



# Transport Access Program

# **Warrawee Station Upgrade**

## Review of Environmental Factors



*Artist's impression of the proposed Warrawee Station Upgrade, subject to detailed design.*

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## Abbreviations

Term	Meaning
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
APS	Access to Premises (Disability Standards)
ARI	Average Recurrence Interval
ASA	Asset Standards Authority (refer to Definitions)
ASS	Acid Sulfate Soils
BCA	Building Code of Australia
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
CAMBA	China Australia Migratory Bird Agreement
CBD	Central Business District
CCTV	Closed Circuit TV
CEMP	Construction Environmental Management Plan
CLM Act	<i>Contaminated Land Management Act 1997 (NSW)</i>
CNVMP	Construction Noise and Vibration Management Plan
CNVS	<i>Construction Noise and Vibration Strategy (TfNSW, 2018)</i>
CPTED	Crime Prevention Through Environmental Design
dBA	A-weighted decibel
DBH	Diameter Breast Height
DBYD	Dial Before You Dig
D&C	Design & Construct
DDA	<i>Disability Discrimination Act 1992 (Cwlth)</i>
DoEE	Department of the Environment and Energy (Cwlth)
DP&E	NSW Department of Planning and Environment
DSAPT	<i>Disability Standards for Accessible Public Transport 2002</i>
DSI	Detailed Site Investigation (Phase II Contamination Investigation)
ECM	Environmental Controls Map
EMS	Environmental Management System

<b>Term</b>	<b>Meaning</b>
EPA	Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i> (NSW)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth)
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development (refer to Definitions)
ETS	Electronic Ticketing System
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
Heritage Act	<i>Heritage Act 1977</i> (NSW)
Ku-ring-gai LEP	Ku-ring-gai Local Environmental Plan 2015
HV	High Voltage
JAMBA	Japan Australia Migratory Bird Agreement
ICNG	<i>Interim Construction Noise Guideline</i> (Department of Environment and Climate Change, 2000).
Infrastructure SEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i> (NSW)
L <sub>xxx</sub>	See 'noise averaging periods' in Definitions section below
LEP	Local Environmental Plan
LGA	Local Government Area
LoS	Level of Service
LV	Low Voltage
NCA	Noise catchment area
NES	National Environmental Significance
NML	Noise management level
Noxious Weeds Act	<i>Noxious Weeds Act 1993</i> (NSW)
NPfl	<i>Noise Policy for Industry</i> (EPA, 2017)
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
NSW	New South Wales
OEH	NSW Office of the Environment and Heritage

<b>Term</b>	<b>Meaning</b>
OHWS	Overhead Wire Structure
OOHW	Out of hours works
PA system	Public Address system
PDP	Public Domain Plan
PoEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
RailCorp	(former) Rail Corporation of NSW
RAP	Remediation Action Plan
RBL	Rating Background Level
REF	Review of Environmental Factors (this document)
Roads Act	<i>Roads Act 1993 (NSW)</i>
Roads and Maritime	NSW Roads and Maritime Services (formerly Roads and Traffic Authority)
RoKAMBA	Republic of Korea Australia Migratory Bird Agreement
SEPP	State Environmental Planning Policy
SHR	State Heritage Register
SoHI	Statement of Heritage Impact
TCP	Traffic Control Plan
TfNSW	Transport for NSW
TGSI	Tactile Ground Surface Indicators (“tactiles”)
TMP	Traffic Management Plan
TPZ	Tree Protection Zone
TVM	Ticket Vending Machine
UDP	Urban Design Plan
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001 (NSW)</i>

# Definitions

Term	Meaning
'A' Frequency weighting	<p>Frequency weightings are used to adjust sound level meters so that they are measuring and reporting noise levels that represent what humans hear.</p> <p>The human ear is more sensitive to midrange frequencies between 500Hz and 6kHz (for example a child's scream) and less sensitive to very low or very high pitch noises. Sound level meters have inbuilt frequency weighting networks that very roughly approximate the human loudness response at low sound levels. It should be noted that the human loudness response is not the same as the human annoyance response to sound. Here low frequency sounds can be more annoying than midrange frequency sounds even at very low loudness levels.</p> <p>The 'A' weighting is the most commonly used frequency weighting for occupational and environmental noise assessments.</p>
Average Recurrence Interval	<p>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.</p>
Asset Standards Authority	<p>The ASA is an independent body within TfNSW, responsible for engineering governance, assurance of design safety, and ensuring the integrity of transport and infrastructure assets.</p> <p>Design Authority functions formerly performed by RailCorp are now exercised by ASA.</p>
Concept design	<p>The concept design is the preliminary design presented in this REF, which would be refined by the Contractor (should the Proposal proceed) to a design suitable for construction (subject to TfNSW acceptance).</p>
dBA	<p>see 'A' Frequency weighting</p>
Decibel (dB)	<p>The decibel (dB) is a unit used to measure the intensity of a sound by comparing it to a given value on a logarithmic scale. The logarithmic scale allows a wide range of values to be compressed into a more comprehensible range, typically 0–120 dB.</p> <p>Noise levels in decibels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50 dB, and another similar machine is placed beside it, the level will increase to 53 dB (from <math>10 \log_{10} (10(50/10) + 10(50/10))</math>) and not 100 dB. The human ear has a vast sound-sensitivity range of over a thousand billion to one so the logarithmic decibel scale is useful for acoustical assessments.</p>
Design and Construct Contract	<p>A method to deliver a project in which the design and construction services are contracted by a single entity known as the Construction Contractor. The Construction Contractor completes the project by refining the concept design presented in the REF and completing the detailed design so that it is suitable for construction (subject to TfNSW acceptance). The Construction Contractor is therefore responsible for all work on the project, both design and construction.</p>
Detailed design	<p>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 TfNSW acceptance).</p>

Disability Standards for Accessible Public Transport	The Commonwealth <i>Disability Standards for Accessible Public Transport 2002</i> ("Transport Standards") (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.
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.
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.
Noise averaging periods	Noise can be measured over various periods of time. The five 'averaging periods' used in this report are described below: <ul style="list-style-type: none"> <li>• <math>L_{Aeq(15\text{ min})}</math> describes an average noise level across a period of time (either day, evening, night, or over a 15-minute period). It accounts for the full range of noise levels encountered in a given area over a given period.</li> <li>• <math>L_{A90}</math> describes the noise level that occurs for 90 per cent of the time and therefore describes the background noise level.</li> <li>• <math>L_{A10}</math> describes the noise level that occurs for 10 per cent of the time and therefore describes what the environment is like during the noisiest periods.</li> <li>• <math>L_{Amax}</math> describes the average maximum noise level recorded at any point in time.</li> </ul>
Noise catchment area (NCA)	Areas containing noise sensitive receivers that have been categorised based on a similar noise environment.
Noise management level (NML)	An NML is a criteria for managing noise levels associated with an activity. They are site/project specific and are calculated based on the level of ambient noise (represented by the rating background level (RBL)) already at the site. An NML will consist of the RBL plus an allowable increase in noise emissions (e.g. RBL + 10dB). If noise emissions increase above the NML, sensitive receivers are likely to be disturbed.  There are usually two types of NML, 'noise affected' and 'highly noise affected.' The noise affected level represents the point above which there may be some community reaction to noise. The highly noise affected level represents the point above which there may be strong community reaction to noise.
Noise sensitive receiver	In addition to residential dwellings, noise sensitive receivers include, but are not limited to, hotels, entertainment venues, pre-schools and day care facilities, educational institutions (e.g. schools, TAFE colleges), health care facilities (e.g. nursing homes, hospitals), recording studios and places of worship/religious facilities (e.g. churches).
NSW Train Link	From 1 July 2013, NSW Trains (NSW Train Link) became the new rail provider of services for regional rail customers.
Opal card	The integrated ticketing smartcard introduced by TfNSW.

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).
Proponent	A person or body proposing to carry out an activity that requires environmental assessment under Division 5.1 of the EP&A Act - in this case, the proponent for the Warrawee Station Upgrade is TfNSW.
Rail shutdown period	Rail shutdown periods (otherwise known as track possessions) is the term to indicate that they have taken possession of the track (usually a section of track) for a specified period, so that no trains operate for a specified time. This is necessary to ensure the safety of workers and rail users.
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.
Sensitive receivers	Land uses which are sensitive to potential noise, air and visual impacts, such as residential dwellings, schools and hospitals.
Sydney Trains	From 1 July 2013, Sydney Trains replaced CityRail as the provider of metropolitan train services for Sydney.
Tactiles	Tactile tiles or Tactile Ground Surface Indicators (TGSIs) are textured ground surface indicators to assist pedestrians who are blind or visually impaired. They are found on many footpaths, stairs and train station platforms.
The Proposal	The construction and operation of the Warrawee Station Upgrade.
Vegetation Offset Guide	The TfNSW guide that applies where there is vegetation clearing proposed, and where the impact of the proposed clearing is not deemed 'significant' for the purposes of Section 5.5 of the EP&A Act. The Guide provides for planting of a minimum of eight trees for each large tree with a diameter at breast height (DBH) of more than 60 cm, four trees where the DBH is 15-60 cm, or two trees where DBH is less than 15 cm.

# Executive summary

## Overview

The NSW Government is improving accessibility at Warrawee Station. This Proposal is being delivered as part of the Transport Access Program, a NSW Government Initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure.

As part of this program, the Warrawee Station Upgrade (the Proposal) would aim to provide a station precinct that is accessible to those with a disability, limited mobility, parents/carers with prams, and customers with luggage.

The Proposal would aim to provide:

- a new lift to the station platform
- new accessible parking spaces, kiss-and-ride spaces, and pedestrian facilities on Heydon Avenue and Warrawee Avenue
- improved amenities such as a new ambulant toilet and family accessible toilet.

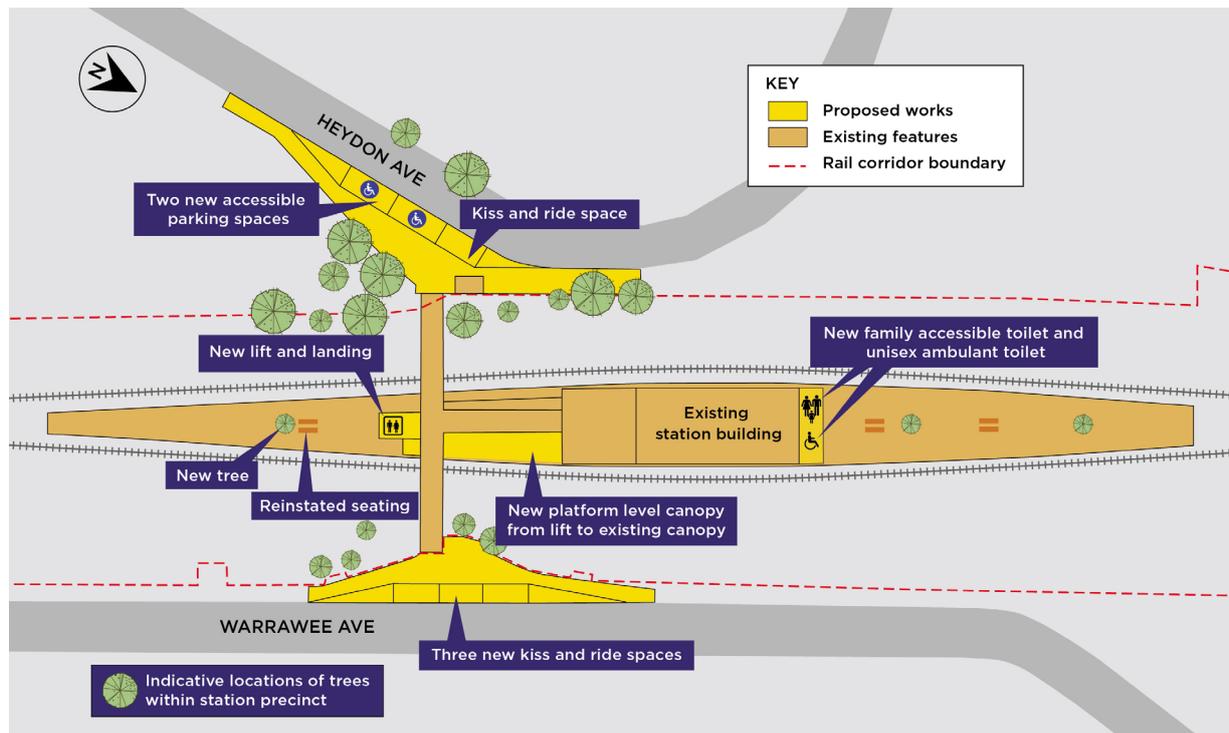
Further details of each of the elements of the Proposal is provided in Chapter 3 of this REF.

Transport for NSW (TfNSW) is the government agency responsible for the delivery of major transport infrastructure projects in NSW and is the proponent for the Proposal.

This Review of Environmental Factors (REF) has been prepared to assess the environmental impacts associated with the construction and operation of the Proposal under the provisions of Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Subject to approval, construction is expected to commence in late 2019 and take approximately 12 to 18 months to complete.

An overview of the Proposal is shown in Figure ES.1 below.



(Indicative only, subject to detailed design)

**Figure ES.1 Key features of the Proposal**

## Need for the Proposal

The Proposal would ensure that Warrawee Station would meet legislative requirements under the *Disability Discrimination Act 1992* (DDA) and the *Disability Standards for Accessible Public Transport 2002* (DSAPT).

The Proposal has been designed to drive a stronger customer experience outcome, to deliver improved travel to and between modes, encourage greater public transport use and better integrate interchanges with the role and function of town centres. The Proposal would also assist in responding to forecasted growth in the region and as such would support growth in commercial and residential development.

Chapter 2 of this REF further describes the need for the Proposal and outlines the options considered in developing the proposed design.

## Community and stakeholder consultation

Community consultation activities for the Proposal would be undertaken during the public display period of this REF and the public invited to submit feedback to help TfNSW understand what is important to customers and the community. The REF would be displayed for a period of two weeks. Further information about these specific activities is included in Section 5.5 of this REF.

During this period a Project Infoline (1800 684 490) and email address ([projects@transport.nsw.gov.au](mailto:projects@transport.nsw.gov.au)) would be also available for members of the public to make enquiries.

TfNSW would review and assess all feedback received during the public display period, prior to determining whether or not to proceed with the Proposal.

### Feedback can be sent to:

- [projects@transport.nsw.gov.au](mailto:projects@transport.nsw.gov.au)
- Transport Access Program – Warrawee

Associate Director Environmental Impact Assessment

Transport for NSW

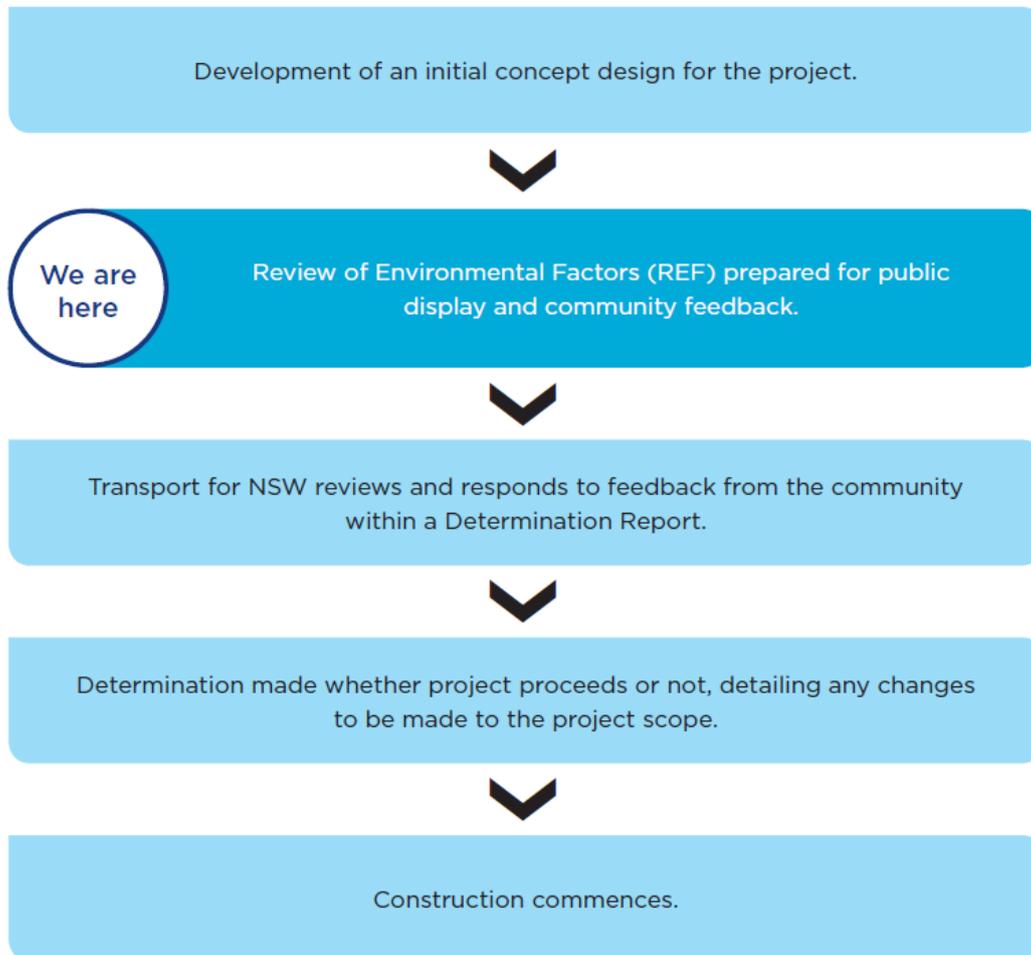
Locked Bag 6501

St Leonards NSW 2065

### Or submitted:

- in person at a project community information session
- via [yoursay.transport.nsw.gov.au/warrawee](https://yoursay.transport.nsw.gov.au/warrawee)

Should the Proposal proceed to construction, the community would be kept informed throughout the duration of the construction period. Figure ES.2 shows the planning approval and consultation process for the Proposal.



**Figure ES.2 Planning approval and consultation process for the Proposal**

## **Environmental impact assessment**

This REF identifies the potential environmental benefits and impacts of the Proposal and outlines the mitigation measures to reduce the identified impacts.

The Proposal would provide the following benefits:

- a station that provides improved accessibility to people with a disability, limited mobility, parents/carers with prams and customers with luggage
- modernisation of the existing station building and facilities that meet the needs of a growing population
- improved interchange and access facilities for all customers utilising Warrawee Station.

The following key impacts have also been identified should the Proposal proceed:

- temporary impacts on local traffic flow associated with construction traffic along Heydon Avenue and Warrawee Avenue
- minor impacts to the heritage fabric of the existing station building and visual environment from the introduction of new elements, such as the lift

- temporary disruptions to station facilities and amenities during construction, including potential weekend closures of Warrawee Station during scheduled Sydney Trains shutdowns
- temporary changes to vehicular, bus, bicycle and pedestrian access around the station during construction
- removal of five trees including one tree on the station platform to accommodate the proposed lift and four trees at the station entrance along Warrawee Avenue
- temporary noise impacts to adjacent residential areas during construction, including periods of weekend works
- potential sediment mobilisation, dust generation and erosion risk during construction.

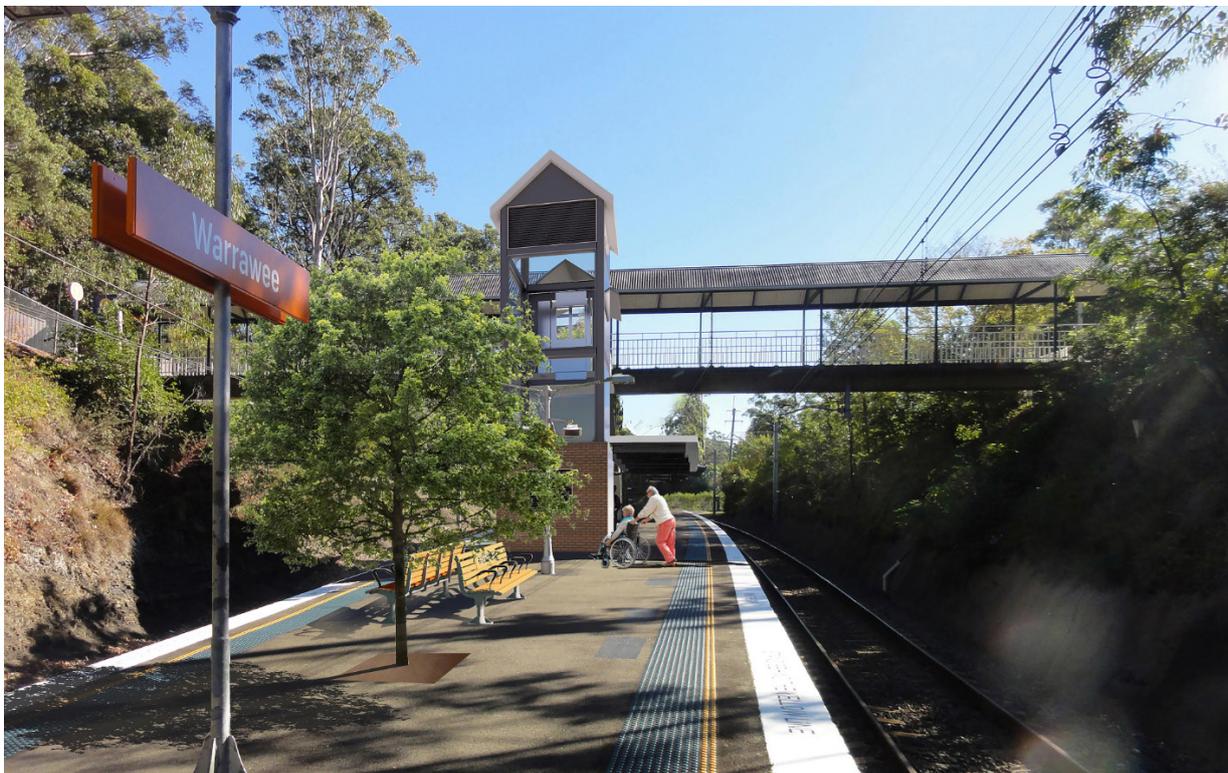
Further information regarding these impacts is provided in Chapter 6 of the REF.

