street trees would be planted on Little Eveleigh Street and Marian Street at the new station entrances. Tall shrub plantings would also be	Little Eveleigh

ID	Management and mitigation measures	Applicable location (s)
	considered along the rail corridor boundary at Marian Street to assist in preserving privacy of residents within the Watertower residential building.	Street and Marian Street
LV9	Lighting would be designed to minimise upward spread of light, and to minimise light spill and glare.	Project area
LV10	Proposed structures/fencing would be designed to limit or deter graffiti.	Project area
LV11	The ongoing maintenance and repair of the concourse and station entrances would be in accordance with Sydney Trains maintenance requirements.	Project area
<u>Land use and property</u>		
Construction		
LP1	Temporary use areas, including public open space at the Gibbons Street Reserve, would be restored to their pre-existing condition (as a minimum) as soon as practicable following completion of construction. This would be undertaken in consultation with Council and/or the landowner.	Project area
<u>Social</u>		
Construction		
SE1	Implementation of the Project's Community Liaison Management Plan including engagement with residents on both Little Eveleigh Street and Marian Street, City of Sydney Council, NSW Police and other stakeholders.	Study area
SE2	Construction ancillary facilities within private and public reserves and parks would be planned to minimise impacts on existing recreational and sporting infrastructure, with construction laydown areas located in areas of open space, where possible. Establishment and use of the laydown areas would consider public safety and maintaining safe access to recreational areas. Private and public reserves and parks proposed for the construction laydown areas would be returned to their original or improved condition following construction (or as otherwise agreed with the relevant authority). Public access to areas of reserves and parks not utilised for construction laydown areas would be maintained throughout construction.	Ancillary facilities
SE3	TfNSW would investigate opportunities to source construction workers from the local community.	Study area
SE4	Access to properties including businesses would be maintained throughout the Project. Temporary measures such as traffic control would need to be implemented to enable this to occur.	Study area
SE5	Construction activities undertaken in proximity to businesses would maintain visibility of business frontage, associated signage and access points, where possible. Temporary signage would be provided in the vicinity of a business if construction works obstruct views to the business. Business impacts resulting from changes to amenity or access would be managed in line with mitigation measures identified for other relevant environmental issues.	Study area

ID	Management and mitigation measures	Applicable location (s)
SE6	<p>Engagement with the local Aboriginal community is ongoing and would continue throughout the Project. Key focus areas for Aboriginal engagement on this Project include:</p> <ul style="list-style-type: none"> • Project design • heritage interpretation and/or community art opportunities • employment and procurement opportunities. 	Study area
Operation		
SE7	<p>During detailed design, the Project would investigate opportunities to encourage the community to use the concourse as a connectivity link. This may include elements such as wayfinding signage to assist customers in identifying exits that help them get to their destination efficiently and signage to inform users that an Opal card or contactless payments (e.g. American Express, Mastercard or Visa debit or credit card), is required to access the concourse, however, once tapped off on the other side, charges would be reversed (i.e. no charge).</p> <p>A customer education campaign would be enacted to inform the community of the process and encourage use of the concourse.</p>	Little Eveleigh Street and Marian Street entrances
SE8	<p>During detailed design, the Project would investigate opportunities to augment the community's sense of place and connection to the community's history through elements associated with heritage interpretation works such as installing historical plaques/signage and public art.</p>	All
SE9	<p>The Project would investigate further opportunities during detailed design to encourage social interaction and reduce opportunistic crime and discourage antisocial behaviour, particularly at Little Eveleigh Street, in accordance with the principles of CPTED and in consultation with NSW Police and the City of Sydney.</p>	All, in particular at Little Eveleigh Street
SE10	<p>Upon opening of the Project, TfNSW would undertake a review of the operation of the shared zones, in consultation with residents and relevant stakeholders, including consideration of any additional mitigation that may be required.</p>	Little Eveleigh Street and Marian Street
Traffic, transport and access		
Construction		
T1	<p>Relocation of bus stops would be carried out by TfNSW in consultation with the City of Sydney, Royal Prince Alfred Hospital, bus operators and other relevant authorities. Wayfinding and customer information would be provided to notify customers of relocated bus stops.</p>	Little Eveleigh Street and Lawson Street
T2	<p>The new offset parking facilities on Little Eveleigh Street would be constructed prior to the removal of parking, to accommodate parking spaces displaced to facilitate construction activities</p>	Little Eveleigh Street
T3	<p>Road Safety Audits would be carried out to address vehicular access and egress, and pedestrian, cyclist and public transport safety. Road Occupancy Licenses (or equivalent) for temporary road/lane closures would be obtained where required. The audit location would be outlined in the Construction Traffic Management Sub-Plan.</p>	The Project area
T4	<p>Appropriate signage and line marking would be provided to guide pedestrians and cyclists past construction sites and on the surrounding network to allow access to be maintained.</p>	The Project area

ID	Management and mitigation measures	Applicable location (s)
	Appropriate access measures would further be developed to guide customers with access requirements for disability, including wheelchair users and people with a visual impairment.	
T5	Community consultation would be carried out and notifications would be issued in advance for any proposed road and pedestrian network changes through appropriate channels and forms of communication.	The Project area
T6	Access to existing properties and buildings would be maintained, where possible, in consultation with property and business owners.	The Project area
T7	Construction sites would be managed to minimise construction worker parking on surrounding streets. Workers would be encouraged to use public or active transport and ride share with the implementation of a Green Travel Plan initiative. A workers' reward scheme would be implemented for those who adhere to the initiative.	The Project area
T8	Construction site traffic would be managed to minimise traffic impacts during the peak periods through scheduling construction vehicle movements outside the peak hours. Where possible, group deliveries would be restricted.	The Project area
Operation		
T9	Enhancement of pedestrian and cycle infrastructure at the Station would be further investigated in consultation with relevant authorities, including TfNSW and the City of Sydney.	The Project area
T10	Carry out pre-parking surveys and post-parking surveys and provide the data to City of Sydney. The surveys are to demonstrate that pressures on parking within the Project area and surrounds are managed in accordance with predicted future supply and demand.	The Project area
Noise and vibration		
Construction		
N1	<p>A Construction Noise and Vibration Management Sub-Plan (CNVMP) would be prepared as part of the CEMP. The CNVMP would include all feasible and reasonable safeguards to manage noise emissions from the Project. The CNVMP would include, as a minimum, the following:</p> <ul style="list-style-type: none"> • identification of nearby residences and other sensitive land uses • description of approved hours of work and an Out of Hours Protocol • description and identification of all construction activities, including work areas, equipment and duration (and provision for re-assessment of noise and vibration impacts if required due to changes) • description of the work practices (generic and specific) that would be applied to minimise noise and vibration • works scheduling to minimise the noise impact on sensitive receivers, with consideration given to cumulative noise impacts (and provision for re-assessment of noise and vibration impacts if required due to changes to work stages or other surrounding projects) • a complaints handling process • noise and vibration monitoring procedures, including for heritage-listed items/structures • overview of community consultation required for identified noise intensive works. <p>The CNVMP and CEMP must be updated as required to account for any changes in noise and vibration management issues and strategies, to ensure these documents remain adequate for their purposes.</p>	All