## Conclusion

This REF has been prepared having regard to Sections 5.5 and 5.7 of the EP&A Act, and clause 228 of the EP&A Regulation, to ensure that TfNSW takes into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the Proposal.

Should the Proposal proceed, any potential associated adverse impacts would be appropriately managed in accordance with the mitigation measures outlined in this REF, and the Conditions of Approval imposed in the Determination Report. This would ensure the Proposal is delivered to maximise benefit to the community and minimise any adverse impacts on the environment.

In considering the overall potential impacts and proposed mitigation measures outlined in this REF, the Proposal is unlikely to significantly affect the environment including critical habitat or threatened species, populations, ecological communities or their habitats.



*(Indicative only, subject to detailed design)*

**Figure ES.3 Artists impression**

# 1 Introduction

---

Transport for NSW (TfNSW) was established in 2011 as the lead agency for integrated delivery of public transport services across all modes of transport in NSW. TfNSW is the proponent for the Warrawee Station Upgrade (the Proposal).

## 1.1 Overview of the Proposal

### 1.1.1 The need for the Proposal

The NSW Government is committed to facilitating and encouraging use of public transport, such as trains, by upgrading stations to make them more accessible, and improving interchanges around stations with other modes of transport such as buses, bicycles and cars. The Transport Access Program is an initiative targeted at achieving compliance with the Disability Standards for Accessible Public Transport (DSAPT) Regulations across the Network.

Warrawee Station has been identified for an accessibility upgrade as it does not currently accommodate mobility impaired access to rail services, or meet key requirements of the DSAPT or the Commonwealth *Disability Discrimination Act 1992* (DDA).

The following accessibility issues have been identified at Warrawee Station and have been addressed in the design of the upgrade:

- access to the station building and platforms is currently via stairs only, is constrained by bollards and does not provide accessibility for wheelchairs onto the platforms
- the existing toilets within the station building do not include provision of a family accessible toilet or ambulant toilet
- the existing handrails, tactile ground surface indicators (TGSIs) and nosing on the stairs are non-compliant with DDA standards
- areas of the existing platform grade, including the ramps into the toilets, are non-compliant with existing DDA standards
- the existing platform edge safety zone line markings and TGSIs are non-compliant with existing DDA standards
- provision of accessible car parking spaces and kiss-and-ride spaces for interchange with cars is not available
- other issues including the lack of hearing loops, accessible water fountain and seating on the Warrawee Avenue side of the station.

### 1.1.2 Key features of the Proposal

The key features of the Proposal are summarised as follows:

- construction of a new lift and landing to provide access between the existing pedestrian bridge and the platforms
- upgrade of the existing stairs to include new compliant handrails, TGSIs, nosings and anti-throw screens
- construction of a new platform canopy from the lift to the existing canopy

- internal station building works including:
  - reconfiguration of the existing male and female toilets within the station building to accommodate:
    - a new family accessible toilet
    - a new unisex ambulant toilet
  - other minor building modifications required to accommodate new electrical equipment including a main switchboard, and new or upgraded station communications equipment
- parking, kiss-and-ride, and pedestrian works including:
  - provision of two new accessible car parking spaces and one kiss-and-ride space along Heydon Avenue
  - provision of three new kiss-and-ride spaces along Warrawee Avenue
  - provision of a paved area and associated kerb ramp works at both the Heydon Avenue and Warrawee Avenue entrances
  - removal of existing bollards and replacement of a single bollard at the Heydon Avenue and Warrawee Avenue entrances
- upgrade of the existing platform surfaces (re-grading/re-surfacing) across the platform to provide compliant accessible paths and ramps to station amenities
- landscaping/planting within the station precinct
- electrical upgrades including a new transformer (to be installed on rail land near Warrawee Avenue). A new service pole would also be required to take the existing electricity supply to the transformer and an undergrounding of the 11kv from the service pole to the transformer
- ancillary works including adjustments to lighting, electronic ticketing, relocation or replacement of existing customer facilities (drinking fountain, vending machine, seating and telephone booth), improvement to station communications systems (including CCTV cameras), hearing loops, wayfinding signage and installation of yellow lines and TGSIs.

Subject to planning approval, construction is expected to commence in late 2019 and take approximately 12 to 18 months to complete.

A detailed description of the Proposal is provided in Chapter 3 of this Review of Environmental Factors (REF).

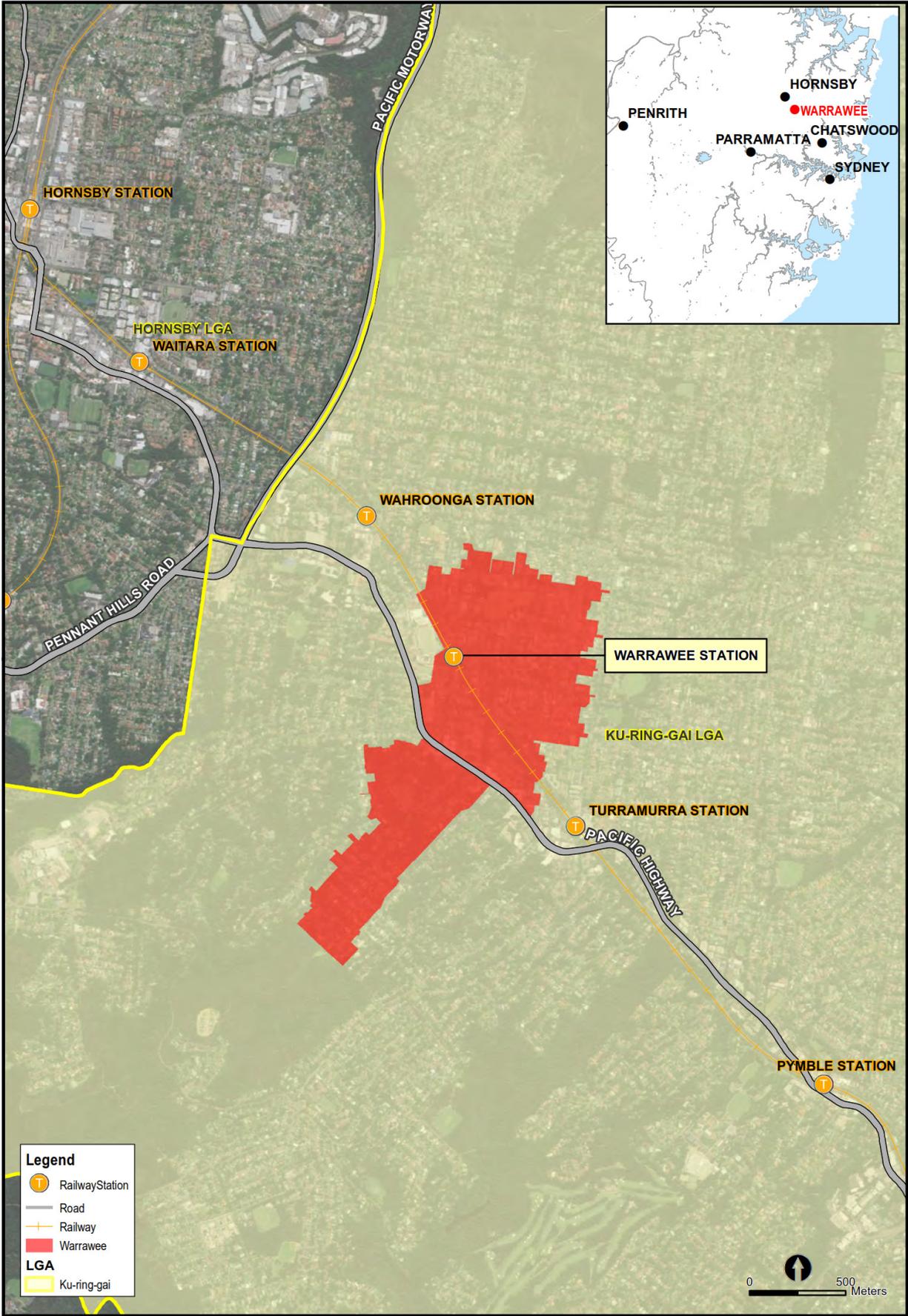
## **1.2 Location of the Proposal**

Warrawee Station is located on the North Shore Line (T1 service), about 22 kilometres by rail from Central Station. It is within the Ku-ring-gai local government area (LGA) in Sydney's north. The suburb of Warrawee consists of predominantly low density residential housing with no commercial activity immediately surrounding the station.

The Proposal study area is generally bounded by Warrawee Avenue to the east and Heydon Avenue to the west as well as low density residential properties. Knox Grammar School is located approximately 50 metres to the west.

The Proposal is mostly located within the station itself, and a small section of kerb, footpath and road on Warrawee Avenue and Heydon Avenue.

The regional location of the Proposal is shown in Figure 1.1.



**Figure 1.1 Regional context**

## **1.3 Existing infrastructure and land uses**

### **1.3.1 Station access and facilities**

Warrawee Station consists of a single island platform which is accessed via a pedestrian bridge that provides cross-rail corridor connectivity linking Warrawee Avenue and Heydon Avenue. Access to the platform is from the pedestrian bridge via stairs.

The pedestrian infrastructure surrounding the station includes footpaths on the station side of Warrawee Avenue and Heydon Avenue. Due to the existing topography, the southern end of the platform is within a cutting and the northern end is located almost at street level.

Platforms 1 and 2 are located on each side of the island platform configuration. Trains arriving on Platform 1 proceed to the city via Gordon. Trains on Platform 2 proceed towards Hornsby.

A station building is located within the middle of the platform and contains a ticket booking office, staff meal room/kitchen, a store room and male and female toilets. Other existing customer facilities within the station precinct include Opal card readers, an Opal top up machine, a drinking fountain, a telephone booth and a vending machine. Weather protection (canopy structure) is provided for commuters between the existing stairs and the northern end of the station building. Seating benches and real time passenger information displays are located on each platform.

### **1.3.2 Interchange facilities**

An existing, unsealed commuter car park containing approximately seven spaces is located immediately west of the station, with access available from Heydon Avenue. No DDA parking provisions are currently allocated within this car park.

Informal kiss-and-ride zones exist on the eastern and western side of Warrawee Station, with dedicated no parking areas on Heydon Avenue and Warrawee Avenue.

No bus stops or bus services are currently provided at Warrawee Station. The nearest bus stop which services the train station is located on the Pacific Highway, about 550 metres south of the station. The stop provides services between Turrumurra and Fox Valley (bus route 573).

Two bike racks are provided on each side of the station. An existing brick shelter with seating is also currently located at the station entrance from Heydon Avenue.

The site location of Warrawee Station is shown in Figure 1.2. Photos of the existing station infrastructure are shown in Figure 1.3 to Figure 1.8.



Figure 1.2 Site locality map



**Figure 1.3** View of existing entrance from Warrawee Avenue



**Figure 1.4** View of existing entrance from Heydon Avenue



**Figure 1.5** View looking north of existing stair access and station building



**Figure 1.6** View looking north from southern end of platform



**Figure 1.7** View of existing station toilet access



**Figure 1.8** View looking south of along Heydon Avenue towards proposed works

## 1.4 Purpose of this Review of Environmental Factors

This REF has been prepared by TfNSW to assess the potential impacts of the Warrawee Station Upgrade. For the purposes of these works, TfNSW is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of this REF is to describe the Proposal, to assess the likely impacts of the Proposal having regard to the provisions of Section 5.5 of the EP&A Act, and to identify mitigation measures to reduce the likely impacts of the Proposal. This REF has been prepared in accordance with clause 228 of the *Environmental Planning and Assessment Regulation 2000* (the EP&A Regulation).

This assessment has also considered the relevant provisions of other relevant environmental legislation, including the *Biodiversity Conservation Act 2016* (BC Act), *Fisheries Management Act 1994* (FM Act) and the *Roads Act 1993* (Roads Act).

Having regard to the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), this REF considers the potential for the Proposal to have a significant impact on matters of National Environmental Significance (NES) or Commonwealth land, and the need to make a referral to the Commonwealth Department of Environment for any necessary approvals under the EPBC Act. Refer to Chapter 4 for more information on statutory considerations.

## 2 Need for the Proposal

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Chapter 2 discusses the need and objectives of the Proposal, having regard to the objectives of the Transport Access Program and the specific objectives of the Proposal. This chapter also provides a summary of the options that have been considered during development of the Proposal and why the preferred option has been chosen.

### 2.1 Strategic justification

#### 2.1.1 Overview

Improving transport customer experience is the focus of the NSW Government's transport initiatives. Transport interchanges and train stations are the important gateways to the transport system and as such play a critical role in shaping the customer's experience and perception of public transport.

The Warrawee Station Upgrade, the subject of this REF, forms part of the Transport Access Program. This program is designed to drive a stronger customer experience outcome to deliver seamless travel to and between modes, encourage greater public transport use and better integrate station interchanges with the role and function of town centres within the metropolitan area and developing urban centres in regional areas of NSW.

In September 2015, the NSW Government announced a series of State Priorities as part of *NSW: Making It Happen* (NSW Government, 2015). The State Priorities are intended to guide the ongoing actions of the NSW Government across the State, and guide resource allocation and investment in conjunction with the NSW Budget. *NSW: Making it Happen* focuses on 12 key 'priorities' to achieve the NSW Government's commitments. These priorities range across a number of issues including infrastructure, the environment, education, health, wellbeing and safety in addition to Government services.

One of the 12 priorities identified as part of *NSW: Making It Happen* relates to investment in building infrastructure. The ongoing development and investment in transport infrastructure is identified as part of the wider building infrastructure priority.

The Proposal would assist in meeting these priorities by improving accessibility to public transport and encouraging greater use of public transport.

TfNSW has also developed a *Future Transport Strategy 2056* (TfNSW, 2018), an overarching strategy, supported by a suite of plans, for transport in NSW to the year 2056. Future Transport 2056 ensures that NSW is prepared for rapid changes in technology and innovation to create and maintain a world class, safe, efficient and reliable transport system over the next 40 years. The Proposal is designed to accommodate the forecast Sydney Trains patronage growth (an increase of 15 per cent to 2036) and changing travel patterns.

The *Disability Inclusion Action Plan 2018-2022* (TfNSW, 2017) was developed by TfNSW, in consultation with the Accessible Transport Advisory Committee, which is made up of representatives from peak disability and ageing organisations within NSW. The Proposal has been developed in consideration of the objectives outlined in this Plan.

Public transport is viewed as critical to urban productivity, expanding employment opportunities by connecting people to jobs, reducing congestion, and supporting delivery of urban renewal.

Further details of the application of NSW Government policies and strategies are discussed in Section 4 of this REF.

## 2.1.2 Objectives of the Transport Access Program

The Transport Access Program is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure. The program aims to provide:

- stations that are accessible to customers with disabilities, limited mobility, 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 network and allow seamless transfers between all modes for all customers
- safety improvements including extra lighting, lift alarm, 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 modes at interchanges
- other improvements and maintenance such as painting, new fencing and roof replacements.

## 2.1.3 Objectives of the Proposal

The specific objectives of the Warrawee Station Upgrade are to:

- provide a station that is accessible to customers with a disability, limited mobility, parents/carers with prams and customers with luggage
- improve overall customer experience by improving accessibility for those with mobility issues (including increased access to station facilities such as the toilets, drinking fountain, telephone booth and accessible parking spaces)
- reduce potential pedestrian conflict and crowding points along the platform
- improve integration with surrounding precinct
- improve customer safety
- improve wayfinding in and around the station
- respond to the heritage values of the site
- improve customer amenity.

## 2.2 Design development

In 2018, Stantec was engaged to prepare a *Scoping Design Report* (Stantec, 2018). The report identified the following key access constraints and issues at Warrawee station:

- access to Warrawee Station is via stairs and does not have accessibility for wheelchairs
- no accessible parking spaces are provided
- bollards at ends of the footbridge constrain the access path to the station
- existing handrails on pedestrian bridge and stairs are non-compliant
- no family accessible toilet
- existing entry to toilets is non-compliant
- TGSIs on existing stairs and platform edge do not comply with standards

- no hearing loop is provided
- no compliant water fountain
- no seating is provided on the Warrawee Avenue side.

## **2.3 Alternative options considered**

Given the existing layout and site constraints of Warrawee Station, only one feasible design option was considered. The identified design would achieve compliance to DSAPT standards through the provision of one lift connection from the platform level to the existing pedestrian footbridge, in addition to a number of other minor works to the station precinct including additional kiss-and-ride facilities and conversion of the existing male and female toilets to a family accessible toilet and an ambulant toilet.

A 'do nothing' option was also considered for comparative purposes to the proposed option.

### **2.3.1 The 'do-nothing' option**

Under a 'do-nothing' option, existing access to the platforms would remain the same and there would be no changes to the way the station currently operates.

### **2.3.2 Assessment of identified options**

As discussed above, given the existing layout and site constraints of Warrawee Station, only one feasible design option was presented at an options selection workshop.

During the workshop, it was identified that the following be considered in future detailed design:

- consider replacing the existing tree and relocating the existing seating located at the proposed lift location
- incorporate a pitched roof on the proposed lift shaft to match the existing pedestrian footbridge.

These design refinements were considered as part of the ongoing design and have been included as part of the Proposal described in Chapter 3.

## **2.4 Justification for the preferred option**

The 'do nothing' option was not considered a feasible alternative as it would be inconsistent with the legislative requirements of the DDA and NSW Government objectives for improving the accessibility of transport interchanges, train stations and commuter car parks across NSW as a priority under the Transport Access Program. The 'do nothing' option would also not help encourage the use of public transport, and would not meet the needs of the Warrawee community.

Given the existing layout and site constraints of Warrawee Station, only one design option was considered to be feasible for the Proposal. The delivery of the Proposal would provide a stronger customer experience outcome, to deliver improved travel to and between modes, encourage greater public transport use and better integrate interchanges with the role and function of town centres. The Proposal would also assist in responding to forecasted growth in the region and as such would support growth in commercial and residential development.

## 3 Description of the Proposal

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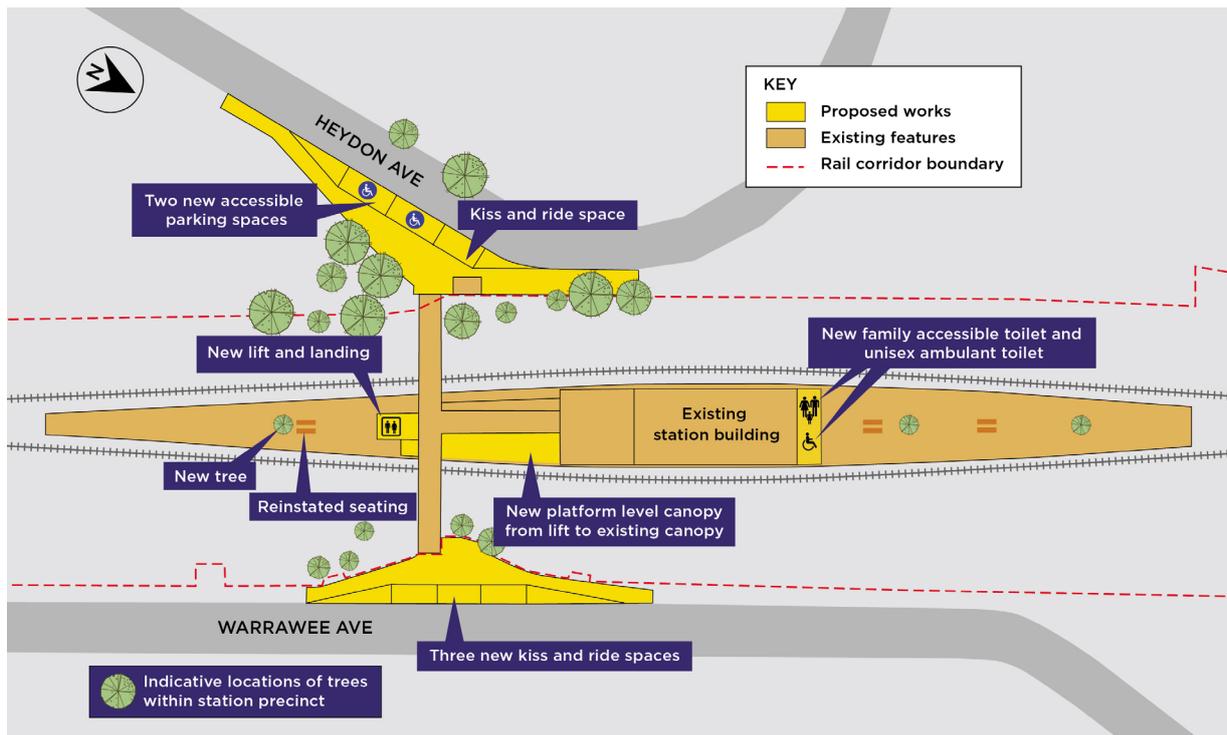
Chapter 3 describes the Proposal and summarises key design parameters, construction method, and associated infrastructure and activities. The description of the Proposal is based on the concept design and is subject to detailed design.

### 3.1 The Proposal

As described in Section 1.1, the Proposal involves an upgrade of Warrawee Station as part of the Transport Access Program which would improve accessibility and amenity for customers. The Proposal would include the following key elements:

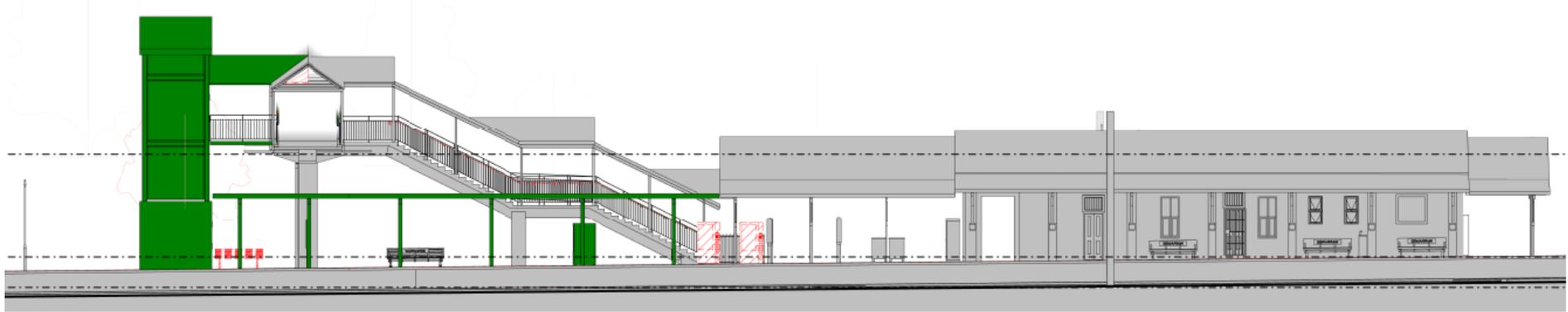
- construction of a new lift and landing to provide access between the existing pedestrian bridge and the platforms
- upgrade of the existing stairs to include new compliant handrails, tactile ground surface indicators (TGSIs), nosings and anti-throw screens
- construction of a new platform canopy from the lift to the existing canopy
- internal station building works including:
  - reconfiguration of the existing male and female toilets within the station building to accommodate:
    - a new family accessible toilet
    - a new unisex ambulant toilet
  - other minor building modifications required to accommodate new electrical equipment including a main switchboard, and new or upgraded station communications equipment
- parking, kiss-and-ride, and pedestrian works including:
  - provision of two new accessible car parking spaces and one kiss-and-ride space along Heydon Avenue
  - provision of three new kiss-and-ride spaces along Warrawee Avenue
  - provision of a paved area and associated kerb ramp works at both the Heydon Avenue and Warrawee Avenue entrances
  - removal of existing bollards and replacement of a single bollard at the Heydon Avenue and Warrawee Avenue entrances
- upgrade of the existing platform surfaces (re-grading/re-surfacing) across the platform to provide compliant accessible paths and ramps to station amenities
- landscaping/planting within the station precinct
- electrical upgrades including a new transformer (to be installed on rail land near Warrawee Avenue). A new service pole would also be required to take the existing electricity supply to the transformer and undergrounding of the 11kv cable from the service pole to transformer.
- ancillary works including adjustments to lighting, electronic ticketing, relocation or replacement of existing customer facilities (drinking fountain, vending machine, seating, telephone booth), improvement to station communications (including CCTV cameras), hearing loops, wayfinding signage and painting of yellow lines.

Figure 3.1 shows the general layout of key elements for the Proposal. Figure 3.2 and Figure 3.3 provide indicative elevations of the Proposal.



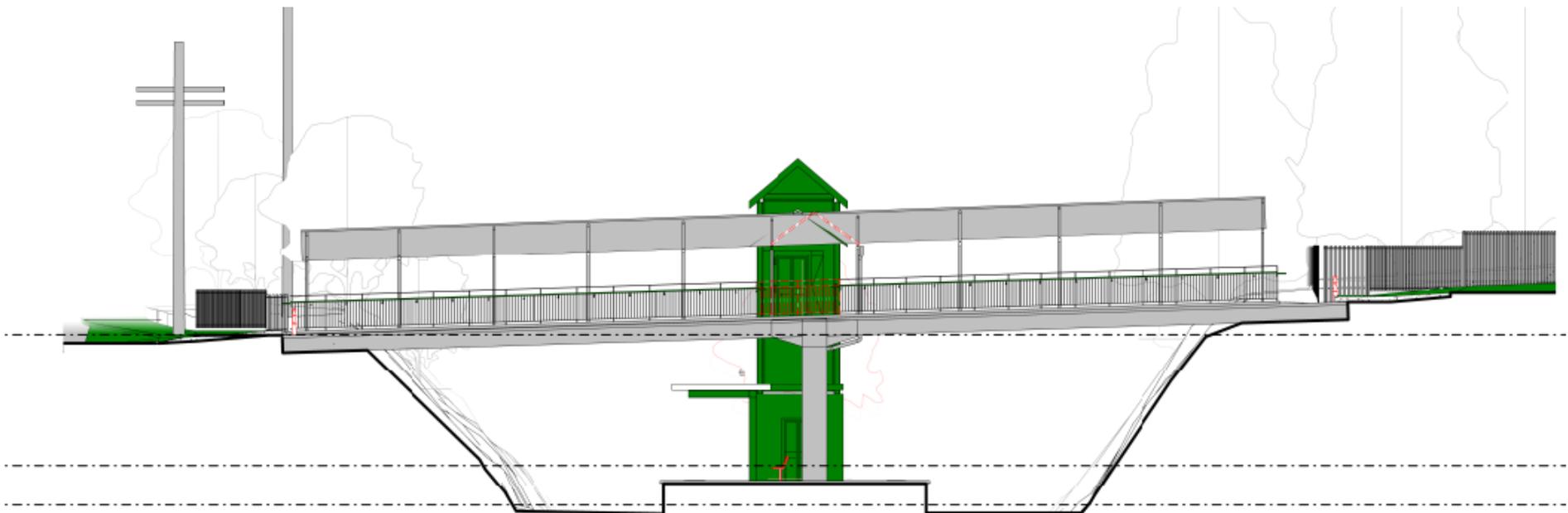
*(Indicative only, subject to detailed design)*

**Figure 3.1 Overview of proposed upgrades**



Source: DesignInc, 2018, Note: proposed works shown in green, existing infrastructure shown in grey

**Figure 3.2 Indicative elevation of the Proposal looking west**



Source: DesignInc, 2018, Note: proposed works shown in green, existing infrastructure shown in grey

**Figure 3.3 Indicative elevation of the Proposal looking south showing the existing footbridge and proposed lift**

### 3.1.1 Scope of works

#### Station upgrade

Details of the proposed works to take place at the station to improve accessibility and customer experience are provided below:

- construction of a new lift and landing south of the existing pedestrian bridge that provides access between the existing footbridge and the station platforms. This would involve construction of a lift pit, foundation and lift shaft structure in accordance with *Technical Note – TN 003: 2016 Collision protection and robustness requirements for lift structures that do not support overbridge structures*
- upgrade of the existing platform surfaces (regrading/re-surfacing) to achieve a maximum cross fall of 1:40 and to provide compliant accessible paths and ramps to station amenities
- upgrade of the existing stairs to include new compliant handrails, TGSIs and nosing
- construction of a new platform-level canopy from the lift to the existing canopy
- internal station building works including:
  - reconfiguration of the existing male and female toilets to accommodate a new family accessible toilet and a unisex ambulant toilet. This would involve shifting the existing internal wall and reconfiguration of the rooms
  - other minor building modifications required to accommodate new electrical equipment including a main switchboard and new or upgraded station communications equipment
- landscaping/planting within the station precinct.

#### Electrical upgrades

To accommodate power requirements for the Proposal, upgrade of the existing 11kV electrical supply would be required. This infrastructure within be installed within the existing rail corridor near Warrawee Avenue to the north of the existing station building. The work would include:

- a new pad-mounted transformer
- a new service pole to take the existing electricity supply to the transformer
- a small section of underground cabling from the service pole to transformer.

The final location of the transformer and alignment for the underground cable would be determined during detailed design.

#### Parking, kiss-and-ride and pedestrian works

On the western side of Warrawee Station, two new accessible car parking spaces and one kiss-and-ride space would be provided along Heydon Avenue. On the eastern side, three new formal kiss-and-ride spaces would be provided along Warrawee Avenue. The accessible parking spaces and kiss-and-ride spaces would be constructed with the required line-marking and signage.

New kerb ramps would also be constructed. This would provide an accessible path to Warrawee Station from the new accessible parking spaces on Heydon Avenue and Warrawee Avenue. A seat would be provided on Warrawee Avenue near the kiss-and-ride spaces.

The existing bollards at the Heydon Avenue and Warrawee Avenue entrances would also be removed and replaced with a single bollard.

## Ancillary work

The following ancillary work would also be undertaken as part of the upgrade:

- relocation and/or adjustments of existing services impacted by the proposed lift, including communications and low voltage cables within the existing island platform
- installation of new station communications systems (including at least five additional CCTV cameras) and lighting
- replacement of any existing non-compliant TGSIs along the existing platforms with new yellow lines and TGSIs
- station power supply upgrade work, which would include an upgrade of the station distribution board and relevant switches, circuit breakers and cables to allow for a three-phase supply
- relocation or replacement of existing customer facilities including installation of a new Opal card reader, relocation of the vending machine and adjustment of the existing drinking fountain and telephone booth height
- new/upgraded wayfinding signage and provision of the statutory/regulatory signage
- replacement of the existing tree and relocation of the existing seating located at the proposed lift location
- adjustments to boundary fencing and landscaping (where required)
- temporary site compounds for storage of materials and equipment
- temporary work (where required) during construction to maintain pedestrian access to the station.

## Materials and finishes

Materials and finishes for the Proposal have been selected to accord with heritage requirements, to minimise visual impacts, urban design outcomes and to satisfy durability/maintenance requirements and cost effectiveness. Life cycle impacts have also been taken into account in the selection process through the consideration of environmental impacts of materials from the point of extraction, transportation, operations and end of life.

Availability and constructability are also important criteria to ensure that materials can be readily sourced and that the structure can be built with ease and efficiently. Materials are also selected for their application based on their suitability for meeting design requirements.

Each of the upgraded or new facilities would be constructed from a range of different materials, with a different palette for each architectural element.

Based on the existing design, the Proposal would include the following materials and finishes for the key elements:

- lift – solid base to lift shaft with painted steel and glass infill panels
- lift car –stainless steel and glass doors
- lift landing – flooring to match the adjacent pedestrian bridge
- new canopy – steel frame and cladding
- upgraded stairs – replace non-compliant handrails, nosing and TGSIs on existing stairs
- regraded platform surface – to achieve compliance
- anti-climb screens to existing stairs.

Subsequent design iterations would be submitted to TfNSW's Urban Design and Sustainability Review Panel for endorsements at various stages for comment, before being accepted by TfNSW. An Urban Design Plan (UDP) would also be prepared by the Construction Contractor, prior to finalisation of detailed design for endorsement by TfNSW.

### 3.1.2 Engineering constraints

There are a number of constraints which have influenced the design development of the Proposal. These are discussed below.

**Existing structures:** the placement and integrity of existing structures were considered during the development of the design – these structures included the platforms, station buildings and pedestrian bridge.

**Sydney Trains' requirements:** modifications for existing structures and new structures within the rail corridor must be designed and constructed with consideration of train impact loads, structural clearances to the track, and safe working provisions.

**Utilities:** A Dial Before You Dig (DBYD) search has identified a number of utilities in the vicinity of the proposed work including:

- electrical services (aboveground)
- telecommunication services (underground)
- stormwater and water
- rail utilities, including signalling cabling and overhead wiring
- gas services.

**Other considerations:** Warrawee Rail Station Group, including the station building, footbridge and platform, is listed as having heritage significance under the Railcorp Section 170 Heritage and Conservation register and Ku-ring-gai LEP 2015 (refer to Section 6.5).

There is also limited crane access and overhead electricity cables in Warrawee Avenue, which may constrain lifting activities during construction.

### 3.1.3 Design standards

The Proposal would be designed having regard to the following:

- *Disability Standards for Accessible Public Transport 2002* (issued under the Commonwealth *Disability Discrimination Act 1992*)
- Building Code of Australia
- relevant Australian Standards
- TfNSW Asset Standards Authority standards
- Sydney Trains standards
- *Guidelines for the Development of Public Transport Interchange Facilities* (Ministry of Transport, 2008)
- Crime Prevention Through Environmental Design (CPTED) principles
- other TfNSW policies and guidelines.

### 3.1.4 Sustainability in design

The proposal is also targeting a rating of ‘Excellent’ using the Infrastructure Sustainability Council of Australia (ISCA) Infrastructure Sustainability (IS) Rating Scheme (v1.2). The rating scheme provides an independent and consistent methodology for the application and evaluation of sustainability outcomes in infrastructure projects. The sustainability outcomes address environmental, social, economic and governance aspects.

The IS Rating Scheme is grouped into six key themes:

- management and governance
- using resources
- emissions, pollution and waste
- ecology
- people and place
- innovation.

These sustainability themes are divided into 15 performance categories, against which the Proposal would be independently assessed and assigned a rating level. The Proposal would need to achieve at least 50 points to be certified as ‘Excellent’.

## 3.2 Construction activities

### 3.2.1 Work methodology

Subject to approval, construction is expected to commence in late 2019 and take approximately 12 to 18 months to complete. The construction methodology would be further developed during the detailed design of the Proposal by the nominated Construction Contractor in consultation with TfNSW.

The proposed construction activities for the Proposal are identified in Table 3.1. This staging is indicative and is based on the current concept design and may change once the detailed design methodology is finalised. The staging is also dependent on the construction Contractor’s preferred methodology, program and sequencing of work.

**Table 3.1 Indicative construction staging for key activities (subject to detailed design)**

Stage	Activities	Timing (indicative)
Site establishment and enabling work	<ul style="list-style-type: none"> <li>• establish site compounds (i.e. fencing, tree protection zones, site offices, amenities and plant/material storage areas)</li> <li>• establish temporary facilities as required (e.g. temporary access stairs, temporary toilets, temporary construction lights etc.)</li> <li>• erect site hoarding as required</li> <li>• service location and relocation</li> <li>• removal of existing tree on platform.</li> </ul>	Typically standard hours with some potential out-of-hours/ rail shutdown periods work

Stage	Activities	Timing (indicative)
Lift work	<ul style="list-style-type: none"> <li>excavation of lift pit (including temporary shoring if required)</li> <li>piling works for lift</li> <li>waterproof (as required), install reinforcement, formwork and concrete to form the lift pit</li> <li>erect glass and steel shaft structure</li> <li>install and commission lift, including fit-out.</li> </ul>	Standard hours or rail shutdown periods
Stair upgrade	<ul style="list-style-type: none"> <li>demolish existing non-compliant rails (where required)</li> <li>modify stairs including installation of new nosings, hand railing and TGSIs.</li> </ul>	Typically standard hours with some potential out-of-hours/ rail shutdown periods work
Interchange upgrades	<ul style="list-style-type: none"> <li>reconfigure the existing roadway (kerb ramps, line marking, etc.) to accommodate the proposed kiss-and-ride spaces</li> <li>install new kerb ramps</li> <li>adjust bollards</li> </ul>	Standard hours
Station building work	<ul style="list-style-type: none"> <li>reconfigure existing male and female toilets to allow for a new Family Accessible Toilet and unisex ambulant toilet</li> </ul>	Typically standard hours with some potential out-of-hours/ rail shutdown periods work
Platform modification work	<ul style="list-style-type: none"> <li>regrade platform surface</li> <li>install new yellow line and TGSIs along platforms</li> <li>install new platform canopy</li> <li>relocate seating</li> <li>adjust drinking fountain and telephone booth height</li> <li>install new Opal card reader</li> </ul>	Standard hours or rail shutdown periods
Demobilisation	<ul style="list-style-type: none"> <li>install other ancillary features and landscaping, including replacement tree</li> <li>remove hoardings</li> <li>clear site.</li> </ul>	Typically standard hours with some potential out-of-hours/ rail shutdown periods work

### 3.2.2 Plant and equipment

The plant and equipment likely to be used during construction includes:

- trucks
- jack hammer
- chainsaw
- piling rig
- franna/mobile cranes
- bobcat
- excavator
- demolition saw
- concrete pump and truck
- lighting tower

- coring machine
- water cart
- suction trucks
- rail mounted elevated
- forklift
- hi-rail plant (EWP/flatbed/hiab)
- vibrating roller/compaction plate
- road rail excavator
- hand tools
- skip trucks
- hammer drills
- torque wrenches
- impact wrenches
- grinders and bar
- benders
- elevated work platform (EWP).

### 3.2.3 Working hours

Most of the work required for the Proposal would be undertaken during standard (NSW) Environment Protection Authority (EPA) construction hours, which are as follows:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm Saturdays.

Occasional work outside of standard hours may be required at night, on weekends and during scheduled Sydney Trains rail shutdown periods. These are scheduled closures that would occur regardless of the Proposal when part of the rail network is temporarily closed and trains are not operating.

Out of hours work is required in some cases to minimise disruptions to customers, pedestrians, motorists and nearby sensitive receivers; and to ensure the safety of railway workers and operational assets. It is estimated that approximately four rail shutdown periods (scheduled Sydney Trains rail shutdown periods) would be required to facilitate activities such as:

- detailed site survey, services investigations and/or geotechnical investigations within and around the rail corridor
- excavation and installation of lift shafts and canopy structures
- regrading platform surface
- service relocations.

Approval from TfNSW would be required for any out of hours work and the affected community would be notified as outlined in the TfNSW *Construction Noise and Vibration Strategy* (TfNSW, 2018) (refer to Section 6.3 for further details).

### 3.2.4 Earthworks

Excavations and earthworks would generally be required for the following:

- the construction of the new lift pit, which would require excavation through the platform into the existing soil/fill at this location
- other minor civil work including footings and foundations for structures and trenching activities for service adjustments and relocations.

Excavated material would be reused onsite where possible or disposed of in accordance with relevant legislative requirements. Subject to detailed design, it is estimated that around 80 cubic metres would be excavated to accommodate the lift pit and foundation, and other ancillary work.

### **3.2.5 Source and quantity of materials**

The source and quantity of materials would be determined during the detailed design phase of the Proposal. Materials would be sourced from local suppliers where practicable. Reuse of existing and recycled materials would be undertaken where practicable.

The Proposal would also consider life cycle impacts. The life cycle impacts of a material is calculated by looking at the environmental impacts of materials from the point of extraction, through to transportation, use, operation and end of life. This would be verified through the IS v1.2 rating.

### **3.2.6 Traffic access and vehicle movements**

Traffic and transport impacts associated with the Proposal are assessed in Section 6.1 of this REF. The potential traffic and access impacts expected during the construction of the Proposal include:

- temporary increase in walking distance for rail customers on the station platform during construction work due to placement of construction hoarding and work sites
- higher road safety risk levels associated with construction vehicle-pedestrian interactions
- congestion at Warrawee Avenue and Heydon Avenue due to the reduced operational and circulation areas for buses and passenger pick-up and set-down
- minor disruptions to pedestrian/cyclist movements in and around the station
- a minor increase in traffic on the local road network.

### **3.2.7 Temporary site facilities**

A temporary construction compound would be required to accommodate a site office, amenities, laydown and storage area for materials. An area for a construction compound has been proposed on the vacant land that was previously used for the TfNSW Warrawee Substation Project.

This area of land is located between the rail corridor and Warrawee Avenue and from the pedestrian footbridge to Brentwood Avenue. Access to the proposed construction compound would be via existing gates on Warrawee Avenue or Brentwood Avenue (refer Figure 3.4).

An additional temporary laydown area may be located on Heydon Avenue within the existing car parking spaces near the station entrance.

Impacts associated with utilising this area have been considered in the environmental impact assessment.



**Figure 3.4 Construction compounds and laydown areas**

### **3.2.8 Service relocation and adjustments**

The Proposal has been designed to avoid relocation of services where feasible, however further investigation may be required. It is likely some services may require relocation, including the existing communications and low voltage cables in the vicinity of the proposed lift.

Such relocation is unlikely to occur outside of the footprint of the work assessed in this REF. In the event that work would be required outside of this footprint, further assessment would be undertaken. The appropriate utility providers would be consulted during the detailed design phase.

Relocation or other work that may affect services would be undertaken in consultation with the respective utility authorities.

## **3.3 Property acquisition**

TfNSW does not propose to acquire any property as part of the Proposal.

### **3.3.1 Operation management and maintenance**

Ongoing operation of the existing station would remain unchanged with Sydney Trains operating and maintaining the station. Structures constructed under this Proposal would be maintained by Sydney Trains. However, it is expected that adjacent garden and landscaped areas on Council land would continue to be maintained by Ku-ring-gai Council.

## 4 Statutory considerations

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Chapter 4 provides a summary of the statutory considerations relating to the Proposal including a consideration of NSW Government policies/strategies, NSW legislation (particularly the EP&A Act), environmental planning instruments, and Commonwealth legislation.

### 4.1 Commonwealth legislation

#### 4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The (Commonwealth) EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places - defined in the EPBC Act as 'matters of National Environmental Significance (NES)'. The EPBC Act requires the assessment of whether the Proposal is likely to significantly impact on matters of NES or Commonwealth land. These matters are considered in full in Appendix A.

The Proposal would not impact on any matters of NES or on Commonwealth land. Therefore, a referral to the Commonwealth Minister for the Environment is not required.

### 4.2 NSW legislation and regulations

#### 4.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act establishes the system of environmental planning and assessment in NSW. This Proposal is subject to the requirements of Division 5.1 of the EP&A Act which specifies the environmental impact assessment requirements for activities undertaken by public authorities, such as TfNSW, which do not require development consent under Part 4 of the EP&A Act.

In accordance with Section 5.5 of the EP&A Act, TfNSW, as the proponent and determining authority, must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the Proposal.

Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) defines the factors which must be considered when determining if an activity assessed under Division 5.1 of the EP&A Act has a significant impact on the environment. Chapter 6 of the REF provides an environmental impact assessment of the Proposal in accordance with clause 228 and Appendix B specifically responds to the factors for consideration under clause 228.

## 4.2.2 Other NSW legislation and regulations

Table 4.1 provides a list of other relevant legislation applicable to the Proposal.