ID	Management and mitigation measures	Applicable location (s)
N2	<p>All employees, contractors and subcontractors would receive an environmental induction. As a minimum the induction must include:</p> <ul style="list-style-type: none"> • all relevant Project specific and standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on noise generating activities with special audible characteristics (noise with characteristics that can cause annoyance and disturbance, containing noticeable factors such as tonality, low frequency noise, impulsive or intermittent noise events) • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures and complaint handling procedures. 	All
N3	<p>All nearby residents and sensitive receivers impacted by noise levels from the Project which are expected to exceed the NML would be consulted prior to the commencement of the particular activity, with the highest consideration given to those that are predicted to be most affected as a result of the works.</p> <p>The information provided to the receivers will include:</p> <ul style="list-style-type: none"> • programmed times and locations of construction work • the hours of proposed works • construction noise and vibration impact predictions • construction noise and vibration mitigation measures being implemented on site. <p>Community consultation regarding construction noise and vibration would be detailed in a Community Liaison Management Plan for the construction of the Project and would include a 24 hour hotline and complaints management process.</p>	All
N4	<p>If vibration intensive equipment is to be used within the minimum working distances for cosmetic damage described in this EIS (Technical report 4 – Noise and vibration), then attended vibration measurements would be undertaken when work commences, to determine “site specific minimum working distances” and confirm appropriate vibration limits for that structure. The Construction Contractor would be informed of the minimum working distances.</p>	All
N5	<p>For heritage items where the screening criteria are predicted to be exceeded, the more detailed assessment would include condition assessment and specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.</p>	Heritage items
N6	<p>The CNVMP would be implemented with the aim of meeting the construction noise management levels where feasible and reasonable. The following mitigation measures would be included in the CNVMP:</p> <ul style="list-style-type: none"> • use of at-source noise attenuation around equipment where possible • where feasible and reasonable structures such as site sheds, earth bunds and fencing shall be used to shield residential receivers from noise (e.g. including along appropriate sections of the rail corridor fence line of Little Eveleigh Street and Marian Street, and through the 	All

ID	Management and mitigation measures	Applicable location (s)
	<p>use of 1.8 m high fencing around ancillary facility 3). Site topography shall be considered when situating plant</p> <ul style="list-style-type: none"> • traffic flow (i.e. vehicle movements, including deliveries), parking and loading/unloading areas would be planned to minimise reversing movements within construction sites • loading and unloading of materials/deliveries would occur as far as possible from sensitive receivers • if site access points and roads are altered during detailed design, they would be selected to be as far as possible away from sensitive receivers within rail corridor access constraints • dedicated loading/unloading areas would be shielded if close to sensitive receivers wherever feasible and reasonable • delivery vehicles would be fitted with straps rather than chains for unloading, wherever possible. • non-tonal reversing beepers would be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work, including delivery vehicles • on-site storage capacity would be maximised to reduce the need for truck movements during sensitive times • the offset distance between noisy plant and adjacent sensitive receivers would be maximised • plant used intermittently would be throttled down or shut down • noise-emitting plant would be directed away from sensitive receivers where feasible and reasonable • the noise levels of plant and equipment must have operating sound power or sound pressure levels as presented in this EIS (Technical report 4 – Noise and vibration) that would meet the predicted noise levels • quieter and less vibration emitting construction methods would be used where feasible and reasonable (e.g. rubber wheeled instead of steel tracked plant) • where practicable, materials would be pre-fabricated and/or prepared off-site to reduce noise with special audible characteristics occurring on site. Materials can then be delivered to site for installation. 	
N7	<p>Work generating noise with special audible characteristics (such as jack hammers, rock breakers, piling rigs and diamond saws) and/or vibration levels would be scheduled during less sensitive time periods for receivers (for example, before 10:00 pm or as determined during community consultation) where feasible and reasonable.</p>	All
N8	<p>Vehicle movements would be routed away from sensitive receivers and scheduled during less sensitive times where feasible and reasonable. The speed of vehicles would be limited, and the use of engine compression brakes avoided.</p>	All
N9	<p>A noise and vibration monitoring program would be carried out for the duration of works in accordance with the CNVS, CNVMP and any approval and licence conditions. Monitoring of noise would be undertaken at appropriate intervals and in response to complaints during construction.</p> <p>In addition, vibration intensive work would not proceed within the site specific minimum working distances unless a permanent vibration monitoring system is installed approximately one metre from the building footprint, to warn operators (e.g. via flashing light, audible alarm, SMS) when vibration levels are approaching the peak particle velocity objective.</p>	All

ID	Management and mitigation measures	Applicable location (s)
N10	In accordance with the CNVS, additional mitigation measures should be implemented according to Table 13-22 and Table 13-23 (and Appendix B of Technical report 4 – Noise and vibration) of this EIS for sensitive receivers where noise levels are predicted to exceed applicable criteria.	As per Table 13-22 and Table 13-23 (and Appendix B of Technical report 4 – Noise and vibration)
Operation		
N11	Mechanical plant selections should be reviewed during the detailed design phase to ensure compliance with the operational noise criteria detailed in this EIS (Technical report 4 – Noise and vibration) is achieved. Standard noise controls such as appropriate selection and placement of mechanical plant and the inclusion of attenuation measures such as duct lining/attenuators are recommended to achieve operational noise criteria.	Redfern Station
N12	Public address system selection should be reviewed during detailed design to ensure that compliance is achieved with the operational noise criteria detailed in Section 13.2.5 .	Redfern Station
N13	The type and design of the new solid fence proposed to be constructed at the boundary of the proposed car park should be developed to optimise the level of acoustic shielding provided. Depending on the acoustic performance of the proposed fence, consideration would be given to at-receiver treatments for 157 Little Eveleigh Street such as the provision of mechanical ventilation to allow windows to be closed and/or upgraded glazing.	Car park boundary and 157 Little Eveleigh Street
N14	The Project would investigate further opportunities to minimise noise impacts to residents through the ongoing design development of the shared zones at Little Eveleigh Street and Marian Street.	Little Eveleigh Street and Marian Street shared zones
Non-Aboriginal heritage		
Construction		
NAH1	<p>Detailed design of the Project would consider the following Heritage opportunities:</p> <ul style="list-style-type: none"> • adaptation of Platform 1 Office Building including: • finding temporary use as soon as practicable • finding a permanent use for the building in consultation with the community • moving the building two metres north of the platform to ensure that access to the building for future use can be maintained • developing a landscape plan with heritage input for the area around the proposed car park that interprets the relationship with the Eveleigh Chief Mechanical Engineers Office. <p>Further design refinement in consultation with a heritage architect of the concourse, platform canopies, stairs and lifts including:</p> <ul style="list-style-type: none"> • reviewing opportunities to increase the transparency of the concourse by: <ul style="list-style-type: none"> - maintaining perforations in aluminium panels to be large as possible noting the limitations imposed by the ASA standard ESB 003. The proposed perforations are 25 x 25 mm. The intent 	<p>Platform 1 Office</p> <p>Car park</p> <p>Marian Street Entrance</p> <p>Concourse</p>