**Table 4.1 Other legislation applicable to the Proposal**

Applicable legislation	Considerations
<i>Contaminated Land Management Act 1997</i> (CLM Act) (NSW)	<p>Section 60 of the CLM Act imposes a duty on landowners to notify the Office of Environment and Heritage (OEH), and potentially investigate and remediate land if contamination is above EPA guideline levels.</p> <p>The site has not been declared under the CLM Act as being significantly contaminated (refer Section 6.8).</p>
<i>Crown Lands Act 1987</i> (NSW)	<p>The Proposal does not involve work on any Crown land.</p>
<i>Disability Discrimination Act 1992</i> (DDA Act) (Cwth)	<p>The Proposal would be designed having regard to the requirements of this Act. The key objective of the Proposal is to improve the accessibility of Warrawee Station which is consistent with the objectives of this Act.</p>
<i>Heritage Act 1977</i> (Heritage Act) (NSW)	<p>One listed heritage item is located within the Proposal study area, the Warrawee Railway Station Group. This heritage item is listed on the RailCorp Section 170 Heritage and Conservation Register (item 4802042) and the Ku-ring-gai LEP 2015 heritage register (item I1105).</p> <p>A heritage impact assessment has been undertaken for the Proposal and is summarised in Section 6.5.</p> <p>The archaeological assessment concluded that there is a low risk of exposing historical archaeological relics during construction and that no archaeological approvals under Section 139 would be required. However, if unexpected archaeological items are discovered during the construction of the Proposal, all work would cease and appropriate advice sought, in accordance with the TfNSW <i>Unexpected Heritage Finds Guideline</i> (TfNSW, 2016b).</p> <p>Formal notification is to be provided by the asset owner to the Heritage Council regarding the demolition of structures associated with the Warrawee Railway Station Group at least 14 days prior to the demolition of these structures in accordance with Section 170A(1)(c) of the Heritage Act.</p> <p>No items of state heritage significance were identified near the Proposal, and therefore an approval under Section 60 of the Heritage Act would not be required.</p>
<i>National Parks and Wildlife Act 1974</i> (NPW Act) (NSW)	<p>Sections 86, 87 and 90 of the NPW Act require consent from OEH for the destruction or damage of Aboriginal objects. The Proposal is unlikely to disturb any Aboriginal objects (refer Section 6.4).</p> <p>However, if unexpected archaeological items or items of Aboriginal heritage significance are discovered during the construction of the Proposal, all work would cease and appropriate advice sought.</p> <p>Additionally, as identified in Table 5.1 below, the Proposal would not involve impacts to land reserved, or adjacent to, land reserved under the NPW Act.</p>
<i>Biosecurity Act 2015</i> (NSW)	<p>No Priority Weeds listed under the <i>Biosecurity Act 2015</i> for the Greater Sydney Region were identified in the study area.</p>

Applicable legislation	Considerations
<i>Protection of the Environment Operations Act 1997</i> (PoEO Act) (NSW)	The Proposal does not involve a 'scheduled activity' under Schedule 1 of the PoEO Act. Accordingly, an Environment Protection Licence (EPL) is not required for the Proposal. However, in accordance with Part 5.7 of the PoEO Act, TfNSW would notify the EPA of any pollution incidents that occur onsite. This would be managed in the Construction Environmental Management Plan (CEMP) to be prepared and implemented by the Construction Contractor.
<i>Roads Act 1993</i> (Roads Act) (NSW)	Section 138 of the Roads Act requires consent from the relevant road authority for the carrying out of work in, on or over a public road. However, clause 5(1) in Schedule 2 of the Roads Act states that public authorities do not require consent for work on unclassified roads. The roads surrounding the Proposal site are local roads, managed and maintained by Ku-ring-gai Council (refer to Section 6.1). The Proposal would involve work on Warrawee Avenue and Heydon Avenue, which are not classified roads. No approvals under the Roads Act are therefore expected to be required. However, the work would be undertaken in consultation with Ku-ring-gai Council including obtaining Road Occupancy Licence(s) for temporary road closures to facilitate work (where required).
<i>Sydney Water Act 1994</i> (NSW)	The Proposal would not involve discharge of wastewater to the sewer.
<i>Biodiversity Conservation Act 2016</i> (BC Act) (NSW)	Although the site is adjacent to known occurrences of threatened species and endangered ecological communities, the site does not contain suitable habitat for any listed threatened species or community, and is unlikely to have a significant impact on any threatened species or community (refer Section 6.7 for further detail).
<i>Waste Avoidance and Resource Recovery Act 2001</i> (WARR Act) (NSW)	TfNSW would carry out the Proposal having regard to the requirements of the WARR Act. A site-specific Waste Management Plan would be prepared.
<i>Water Management Act 2000</i> (NSW)	The Proposal would not involve any water use (from a natural source e.g. aquifer, river – only from the network), water management work, drainage or flood work, controlled activities or aquifer interference.

## 4.3 State Environmental Planning Policies

### 4.3.1 State Environmental Planning Policy (Infrastructure) 2007

The Infrastructure SEPP is the key environmental planning instrument which determines the permissibility of the Proposal and which part of the EP&A Act an activity or development may be assessed.

Clause 79 of the Infrastructure SEPP allows for certain types of development to be carried out by or on behalf of a public authority without consent on any land (i.e. assessable under Division 5.1 of the EP&A Act). Specifically, Clause 79(1) of the Infrastructure SEPP states 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.'*

Clause 78 defines ‘rail infrastructure facilities’ as including elements such as:

*(d) railway stations, station platforms and areas in a station complex that commuters use to get access to the platforms*

*(e) public amenities for commuters*

*(f) associated public transport facilities for railway stations...’*

Consequently, development consent is not required for the Proposal which is classified as a rail infrastructure facility, however the environmental impacts of the Proposal have been assessed under the provisions of Division 5.1 of the EP&A Act.

Part 2 of the Infrastructure SEPP contains provisions for public authorities to consult with local councils and other agencies prior to the commencement of certain types of development. Section 5.2 of this REF discusses the consultation undertaken under the requirements of the Infrastructure SEPP.

It is noted that the Infrastructure SEPP prevails over all other environmental planning instruments except where *State Environmental Planning Policy (Major Development) 2005* or *State Environmental Planning Policy (Coastal Management) 2018* applies. The Proposal does not require consideration under these SEPPs and therefore do not require further consideration as part of this REF.

#### **4.3.2 State Environmental Planning Policy 55 – Remediation of Land**

SEPP 55 provides a State-wide approach to the remediation of contaminated land for the purpose of minimising the risk of harm to the health of humans and the environment. While consent for the Proposal is not required, the provisions of SEPP 55 have still been considered in the preparation of this REF.

Section 6.8 of this REF contains an assessment of the potential contamination impacts of the Proposal. It is not expected that any large-scale remediation (Category 1) work would be required as part of the Proposal. The proposed land use does not differ to the existing use and is, therefore, unlikely to be affected by any potential contaminants that exist within the rail corridor.

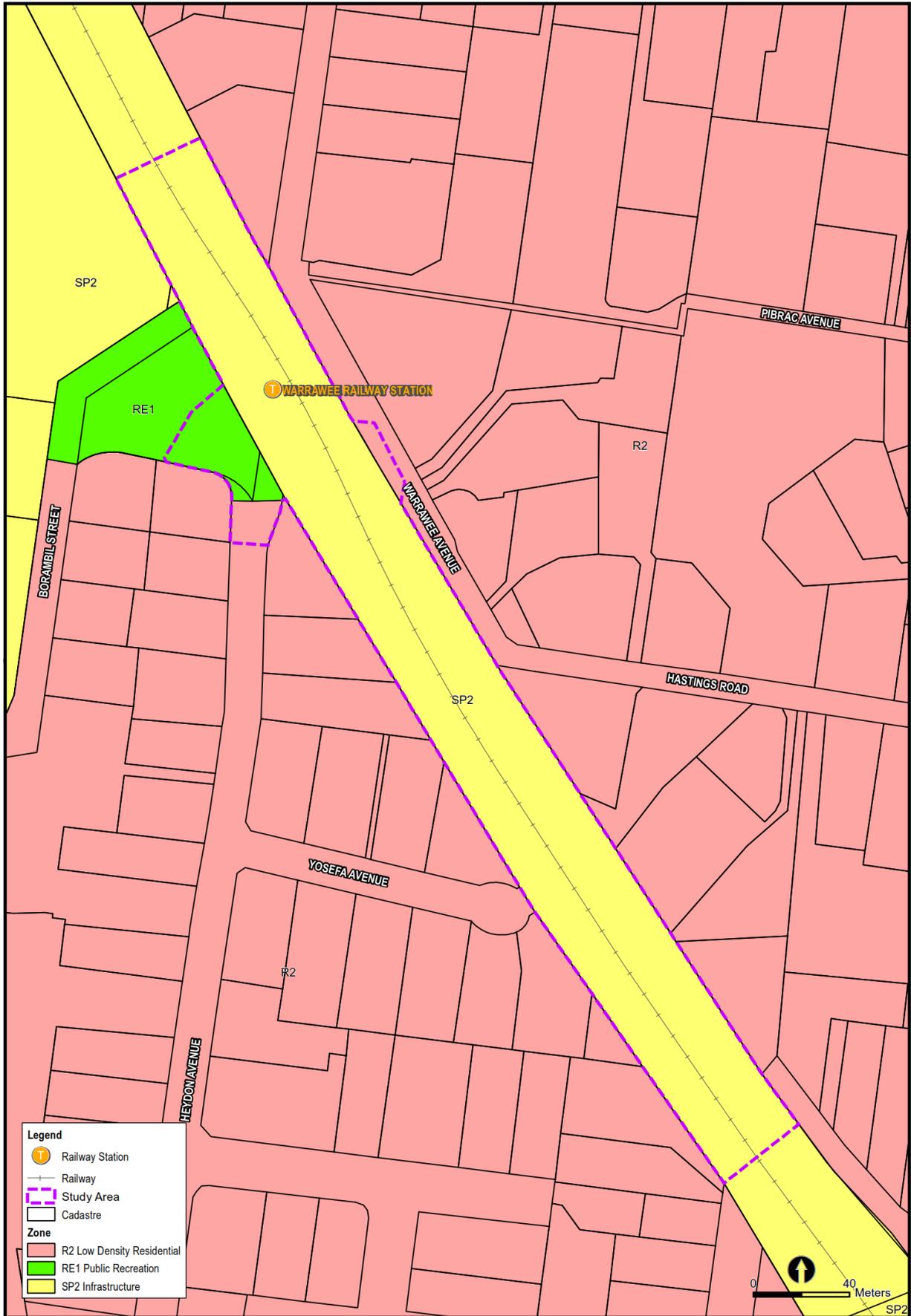
### **4.4 Local environmental planning instrument and development controls**

The Proposal is located within the Ku-ring-gai Council LGA. The provisions of the Infrastructure SEPP mean that Local Environmental Plans (LEPs), prepared by councils for an LGA, do not apply. However, during the preparation of this REF, the provisions of the *Ku-ring-gai Local Environmental Plan 2015* were considered.

#### **4.4.1 Ku-ring-gai Local Environmental Plan 2015**

The *Ku-ring-gai Local Environmental Plan 2015* (Ku-ring-gai LEP) is the governing plan for the Ku-ring-gai LGA, including Warrawee. Table 4.2 summarises the relevant aspects of the Ku-ring-gai LEP applicable to the Proposal.

Figure 4.1 shows the relevant section of the zoning map from the Ku-ring-gai LEP, with the indicative location of the Proposal.



**Figure 4.1** Ku-ring-gai LEP zoning map

**Table 4.2 Relevant provisions of the Ku-ring-gai LEP**

Provision description	Relevance to the Proposal
<p>Clause 2.3 – Zone objectives and Land Use Table</p>	<p><b>Applicable land zones</b></p> <p>Under the Ku-ring-gai LEP, the Proposal is located in areas zoned as:</p> <ul style="list-style-type: none"> <li>• SP2 Infrastructure (Rail Infrastructure) for the proposed work associated with the station</li> <li>• R2 Low Density Residential for the proposed work on Warrawee Avenue and some of the work on Heydon Avenue</li> <li>• RE1 Public Recreation for the proposed work on Heydon Avenue.</li> </ul>
<p>Clause 2.3 – Zone objectives and Land Use Table (cont.)</p>	<p><b>Zone objectives</b></p> <p>The objectives of the applicable land zones are as follows:</p> <ul style="list-style-type: none"> <li>• SP2 Infrastructure (Rail Infrastructure) – to provide for infrastructure and related uses and to prevent development that is not compatible with or that may detract from the provision of infrastructure</li> <li>• R2 Low Density Residential – to provide for the housing needs of the community within a low density residential environment, to enable other land uses that provide facilities or services to meet the day to day needs of residents and to provide for housing that is compatible with the existing environmental and built character of Ku-ring-gai</li> <li>• RE1 Public Recreation – to enable land to be used for public open space or recreational purposes, to provide a range of recreational settings and activities and compatible land uses, to protect and enhance the natural environment for recreational purposes and to protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.</li> </ul> <p>The Proposal is consistent with the objectives of these zones.</p> <p><b>Permissible development within land zones</b></p> <p>Development for the purposes of a rail infrastructure facility is permissible with consent under the provisions of the SP2 Infrastructure (Rail Infrastructure) zone, and road development is permissible with consent under the R2 Low Density Residential zones. However, as the provisions of the Infrastructure SEPP prevail over the Ku-ring-gai LEP, development consent from Ku-ring-gai Council is not required.</p>
<p>Clause 5.10 – Heritage Conservation</p>	<p>Clause 5.10 of the Ku-ring-gai LEP provides for the protection of items, places and archaeological sites which have been identified in the Ku-ring-gai LEP as having heritage significance. Warrawee Railway Station Group (item I1105) is listed on the heritage schedule of the Ku-ring-gai LEP.</p> <p>A discussion of potential impacts to local heritage and the requirements for consent is provided in Section 6.5.</p>
<p>Clause 6.1 – Acid Sulfate Soils</p>	<p>The Proposal study area is on land mapped as Class 5 on the Acid Sulfate Soils Map. This classification means that there are additional development consent conditions for work within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which the watertable is likely to be lowered below one metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land. However, as the provisions of the Infrastructure SEPP prevail over the Ku-ring-gai LEP, development consent from Ku-ring-gai Council is not required.</p>

Provision description	Relevance to the Proposal
Clause 6.2 – Earthworks	<p>Clause 6.2 of the Ku-ring-gai LEP aims to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land.</p> <p>By virtue of clause 5(3) and 79 of the Infrastructure SEPP, the Proposal is permissible without development consent. Consideration of the potential impacts and mitigation measures for earthworks for the Proposal is outlined in Section 6.8.</p>
Clause 6.3 – Terrestrial Biodiversity	<p>Clause 6.3 of the Ku-ring-gai LEP aims to protect, maintain and improve the diversity and condition of native vegetation and habitat. The western side of the Proposal study area is on land that is mapped as having terrestrial biodiversity.</p> <p>A discussion of potential impacts to terrestrial biodiversity and the requirements for consent is provided in Section 6.7.</p>
Clause 6.5 – Stormwater and water sensitive urban design	<p>Clause 6.5 of the Ku-ring-gai LEP aims to avoid or minimise the adverse impact of urban stormwater on the land on which development is to be carried out, adjoining properties, native bushland, waterways and groundwater systems.</p> <p>A discussion of potential impacts to stormwater and the integration of water sensitive design principles is provided in Section 6.9.</p>

## 4.5 NSW Government policies and strategies

Table 4.3 provides an overview of other NSW Government policies and strategies relevant to the Proposal.

**Table 4.3 NSW Government policies and strategies applicable to the Proposal**

Policy/Strategy	Commitment	Comment
<b><i>Future Transport Strategy 2056</i></b> <b>(TfNSW, 2018)</b>	<p>Future Transport 2056 is an update of NSW's Long Term Transport Master Plan. It is a suite of strategies and plans for transport to provide an integrated vision for the state.</p> <p>The strategy places the customer at the centre of work undertaken by TfNSW. It includes issue specific and place based supporting plans that seek to integrate transport modes.</p> <p>The strategy outlines 6 state-wide outcomes</p> <ul style="list-style-type: none"> <li>• customer focused</li> <li>• successful places</li> <li>• a strong economy</li> <li>• safety and performance</li> <li>• accessible services</li> <li>• sustainable.</li> </ul>	<p>The Proposal supports the vision of the <i>Future Transport Strategy</i> by providing accessible services for people who currently find it difficult to access public transport services.</p> <p>New lifts and accessible paths as proposed by the Proposal would provide a more physically accessible network allowing greater choice for people with mobility constraints to access public transport. Greater accessibility would also mean better connections to places and opportunities for employment, education, business and leisure.</p>

Policy/Strategy	Commitment	Comment
<p><i>Disability Inclusion Action Plan 2018-2022</i> (TfNSW, 2017)</p>	<p>The <i>Disability Inclusion Action Plan 2018-2022</i> was developed by TfNSW in consultation with the Accessible Transport Advisory Committee, which is made up of up of representatives from peak disability and ageing organisations within NSW.</p> <p>The Disability Plan discusses the challenges, the achievements to date, the considerable undertaking that is required to finish the job, and provides a solid and practical foundation for future progress over the next five years.</p>	<p>The Proposal has been developed with consideration of the objectives outlined in this Plan and seeks to improve and provide equitable access to public transport facilities.</p>
<p><i>Sydney's Walking Future - Connecting people and places</i> (TfNSW, 2013b)</p>	<p><i>Sydney's Walking Future</i> outlines the NSW government's efforts to:</p> <ul style="list-style-type: none"> <li>• promote walking for transport</li> <li>• connect people to places through safe walking networks around activity centres and public transport interchanges.</li> </ul>	<p>The Proposal would facilitate walking by removing physical barriers to accessible public transport and by providing accessible cross-corridor access, hence contributing a relative reduction in local trips via private cars.</p>
<p><i>NSW State Infrastructure Strategy 2018-2038</i> (NSW Government, 2018)</p>	<p>The <i>NSW State Infrastructure Strategy 2018–2038</i> builds on the NSW Government's major long-term infrastructure plans over the last seven years.</p> <p>The strategy sets out the government's priorities for the next 20 years, and combined with the <i>Future Transport Strategy 2056</i>, the <i>Greater Sydney Region Plan</i> and the <i>Regional Development Framework</i>, brings together infrastructure investment and land-use planning for our cities and regions.</p> <p>Public transport is viewed as critical to urban productivity, expanding employment opportunities by connecting people to jobs, reducing congestion, and supporting delivery of urban renewal.</p>	<p>The Proposal supports investment in rail infrastructure, and aligns with the need to continue to provide urban public transport to support Sydney's increasing population.</p> <p>The Proposal is also consistent with overall aims and objectives of the <i>Future Transport Strategy 2056</i> to improve transport infrastructure across NSW.</p>
<p><i>A Metropolis of Three Cities – The Greater Sydney Region Plan</i> (Greater Sydney Commission, 2018)</p>	<p><i>A Metropolis of Three Cities</i> is a plan designed to complement the <i>Future Transport 2056</i> plan and <i>State Infrastructure Strategy</i> by aligning land use, transport and infrastructure planning. It aims to reshape Greater Sydney as three unique but connected cities.</p> <p>The Proposal would form part of the proposed Eastern Harbour City, which would be focused around Sydney CBD. It is important for this Eastern Harbour City to invest in a wide variety of infrastructure and services and improve amenity.</p>	<p>The Proposal particularly supports Objective 6 of the Three Cities Plan, which is to ensure 'services and infrastructure meet communities' changing needs', as it would increase the accessibility of places and transport for all people that use Warrawee Station.</p>

Policy/Strategy	Commitment	Comment
<p><i>NSW: Making It Happen</i> (NSW Government, 2015)</p>	<p>In September 2015, the NSW Government announced a series of State Priorities as part of <i>NSW: Making It Happen</i> (NSW Government, 2015). The State Priorities are intended to guide the ongoing actions of the NSW Government across the State, and guide resource allocation and investment in conjunction with the NSW Budget. <i>NSW: Making it Happen</i> focuses on 12 key 'priorities' to achieve the NSW Government's commitments. These priorities range across a number of issues including infrastructure, the environment, education, health, wellbeing and safety in addition to Government services.</p> <p>One of the 12 priorities identified as part of <i>NSW: Making It Happen</i> relates to investment in building infrastructure. The ongoing development and investment in transport infrastructure is identified as part of the wider building infrastructure priority.</p>	<p>The Proposal would assist in meeting the priority to develop and invest in transport infrastructure by improving accessibility to, and encouraging greater usage of, public transport.</p>
<p><i>Access and Disability Inclusion Plan</i> (Ku-ring-gai Council, 2014)</p>	<p>The <i>Access and Disability Inclusion Plan</i> identifies key strategies to address access barriers or assess opportunities.</p> <p>Relevant actions identified in the plan include:</p> <ul style="list-style-type: none"> <li>• Ensure council services operating from heritage buildings provide appropriate access as per DDA requirements</li> <li>• Invest in safe, accessible, convenient and coherent pedestrian infrastructure on key pedestrian routes.</li> </ul>	<p>The Proposal would assist in meeting the objectives of the <i>Access and Disability Inclusion Plan</i>, as it would make public transport facilities in Ku-ring-gai LGA more accessible for people with a disability.</p> <p>It also would involve upgrading of the heritage railway station and pedestrian footpaths, which aligns with two of the identified actions in the plan.</p>

## 4.6 Ecologically sustainable development

TfNSW is committed to ensuring that its projects are implemented in a manner that is consistent with the principles of ecologically sustainable development (ESD). The principles of ESD are generally defined under the provisions of clause 7(4) of Schedule 2 to the EP&A Regulation as:

- the precautionary principle – If there are threats of serious or irreversible damage, a lack of full scientific uncertainty should not be used as a reason for postponing measures to prevent environmental degradation
- intergenerational equity – the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations
- conservation of biological diversity and ecological integrity – the diversity of genes, species, populations and their communities, as well as the ecosystems and habitats they belong to, should be maintained or improved to ensure their survival
- improved valuation, pricing and incentive mechanisms – environmental factors should be included in the valuation of assets and services.

The principles of ESD have been adopted by TfNSW throughout the development and assessment of the Warrawee Station Upgrade. Section 3.1.4 summarises how ESD would be incorporated in the design development of the Proposal. Section 6.13 includes an assessment of the Proposal on climate change and sustainability, and Section 7.2 lists mitigation measures to ensure ESD principles are incorporated during the construction phase of the Proposal.

## 5 Community and stakeholder consultation

Chapter 5 discusses the consultation undertaken to date for the Proposal and the consultation proposed for the future. This chapter discusses the consultation strategy adopted for the Proposal and the results of consultation with the community, relevant government agencies and stakeholders.

### 5.1 Stakeholder consultation during concept design

Key stakeholders for Warrawee Station, including a range of TfNSW divisions and Sydney Trains, were engaged during the development of the Proposal to provide insights into the scope of work for the Proposal, and to also participate in the development and assessment of the station improvement options.

Workshops and meetings undertaken during design development included:

- options assessment workshop with relevant stakeholders including TfNSW, Sydney Trains and a heritage conservation architect
- TfNSW Design and Sustainability panel presentation
- safety in design meetings.

### 5.2 Consultation requirements under the Infrastructure SEPP

Part 2, Division 1 of the Infrastructure SEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Clauses 13, 14, 15 and 16 of the Infrastructure SEPP require that public authorities undertake consultation with councils and other agencies, when proposing to carry out development without consent.

Table 5.1 provides details of consultation requirements under the Infrastructure SEPP for the Proposal.