ID	Management and mitigation measures	Applicable location (s)
	<p>is for the perforations to increase gradually to form large openings in succession from the lower portion to the roof of the concourse. Each horizontal section should be assessed for compliance to achieve the maximum opening size i.e. greater than 25 x 25 mm. Where compliance cannot be achieved, dispensation and/or alternative solutions should be exhausted.</p> <ul style="list-style-type: none"> - installing roof canopies only where necessary and detailing these to be of a slim profile. - incorporating clear glazing on the concourse as much as possible; including the proposed framed views across the rail corridors. The size of these clear glazed elements should be as large as possible - incorporating clear glazed elements into the proposed lifts and ensuring the required structures for lifts and glazing are consolidated to achieve minimal bulk and maximum transparency. • reducing the bulk and scale of the proposed concourse: <ul style="list-style-type: none"> - detail design should aim for steel framing and supports to be as slim as possible - the height of the concourse should be analysed during detailed design to ensure that overall structural and architectural elements are kept to a minimum profile to achieve an overall reduced height. • assessing perforated aluminium panels for reflectivity to ensure that glare is reduced • ensuring that a separation between heritage fabric and new elements is retained such as the incorporation of glazing or voids at the junction of the concourse and 125-127 Little Eveleigh Street • avoiding inserting advertising on the concourse that would reduce the transparency and disrupt views • ensuring that materiality of new elements at the Marian Street entry is in keeping with the public domain design • ensuring that the design incorporating the independent TfNSW DRP comments is presented to the TfNSW DRP for further review and comment during detailed design. 	
NAH2	A heritage architect would be engaged to provide ongoing heritage and conservation advice throughout detailed design and construction and any subsequent relevant design modifications.	General
NAH3	A specialist tradesperson, well versed in working with heritage fabric, would be engaged during the construction stage of the Project.	General
NAH4	<p>A historical record of areas modified would be prepared for future reference. Archival recording should be completed prior to the commencement of construction and at completion of construction. The following elements would be included:</p> <ul style="list-style-type: none"> • identified significant views • Platform 1 Office Building and surrounding area • Platform 4/5, 6/7 and 8/9 buildings • retaining walls on Platform 1 and 10 • examples of various platform facings • 125-127 Little Eveleigh Street • Little Eveleigh Street streetscape. 	General

ID	Management and mitigation measures	Applicable location (s)
NAH5	<p>A Heritage Management Sub-Plan would be included in the CEMP. This would include the following measures:</p> <ul style="list-style-type: none"> • protecting heritage items from adjacent construction works by: <ul style="list-style-type: none"> - prioritising protection of heritage elements as part of the early works - monitoring impacts from noise and vibration. If maximum vibration levels are exceeded, or are predicted to exceed applicable standards, consider alternative construction methods to minimise damage to heritage elements • undertaking a dilapidation survey of the area adjacent to the Chief Mechanical Engineers Office Building driveway prior to carrying out the works associated with the new car park and upon completion making good all affected areas • compiling a program of salvageable heritage fabric and a reuse plan, approved by the heritage architect prior to commencing works • avoiding potential damage to heritage items from negligence during construction by implementing a heritage induction to all on-site staff and contractors. The induction should clearly describe the heritage constraints of the site. 	<p>General</p> <p>At various heritage elements</p>
NAH6	<p>The heritage elements of the Platform 1 Office Building would be conserved and protected by:</p> <ul style="list-style-type: none"> • undertaking a dilapidation survey • prior to relocating, the windows and door would be secured and boarded up, using a reversible methodology • undertaking investigative work to avoid disturbance of fabric • maintaining the same alignment when relocating the Building • protecting and conserving Elston's Siding during the works • avoiding installing a concrete finished floor to the Building • ensuring that relocation works are closely supervised by the heritage architect and specialist tradesperson • ensuring the following steps are undertaken during or post building relocation, if damage to the building is sustained: <ul style="list-style-type: none"> - the nominated Project architect would be contacted immediately - all damage to elements would be recorded - a heritage architect and specialist tradesperson would supervise and undertake required repairs - conserving and retaining the existing path from Platform 1 to the Telecommunications Equipment Centre. 	<p>Platform 1 Office Building and surrounding heritage elements</p>
NAH7	<p>Ensuring that the heritage elements on Platform 4/5, 6/7 and 8/9 buildings be conserved and protected by:</p> <ul style="list-style-type: none"> • using traditional repair and conservation methods for detailing proposed works • ensuring the demolition of the extension to the Platform 8/9 building would not damage the surrounding fabric • retaining original features of the building and their conservation and restoration if feasible • incorporating new sympathetic fabric in accordance with the guidelines of the Burra Charter. 	<p>Platform 4/5, 6/7 and 8/9 buildings</p>

ID	Management and mitigation measures	Applicable location (s)
NAH8	<p>Ensuring that the warehouse character of 125-127 Little Eveleigh Street would be retained by:</p> <ul style="list-style-type: none"> • retaining external building elements: Masonry walls, parapet line of the roof, fenestration, patina (including painted signs) of the brickwork (including remnant painted signs) • internal building elements: Original timber columns, original exposed timber framing to floors and ceilings (subject to detailed structural review) • designing new entry canopies to be a slim profile, sympathetic to the colours and material of the existing building <ul style="list-style-type: none"> - modifying the external openings, where appropriate, to make reference to the existing fenestration pattern of the building - undertaking conservation works and repair works to the exterior of the building - designing the new Colorbond roof to be sympathetic to the existing colour palette of the building - avoiding anti-graffiti paint to the exterior of the brickwork. 	125-127 Little Eveleigh Street
NAH9	<p>Reducing the aesthetic impacts associated with the insertion of the proposed car park through landscaping treatments by:</p> <ul style="list-style-type: none"> • undertaking a holistic approach when selecting materials and finishes in areas that are located within or adjacent to the Eveleigh Railway Workshops including boundary fencing, planning layouts, signage, materials, and plantings • updating the Urban Design and Public Domain Plan prior to finalisation of detailed design that incorporates a coherent presentation and linkage with the Eveleigh Railway Workshops. Retaining and protecting existing trees • introducing minimal soft landscaping to retain the existing industrial character of the rail yard. 	Eveleigh Railway Workshops
NAH10	<p>The existing SHR curtilage of the Eveleigh Chief Mechanical Engineer's Office would be protected by:</p> <ul style="list-style-type: none"> • retaining and protecting the existing trees • protecting and retaining the existing garden within the heritage boundary of the building and minimising impacts of the proposed works - physically or visually. 	Eveleigh Chief Mechanical Engineer's Office
NAH11	<p>The building fabric of the McMurtrie, Kellerman & Co factory at 181 Lawson Street would be protected during construction in particular adjacent to basement windows.</p>	Ivy Street and McMurtrie, Kellerman & Co factory, 181 Lawson Street (I2245)
NAH12	<p>Designing new infrastructure such as OHW as simple clean structures with consolidated service runs to reduce the cluttered look of existing infrastructure at the station.</p>	Ivy Street and McMurtrie, Kellerman & Co factory, 181 Lawson Street (I2245)