**Table 5.1 Infrastructure SEPP consultation requirements**

Clause	Clause particulars	Relevance to the Proposal
Clause 13   Consultation with Councils – development with impacts on council related infrastructure and services	<p>Consultation is required where the Proposal would result in:</p> <ul style="list-style-type: none"> <li>• substantial impact on stormwater management services</li> <li>• generating traffic that would place a local road system under strain</li> <li>• involve connection to or impact on a council owned sewerage system</li> <li>• involve connection to and substantial use of council owned water supply</li> <li>• significantly disrupt pedestrian or vehicle movement</li> <li>• involve significant excavation to a road surface or footpath for which Council has responsibility.</li> </ul>	<p>The Proposal includes work that would:</p> <ul style="list-style-type: none"> <li>• disrupt pedestrian and vehicle movements</li> <li>• impact on road pavements under Council’s care and control</li> <li>• impact on Council-operated footpaths.</li> </ul> <p>Consultation with Ku-ring-gai Council would be undertaken throughout the public display, detailed design and construction phases of the Proposal.</p>

Clause	Clause particulars	Relevance to the Proposal
Clause 14   Consultation with Councils – development with impacts on local heritage	<p>Where railway station work:</p> <ul style="list-style-type: none"> <li>substantially impact on local heritage item (if not also a State heritage item)</li> <li>substantially impact on a heritage conservation area.</li> </ul>	<p>Warrawee Railway Station Group is listed on the Ku-ring-gai LEP 2015 heritage schedule (refer to Section 6.5).</p> <p>Consultation with Ku-ring-gai Council would be undertaken throughout the detailed design and construction phases.</p>
Clause 15   Consultation with Councils – development with impacts on flood liable land	<p>Where railway station work:</p> <ul style="list-style-type: none"> <li>impact on land that is susceptible to flooding – reference would be made to <i>Floodplain Development Manual: the management of flood liable land</i>.</li> </ul>	<p>The Proposal is not located on land that is susceptible to flooding.</p> <p>Consultation with Ku-ring-gai Council is not required in regard to this aspect. Refer to Section 6.9.</p>
Clause 15AA   Consultation with State Emergency Service – development with impacts on flood liable land	<p>For development that may be carried out without development consent under a relevant provision. Relevant provisions include Division 15 (Railways) and Division 17 (Roads and traffic).</p>	<p>The Proposal is not located on land that is susceptible to flooding.</p> <p>Consultation with State Emergency Service is not required in regard to this aspect. Refer to Section 6.9.</p>
Clause 15A   Consultation with councils – development with impacts on certain land within the coastal zone	<p>For development on land that is within a coastal vulnerability area and is inconsistent with a certified coastal management program.</p>	<p>The Proposal is not located within a coastal vulnerability area as per the <i>Coastal Management Act 2016</i>. Consultation with Ku-ring-gai Council is not required in regard to this aspect.</p>
Clause 16   Consultation with public authorities other than Councils	<p>For <i>specified development</i> which includes consultation with the OEH for development that is undertaken adjacent to land reserved under the <i>National Parks and Wildlife Act 1974</i>, and other agencies specified by the Infrastructure SEPP where relevant.</p> <p>Although not a specific Infrastructure SEPP requirement, other agencies TfNSW may consult with could include:</p> <ul style="list-style-type: none"> <li>Roads and Maritime</li> <li>Sydney Trains</li> <li>OEH.</li> </ul>	<p>The Proposal is not located adjacent to land reserved under the <i>National Parks and Wildlife Act 1974</i>. Accordingly, consultation with the OEH on this matter is not required.</p> <p>Consultation with other public authorities as specified in this clause is not required. However, consultation with Sydney Trains would be ongoing through the next stage(s) of the Proposal.</p>

### 5.3 Consultation strategy

The consultation strategy for the Proposal was developed to encourage stakeholder and community involvement and foster interaction between stakeholders, the community and the project team. The consultation strategy that was developed, having regard to the requirements of the planning process ensures that stakeholders, customers and the community are informed of the Proposal and have the opportunity to provide input.

The objectives of the consultation strategy are to:

- provide accurate and timely information about the Proposal and REF process to relevant stakeholders
- raise awareness of the various components of the Proposal and the specialist environmental investigations
- ensure that the directly impacted community are aware of the REF and consulted where appropriate
- provide opportunities for stakeholders and the community to express their view about the Proposal
- understand and access valuable local knowledge from the community and stakeholders
- record the details and input from community engagement activities
- build positive relations with identified community stakeholders
- ensure a comprehensive and transparent approach.

### 5.4 Public display

The REF display strategy adopts a range of consultation mechanisms, including:

- public display of the REF at various locations (refer below)
- distribution of a project newsletter at the station, and to the local community, key stakeholder groups and commuters, outlining the Proposal and inviting feedback on the REF
- advertisement of the REF public display in the local newspapers that includes a summary of the Proposal and information on how to provide feedback with a link to the TfNSW website
- consultation with Ku-ring-gai Council, Sydney Trains, and other key stakeholders
- a community information stall at Warrawee Station.

Community consultation activities for the Proposal would be undertaken during the public display of this REF. The display period of the REF would be advertised in the week that the public display commences. The REF would be displayed for a period of approximately two weeks.

The REF would be placed on public display on the TfNSW website<sup>1</sup>, TfNSW yoursay page<sup>2</sup>, NSW Government Have Your Say website<sup>3</sup> and hard copies at the following locations:

- Ku-ring-gai Council  
818 Pacific Highway  
Gordon NSW 2072
- Turramurra Library  
5 Ray Street  
Turramurra NSW 2074
- TfNSW Office  
Level 5, Tower A, Zenith Centre, 821 Pacific Highway, Chatswood 2067.

Further information of the Proposal may be requested by contacting the Project Infoline (1800 684 490) or by email<sup>4</sup>.

During the display period feedback from the community is invited and can be submitted in the following ways:

- Mail: Transport Access Program - Warrawee  
Associate Director, Environmental Impact Assessment  
Transport for NSW  
Locked Bag 6501  
St Leonards NSW 2065
- Email: [projects@transport.nsw.gov.au](mailto:projects@transport.nsw.gov.au)
- TfNSW YourSay website: [www.yoursay.transport.nsw.gov.au/warrawee](http://www.yoursay.transport.nsw.gov.au/warrawee)
- TfNSW website: [www.transport.nsw.gov.au/warrawee](http://www.transport.nsw.gov.au/warrawee).

TfNSW would review and assess all feedback received during the public display period, prior to determining whether or not to proceed with the Proposal. Responses will be provided to all submissions. Following the consideration of feedback received during the public display period, TfNSW would determine whether to proceed with the Proposal and what conditions would be imposed on the project should it be determined to proceed.

## 5.5 Ongoing consultation

At the conclusion of the public display period for this REF, TfNSW would acknowledge receipt of feedback from each respondent. The issues raised by the respondents would be considered by TfNSW before determining whether to proceed with the Proposal (refer Figure ES.2).

Should TfNSW determine to proceed with the Proposal, the Determination Report would be made available on the TfNSW website and would summarise the key impacts identified in this REF, demonstrate how TfNSW considered issues raised during the public display period, and include a summary of mitigation measures proposed to minimise the impacts of the Proposal.

Should TfNSW determine to proceed with the Proposal, the project team would keep the community, Council and other key stakeholders informed of the process, identify any further issues as they arise, and develop additional mitigation measures to minimise the impacts of the Proposal. The interaction with the community would be undertaken in accordance with a Community Liaison Management Plan to be developed prior to the commencement of construction.

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<sup>1</sup> [www.transport.nsw.gov.au/warrawee](http://www.transport.nsw.gov.au/warrawee)

<sup>2</sup> [www.yoursay.transport.nsw.gov.au/warrawee](http://www.yoursay.transport.nsw.gov.au/warrawee)

<sup>3</sup> [www.nsw.gov.au/improving-nsw/have-your-say/warrawee-station-upgrade/](http://www.nsw.gov.au/improving-nsw/have-your-say/warrawee-station-upgrade/)

<sup>4</sup> [projects@transport.nsw.gov.au](mailto:projects@transport.nsw.gov.au)

## 6 Environmental impact assessment

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Chapter 6 of the REF provides a detailed description of the likely environmental impacts associated with the construction and operation of the Proposal. For each likely impact, the existing environment is characterised and then an assessment is undertaken as to how the Proposal would impact on the existing environment.

This environmental impact assessment has been undertaken in accordance with clause 228 of the EP&A Regulation. A checklist of clause 228 factors and how they have been specifically addressed in this REF is included at Appendix B.

### 6.1 Traffic and transport

#### 6.1.1 Existing environment

##### Station access

The majority of people walk to Warrawee Station (69 per cent). Other access modes include kiss-and-ride (15 per cent), park and ride (11 per cent) and bus (five per cent) (Stantec, 2018). The present access to Warrawee Station is currently not compliant with *Disability Standards for Accessible Public Transport 2002* (DSAPT), resulting in its consideration for an upgrade.

Warrawee Station is accessed via a pedestrian footbridge connecting both Warrawee Avenue and Heydon Avenue with stairs to the station platforms. From Warrawee Avenue and Heydon Avenue, there is a 30 metre and 35 metre walk to the station platforms respectively. The narrowest point of access is the stairs accessing the platforms, which have a width of 2.5 metres.

##### Surrounding road network

Warrawee Station is located between Warrawee Avenue to the east and Heydon Avenue to the west (refer to Figure 1.2). Warrawee Avenue is a local two-way road that runs parallel to the station platforms. Heydon Avenue is a local two-way road that connects Warrawee Station and Knox Grammar School with the Pacific Highway to the south, which is a classified road managed by Roads and Maritime Services. The Pacific Highway is also the closest road to the Project that is approved for B-double heavy vehicles.

The surrounding road network comprises local roads (residential streets) managed by Ku-ring-gai Council. Traffic in the area is mainly local traffic and through traffic to Knox Grammar School.

##### Parking

Warrawee Station is supported by an existing, unsealed commuter car park located immediately west of the station, with access available from Heydon Avenue. However, no DDA compliant parking spaces are provided.

There are informal kiss-and-ride zones on the eastern and western sides of Warrawee Station, with dedicated no parking areas on Heydon Avenue and Warrawee Avenue. There is also on-street parking along the western side of Heydon Avenue and eastern side of Warrawee Avenue.

There is no formal taxi rank at the station.

## **Public transport**

### *Rail*

Warrawee Station is on the T1 North Shore Line providing services to Epping, Richmond, Emu Plains, Hornsby and Berowra from Central. Trains run from Warrawee Station towards the city and Hornsby approximately every 15 minutes in both peak and off peak periods.

### *Bus*

No bus stop or bus services currently service Warrawee Station. The nearest bus stop is located on the Pacific Highway, about 550 metres south of the station. The stop provides services between Turramurra and Fox Valley (bus route 573).

## **Pedestrian infrastructure**

There are pedestrian footpaths along the station side of Heydon Avenue and Warrawee Avenue and bike racks on both sides of the station for cyclists.

### **6.1.2 Potential impacts**

#### **a) Construction phase**

##### **Site compound haulage routes**

As described in Section 3.2, the main construction compound would be located within an area of land that is between the rail corridor and Warrawee Avenue, with access via existing gates on the corner of Warrawee Avenue/Hastings Road, and Brentwood Avenue (refer to Figure 3.4). This area was previously used for parking and as a construction compound for the TfNSW Warrawee Substation project. The final construction haulage route would be determined by the nominated Construction Contractor during the detailed design of the Proposal. Heavy vehicle access to the construction compound would be via the Pacific Highway.

##### **Traffic**

The construction traffic generated by the Proposal would be up to 20 to 30 light vehicles and 10 heavy vehicles per day during peak construction periods. Most of this construction traffic would be due to construction workers moving to and from site. The heavy vehicles would be required for the delivery and removal of materials, plants, and equipment. Given the low construction vehicle volumes predicted, this additional traffic is unlikely to impact the performance of the surrounding road network and intersections.

Most of the construction work would occur within the Sydney Trains rail corridor boundary. However, the work on Warrawee Avenue and Heydon Avenue (for the footpath, kerb, accessible parking spaces and kiss-and-ride spaces) could result in traffic impacts due to the need for temporary traffic management controls such as lane closures or detours. However, the work would be relatively fast, and so any delays on the surrounding road network would be temporary and minor.

## **Parking**

The proposed construction work, including construction site and access points, would be designed to avoid impacts on parking provisions (where possible). Construction vehicles would be required to park within the main construction compound located along Warrawee Avenue. Part-time loss of parking spaces may occur during construction on Warrawee Avenue and Heydon Avenue, with the closure expected to be dependent on the work undertaken. However, any loss in parking is expected to be short term.

## **Pedestrians and cyclists**

Construction work is expected to have a minor impact on the pedestrian and cycle network given the restricted space in which construction work is to be carried out. It is expected that there may be restrictions and disruptions to pedestrian and bicycle access as a result of the following construction activities:

- upgrading the existing stairs, which would impede customer access to the platforms during construction
- upgrading the footpaths between the station and Warrawee Avenue and Heydon Avenue, which would impede customer entrance to the station.

However, any closures would be temporary, with safe and suitable detours provided as a part of the construction traffic management to be implemented during the construction period.

## **Emergency vehicle access**

Access for emergency vehicles would be maintained at the construction site at all times. Emergency services would be advised of all planned changes to traffic arrangements prior to applying the changes. Advice would include information about upcoming traffic disruptions, anticipated delays to traffic, extended working hours and locations of any road shutdown periods.

## **b) Operational phase**

### **Pedestrians**

The Proposal would improve pedestrian movements within and to/from Warrawee Station due to the installation of the lift to the platforms, regrading of the platform surface, footpath upgrade and new kerb ramps. This would allow for accessible movement to and from the pedestrian bridge, station platforms, external road network and accessible parking spaces.

### **Traffic**

The proposed scope of work is not anticipated to have a direct increase in traffic generation during operation.

### **Parking**

The Proposal would result in minimal changes to the parking supply within the station precinct. However, the two new accessible car parking spaces and kiss-and-ride space on Heydon Avenue would have a positive impact for users of Warrawee Station. The location of the kiss-and-ride spaces close to the station along Heydon Avenue and Warrawee Avenue are considered suitable and effective to prevent motorists stopping at informal locations to allow passengers to disembark/embark from the vehicles, which can lead to traffic congestion and/or safety issues.

## Public transport and pedestrian infrastructure

The Proposal does not include changes to existing bus/rail services and would not impact on the operation (service operation or timetabling) of public transport in the vicinity of Warrawee Station.

### 6.1.3 Mitigation measures

The following mitigation measures are recommended to be implemented to minimise impacts during the construction of the Proposal. Refer to Table 7.1 for a complete list of mitigation measures.

#### General Mitigation Measures

The following general mitigation measures are recommended for implementation, to minimise impacts during the construction of the Proposal.

- prior to the commencement of construction, a Construction Traffic Management Plan (CTMP) would be prepared as part of the Construction Environmental Management Plan and would include at a minimum:
  - ensuring adequate regulatory road signage, line marking and all other traffic control devices necessary to inform motorists and pedestrians of the work site ahead. This would ensure that the risk of road accidents and disruption to surrounding land uses is minimised
  - ensuring access to railway stations, businesses, recreational premises and residential properties (unless affected property owners have been consulted and appropriate alternative arrangements made)
  - managing impacts and changes to on and off street parking
  - ensuring parking locations for construction workers are away from the station and busy residential areas and providing details of how this will be monitored for compliance
  - designating routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and businesses
  - undertaking consultation with the relevant roads authorities during preparation of the construction TMP and obtaining necessary Road Occupancy Licences for temporary road closures. The performance of all project traffic arrangements must be monitored during construction.
- communication would be provided to the community and local residents via notifications and signage to inform them of changes to parking, pedestrian access and/or traffic conditions including vehicle movements and anticipated effects on the local road network relating to site work
- suitable vehicle and pedestrian provisions would be maintained throughout construction to ensure that pedestrian connectivity is not impacted as a part of the work and that suitable and safe paths are provided
- qualified traffic controllers would be used during construction work to ensure safe and efficient movement of vehicle and pedestrian traffic on the external road as well as in and out of the construction site
- fencing and barriers would be installed between the construction site and outside the construction zone to ensure safe and easy navigation of pedestrians and cyclists
- all work with the potential to impact pedestrian movements such as lifting should be carried out during scheduled rail shutdown periods.

## Operation

The proposed upgrades to Warrawee Station are expected to provide a safer passage for all users to and from the station platforms. No specific mitigation measures during operation of the Proposal have been identified.

## 6.2 Urban design, landscape and visual amenity

This section provides a summary of the *Visual Impact Assessment* prepared by IRIS Visual Planning + Design (2018) (Technical Paper 1). The methodology used to undertake this assessment is provided in Section 6.0 of Technical Paper 1.

The assessment included a desktop analysis and site inspection to identify the potential visual impacts of the Proposal on views to the station from surrounding publicly accessible areas.

### 6.2.1 Existing environment

Warrawee Station is located within a cutting between Warrawee and Heydon Avenue. The landform descends gradually to the north, with the northern end of the platforms generally level with Warrawee Avenue. A pedestrian footbridge provides access to the platform and is level with the adjacent streets and allows elevated views over the station.

Warrawee Station, particularly the platforms and station building is a local landmark. The station consists of a single island with two platforms, and a heritage listed single storey station building featuring a decorative red-brick façade and a gabled roof with timber bargeboards. The footbridge, stairs and ends of the station building feature a recent steel framed gable roof, which is a unifying feature of the station. The pedestrian footbridge and stairs are predominantly modern concrete structures, with steel canopy structures. A footpath extends south from the station along the western rail corridor, linking to residential areas to the south and east. The rail corridor includes numerous overhead poles and wires, and corridor security fencing, which create some visual clutter.

The boundary of the railway corridor is densely vegetated, creating a strong east-west visual boundary, enclosing views between the station and adjacent residential areas (refer to Figure 6.1). The group of mature native trees in the Warrawee reserve and streetscape of Heydon Avenue to the west of the station filter views between the station, the commuter car park and adjacent school.

The station is located within a well-established and historic suburban area of Warrawee. This area has a high concentration of architect-designed heritage listed buildings, built from the late 19th century. Development of land to the east and west of the station in low density residential areas are permitted to reach maximum building heights of 9.5 metres, reflecting the desire to maintain the existing, low density character of built form in these areas.

At night, the Proposal would be in an area that is moderately well-lit due to lights surrounding the existing station and railway corridor. Surrounding this, the residential areas are less well-lit at night.



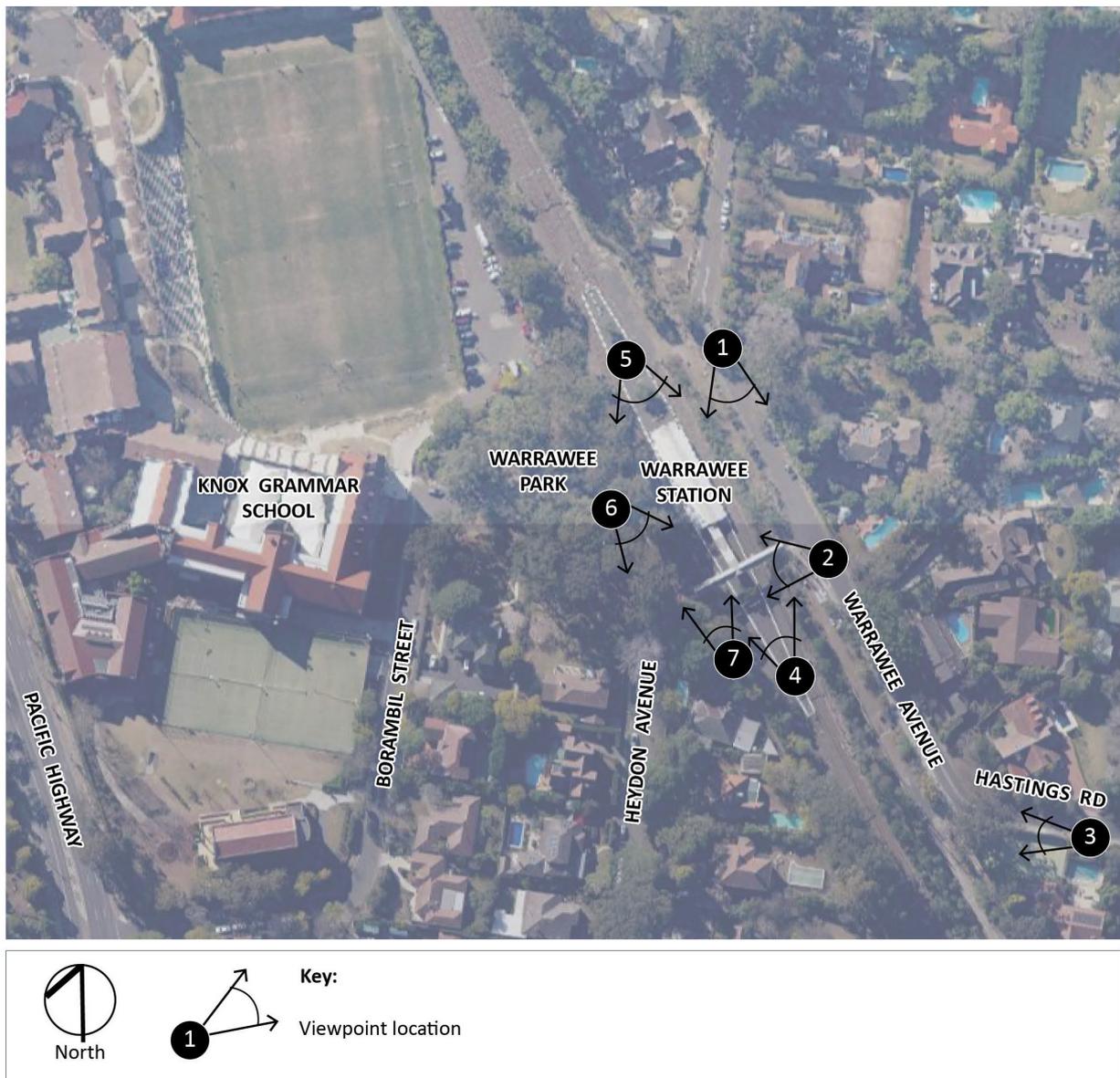
**Figure 6.1 Landscape and visual features of the site**

## 6.2.2 Potential impacts

The following viewpoints were selected as representative of the range of views to the site and the proposed development:

- Viewpoint 1 – View south from Warrawee Avenue
- Viewpoint 2 – View north-west from Warrawee Avenue
- Viewpoint 3 – View west along Hastings Road
- Viewpoint 4 – View north along the station platforms
- Viewpoint 5 – View south along the station platforms
- Viewpoint 6 – View east from Heydon Avenue
- Viewpoint 7 – View north from the footpath along the western side of the rail corridor.

The location of each viewpoint is shown on Figure 6.2 and photographs of these viewpoints are provided in Figure 6.3 to Figure 6.9.



**Figure 6.2 Viewpoint location plan**



**Figure 6.3 Viewpoint 1 – View south from Warrawee Avenue**



**Figure 6.4 Viewpoint 2 – View north-west from Warrawee Avenue**



**Figure 6.5 Viewpoint 3 – View west along Hastings Road**



**Figure 6.6 Viewpoint 4 – View north along the station platform**



**Figure 6.7 Viewpoint 5 – View south along the station platform**



**Figure 6.8 Viewpoint 6 – View east from Heydon Avenue**



**Figure 6.9 Viewpoint 7 – View north from footpath along western side of the rail corridor**

**a) Construction phase**

**Views during the daytime**

Table 6.1 summarises the daytime construction impacts assessed at each of the representative viewpoint locations.

**Table 6.1 Assessment of visual impacts during construction of the Proposal**

Viewpoint	Assessment of visual impact	Impact rating
<p><b>Viewpoint 1 – View south from Warrawee Avenue</b></p>	<p>The construction activity on the station platform and to construct the lift structure would be screened as the station is located below street level, and the vegetation along the rail corridor would be retained.</p> <p>There may be some glimpses to construction vehicles approaching the construction compound. However, the existing vegetation would likely screen views to the work within the compound itself.</p> <p>Installation of a new isolating transformer would be seen from this location on rail land adjacent to Warrawee Avenue (to the right and out of this view). Installation of this new service pole may also be seen, with wires connecting to an existing electricity supply within the rail property boundary. Although a small area of grass would be cleared to accommodate the transformer, no trees would be removed.</p>	<p>Negligible</p>

Viewpoint	Assessment of visual impact	Impact rating
<p><b>Viewpoint 2 – View north-west from Warrawee Avenue</b></p>	<p>A construction compound would be established in rail corridor land, between the track and Warrawee Avenue, to be used for construction activities such as materials delivery and laydown. The compound would be located further to the south, adjacent to access gate, and would not be seen from this location.</p> <p>Work to construct the new lift structure would be visible in front and rising above the existing footbridge. This structure would contrast somewhat with the surrounding leafy view. As the station is located below street level, the platform re-grading and construction of the lower areas of the lift structure would be out of view.</p> <p>The pole transformer and ancillary equipment visible in the centre of view would be decommissioned and removed. Further to the north (right of view), up to four trees would be removed at the station entrance, as part of the footpath upgrade works, opening up views to the rail corridor.</p>	<p>Minor adverse</p>
<p><b>Viewpoint 3 – View west along Hastings Road</b></p>	<p>A construction compound would be established in the middle ground of the view, between Hastings Road and the rail corridor, at the top of the rail cutting. Trucks and construction vehicles would be seen travelling along Hastings Road, between the main construction compound and lift work area. The gardens and trees along Hastings Road would screen much of this compound from adjacent properties.</p> <p>As the station is located below street level, the platform re-grading and construction of the lift structure would be out of view.</p>	<p>Minor adverse</p>
<p><b>Viewpoint 4 – View north along the station platform</b></p>	<p>Work to construct the lift would be seen in the middle and foreground of this view and above any site fencing. The footbridge would be retained, and hoarding erected along the southern side. The existing tree on the platform would be removed (and replaced with a similar tree) and adjacent seating and lighting would be relocated to make room for the new lift structure. Work to regrade the platform and upgrade the stairs would also be seen.</p> <p>The construction compound along Warrawee Avenue would not be visible from this location, due to intervening landform and vegetation.</p> <p>The character and close proximity of this construction activity would contrast with the heritage and leafy character of the station and be seen in close proximity to commuters. This would result in a temporary considerable reduction in the visual amenity of this view.</p>	<p>Moderate adverse</p>
<p><b>Viewpoint 5 – View south along the station platform</b></p>	<p>Work to regrade the platform and reconfigure the station building would be seen in the foreground of this view.</p> <p>Work to construct the lift would be located in the background of view, and would be screened by the intervening tree and platform building. The construction compound along Warrawee Avenue would also be out of view.</p>	<p>Minor adverse</p>
<p><b>Viewpoint 6 – View east from Heydon Avenue</b></p>	<p>Work to the existing footbridge and the lift would be visible rising above the existing footbridge and surrounding vegetation.</p> <p>In the middle and foreground of the view, work to construct two accessible car parking spaces and one kiss-and-ride space, a paved area at the station entrance and kerb ramp work would be seen on Heydon Avenue.</p>	<p>Minor adverse</p>

Viewpoint	Assessment of visual impact	Impact rating
<b>Viewpoint 7 – View north from footpath along western side of the rail corridor</b>	<p>Construction of the new lift structure would be visible in this view; particularly the lift shaft rising above the roofline of the footbridge.</p> <p>The existing platform tree would be removed (and replaced with a similar tree) and there would be work on the platform. This work would be seen through intervening vegetation and existing rail corridor fencing.</p> <p>The character of this construction activity would contrast somewhat with the leafy character of this view but be filtered through intervening vegetation and seen in the middle to background of the view.</p>	Minor adverse

### Views at night

During construction, the work areas and adjacent main construction compound would be lit for security. However, it is unlikely that these areas would be used on an ongoing basis for construction activity during evening hours (other than for specific activities or where work is undertaken during scheduled rail shutdown periods). Generally, the character of the construction work would be visually absorbed into the surrounding brightly lit environment of the station.

The work would create a minor reduction in amenity and result in negligible adverse visual impact during construction.

### Urban design and landscape character

The Proposal would result in improvements in station accessibility and legibility during construction, and only require the removal of five trees (one tree on the station platform and four trees at the station entrance along Warrawee Avenue). This would result in a temporary minor reduction in the landscape quality and urban design functionality of the station precinct and a minor adverse urban design and landscape impact during construction.

### b) Operational phase

#### Views during the daytime

Table 6.2 summarises the daytime operational impacts assessed at each of the representative viewpoint locations.

**Table 6.2 Assessment of visual impacts during operation of the Proposal**

Viewpoint	Assessment of visual impact	Impact rating
<b>Viewpoint 1 – View south from Warrawee Avenue</b>	<p>The upgrade work to Warrawee Station would not be seen from this location.</p> <p>The new transformer and service pole would not contrast with the visual character of the rail corridor, which already contains infrastructure elements.</p>	Negligible

Viewpoint	Assessment of visual impact	Impact rating
<p><b>Viewpoint 2 – View north-west from Warrawee Avenue</b></p>	<p>The upper portion of the new lift structure would be seen in the middle ground of the view, in front of the existing footbridge and rising above it by a storey. This structure would be in keeping with the character of the existing station with a pitched roofline and corrugated metal sheet roofing. The lift structure would incorporate glazing and have some transparency at the upper level. A photomontage from this viewpoint is shown in Figure 6.10.</p> <p>This work would be seen through rail corridor fencing and be partly screened by vegetation and the pad-mount transformer. Removal of the pole transformer and ancillary equipment would declutter the central part of this view and improve the visual character of the station entrance.</p> <p>The work would be consistent with the built character of this view and absorbed into the character of this view.</p>	Negligible
<p><b>Viewpoint 3 – View west along Hastings Road</b></p>	<p>The upgrade work to Warrawee Station would be out of view. The construction compound would undergo rectification work post construction.</p>	Negligible
<p><b>Viewpoint 4 – View north along the station platform</b></p>	<p>The lift structure would be a new and prominent feature in this view (refer to Figure 6.11). The lift shaft would be seen in the middle ground of view, with a new canopy extending along the platform and linking to the stairs. The base of the lift shaft would be solid with a glazed lift shaft and pitched roof with steel sheeting rising above the roof of the footbridge. The balustrade and handrails on the footbridge would be replaced with new compliant handrails, changing the appearance of the bridge somewhat.</p> <p>Improvements to the platform surface, including minor regrading and tactile indicators, would be consistent in character with the surrounding station platform.</p> <p>Whilst the lift structure would be consistent in character with the existing structures at the station, the scale and massing of the lift would obstruct views to the heritage platform building from the southern end.</p>	Minor adverse
<p><b>Viewpoint 5 – View south along the station platform</b></p>	<p>The new lift structure and platform-level canopy would not be seen from this location. Upgrades to the platform surface and TGSIs would appear consistent with the surrounding platform. Work to the station building would also not be noticeable.</p>	Negligible
<p><b>Viewpoint 6 – View east from Heydon Avenue</b></p>	<p>Upgrades to the kerbside facilities on Heydon Avenue would be visible in the middle to foreground of this view and be consistent in character with the existing streetscape. The upper portions of the new lift structure would also be seen, rising above the existing footbridge, in the background of the view. This new structure would be largely screened by intervening landform and vegetation and be absorbed into the background of the view.</p> <p>Overall, the new work would comprise a small part of this view, as the trees that contribute to the leafy character of this location would be retained.</p>	Negligible

Viewpoint	Assessment of visual impact	Impact rating
<p><b>Viewpoint 7 – View north from footpath along western side of the rail corridor</b></p>	<p>From this location, the new lift structure would be visible including the new glazed solid lift shaft and a solid pitched roof.</p> <p>The roof of the lift shaft would rise above the existing footbridge, providing a new skyline element. However, the visual impact of the lift would be reduced by the proposed simple form and material palette. The structure would also be seen in the middle to background of views from this footpath and be filtered through intervening vegetation. The platforms would have minor resurfacing work visible.</p> <p>Overall, the station would have an increased visual prominence in this view, however, the lift structure would be seen in the developed context of the station, be visually contained by the leafy backdrop of trees and filtered through intervening vegetation.</p>	<p>Negligible</p>



**Figure 6.10 Photomontage of the Proposal during operation from Viewpoint 2**



**Figure 6.11** Photomontage of the Proposal during operation from Viewpoint 4



**Figure 6.12** Photomontage of the Proposal during operation from Viewpoint 6

## Views at night

During operations, the upgraded station would continue to be brightly lit for security and safe use at night. The new lift and minor upgrades at Warrawee Avenue would be seen in the context of the existing station lighting. The location of the new lift structure in a deep cutting would further enclose the additional lighting provided by the Proposal.

Generally, the character of the proposed station upgrade at night would be visually absorbed into the surrounding brightly lit station environment and the legibility of the precinct would be improved. Overall, this would result in no perceived change in the amenity of views at night, resulting in a negligible visual impact at night during operation.

## Urban design and landscape character

During operation, there would be a substantial improvement to accessibility created by the introduction of a lift, improvements to the platform levels and TGSIs, new platform-level canopy and improvements to the surrounding footpaths. There would be potentially less shaded areas and amenity on the southern portion of the station due to the removal of the existing tree, however, the replacement of the tree along the platform would assist with compensating for this impact.

Overall, this would result in a minor improvement in the urban design functionality of the station precinct and a minor beneficial urban design and landscape impact during operation.

### 6.2.3 Mitigation measures

The following mitigation measures would be implemented to reduce the visual impacts of the Proposal:

- an Urban Design Plan (UDP) is to be submitted to TfNSW and endorsed by the Precincts and Urban Design team prior to construction commencement. The Urban Design Plan is to address the fundamental design principles as outlined in 'Around the Tracks' – urban design for heavy and light rail, TfNSW, Interim 2016. The Urban Design Plan shall:
  - demonstrate a robust understanding of the site through a comprehensive site analysis to inform the design direction, demonstrate connectivity with street networks, transport modes, active transport options, and pedestrian distances
  - identify opportunities and challenges
  - establish site specific principles to guide and test design options
  - demonstrate how the preferred design option responds to the design principles established in 'Around the Tracks', including consideration of Crime Prevention through Environmental Design Principles

The Urban Design Plan is to include the Public Domain Plan for the chosen option and will provide analysis of the:

- landscape design approach including design of pedestrian and bicycle pathways, street furniture, interchange facilities, new planting and opportunities for public art
- materials Schedule including materials and finishes for proposed built work, colour schemes, paving and lighting types for public domain, fencing and landscaping
- an Artist's Impression or Photomontage to communicate the proposed changes to the precinct

The following design guidelines are available to assist and inform the Urban Design Plan for the Proposal:

- *TAP Urban Design Plan, Guidelines*, TfNSW, Draft 2018
- *Commuter Car Parks, urban design guidelines*, TfNSW, Interim 2017
- *Managing Heritage Issues in Rail Projects Guidelines*, TfNSW, Interim 2016
- *Creativity Guidelines for Transport Systems*, TfNSW, Interim 2016
- *Water Sensitive Urban Design Guidelines for TfNSW Projects*, 2016

Endorsement of the Urban Design Plan will demonstrate compliance with the Conditions of Approval in the Review of Environmental Factors (REF) Determination Report.

- all permanent lighting would be designed and installed in accordance with the requirements of standards relevant to *AS 1158 Lighting for Roads and Public Spaces* and *AS 4282 Controlling the Obtrusive Effects of Outdoor Lighting*
- the detailed design of the Proposal would comply with Crime Prevention Through Environmental Design principles
- worksite compounds would be screened with shade cloth (or similar material, where necessary) to minimise visual impacts from key viewing locations
- temporary hoardings, barriers, traffic management and signage would be removed when no longer required
- during construction, graffiti would be removed in accordance with TfNSW's Standard Requirements
- all trees to be retained should be protected prior to the commencement of construction in accordance with AS4970 the *Australian Standard for Protection of Trees on Development Sites and Adjoining Properties*
- temporary access arrangements should be well signed and provide a visually legible route for pedestrians
- site equipment and facilities should be consolidated to maximise the area of useable public realm and maintain pedestrian permeability
- a colour palette which is complementary to the heritage character of the station should be selected.

Refer to Table 7.1 in Section 7.2 for a full list of proposed mitigation measures.

## 6.3 Noise and vibration

### 6.3.1 Existing environment

#### Sensitive receivers

Receivers potentially sensitive to both noise and vibration in the following categories as defined in *Noise Policy for Industry* (NPfI) (EPA, 2017) and *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) have been identified in the surrounding area:

- residential
- commercial
- educational institution
- place of worship
- active recreation areas.

Sensitive receivers are outlined in Table 6.3 and shown in Figure 6.13.

**Table 6.3 Noise Catchment Area (NCA) and classification of representative receivers**

NCA	Receiver Type	Address	Receiver ID
1	Active Recreation	1499 Pacific Highway, Wahroonga	AR1
	Educational	2 Borambil Street, Wahroonga	E1
	Place of Worship	7 Borambil Street, Wahroonga	W1
2	Residential	19 Heydon Avenue, Warrawee	R2
3	Residential	11 Yosefa Avenue, Warrawee	R3
4	Residential	54 Hastings Road, Warrawee	R4
5	Residential	1 Warrawee Avenue, Warrawee	R5
6	Residential	7 Warrawee Avenue, Warrawee	R6

*Note: A potential Hotel (Barton Bed and Breakfast) located at 6 Yosefa Avenue was identified during a desktop review. Further investigation has shown this appears to be a transient BnB only and is primarily used as residence. As such, residential criteria have been applied.*



**Figure 6.13 Sensitive receivers and noise monitoring locations**

## Background noise levels

The prevailing background and ambient noise levels surrounding the Proposal were determined through a combination of unattended and operator attended noise surveys in accordance with the *Australian Standard 1055-1997- Acoustics-Description and Measurement of Environmental Noise* (AS 1055) and the NPfl.

The aim of the monitoring is to provide a representative characterisation of the long-term noise environment within the entire noise catchment area, not the noise levels at the worst case sensitive receivers. Therefore, the noise monitoring locations have been selected to avoid being too influenced by rail noise or road traffic noise from the Pacific Highway.

The background characteristics for NM01 and NM02 included:

- at NM01, the background levels were characterised by traffic along the Pacific Highway. Ambient noise levels were controlled by insects, birds and traffic along Heydon Avenue
- at NM02, the background levels were characterised by insect noise and general urban hum. Ambient noise levels were controlled by insects, light traffic on Pibrac Avenue, with aircraft fly-overs contributing.

The results of the unattended and attended noise surveys and observations are detailed in Table 6.4 and Table 6.5.

**Table 6.4 Summary of unattended noise monitoring results**

Location	Rating Background Level (RBL) dBA L <sub>90</sub> <sup>1,2</sup>			Ambient Noise Level dBA L <sub>eq</sub> (15 minute)		
	Day	Evening	Night	Day	Evening	Night
NM01	46	42	36	56	56	52
NM02	36	33	30 <sup>3</sup>	53	50	43

1. Rating Background Level (RBL) The overall single-figure background level representing each assessment period (daytime/evening/night-time) as defined in the NPfl.
2. Time periods defined as – Day: 7am to 6pm Monday to Saturday, 8am to 6pm Sunday; Evening: 6pm to 10pm; Night: 10pm to 7am Monday to Saturday, 10pm to 8am Sunday.
3. Where background levels are below 30 dBA, they have been adjusted to be 30 dBA in accordance with the NPfl

**Table 6.5 Summary of attended noise measurement results**

Location	Time	dBA L <sub>eq</sub> (15min)	dBA L <sub>90</sub> (15 minute)	Observations
NM01	11:35 am to 11:50 am	55	47	Insects: up to 57 dBA Birds: up to 67 dBA Car pass-bys: up to 65 dBA
NM02	12:41 pm to 12:53 pm <sup>1</sup>	60 (50 <sup>2</sup> )	48 (39 <sup>2</sup> )	Insects: up to 63 dBA Car pass-bys: up to 65 dBA

1. Monitoring was reduced to 12 minutes due to the presence of a lawn mower in operation after this time. It is noted that operator attended noise measurements are conducted to characterise the noise environment only, values are indicative and not used in the assessments.
2. The presented L<sub>eq</sub> and L<sub>90</sub> have been adjusted (excluded noise above 5kHz) to eliminate insect noise for comparison with ambient noise monitoring.

The results of the survey were used to set Noise Management Levels (NMLs) in accordance with the *Interim Construction Noise Guideline* (DECCW, 2009) and noise triggers for operational noise in accordance with the NPfl.

### **6.3.2 Potential impacts**

#### **a) Construction phase**

##### **Predicted noise levels**

Table 6.6 presents the predicted noise levels for the representative receivers for the key construction work activities excluding demobilisation (refer to Section 3.2.1). Maps of the predicted noise levels are provided in Appendix B of the *Noise and Vibration Impact Assessment* (WSP, 2018).

The calculations are conservative as they include all equipment operating simultaneously at their closest point to the receiver in a worst case 15-minute period. Actual noise levels from the construction site would be expected to be lower. Where a predicted noise level exceeds a less stringent management level, it follows that the more stringent management levels are also exceeded.

Table 6.7 presents the results of the maximum noise level assessment.

**Table 6.6 Predicted construction noise levels**

NCA	Receiver ID	Receiver type	Noise management level				Activity predicted noise level dBA L <sub>eq, 15 minute</sub>					
			Standard Hours	OOH Day	OOH Evening	OOH Night	Site establishment and enabling work	Lift work	Stair upgrade	Interchange upgrade	Station building work	Platform modification work
1	AR1	Active Recreation	65	65	65	65	65 ( <b>78</b> )	60 (70)	61 (70)	65 (73)	65 (75)	70 ( <b>79</b> )
	E1	Educational	55	55	55	55	62 (75)	61 (71)	64 (73)	68 ( <b>76</b> )	63 (73)	65 (74)
	W1	Place of worship	55	55	55	55	55 (68)	56 (66)	58 (67)	61 (69)	55 (65)	58 (67)
2	R2	Residential	56	51	47	41	>80 (>80)	72 (>80)	75 (>80)	>80 (>80)	64 (74)	75 (>80)
	R3	Residential	56	51	47	41	44 (57)	46 (56)	46 (55)	50 (58)	39 (49)	44 (53)
4	R4	Residential	46	41	38	35	55 (68)	55 (65)	57 (66)	61 (69)	49 (59)	55 (64)
5	R5	Residential	46	41	38	35	74 (>80)	68 ( <b>78</b> )	73 ( <b>82</b> )	80 (>80)	67 ( <b>77</b> )	69 ( <b>78</b> )
6	R6	Residential	46	41	38	35	66 ( <b>79</b> )	60 (70)	62 (71)	69 ( <b>77</b> )	64 (74)	71 ( <b>80</b> )

Note 1: Values in brackets indicate predicted noise levels including plant items with special audible characteristics (concrete saw)

The formatting within the construction noise assessment tables indicates the following:

- the orange shaded cells show exceedances of the standard hours day period NML
- the yellow shaded cells show exceedances of the out-of-hours (OOH) day period NML
- the green shaded cells show exceedances of the OOH evening period NML
- the blue shaded cells show exceedances of the OOH night period NML
- the cells with red text show exceedances of highly noise affected noise management levels.

**Table 6.7 Predicted sleep disturbance assessment**

NCA	Receiver ID	Noise management level (NML)		Activity predicted maximum noise level $L_{max}$ dBA					
		RBL +15 dBA screening criteria	Maximum noise level event	Site establishment and enabling work	Lift work	Stair upgrade	Interchange upgrade	Station building work	Platform modification work
2	R2	51	65	84 (97)	88 (98)	88 (97)	90 (98)	88 (98)	89 (98)
3	R3	51	65	52 (65)	56 (66)	56 (65)	58 (66)	56 (66)	57 (66)
4	R4	45	65	63 (76)	67 (77)	67 (76)	69 (77)	67 (77)	68 (77)
5	R5	45	65	81 (94)	85 (95)	85 (94)	87 (95)	85 (95)	86 (95)
6	R6	45	65	74 (87)	78 (88)	78 (87)	80 (88)	78 (88)	79 (88)

Note 1: Values in brackets indicate predicted noise levels including plant items with special audible characteristics (concrete saw)

The formatting within the sleep disturbance maximum noise level table indicates the following:

- the grey shaded cells show exceedances of the RBL + 15 dBA screening criteria
- the blue shaded cells show exceedances of the  $L_{max}$  screening criteria.