ID	Management and mitigation measures	Applicable location (s)
NAH13	<p>Inspection of the following areas would be undertaken to identify movable heritage items:</p> <ul style="list-style-type: none"> • Platform 1 Office Building • Platforms 4-9 buildings • 125-127 Little Eveleigh Street. <p>If movable heritage items are found:</p> <ul style="list-style-type: none"> • tag and record items • storage of moveable heritage should be coordinated with the Eveleigh Railway Workshop Collection. 	Platform 1 Office Building, Platforms 4-9 buildings, 125-127 Little Eveleigh Street
NAH14	<p>Protecting and managing the potential archaeology on site by undertaking the following:</p> <ul style="list-style-type: none"> • archaeological test excavation and salvage on the northern side of Marian Street, proposed car park off Little Eveleigh Street and area of relocation of the Platform 1 Office Building, prior to the commencement of bulk excavation works. A Historical Archaeological Research Design (HARD) would be prepared in accordance with the relevant Heritage, DPC guidelines • archaeological monitoring for excavation works in the area of the proposed new car park on Little Eveleigh Street. The methodology for undertaking this archaeological monitoring would be included in the HARD • archaeological monitoring for any excavation works along Marian Street, Rosehill Street and Cornwallis Street to record remains of earlier road surfaces. Once recorded, these road surfaces can be removed. The archaeological monitoring methodology would be included in the HARD • stop-work procedures would be implemented should unexpected finds be uncovered in accordance with TfNSW's Unexpected Heritage Finds Guidelines. 	<p>Marion Street Entrance</p> <p>Little Eveleigh Street Car park</p> <p>Marian Street, Rosehill Street and Cornwallis Street</p> <p>General</p>
NAH15	<p>Communicate the heritage value of the Project by the following:</p> <ul style="list-style-type: none"> • implementing the heritage interpretation strategy for the Project • Considering guidelines provided in <i>Sydney Trains Heritage Interpretation Guidelines</i>, and the City of Sydney council signage policies • undertaking further community consultation as part of the Heritage Interpretation Strategy • developing a Signage Plan to ensure that the design is contemporary, of high design quality, and reflects traditional patterns • interpreting the current position of the Platform 1 Office Building after the building is relocated • interpreting the association of Redfern Station with the Aboriginal community of Redfern • interpreting the historic gardens on the platforms at Redfern Station • interpreting the story of the former footbridge (1914-1996) at the proposed car park entry. 	General

ID	Management and mitigation measures	Applicable location (s)
NAH16	Consulting with the City of Sydney with regard to refining detailed design in the following areas: <ul style="list-style-type: none"> • 125-127 Little Eveleigh Street • streetscape works. 	125-127 Little Eveleigh Street, Darlington and Golden Grove Heritage Conservation Areas
Operation		
NAH17	Updating the SHR, SHI, s170 listing description for Redfern Railway Station Group and Eveleigh Railway Workshops to reflect the upgrades from the Project, following completion of works.	Operation
<u>Aboriginal heritage</u>		
Construction		
AB1	Consultation with MLALC and DPC would be undertaken in relation to the status of the Wynyard St Midden' (AHIMS ID #45-6-2597) to amend the status of the site on the AHIMS register.	Recorded site of AHIMS site ID #45-6-2597
AB2	A Heritage Management Sub-Plan for construction of the Project would include the following mitigation measures: <ul style="list-style-type: none"> • all relevant contractors and TfNSW personnel should be made aware of the nature and location of previously identified areas of Potential Archaeological Deposits (PADs) located immediately adjacent to the Project area and avoid impact to these areas. Contractors and TfNSW personnel should also be made aware of TfNSW's legal responsibilities under the NPW Act and the <i>Heritage Act 1977</i> and the need to avoid impacts to sites (including heritage interpretation and relevant information in the site induction • in the unlikely event that a site or objects (as defined by the NPW Act) are identified during the Project, the procedure outlined in TfNSW's <i>Unexpected Heritage Finds Guideline</i> (Transport for NSW, 2019e) should be followed. Works should immediately cease at the location and the find should be immediately reported to appropriate TfNSW personnel, and the regulator in accordance with legislation. No work should commence in the vicinity of the find until any required approvals have been issued by the regulator. 	Project area
<u>Biodiversity</u>		
Construction		
B1	A Flora and Fauna Management Sub-Plan would be prepared and implemented as part of the CEMP.	Project area
B2	Should the detailed design determine the need to remove or trim additional trees not identified in this EIS, the construction contractor would be required to complete the TfNSW Tree Removal Application Form and submit it to TfNSW for approval.	Project area
B3	Disturbance of vegetation would be limited to the minimum necessary to construct the Project. Trees nominated to be removed would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal.	Project area

ID	Management and mitigation measures	Applicable location (s)
B4	A qualified and experienced fauna spotter/ecologist would be engaged to inspect trees prior to and during removal and trimming to relocate any fauna that may be present in each tree. This process should be documented (including photos) for record keeping.	Project area
B5	Where space restrictions allow, Tree Protection Zones (TPZs) would be established around trees to be retained, using an appropriate physical demarcation. Tree protection would be undertaken in line with AS 4970-2009 Protection of Trees on Development Sites and would include exclusion fencing of TPZs. Where TPZs are not feasible, alternative measures would be implemented including branch and trunk protection. An arborist may be consulted if necessary.	Project area
B6	All workers involved in tree removal/trimming would be provided with a specific induction relevant to this task prior to commencing work.	Project area
B7	Equipment would be stored, stockpiled and refuelled within the identified construction ancillary facilities.	Project area
B8	Vegetation offsets and/or landscaping would be undertaken in accordance with the <i>Vegetation Offset Guide</i> (TfNSW, 2019b).	Project area
B9	Plant equipment would be turned off when not in use to avoid noise and air impacts to nearby fauna.	Project area
B10	Weed control measures, consistent with TfNSW's <i>Weed Management and Disposal Guideline</i> (TfNSW, 2019f), would be developed and implemented as part of the Flora and Fauna Management Sub-Plan to manage the potential dispersal and establishment of weeds during the construction phase of the Project. This would include the management and disposal of weeds in accordance with the <i>Biosecurity Act 2015</i> .	Project area
B11	Works must be stopped if any previously undiscovered threatened flora or fauna species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained before proceeding.	Project area
B12	WIRES should be consulted if any injured fauna are encountered, or any fauna is otherwise found within the construction areas and is impeding work.	Project area
B13	Inspections would be undertaken at least every three months for weed infestations and to assess the need for control measures. Any weeds identified would be managed in accordance with the relevant guidelines.	Project area
<u>Soils, geology, groundwater and contamination</u>		
Construction		
SC1	A Soils and Water Management Sub-Plan would be developed to manage the soil and water issues relevant to the construction of the Project. This sub-plan would be part of the CEMP. The sub-plan would include detailed erosion and sediment control plans for each work site and would outline which erosion and sediment control measures would be implemented at each location or for specific works. These control measures would align with the management approaches outlined in <i>Managing Urban Stormwater: Soils and Construction Volume 1</i> (Landcom, 2004), <i>Managing Urban Stormwater: Soils and Construction Volume 2A</i> (DECC, 2008) (referred to as the Blue Book), the <i>Water Discharge and Reuse Guideline</i> (TfNSW, 2015c), <i>Concrete Washout Guideline</i> (TfNSW, 2015b), <i>Water Sensitive Urban Design Guideline</i> (TfNSW, 2017b) and <i>Chemical Storage and Spill Response Guideline</i> (TfNSW, 2015a).	Project area

ID	Management and mitigation measures	Applicable location (s)
SC2	Prior to construction commencing a detailed contamination assessment would be undertaken within the Project area to confirm whether additional contamination risks are present and to develop site and/or location specific management responses if necessary. Where remediation options are required, they would be identified and selected using a sustainability hierarchy.	Project area
SC3	Hazardous materials surveys would be undertaken during detailed design for all proposed demolition activities, and for utility adjustments as required.	Project area
SC4	Should asbestos be identified (in the hazardous material surveys or otherwise) within excavation areas or in buildings requiring demolition, an Asbestos Management Plan (AMP) would be developed and implemented for the relevant works. The AMP would be prepared by a suitably qualified practitioner and in accordance with relevant guidelines.	Project area
SC5	In the event a remediation action plan is required, it would be developed in accordance with <i>Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land</i> (Department of Urban Affairs and Planning and Environment Protection Authority, 1998), and a NSW EPA Accredited site auditor suitably qualified and experienced contamination advisor would be engaged to audit the works.	Project area
SC6	In the event that indicators of contamination or acid sulfate soils are encountered during construction (such as odours, visually contaminated materials etc.), work in the immediate area would cease, and the finds would be managed in accordance with the unexpected contamination finds procedure.	Project area
SC7	The NSW EPA would be notified in writing of any contamination identified within the Project area, in accordance with the requirements of Section 60 of the <i>Contaminated Land Management Act 1997</i> .	Project area
<u>Flooding, hydrology and water quality</u>		
Construction		
SW1	Temporary drainage or drainage diversions would be installed so that stormwater function is not impeded during construction.	Project area
SW2	Stockpiles and storage areas would be located outside of the five per cent AEP flood extent and ideally outside of the one per cent AEP flood extent where possible, particularly any loose materials with the potential to wash away.	Ancillary Facility 1
SW3	Works would cease in flood prone areas when a severe weather warning is issued for the immediate area, and work sites would be secured accordingly.	Project area
SW4	<p>A Soils and Water Management Sub-Plan would be developed to manage the soil and water issues relevant to the construction of the Project. This sub-plan would be part of the CEMP. The sub-plan would include detailed erosion and sediment control plans for each work site and would outline which erosion and sediment control measures would be implemented at each location or for specific works.</p> <p>These control measures would align with the management approaches outlined in <i>Managing Urban Stormwater: Soils and Construction Volume 1</i> (Landcom, 2004), <i>Managing Urban Stormwater: Soils and Construction Volume 2A</i> (DECC, 2008) (referred to as the Blue Book), the <i>Water Discharge and Reuse Guideline</i> (TfNSW, 2015c), <i>Concrete Washout Guideline</i> (TfNSW, 2015b), <i>Water Sensitive Urban Design Guideline</i></p>	Project area

ID	Management and mitigation measures	Applicable location (s)
	(TfNSW, 2017b) and <i>Chemical Storage and Spill Response Guideline</i> (TfNSW, 2015a).	
SW5	Undertake consultation with City of Sydney Council and/or Sydney Water (as relevant) prior to connecting to existing stormwater drainage system/s.	Project area
Operation		
SW6	A 300 millimetre wide 'Heel Safe' trench grated drain would be installed either side of Little Eveleigh Street connecting to existing downstream stormwater drainage systems.	Little Eveleigh Street
SW7	The existing localised sag depression would be regraded at Little Eveleigh Street.	Little Eveleigh Street
SW8	A treatment device would be installed to treat the first flush of rainfall from the new concourse.	New concourse
SW9	Stormwater treatment device/s/water sensitive urban design features would be installed in the new car park at Little Eveleigh Street (which may include a vegetated bioretention basin or similar).	At or near proposed car park, Little Eveleigh Street
Air quality		
Construction		
AQ1	An Air Quality Management Sub-Plan would be developed to manage the potential air quality impacts relevant to the construction of the Project. This sub-plan would be part of the CEMP. The sub-plan would identify potential dust and exhaust emission sources and outline appropriate mitigation measures to ensure that the performance objectives noted in the EIS are achieved. Locations within the Project area with contaminants of potential concern at unacceptable levels would be identified within the Air Quality Management Sub-Plan and specific measure put in place to manage risks associated with this material.	Project area
AQ2	The Air Quality Management Sub-Plan would include contingency measures to address air quality complaints if received.	Project area
AQ3	Work activities would be reviewed if the air quality management measures are ineffective in minimising dust or other emissions.	Project area
AQ4	<p>The Air Quality Management Sub-Plan would include measures to manage dust emissions. These would include the following:</p> <ul style="list-style-type: none"> • when using machinery to handle dusty/dust-generating materials, minimise the distance between where the material is stored and its final location • vehicles carrying loose or potentially dusty material to or from the Project area would be adequately covered • water would be sprayed on unsealed access roads and open areas during conditions conducive to dust generation • a wheel cleaning/washing system would be established for vehicles entering and leaving the Site • on-site vehicle speed limits would be established and enforced to prevent dust emissions • water-assisted dust sweepers would be used on internal access tracks and local roads, to remove material tracked out of the Project area • stockpiled material would be appropriately managed and shaped to reduce wind erosion and covered as appropriate 	Project area

ID	Management and mitigation measures	Applicable location (s)
	<ul style="list-style-type: none"> stockpiles containing contaminated material would be banded and covered when not being actively managed, and removed from site as soon as possible in accordance with contaminated waste procedures during extreme weather events where dust generation cannot be effectively minimised (such as high winds), dust generating works would cease until adequate controls can be implemented or until adverse weather conditions subside demolition of buildings and structures would be carried out using techniques and practices that minimise dust generation. This may include soft stripping inside buildings before demolition. 	
AQ5	<p>Measures to manage exhaust emissions would include the following:</p> <ul style="list-style-type: none"> plant, machinery and vehicles would be turned off while not in use, where safe to do so equipment (including all internal combustion engines) would be properly maintained and would run efficiently to ensure exhaust emissions are minimised, where practicable construction plant, machinery or vehicles producing excessive visual exhaust would be turned off, tagged 'out of order' and not used all emission controls used on vehicle and equipment would comply with standards listed in Schedule 4 of the <i>Protection of the Environment Operations (Clean Air) Regulation 2010</i> emissions from plant would be considered as part of pre-acceptance checks. 	Project area
AQ6	Construction site layout and placement of plant would consider air quality impacts to nearby receivers.	Project area
AQ7	In the event that odour emissions are generated, work would cease until the source and nature of the odour can be determined and an appropriate course of action carried out. This may include further assessment to determine potential impacts on the nearest sensitive receptors.	Project area
Hazards and risk		
Construction		
HRS1	A hazard analysis would be undertaken during the detailed design stage to identify risks to public safety from the project, and how these can be mitigated through safety in design (with reference to the <i>International Standard (ISO/IEC 31010) - Risk Assessment Technique and Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace</i> (NSW Government, 2019b) (or updated equivalent) where relevant).	Project area
HRS2	Relevant standards and guidelines will be applied during detailed design to ensure that EMF emissions comply with relevant limits for all receivers (including the International Commission on Non-Ionizing Radiation Protection's (ICNIRP) <i>Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1Hz – 100kHz)</i> , as adopted by the Australian Radiation Protection and Nuclear Safety Agency.	Project area (and area of potential EMF emission exposure)
HRS3	All hazardous substances that may be required for construction and operation would be stored and managed in accordance with the <i>Work Health and Safety Act 2011, Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace</i> (NSW Government, 2019b) and the <i>Hazardous and Offensive Development Application Guidelines: Applying SEPP 33</i> (Department of Planning, 2011) (or updated equivalent publications).	Project area