## Assessment of predicted noise levels

During construction activities, the predicted noise levels indicate that construction noise could result in noise management levels exceedances, highly noise affected receivers, and in some cases, sleep disturbance for nearby sensitive receivers. However, work is expected to take place intermittently over a 12 to 18 month period, so these exceedances would not be expected to occur continuously over the duration of the Proposal. Additionally, the predictions are based on a worst case 15 minute period, so actual noise levels from the construction site are expected to be lower than those indicated.

A separate noise assessment was undertaken for the worst-case noise impacts involving use of concrete saws, which are expected to be infrequently used during the construction duration. In this assessment (with use of concrete saws), exceedances of standard hours and OOH NMLs within all NCAs at representative residential receivers during all activities were predicted. Residential receiver R2 is predicted to be highly noise affected during all activities except Activity 5 (station building work). Non-residential receivers AR1, E1 and W1 were predicted to exceed NMLs during all activities.

In the noise assessment without use of a concrete saw, a decrease in noise level of around 10dB was predicted for all activities, however the worst affected receivers in all NCAs were still predicted to have exceedances of the standard hours and OOH NMLs for all activities. Receivers R2 and R5 were still predicted to be highly noise affected, however only during activity 1 (site establishment) and activity 4 (interchange upgrades). Non-residential receiver E2 is expected to exceed standard hours NMLs during all activities. Non-residential receivers AR1 and W1 are expected to exceed NMLs during lift, stair and interchange upgrades and platform work.

Maximum noise level exceedances are predicted to occur during all OOH activities at all NCAs, with the greatest exceedances at R2.

These impacts would be managed and minimised where possible through the implementation of mitigation measures (refer to Section 6.3.3).

## Construction traffic noise

The potential for noise impacts to occur due to light and heavy vehicle movements on public roads generated by the construction work has also been assessed in accordance with the *Road Noise Policy* (RNP) (EPA, 2011). Overall, it is expected that construction traffic due to the Proposal would comply with RNP criteria.

## Vibration

Certain construction activities would require the use of vibration intensive equipment that may affect the nearest sensitive receivers. The vibration intensive plant nominated as part of the work is jack hammering for the stair upgrade, interchange upgrades and station building work.

Minimum working distances for vibration intensive plant have been outlined to comply with human comfort and cosmetic damage vibration limits. If minimum working distances are complied with, no adverse impacts are expected for cosmetic damage or human response on nearby sensitive receivers. All receivers are outside the minimum working distance of one metre.

## b) Operational phase

For operational noise, the mechanical plant selections have not yet been finalised. However, it is not expected that the mechanical plant would have a significant noise impact. Any mechanical plant, equipment or other operational noise source proposed is to be designed to meet the NPfl noise triggers identified in this report. Operational noise would not be noticeably different what is currently experienced.

### 6.3.3 Mitigation measures

The following mitigation measures are proposed with respect to potential noise and vibration impacts (refer to Section 6 of the *Noise and Vibration Assessment* for more detail):

- prior to commencement of work, a Construction Noise and Vibration Management Plan (CNVMP) would be prepared and implemented in accordance with the requirements of the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009), *Construction Noise and Vibration Strategy* (TfNSW, 2018b) and the *Noise and Vibration Impact Assessment* for the Proposal (WSP, 2019). The CNVMP would take into consideration measures for reducing the source noise levels of construction equipment by construction planning and equipment selection where practicable.
- work would generally be carried out during standard construction hours (i.e. 7.00 am to 6.00 pm Monday to Friday; 8.00 am to 1.00 pm Saturdays). Any work outside these hours may be undertaken if approved by TfNSW and the community is notified prior to these work commencing. An Out of Hours Work application form would need to be prepared by the Contractor and submitted to the TfNSW Environment and Planning Manager for any work outside normal hours as per the TfNSW Construction Noise Strategy
- where the  $L_{Aeq (15minute)}$  construction noise levels are predicted to exceed 30 dBA above the Rating Background Level and/or 75 dBA (total including RBL) at nearby affected sensitive receivers, respite periods would be observed, where practicable, and in accordance with the TfNSW *Construction Noise and Vibration Strategy* (TfNSW, 2018b). This would include restricting the hours that very noisy activities can occur
- to avoid structural impacts as a result of vibration or direct contact with structures, the proposed work would be undertaken in accordance with the safe work distances outlined in the *Noise and Vibration Assessment* (WSP, 2018) and attended vibration monitoring or vibration trials would be undertaken where these distances are required to be challenged. This would include undertaking a pre-construction building condition survey of heritage structures within 50 metres of construction works prior to commencement of works.
- during site establishment, temporary barriers should be erected to ensure that work would be conducted behind temporary hoardings/screens wherever practicable. The installation of construction hoarding would take into consideration the location of sensitive receivers to ensure that 'line of sight' is broken, where feasible. This has the potential to reduce noise levels between 5 and 10 dB.
- during site establishment, lift, stairs and station building and platform work, use of the concrete saw is the main contributor to construction noise. It is recommended that the use of concrete saws is limited where possible, and work is undertaken during standard hours. Where work is required outside of standard hours, the use of this equipment is to avoid sensitive periods such as after midnight and before 7am.
- due to the exceedances for all stages of construction at the educational receiver E1 (Knox Grammar School) and the place of worship receiver W1, where possible, it is recommended that a temporary screen or enclosure (10 – 15 dB reduction) is placed around the work in conjunction with temporary barriers. Further consultation should also be undertaken to determine feasible construction periods and inform construction staging with respect to minimising the impacts on receivers E1 and W1. As much as reasonably possible, noise intensive construction work near affected education buildings are to be minimised. It is also recommended that where reasonable and feasible the use of the concrete saw is limited to standard hours or when the premises are not in use.

## **6.4 Aboriginal heritage**

### **6.4.1 Existing environment**

The Aboriginal heritage of the region is thousands of years old, the region inhabited by the Aboriginal Darramuragal or Darug people (Ku-ring-gai Council, 2016).

A search for known Aboriginal heritage items in the vicinity of Warrawee Station (plus a 200 metre buffer) was undertaken on 13 December 2018 using the Office of Environment and Heritage AHIMS database. The AHIMS search confirmed there to be no known Aboriginal heritage items within or close to Warrawee Station.

The extensive landscape modification that has occurred across the Proposal study area, with the station existing within a cutting, suggests that intact evidence of Aboriginal land use is unlikely to occur. Similarly, the high level of disturbance due to construction of the rail line and platforms would suggest that the archaeological potential of the area is low.

### **6.4.2 Potential impacts**

#### **a) Construction phase**

Construction of the Proposal would involve some minor excavation and other ground disturbing activities, particularly for the foundation and pit for the new lift. Ground disturbing activities have the potential to impact Aboriginal sites, if present. However, as no known Aboriginal heritage items are located in the vicinity of the Proposal and no significant excavations are proposed, no impacts on Aboriginal heritage are expected due to construction of the Proposal.

#### **b) Operational phase**

It is not expected that there would be any risks to Aboriginal heritage from the operation of the Proposal.

### **6.4.3 Mitigation measures**

The following mitigation measures are proposed with respect to potential Aboriginal heritage impacts:

- all construction staff would undergo an induction in the recognition of Aboriginal cultural heritage material. This training would include information such as the importance of Aboriginal cultural heritage material and places to the Aboriginal community, as well as the legal implications of removal, disturbance and damage to any Aboriginal cultural heritage material and sites
- if unforeseen unidentified Aboriginal objects are uncovered during construction, the procedures contained in the TfNSW *Unexpected Heritage Finds Guideline* (TfNSW, 2015b) would be followed, and work within the vicinity of the find would cease immediately. The Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager so they can assist in co-ordinating next steps which are likely to involve consultation with an Aboriginal heritage consultant, the OEH and the Local Aboriginal Land Council
- if human remains are found, work would cease, the site secured and the NSW Police and the OEH notified. Where required, further archaeological investigations and an Aboriginal Heritage Impact Permit would be obtained prior to work recommencing at the location.

Refer to Table 7.1 in Section 7.2 for a full list of proposed mitigation measures.

The project would also investigate opportunities for recognising and celebrating Aboriginal Culture during design and construction. Specific design responses and initiatives will be developed in consultation with key stakeholders. This approach is outlined in the TAP 3 Aboriginal Inclusion Plan.

## **6.5 Non-Aboriginal heritage**

This section provides a summary of the *Statement of Heritage Impact* (SoHI, Technical Paper 3) prepared by Artefact Heritage (2019). The methodology used to undertake this assessment is provided in Section 1.4 of Technical Paper 3.

### **6.5.1 Existing environment**

#### **Historical background**

Early settlement and land use in Warrawee centred around timber getting, orcharding and the establishment of large rural estates.

Construction of the North Shore Line began in 1887 and was completed in 1890. The station at Warrawee was opened in August 1900, making it the last station along the line to be completed. It comprised an unattended station with two temporary timber buildings on the platform. Extensive earthworks would have been required to create a level grade for the rail corridor, which is evident in the visible cuttings on either side of the Warrawee rail corridor.

The North Shore Line was gradually duplicated between 1900 and 1909. This required the original timber platform at Warrawee to be demolished and replaced with a new brick island platform and station building, which remain at the site today. The platform was initially accessed via a timber overhead footbridge that provided access from Warrawee Avenue and Borambil Street. The original footbridge was replaced in 1977 with a precast concrete footbridge. The station was upgraded in 1995, with the addition of a new steel framed roof at each end of the station and an alteration of the station building to include male and female toilets.

The area surrounding Warrawee Station is typically residential, which maintains its original Federation era character.

#### **Listed heritage items**

The desktop search of relevant non-Aboriginal heritage registers on 5 January 2019 did not identify any heritage items listed on the World, Commonwealth or National Heritage Lists, the Register of the National Estate or State Heritage Register within proximity of the Proposal.

There are 11 heritage items listed in the Ku-ring-gai LEP and one item on the NSW RailCorp s170 Register in the vicinity of the Proposal (outlined in Table 6.8 and shown on Figure 6.14). An assessment and/or statement of significance for each of these heritage items is provided in Chapter 5 of Technical Paper 3.



**Figure 6.14 Heritage items within the vicinity of Warrabee Station**

**Table 6.8 Heritage items in the vicinity of the Proposal**

Item	Address	Listing and Item Number	Significance	Distance from Proposal
Warrawee Railway Station Group	Heydon Avenue, Warrawee	NSW RailCorp s170 Register (SHI listing no. 4802042)	Local	Within
Warrawee Railway Station	Heydon Avenue, Warrawee	Ku-ring-gai LEP 2015 (Item No. 1105)	Local	Within
'Dwelling house'	1 Warrawee Avenue, Warrawee	Ku-ring-gai LEP 2015 (Item No. 11072)	Local	25 metres east
"Rowardennan" (formerly Lyndon Lodge)	5 Warrawee Avenue, Warrawee	Ku-ring-gai LEP 2015 (Item No. 11074)	Local	80 metres north-east
"Maiala"	7 Warrawee Avenue, Warrawee	Ku-ring-gai LEP 2015 (Item No. 11075)	Local	30 metres north-east
"Wirepe"	69 Hastings Road, Warrawee	Ku-ring-gai LEP 2015 (Item No. 11050)	Local	30 metres east
'Dwelling house'	2 Borambil Street, Warrawee	Ku-ring-gai LEP 2015 (Item No. 11028)	Local	120 metres northwest
"Reaycroft"	17 Heydon Avenue, Warrawee	Ku-ring-gai LEP 2015 (Item No. 11054)	Local	10 metres south-west
"Chantreys"	32 Heydon Avenue, Warrawee	Ku-ring-gai LEP 2015 (Item No. 11055)	Local	50 metres south-west
'Dwelling house'	34 Heydon Avenue, Warrawee	Ku-ring-gai LEP 2015 (Item No. 11056)	Local	30 metres west
'Heydon Avenue, Warrawee and Woodville Avenue, Wahroonga Conservation Area'	-	Ku-ring-gai LEP 2015 (Item No. C2)	Local	Partially within
'Warrawee Conservation Area'	-	Ku-ring-gai LEP 2015	Local	Partially within

Most of the heritage items listed in Table 6.8 are within the Warrawee Conservation Area or the Heydon Avenue, Warrawee and Woodville Avenue, Wahroonga Conservation Area, located immediately east and west of the Proposal respectively. These heritage items are generally associated with late-19th and early to mid-20th century residential development, which are registered on the Ku-ring-gai LEP 2015 as having local heritage significance and feature well-established trees and plantings.

The following statement of significance has been sourced from the SHI database listing for the Warrawee Railway Station Group.

*"Warrawee Railway Station is significant at local level. Built in 1909 following the duplication of the North Shore line between Lindfield and Hornsby, the present station has historical significance as the construction of the railway encouraged rapid subdivision and the development of the area and is associated with the early 1900s expansion of the suburban railway network. The station contributes to the character of the North Shore line with its*

*homogenous, early 20th century railway architecture and landscaped settings. Unlike other stations on this line however, it does not have its original footbridge or any landscaping of particular note. The significance of the place is largely embodied in its original station building and platform.”*

The relative heritage significance of the components of Warrawee Station has been assessed as follows (refer to Section 5.2.1 in Technical Paper 3):

- high – Platform station building – external, platform station building – internal, platform, moveable heritage items (including historical signage, a clock and framed posters)
- moderate – Pedestrian footbridge and stairs, Evergreen ash (*Fraxinus griffithii*) and associated ornamental plantings
- little – Carpark and pedestrian areas.

## 6.5.2 Potential impacts

### a) Construction phase

#### Assessment of construction impacts

Table 6.9 outlines the potential impacts of the work upon the heritage significance of Warrawee Station.

**Table 6.9 Potential construction impacts to heritage associated with the Proposal**

Component	Assessment
<p>Lift, walkway and canopy structures:</p> <ul style="list-style-type: none"> <li>• construction of a new lift and landing</li> <li>• upgrade of the existing stairs.</li> </ul>	<p>This would involve the removal of:</p> <ul style="list-style-type: none"> <li>• some sections of fixings and handrails associated with the current pedestrian footbridge deck (no heritage impact)</li> <li>• an existing garden bed and Evergreen ash tree (minor to moderate direct impact to Warrawee Railway Station Group)</li> <li>• part of the platform to accommodate the base of the lift shaft (moderate direct impact to Warrawee Railway Station Group).</li> </ul>
<p>Carparking and footpath modifications:</p> <ul style="list-style-type: none"> <li>• provision of two new accessible car parking spaces along Heydon Avenue</li> <li>• provision of three new kiss-and-ride <b>spaces</b> along Warrawee Avenue</li> <li>• construction work to the existing footpath and associated kerb <b>ramp</b> work.</li> </ul>	<p>These works would be constrained to areas within the road corridor only and would not occur within the lot boundaries of any private properties or Warrawee Station. These works would not require the removal of any existing structures or trees. However, they would occur within the curtilages of Heydon Avenue, Warrawee and Woodville Avenue, Wahroonga Conservation Area and Warrawee Conservation Area.</p> <p>This component of the Proposal would have a negligible to minor direct impact on the surrounding heritage conservation areas.</p>

Component	Assessment
Platform modifications: <ul style="list-style-type: none"> <li>• upgrade of the existing platform surfaces (re-grading/re-surfacing).</li> </ul>	The surface on platform 1 and 2 would be regraded to create a DDA-compliant level surface for commuters. It is unlikely that the horizontal extent of regrading would impact original fabric associated with the platform 1 or 2 coping and retaining wall. These works would therefore be considered a minor direct (physical) impact to the heritage significance of the Warrawee Railway Station Group. However, if platform coping and fabric associated with the retaining wall were to be directly impacted, this would be considered a moderate impact.
Modifications to platform station building: <ul style="list-style-type: none"> <li>• reconfiguration of the existing male and female toilets within the station building and installation of new bathroom facilities</li> <li>• ancillary work within the station building.</li> </ul>	This would involve: <ul style="list-style-type: none"> <li>• fastening new items to existing internal walls within the station master's office (minor direct impact to Warrawee Railway Station Group)</li> <li>• removal of existing toilets, walls, tiling and finishes within existing bathrooms and installation of new (minor direct impact to Warrawee Railway Station Group)</li> <li>• widening of the existing bathroom doorways (minor direct (physical) and indirect (visual) impact to Warrawee Railway Station Group).</li> </ul>
Utility services and signage work: <ul style="list-style-type: none"> <li>• ancillary work associated with utilities and signage.</li> </ul>	New in-platform and above-ground services would be required for the Proposal. These works would require localised impacts to station building and platform fabric associated with fastening items to walls and other surfaces. However, it is understood that the majority of these upgrades will utilise existing penetrations and electrical connections. Therefore, these works would result in a minor impact to fabric associated with Warrawee Station.
<b>Electrical upgrades</b> <ul style="list-style-type: none"> <li>• <b>installation of a new 11kV transformer and associated electrical works within the rail corridor</b></li> </ul>	The installation of a new 11kV transformer and service pole within the rail corridor are unlikely to impact fabric associated with the station and platform as they are located approximately eight metres north of the station platform. Therefore, impacts to fabric associated with this works are considered to be negligible.
Temporary site compound area: <ul style="list-style-type: none"> <li>• use of temporary site compound areas.</li> </ul>	No subsurface excavations or vegetation clearance would be required, and the site will be returned to its current condition at the end of the Proposal. The site would be shielded by trees. Therefore, no heritage impact is anticipated.

Overall, the construction of the Proposal would have a minor to moderate direct (physical) impact and a moderate indirect (visual) impact to the heritage significance of the Warrawee Railway Station Group. The Proposal would not result in any direct (physical) impacts to heritage listed items surrounding the Proposal.

Subsurface excavations are required for the installation of a new lift structure and service route installation and relocation. The majority of this work would occur within the platform itself, although excavations for the lift shaft may extend below the base of the platform. The risk of encountering significant archaeology during construction is low and so no impacts on archaeology are expected (refer to Section 8.1.3 of Technical Paper 3).

## b) Operational phase

The Proposal would result in a new major visual element associated with the new lift and canopy structures. This may result in a minor indirect visual impact to some LEP listed heritage items surrounding the Proposal, as their view to the station would be disrupted, including:

- 'Dwelling house' (Item I1072)
- 'Wirepe' (Item I1050)
- 'Reaycroft' (Item I1054)
- 'Dwelling house' (Item I1056).

The platform regrading work would not significantly alter the existing appearance of the platforms and would likely improve their presentation. This would have a neutral indirect (visual) impact to the Warrawee Railway Station Group.

The locations of the utility services and signage work associated with the Proposal would be confirmed during detailed design. Any above ground features associated with utilities or signage may alter the existing nature of the station platforms, be installed along the walls of the building and/or obstruct detailing (brickwork, timber sills and lintels). This may result in minor indirect (visual) heritage impacts to Warrawee Railway Station Group.

### 6.5.3 Mitigation measures

The following mitigation measures are proposed with respect to potential non-Aboriginal heritage impacts:

- opportunities to reduce the heritage impact of the Proposal on the Warrawee Railway Station Group should be investigated during detailed design including consideration of the following design elements (refer to Section 9.2.1 in Technical Paper 3):
  - the size, form and materials chosen for the proposed lift, platform-level canopy and landing structure
  - the methodology for the platform regrading, installation of conduits or electrical items and reconfiguration of the toilets
- a heritage induction would be provided to workers prior to construction, informing them of the location of known heritage items and guidelines to follow if unanticipated heritage items or deposits are located during construction
- In the event that any unanticipated archaeological deposits are identified within the project site during construction, the procedures contained in the TfNSW *Unexpected Heritage Finds Guideline* (TfNSW, 2015a) would be followed, and work within the vicinity of the find would cease immediately. The Construction Contractor would immediately notify the TfNSW Project Manager and the TfNSW Environment and Planning Manager so they can assist in co-ordinating the next steps which are likely to involve consultation with an archaeologist and OEH. Where required, further archaeological work and/or consents would be obtained for any unanticipated archaeological deposits prior to work recommencing at the location
- if archaeological 'relics', as defined under the Heritage Act, are encountered during any ground disturbing works associated with the Proposal, a Section 146 notification would be prepared and submitted to the NSW Heritage Division, Office of Environment and Heritage prior to their removal.

- an area of archaeological potential (Phase 3) associated with a former footbridge has been identified within in the Warrawee Station platform. These potential remains would be defined as 'works' under the Heritage Act and therefore no approval permits are required. Service trenching may occur in this area and it is recommended that service conduit locations be designed to avoid this area of archaeological potential if possible. Where it is identified during detailed design that ground disturbance may impact Phase 3 archaeological remains, a Work Method Statement (WMS) would need to be prepared by a suitably qualified heritage specialist to guide archaeological monitoring and recording where required.
- a copy of the SoHI report should be provided to Sydney Trains and Ku-ring-gai Council for their review and comment
- a Photographic Archival Recording (PAR) would be prepared for the station, in accordance with relevant guidelines issues by the NSW Heritage Division prior to work commencing
- consideration should be given to the provision of interpretation as part of the Proposal, which would outline the history, associations and significance of Warrawee Station and the wider Warrawee area. Interpretive measures could involve interpretive signage, panels or displays at entry/exit points to the station, including on the proposed lift and platform-level canopy structure

Based on the Proposal, a notification under Section 170A of the Heritage Act would be provided to the OEH Heritage Division at least 14 days prior to commencement of works as a precautionary approach for the Proposal.

Refer to Table 7.1 in Section 7.2 for a full list of proposed mitigation measures.

## **6.6 Socio-economic impacts**

### **6.6.1 Existing environment**

As discussed in Chapter 4, the Proposal would primarily be located within the existing rail corridor. Land use surrounding the Proposal typically comprises of low density residential properties, with the exception of a pocket park and Knox Grammar School immediately to the west of the station. The closest residences are approximately 20 metres from the proposed work, on Warrawee Avenue and Heydon Avenue. There are no existing businesses located within the immediate vicinity of the Proposal.

Other community, religious and educational facilities located within the broader area include:

- Farthing Park (approximately 75 metres south-east)
- Gillespie Field (approximately 250 metres north-east)
- Warrawee Function Centre (approximately 250 south-west)
- Turramurra Memorial Park (approximately 400 metres east)
- Warrawee Public School (approximately 500 metres south)
- Wahroonga station and shops (approximately 800 metres north-west).