ID	Management and mitigation measures	Applicable location (s)
HRS4	<p>The CEMP would include emergency and incident response procedures, as specified by the CEMF. The procedures would specify:</p> <ul style="list-style-type: none"> • roles and responsibilities • notification and reporting protocols • action and investigation requirements • training programs to ensure that all staff are familiar with the plan • design and management measures to address the potential environmental impacts of an emergency situation. 	Project area
HRS5	<p>To minimise hazards related to the demolition or removal of buildings and structures, a risk assessment would be carried out prior to these works commencing. The risk assessment would include:</p> <ul style="list-style-type: none"> • an assessment of the structural integrity of the structure to be demolished • an assessment of the method of demolition, including sequencing, scheduling, plant and equipment, and the layout of work areas • a hazardous material survey for those buildings and structures suspected of containing hazardous materials (particularly asbestos). <p>Demolition would be carried out by licensed demolition contractors.</p> <p>Asbestos removal would be undertaken by qualified and licensed asbestos removalists in accordance with the <i>Work Health and Safety Act 2011</i> and supporting <i>Work Health and Safety Regulations 2014</i>, and relevant SafeWork NSW and SafeWork Australia guidelines/codes of practice.</p>	Project area
HRS6	‘Dial before you dig’ searches would be carried prior to excavation work taking place.	Project area
Waste		
Construction		
WM1	<p>A Waste Management Sub-Plan would be prepared as part of the CEMP. The Sub-Plan would:</p> <ul style="list-style-type: none"> • identify requirements consistent with the waste and resource management hierarchy and cleaner production initiatives • include relevant measures from the <i>National Waste Policy: Less Waste, More Resources</i> (Department of Agriculture, Water and the Environment, 2018) • ensure resource efficiency is delivered through the design and construction practices • provide consistent clear direction on waste and resource handling, storage, stockpiling, use and reuse management measures • outline procedures for stockpiling of wastes (refer to mitigation measure WM2) • set out processes for disposal, including on-site transfer, management and the necessary associated approvals/permits. All waste generated would be regularly removed from site as required by licensed contractors, in order to avoid potential issues associated with odour, visual amenity and attracting animals/pest species • outline that waste generated within the Project area would be segregated at source and suitably stored in designated waste management areas within the Project area • include material tracking measures to track waste and recyclables generated from the Project and removed from the Project area. 	Project area

ID	Management and mitigation measures	Applicable location (s)
	<p>Material tracking records would include types, volumes and management measures for waste and resources arising from/used for the Project</p> <ul style="list-style-type: none"> outline an unexpected finds protocol to manage the potential for unexpected finds during construction of the Project (i.e. asbestos or other hazardous materials) include a process for auditing, monitoring and reporting. 	
WM2	<p>Stockpiled wastes would be:</p> <ul style="list-style-type: none"> appropriately segregated to avoid mixing and contamination appropriately labelled appropriately stored to minimise risk of erosion less than three metres in height with an appropriate height to length batter ratio (e.g. 1:3) located as far away as practical from sensitive receivers, ecological areas and watercourses. 	Project area
WM3	<p>Where a NSW EPA Resource Recovery Order exists for a specific waste material the opportunity to re-use the waste under that order should be considered prior to disposal. Current orders (and exemptions) are found on the NSW EPA website: https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/resource-recovery-framework/current-orders-and-exemption</p> <p>The current orders should be periodically reviewed during construction for applicability.</p>	Project area
WM4	<p>All waste would be assessed, classified, managed and disposed of (where they cannot be re-used) in accordance with the <i>Waste Classification Guidelines</i> (NSW EPA, 2014a).</p>	Project area
WM5	<p>Waste segregation bins would be located at various locations within the Project area, if space permits, to facilitate segregation and prevent cross contamination.</p>	Project area
<u>Sustainability and climate change</u>		
Construction		
SCC1	<p>Sustainability initiatives would be incorporated into the detailed design and construction of the Project to support the achievement of the Project sustainability objectives and would be detailed in the SMP.</p>	All
SCC2	<p>A rating level of 'Excellent' would be targeted under version 1.2 of the IS Rating Tool.</p>	All
SCC3	<p>A workforce development and industry participation strategy would be developed and implemented during construction.</p>	All
SCC4	<p>Adaptation measures, as outlined in the TfNSW <i>Climate Risk Assessment Guidelines</i>, would be further assessed during detailed design and where practicable incorporated into the detailed design and construction of the Project.</p>	All
Operation		
SCC5	<p>Sustainability initiatives would be incorporated into the operation of the Project to support the achievement of the Project sustainability objectives and would be detailed in the SMP.</p>	All
SCC6	<p>Adaptation measures, as outlined in the TfNSW <i>Climate Risk Assessment Guidelines</i>, would be further assessed during detailed design and where practicable incorporated into the operation of the Project.</p>	All

ID	Management and mitigation measures	Applicable location (s)
SCC7	Periodic review of climate change risks would be undertaken during operations to ensure ongoing resilience to the impacts of climate change.	All
Cumulative impacts		
Construction		
CI1	TfNSW would co-ordinate with other project developers with projects under construction at the same time in regard to potential cumulative impacts (including potential cumulative noise and traffic impacts). Co-ordination and consultation with relevant stakeholders would also occur when necessary (e.g. DPIE, Sydney Trains, State Transit Authority, City of Sydney Council, utility providers, emergency service providers). These stakeholders would be kept informed of construction progress and scheduling, in an effort to minimise community impacts. Co-ordination and consultation with these stakeholders would also include development of mitigation strategies to manage conflicts such as adjustments to the construction program and work activities, co-ordination of traffic management arrangements between projects and coordination of consultation activities to minimise the potential for consultation fatigue.	All
CI2	Noise mitigation measures (refer Chapter 13 of the EIS) would be reviewed for their appropriateness in line with the <i>Interim Construction Noise Guideline</i> (DECC, 2009) where cumulative noise impacts on a receiver are expected and the Project is the dominant source.	All

25.7 Compilation of performance outcomes

The SEARs identify a number of desired performance outcomes for the Project (refer **Appendix A**). These desired performance outcomes outline the broader objectives to be achieved during design, construction, and operation.

Based on the outcomes of the environmental impact assessment, and having regard to the performance outcomes nominated in the SEARs, Project specific performance outcomes have also been developed. These performance outcomes would also assist in managing residual impacts identified for the Project (described in **Section 25.4**).

TfNSW have committed to achieving the Project specific performance outcomes described in **Table 25-5**.

Future design development and any design changes would be considered against these environmental performance outcomes.

Table 25-5 Compilation of environmental performance outcomes

Environmental aspect	Project specific environmental performance outcomes
Urban design	<ul style="list-style-type: none"> minimal impacts to existing structures during construction a public domain that is accessible, legible and safe during construction a public domain that is accessible, legible and safe during operation public domain finishes reference the City of Sydney Public Domain Manual selection of materials that are durable and easy to maintain during operation clear pedestrian circulation space inside and outside the station, at station entries and adjoining streets during operation landscaping with street trees selected for canopy and shade.

Environmental aspect	Project specific environmental performance outcomes
Landscape and visual	<ul style="list-style-type: none"> • construction sites and compounds are planned and managed to minimise adverse visual effects • the obtrusive effects of lighting are minimised during construction • the obtrusive effect of lighting are minimised during operation • materials and finishes for the concourse are selected with consideration of minimising visual impacts • additional tree removal and trimming of vegetation is avoided where possible to minimise changes in landscape character • there is a net increase in trees within the vicinity of the Project area to minimise adverse landscape impacts • community artwork investigated and included as appropriate • graffiti avoidance measures are incorporated into the design.
Land use and property	<ul style="list-style-type: none"> • effective construction design and planning to minimise residual land to allow integration with adjoining land uses and provide accessibility to properties and community facilities • consultation with individual property owners/managers to identify individual concerns and develop and document strategies to address these concerns.
Social	<ul style="list-style-type: none"> • adverse social and economic impacts are minimised through ongoing consultation with individual property owners and the community to document, address and develop strategies to address community concerns.
Traffic, transport and access	<ul style="list-style-type: none"> • safe and efficient access routes are provided for pedestrians, cyclists and road users, including buses • maintain access for all customers to Redfern Station, while the station is operational • access to residences and commercial properties is maintained • access for emergency vehicles, waste management services and deliveries is maintained • the local community, relevant authorities and other proponents undertaking concurrent work close to the Project are consulted to minimise disruptions to road, active transport and public transport users • the local community and relevant authorities are consulted regarding upcoming Project construction activities to minimise disruptions to road, active transport and public transport users the Project provides convenient, safe and direct access for customers to the station during operation.
Noise and vibration	<ul style="list-style-type: none"> • construction airborne and ground-borne noise and vibration is effectively managed to minimise adverse impacts on acoustic amenity • construction vibration is effectively managed to minimise adverse impacts on the structural integrity of buildings and items • increases in noise emissions and vibration during operation of the Project affecting nearby properties and other sensitive receivers are effectively managed to protect the amenity and well-being of the community • appropriate mitigation measures outlined in the TfNSW CNVS are identified and implemented to minimise noise and vibration impacts • specific notifications to the community are issued no later than seven days prior to construction works.

Environmental aspect	Project specific environmental performance outcomes
Non-Aboriginal heritage	<ul style="list-style-type: none"> • the Project has considered the following heritage opportunities: <ul style="list-style-type: none"> - transparency of the concourse is maximised - the bulk and scale of the concourse is minimised - the reflectivity of proposed materials of the concourse is minimised - separation between heritage fabric and new elements is incorporated - bulk and scale of platform canopies are minimised - structures such as billboards or advertising on the concourse that would diminish the transparency of the structure and disrupt views are avoided. • heritage items are sensitively protected and managed during the construction of the Project • heritage elements are protected as far as practicable including: <ul style="list-style-type: none"> - careful relocation of the Platform 1 Office Building and sensitive work to existing buildings on Platforms 4/5, 6/7 and 8/9 - the warehouse character of 125-127 Little Eveleigh Street is retained. - the industrial character of the Eveleigh Railway workshops is respected - the existing SHR curtilage of the Eveleigh Chief Mechanical Engineer's Office is retained. • materiality of new elements at the Marian Street entry is in keeping with the public domain design • movable heritage items are identified, conserved and protected during construction • heritage fabric is conserved through the reuse of salvageable heritage fabric where possible • a historical record of areas modified by the Project is maintained for future reference through archival recording • heritage interpretation is undertaken that communicates the heritage value of the site to visitors • potential archaeology within the Project area is protected or appropriately managed • heritage inventories are updated to reflect the Project design to ensure that records of heritage items are maintained • avoidance of structures such as billboards or advertising on the concourse that would diminish the transparency of the structure and disrupt views.
Aboriginal heritage	<ul style="list-style-type: none"> • no impacts to Aboriginal sites, objects and places identified in the assessment during construction • if an unexpected find is encountered during construction, relevant procedures under TfNSW's Unexpected Heritage Finds Guideline (Transport for NSW, 2019e) are followed.
Biodiversity	<ul style="list-style-type: none"> • impacts are avoided to flora and fauna not already identified in this EIS • flora and fauna habitat is retained/impacts avoided, or enhanced where possible • impacts to threatened ecological communities or endangered species are offset in accordance with the requirements of the TfNSW Vegetation Offset Guide (TfNSW, 2019b) • weeds and plant pathogens are managed in accordance with TfNSW's Weed Management and Disposal Guideline (TfNSW, 2019f) and the Biosecurity Act 2015.

Environmental aspect	Project specific environmental performance outcomes
Soils, geology, groundwater and contamination	<ul style="list-style-type: none"> risks to human health and ecological receivers are minimised through effective management of soil and contaminated materials.
Flooding, hydrology and water quality	<ul style="list-style-type: none"> stormwater drainage within the Project area is maintained during construction so as not to cause localised flooding or drainage issues as a result of Project works adverse impacts to stormwater quality during construction are avoided adverse impacts to stormwater quality during operation are avoided adverse impacts to local drainage during operation are avoided.
Air quality	<ul style="list-style-type: none"> during construction, dust is managed to minimise the release beyond the site boundaries so that dust complaints are avoided during construction, tracking or spilling of soil/spoil from the Project onto offsite areas is minimised, and offsite road surfaces are cleaned at the end of each day so that they are free of visible, loose soil/spoil material (which may be washed away in runoff or otherwise cause complaints) dust impacts from soil waste stockpiles are prevented by removing these stockpiles as soon as practicable by an appropriately licenced contractor.
Hazards and risk	<ul style="list-style-type: none"> during construction and operation, dangerous goods in the Project area are stored at least the minimum storage distance from sensitive receivers as defined by Applying SEPP 33.
Waste and resources	<ul style="list-style-type: none"> waste from construction and operation of the Project is classified in accordance with the Waste Classification Guidelines (NSW EPA, 2014a) waste types once classified are reviewed against appropriate guidelines to manage waste appropriately at least 80 percent (by volume) of non-contaminated spoil excavated during construction would be diverted from landfill, either by re-using suitable material on site or identifying other sites/re-purposing facilities where suitable material may be re-used contaminated and asbestos contaminated wastes are safely disposed of in accordance with their relevant waste classification.
Sustainability and climate change	<ul style="list-style-type: none"> the Project reduces the NSW Government's operating costs and ensures the effective and efficient use of resources conservation of natural resources is maximised the Project is designed, constructed and operated to be resilient to the future impacts of climate change.
Cumulative impacts	<ul style="list-style-type: none"> the Project is coordinated with other projects being constructed in the area to minimise cumulative impacts.

25.8 Project justification

25.8.1 Summary of Project justification

The Project forms part of the TAP, a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure across NSW.

Redfern Station does not currently meet key requirements of the *Disability Standards for Accessible Public Transport 2002* (DSAPT). Existing platforms are accessed by a single stairway at the northern end of the platforms (with the exception of Platforms 6/7 which are also serviced by an existing lift). The stairways do not provide an accessible path of travel for several groups of people including those with a disability, limited mobility or parents/carers with prams or customers with luggage.

In addition, the Station is located within the Sydney Innovation and Technology Precinct (NSW Government, 2018), which is a commitment by the NSW Government to create a globally competitive innovation and technology precinct located in the Central to Eveleigh corridor. The vision for the Sydney Innovation and Technology Precinct includes the development of around 250,000 square metres of dedicated floorspace for technology companies with a focus on enabling the growth of new companies. The development of this Precinct aims to create 25,000 new innovation jobs, 100 new scale-up companies and triple NSW's technology exports. This precinct contributes to the high forecast demand for the Station.

The Project has been designed to meet the DSAPT and would support the objectives of relevant NSW government policies and plans. The Project would provide safe and equitable access to Platforms 1-10 and the surrounding pedestrian network, along with generally improving customer facilities, amenity and safety. The improvements would in turn facilitate existing demand, ease congestion and assist in supporting the growth in public transport use, providing an improved customer experience for existing and future users of Redfern Station.

25.8.2 Summary of Project benefits

The Project aims to address current demand for the Station and significant forecast growth in the surrounding area associated with the Sydney Innovation and Technology Precinct and subsequent increase in rail patronage.

The Project would enable equitable access to Redfern Station and platforms from both Little Eveleigh Street and Marian Street through the inclusion of lifts to Platforms 1-10. New stairs to platforms would provide a secondary entry/exit point which would serve to reduce capacity issues and improve customer movements within the Station precinct.

The proposed concourse not only provides connectivity between the platforms at Redfern Station and access to both Marian Street and Little Eveleigh Street, but also provides cross corridor connectivity. This would address the existing desire line constraint, by providing access to the Station's above ground platforms closer to South Eveleigh, Carriageworks and the University of Sydney.

25.8.3 Consequence of not proceeding

Redfern Station is currently the sixth busiest station in NSW with around 70,000 customers on an average weekday. It is already at capacity and has deficiencies that restrict capacity to meet future demands and present a risk to customer safety.

Access to the station platforms does not currently comply with DSAPT requirements, as only a single point of access (consisting of a stairway) is available to the majority of platforms. Currently only Platforms 6 and 7 are accessible via a lift, greatly restricting the availability of services for disabled customers and other people with mobility issues.

Should the Project not proceed, the benefits outlined above would not be realised. Existing capacity constraints at Redfern Station would remain and the Station would not comply with DSAPT requirements.

25.8.4 Environmental considerations

Environmental investigations were undertaken during preparation of the EIS to assess the potential impacts of the Project. These included specialist assessments of traffic, transport and access, noise and vibration, non-Aboriginal heritage, Aboriginal heritage, social and economic impacts, landscape and visual impact and flooding, hydrology and water quality. The EIS has documented the potential environmental impacts, including potential cumulative impacts, considering both potential beneficial and adverse impacts, and identifies mitigation measures to protect and manage identified environmental impacts.

The residual impacts identified on the biophysical, social and cultural environments are summarised in **Section 25.4**.

As described in **Chapter 24** and **Section 25.5**, the Project would incorporate environmental management and design features to ensure that potential impacts are managed and mitigated as far as practicable.

25.8.5 Ecologically sustainable development

The EP&A Act adopts the definition of ecologically sustainable development contained in the *Protection of the Environment Administration Act 1991*. An assessment of the Project against the principles of ecologically sustainable development as per clause 7(4) of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* is provided below. The Project is targeting an 'Excellent' rating under the ISCA IS Rating Tool, which incorporates best practice benchmarks for sustainable design and construction. The ISCA IS Rating Tool has been designed to help infrastructure meet its full sustainability potential.

Precautionary principle

A range of environmental investigations have been undertaken during the development of the Project and the environmental assessment process, to ensure that potential impacts are understood with a high degree of certainty. The assessment of the potential impacts of the Project is considered to be consistent with the precautionary principle. The assessments undertaken are consistent with accepted scientific and assessment methodologies and have considered relevant statutory and agency requirements. The assessments have applied a conservative approach with regard to construction and operational arrangements, and the modelling used.

The Project has evolved to avoid impacts where possible, and to reflect the findings of the assessments undertaken. A number of safeguards have been proposed to minimise potential impacts. These safeguards would be implemented during construction and operation. No safeguards have been postponed as a result of lack of scientific certainty.

Principle of inter-generational equity

Construction of the Project has the potential for some degree of environmental and social disturbance. These disturbances include amenity impacts during construction, impacts to heritage items and changes to traffic movements and access. However, the potential for environmental and social disturbance as a result of construction has to be balanced against the long-term benefits of the Redfern Station Upgrade overall.

Once operational, the Project would benefit future generations. The Project would provide long term benefits by improving accessibility to a key station on the Sydney Trains network and surrounding education, health and business precincts. The benefits of the Project would be felt most by future generations as the area surrounding the Project continues to develop in line with the Central to Eveleigh Urban Transformation Strategy.

Conservation of biological diversity and ecological integrity

The majority of the Project area is located within an existing transport corridor with minimal habitat value. Two individuals of *Eucalyptus scoparia* have been identified within or next to the Project footprint, near the Platform 10 station entry. This species is listed as endangered under the BC Act and vulnerable under the EPBC Act. The natural range for this species in NSW is between Glen Innes and the Queensland border. The two identified individuals have been planted as part of a landscaping effort and are not part of a naturally occurring population.

Assessments of significance under the BC Act and EPBC Act have been undertaken for this species (refer **Appendix F**). These assessments indicate that the Project would not result in a significant impact upon this species at either the NSW or Commonwealth levels.

Construction of the Project would require the trimming or removal of vegetation in several areas as described in **Chapter 16**. Where possible trees would be retained and branches trimmed or temporarily tied back to facilitate construction activities. Offsets and/or landscaping would be undertaken in accordance with the *Vegetation Offset Guide* (TfNSW, 2016).

Improved valuation and pricing of environmental resources

Economic appraisal draws on several established methodologies that provide for the valuation of externalities, including environmental externalities, and their inclusion in the appraisal process. Environmental parameters that can be valued include air pollution, greenhouse gas emissions, noise pollution and water run-off. Valuations typically adopt broad average values.

The design has been developed with an objective of minimising potential negative impacts on the surrounding environment. This assessment has identified the environmental and other consequences of the Project and identified mitigation measures where appropriate to manage potential impacts. If approved, construction and operation of the Project would be undertaken in accordance with relevant legislation, the conditions of approval, and the environmental management plans described in **Section 25.5**. These requirements would result in an economic cost to the proponent. The implementation of mitigation measures would increase the capital and operating costs of the Project. This signifies that environmental resources have been given appropriate valuation.

25.9 Conclusion

The Project has been developed with the objective of minimising potential impacts on the local and regional environment and community. The design and construction methodology would continue to be developed with this overriding objective in mind and would continue to consider the input of stakeholders and the local community.

The Project's environmental performance would be demonstrated by implementing the CEMF, CEMP (and its' sub-plans) and CNVS. These plans would be designed to comply with relevant legislation and conditions of approval. They would include a range of environmental mitigation measures developed following the environmental assessment documented in this EIS.

With the implementation of the proposed management and mitigation measures, the potential environmental impacts of the Project are considered manageable. The Project is therefore considered justified and should proceed.

26 References

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