Sensitive receivers that have the potential to be influenced by the Proposal include:

- local residents, particularly on Warrawee Avenue, Hastings Road, Heydon Avenue, Borambi Street and Yosefa Avenue
- school students and staff of Knox Grammar School
- commuters including train passengers using Warrawee station.

A review of the 2016 Australian Bureau of Statistics (ABS) Census data was undertaken for Warrawee. The suburb of Warrawee has a population of approximately 3,000 people with a median age of 41 years. Of this population, approximately 96 per cent were identified as being employed and 28 per cent travelled to work via train, which was the second most common mode of travel to work (ABS, 2016).

## **6.6.2 Potential impacts**

### **a) Construction phase**

The construction of the Proposal has the potential to temporarily impact customers, pedestrians, residents, motorists and other receivers as a result of:

- temporary changes to vehicular, bicycle and pedestrian access to, through and around the station
- temporary closures of Warrawee Station to accommodate construction work (as part of pre-scheduled rail shutdown periods)
- temporary disruptions to station facilities and amenities (e.g. seating, toilets, drinking fountain, telephone booth)
- temporary impacts to local traffic movements due to an increase in truck movements in the area, delivering site materials, plant and equipment
- construction noise, dust and visual impacts.

Access for emergency services would be maintained at all times and it is not anticipated that access to residential properties would be affected during construction of the Proposal.

Construction work would be managed to ensure pedestrian and cyclist access to and through the station would be maintained. Where work is carried out that may potentially disrupt the existing pedestrian facilities, appropriate signage and/or traffic controllers would be positioned to notify pedestrians of the temporary arrangements.

Refer to Sections 6.1, 6.2 and 6.3 for discussion on the potential traffic, visual and noise impacts arising from construction of the Proposal and the proposed management strategies.

### **b) Operational phase**

Overall, the Proposal would provide positive socio-economic benefits to Warrawee and the Ku-ring-gai LGA, including:

- improved accessibility for customers at Warrawee Station providing an accessible route to station platforms through the provision of upgraded footpaths and lifts, regraded platform surface and more accessible parking spaces
- improved customer amenity and facilities at the station including a new family accessible toilet and unisex ambulant toilet, adjusted drinking fountain and telephone booth, new platform-level weather protection linking the lift to the existing canopy, new TGSIs and wayfinding signage
- improved transport interchange facilities including new formalised kiss-and-ride spaces
- potential increased use of public transport to and from Warrawee
- additional lighting and CCTV would provide positive CPTED outcomes for the area.

### 6.6.3 Mitigation measures

The following mitigation measures are proposed to manage potential socio-economic impacts:

- feedback through the submissions process would be encouraged to facilitate opportunities for the community and stakeholders to have input into the Proposal, where practicable
- a Community Liaison Management Plan would be prepared prior to construction to identify all potential stakeholders and the best practice methods for consultation with these groups during construction. The Plan would also encourage feedback and facilitate opportunities for the community and stakeholders to have input into the Proposal, where practicable
- contact details for a 24-hour construction response line, Project Infoline and email address would be provided for ongoing stakeholder contact throughout the construction phase
- the community would be kept informed of construction progress, activities and impacts in accordance with the Community Liaison Management Plan to be developed prior to construction.

Refer to Table 7.1 in Section 7.2 for a full list of proposed mitigation measures.

## 6.7 Biodiversity

This section provides a summary of the *Biodiversity Assessment Report* (Technical Paper 4) prepared by WSP (2019) and the *Arboricultural Impact Assessment* (Technical Paper 5) prepared by Earthscape Horticultural Services (2019), which included a desktop assessment, literature review and site inspection of the study area. The detailed methodologies for the *Biodiversity Assessment Report* and the *Arboricultural Impact Assessment* are provided in Technical Paper 4 and Technical Paper 5 respectively.

### 6.7.1 Existing environment

#### Vegetation Communities

Two vegetation communities were recorded within or adjacent to the study area during field survey and comprise of one native vegetation type and one non-native / highly disturbed vegetation type. A description of each vegetation community is provided below.

*PCT 1237 Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion*

This community is mostly comprised of remnant forest scale trees and exhibits a canopy, with only the ground and mid strata vegetation being heavily disturbed or absent due to historic clearing for residential, road, rail and footpath construction. The ground stratum is mostly comprised of opportunistic exotic weed species although some minor remnant native grass and forb species were observed.

This community occurs to the west of Warrawee Station and is bisected by Heydon Avenue and Borambil Street. This community is bound by the North Shore Line to the east, Knox Grammar to the north and residential properties to the west and south.

All work associated with the Proposal are positioned outside of this community in existing cleared areas and would not result in any direct or indirect impacts.

Examples of this plant community type are show in Figure 6.15 and Figure 6.16.



**Figure 6.15** PCT 1237 trees adjacent to Heydon Avenue opposite the Proposal work area



**Figure 6.16** PCT 1237 treed canopy lining either side of Heydon Avenue

*Highly disturbed areas with no or limited native vegetation*

This non-native vegetation community occurs over the entire study area with all work associated with the Proposal being located wholly within this vegetation type. The vegetation comprises of ornamental landscape plantings, opportunistic regrowth and environmental weeds (Figure 6.17 and Figure 6.18). (*Note* (\*) *delineates exotic species*).

Planted ornamental garden specimens occurring within the station platform consist of *Fraxinus griffithii*\* (Evergreen Ash) with an understorey planting of *Dietes bicolor*\* (African Iris).

The rail line batter slopes exhibit a mixture of exotic environmental weeds and opportunistic native regrowth that includes *Acacia elata* (Mountain Cedar Wattle), *Cissus antarctica* (Water Vine), *Ehrharta erecta*\* (Panic Veldtgrass), *Eucalyptus paniculata* subsp. *paniculata* (Grey Ironbark), *Hedera helix*\* (Ivy), *Imperata cylindrica* var. *major* (Blady Grass), *Jacaranda mimosifolia*\* (Jacaranda), *Ligustrum lucidum*\* (Large-leaved Privet), *Olea europaea* subsp. *cuspidata*\* (African Olive), *Pteridium esculentum* (Bracken) and *Ulmus parvifolia*\* (Chinese Elm).

Exotic species dominate the area of proposed work on the eastern side of the station adjacent to Warrawee Avenue. This includes *Ulmus parvifolia*\* (Chinese Elm), *Robinia pseudoacacia*\* (Black Locust), *Olea europaea* subsp. *cuspidata*\*, *Jacaranda mimosifolia*\* (Jacaranda) along with many exotic perennial grass and forb species. Native plantings along the western side of Warrawee Avenue include *Callistemon* sp. (Cultivar)\* (Bottlebrush), *Dodonaea triquetra* (Large-leaf Hop-bush) and *Hakea sericea* (Needlebush).



**Figure 6.17** Example of *Fraxinus griffithii*\* (Evergreen Ash) along the station platform



**Figure 6.18** Exotic tree species *Ulmus parvifolia*\* (Chinese Elm) and *Robinia pseudoacacia*\* (Black Locust)

### Fauna habitats

The fauna habitat within the study area is limited, with the majority of vegetation in the form of planted ornamental native and exotic trees and shrubs. Much of the original vegetation within the study area has been cleared for rail infrastructure and urban development and what remains is landscape gardens, plantings and minor native regrowth. The habitat and vegetation within the study area provides limited resources and lacks important features such as hollow bearing trees, rocky outcrops, dense litter layer or fallen woody debris.

The study area does not provide any significant habitat for fauna. The species likely to utilise resources within the study area are those that are well adapted to urban environments or those species that are highly mobile (i.e. birds and bats). The surrounding trees (both native and introduced) provide some foraging habitat (i.e. fruits and blossom) for mobile species (i.e. birds and bats). It is unlikely that these resources are heavily utilised or relied upon by the majority of fauna, but instead are intermittently used by fauna foraging within the greater locality.

PCT 1237 Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion, which adjoins the study area, provides potential periodic foraging habitat for locally recorded threatened fauna species including Gang-gang Cockatoo, Powerful Owl, Grey-headed Flying-fox and threatened microchiropteran bats. There is potential for these species to occur irregularly within this adjacent habitat, however, it is unlikely that threatened species would utilise the habitat within the study area due to its disturbed nature.

### Weeds

No Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region were identified in the study area.

### Trees

A total of 16 trees on site were assessed for their tree retention value (refer to Table 6.10). Of these, ten were assessed as having moderate retention value, and six were assessed as having low retention value. The location of these trees is shown in Appendix 5 of the *Arboricultural Impact Assessment* (Earthscape Horticultural Services, 2018).

**Table 6.10 Trees assessed for retention value**

Tree ID Number	Species	Retention value	Location
1	<i>Jacaranda mimosifolia</i> (Jacaranda)	Low	19 Heydon Avenue
2	<i>Syzygium leuhmannii</i> (Small-leaf Lillypilly)	Moderate	19 Heydon Avenue
3	<i>Olea europaea subsp. Africana</i> (African Olive)	Low	19 Heydon Avenue
4	<i>Syzygium leuhmannii</i> (Small-leaf Lillypilly)	Low	19 Heydon Avenue
5	<i>Ulmus parvifolia</i> (Chinese Elm)	Moderate	Railway corridor
6	<i>Angophora floribunda</i> (Rough-barked Apple)	Moderate	Nature strip
7	<i>Eucalyptus pilularis</i> (Blackbutt)	Moderate	Nature strip
8	<i>Fraxinus graffithii</i> (Evergreen Ash)	Moderate	Railway platform
9	<i>Fraxinus graffithii</i> (Evergreen Ash)	Moderate	Railway platform
10	<i>Fraxinus graffithii</i> (Evergreen Ash)	Moderate	Railway platform
11	<i>Ulmus parvifolia</i> (Chinese Elm)	Moderate	Railway corridor
12	<i>Ulmus parvifolia</i> (Chinese Elm)	Moderate	Railway corridor
13	<i>Ulmus parvifolia</i> (Chinese Elm)	Low	Railway corridor
14	<i>Ulmus parvifolia</i> (Chinese Elm)	Moderate	Railway corridor
15	<i>Acacia elata</i> (Cedar Wattle)	Low	Railway corridor
16	<i>Ulmus parvifolia</i> (Chinese Elm)	Low	Railway corridor

## Threatened biodiversity

### *Threatened Ecological Communities*

One threatened ecological community listed under the BC Act has been recorded to occur adjacent to the study area adjacent to the study area to the west of Warrawee station. This community consists of Blue Gum High Forest in the Sydney Basin Bioregion – Critically Endangered Ecological Community (BC Act).

No patches of native vegetation recorded meet condition thresholds for any EPBC Act threatened ecological community listings.

### *Threatened Flora*

No threatened flora was identified during site inspections. Background investigations identified 45 threatened flora species listed under the BC Act and/or EPBC Act that were considered to have the potential to occur within the locality of the study area.

Following field surveys, it is considered that the study area is unlikely to provide habitat to threatened flora species. No specific assessment of significance for any threatened flora species listed under either the BC Act or EPBC Act is considered warranted to assess the impacts of the Proposal.

### *Threatened Fauna*

No threatened fauna species were identified during site inspections. Background investigations identified 94 threatened fauna species listed under the BC Act and/or EPBC Act that have been previously recorded or have the potential to occur within the locality.

The likelihood of these species occurring within the study area was determined based on field investigations and fauna habitat available. Based on available habitat and the potential impacts of the Proposal, it is considered unlikely that any threatened fauna have a moderate to high likelihood of occurrence or utilisation of the available habitat within the study area.

### **Migratory species**

Migratory species are protected under international agreements, to which Australia is a signatory, including JAMBA, CAMBA, RoKAMBA and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered MNES and are protected under the EPBC Act.

A total of 40 species listed as migratory under the EPBC Act and that have been previously recorded or have the potential to occur within the locality were identified during background investigations. Of these, no species are considered likely to utilise the habitat present within the study area.

The habitats within the study area are unlikely to constitute important habitat for any of the listed species. The habitat present is unlikely to support significant proportions of the population of any migratory species, nor are the habitats critical to any life stage of these species. Due to their mobile nature, the mentioned species are likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur.

## **6.7.2 Potential impacts**

### **a) Construction phase**

#### **Impacts to native vegetation**

Direct impacts to biodiversity as a result of the Proposal are considered negligible due to the existing disturbed nature of the available habitat and the nature of the construction work to be undertaken. Vegetation clearing would be minimal and only require the removal of five planted ornamental trees, which comprise *Fraxinus griffithii* (Evergreen Ash), *Ulmus parvifolia*\* (Chinese Elm) and *Acacia elata* (Cedar Wattle) tree species, along with a small amount of landscape plantings and exotic environmental weed species. No impacts to remnant native vegetation (including a recorded patch of the threatened ecological community listed as Blue Gum High Forest) or high quality fauna habitat are predicted as a result of the Proposal.

#### **Impacts to threatened ecological communities**

Remnant trees associated with the Blue Gum High Forest community, *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus paniculata* subsp. *paniculata* (Grey Ironbark), occur on the opposite side of the avenue (western side) and would not be impacted by the proposed work. No other work is proposed near this threatened ecological community.

Based on an inspection of the study area and review of the Proposal site plan there would be no direct or indirect impact likely to occur on the Blue Gum High Forest threatened ecological community.

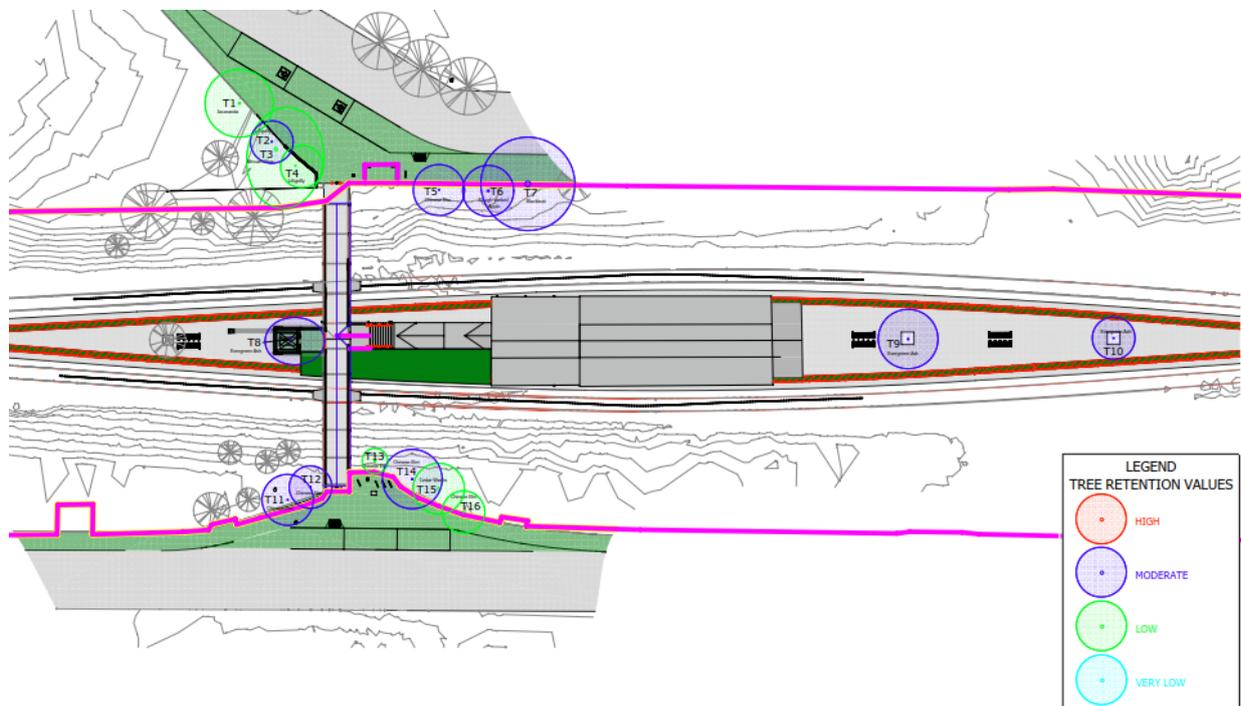
## Impacts to threatened fauna

No threatened fauna are likely to be significantly impacted by the Proposal. It is unlikely that any threatened fauna identified within the locality would have a moderate to higher likelihood to utilise the habitat to be impacted by the Proposal, nor are any threatened fauna likely to be reliant on the habitat to be removed or impacted.

## Removal of vegetation

The vegetation identified within the study area does not contain important habitat features (i.e. hollows for breeding) for any potential threatened species known or predicted to occur within the locality. Given this, the Proposal is considered unlikely to significantly affect threatened species or ecological communities, or their habitats.

The proposed development would potentially necessitate the removal of up to three trees of moderate retention value (Tree IDs T8, T11 and T12) and up to two trees of low retention value (Tree IDs T15 and T16). T8 is a semi-mature *Fraxinus griffithii* (Evergreen Ash) planted ornamental tree located on the platform at the location of the proposed lift. T11, T12, T15, T16 are located along the rail corridor where the proposed work is to occur. The location of the trees currently identified for removal are shown on Figure 6.19.



**Figure 6.19** Locations of existing trees at Warrawee Station, including trees to be removed

None of the trees with moderate retention value have special ecological or heritage significance, being recent plantings. However, they are in good health and condition and make a contribution to the amenity of the streetscape. Mitigation measures and offset requirements would be considered for these trees (including a replacement planting for the tree to be removed along the platform). The trees with low retention value are not considered significant and do not warrant any specific measures to ensure its preservation.

Various construction activities would also occur within the tree protection zones (TPZ) of a number of other trees on site. These majority of this work would not result in any adverse impacts on the trees on site, provided the mitigation measures outlined in Section 6.7.3 are implemented.

## Potential environmental impact of noise, light and vibrations on wildlife

It is likely that noise from the existing rail corridor and arterial roads would already impact background levels of noise in the study area. However, construction and operation phases of the Proposal (along with its ancillary activities) may cause disturbance to animals. The impacts from noise emissions are likely to be localised close to the project and are not likely to have a significant long-term impact on wildlife populations, given that populations are already exposed to noise associated with the existing rail corridor. Furthermore, it is likely that most animal species would habituate to periodic noise disturbance from regular maintenance activities (Forman et al, 2000).

## Weeds

The Proposal is unlikely to impact any Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region such that they would pose a risk to any areas of native vegetation.

## Conclusion on construction impacts

Impacts to biodiversity as a result of the Proposal are considered negligible due to the existing disturbed nature of the available habitat and the nature of the construction work to be undertaken.

### b) Operational phase

The operation of the Proposal is not anticipated to result in any further impacts to biodiversity.

### 6.7.3 Mitigation measures

Construction of the Proposal must be undertaken in accordance with the TfNSW *Vegetation Management (Protection and Removal) Guideline (2015d)* and the TfNSW *Fauna Management Guideline (2015e)*. Various controls for the protection of biodiversity and trees on site would be incorporated into the Construction Environmental Management Plan (CEMP) and implemented during construction work, including:

- the removal of trees T8, T11, T12, T15 and T16 should be carried out by an experienced tree surgeon in accordance with the NSW WorkCover *Code of Practice for the Amenity Tree Industry (1998)*. Care shall be taken to avoid damage to other trees during the felling operation
- all workers would be provided with an environmental induction prior to commencing work onsite. This induction would include information on the protection measures to be implemented to protect vegetation, penalties for breaches and locations of areas of sensitivity
- disturbance of vegetation would be limited to the minimum amount necessary to construct the Proposal. Trees nominated to be removed in the *Arboricultural Impact Assessment Report* (Earthscape Horticultural Services, 2019) would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal. Trees to be retained would be protected through temporary protection measures discussed below
- A Tree Protection Plan and tree protection measures has been prepared for the Proposal (refer to the *Arboricultural Impact Assessment* report by Earthscape, 2019, in Technical Paper 5). Tree Protection Zones (TPZs) would be established around trees to be retained, as nominated in the *Arboricultural Impact Assessment* (Earthscape, 2019). 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 the loss of trees is unable to be mitigated, Transport for NSW would replace trees removed as a result of the project in accordance with the TfNSW's *Vegetation Offset Guide* (2016) (refer to Section 11 in Technical Paper 5)
- in the event of any tree to be retained becoming damaged during construction, the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager to coordinate the response which may include contacting an arborist to inspect and provide advice on remedial action, where possible
- should the detailed design or onsite work determine the need to remove or trim any additional trees, which have not been identified in the REF, the Construction Contractor would be required to complete TfNSW's *Removal or Trimming Vegetation Application Form* and submit it to TfNSW for approval
- no stockpiling of materials or storage of machinery is to be undertaken within non-paved grass areas within the Blue Gum High Forest adjacent to Heydon Avenue. These areas would be marked on the Environmental Control Maps for the Proposal
- for new landscaping work, mulching and watering would be undertaken until plants are established. New plantings shall be maintained for a minimum period of twelve (12) months from the date of installation to ensure successful establishment. The maintenance regime shall include regular watering, replenishment of mulch, weed control, adjustment of any stakes or ties used for temporary support and monitoring of the general health and condition of the trees. Any of the trees that fail within the first 12 months shall be replaced with new tree stock of equivalent species. Replacement trees shall be maintained for a further 12 months from planting to ensure successful establishment.
- weed control measures, consistent with TfNSW's *Weed Management and Disposal Guideline*, would be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during the construction phase of the Proposal. This would include the management and disposal of weeds in accordance with the *Noxious Weeds Act 1993*.

Refer to Table 7.1 in Section 7.2 for a full list of proposed mitigation measures to be incorporated into the CEMP.

## 6.8 Contamination, landform, geology and soils

### 6.8.1 Existing environment

#### Landform, geology and soils

The natural topography in the vicinity of the station is a gentle slope toward the east at approximately 186 metres above Australian Height Datum (mAHD). However, Warrawee station is in a cutting, with the platform level at approximately 181 metres/AHD.

The *1:100,000 Geological Series Sheet Sydney 9130* (NSW Department of Mineral Resources, 1983) indicates that the Proposal is underlain by Ashfield Shale and Bringelly Shale formations of the Wianamatta Group. Ashfield Shale is comprised of laminite and dark grey shale. Bringelly Shale consists of shale, calcareous claystone, laminite, fine to medium grained lithic-quartz sandstone.

The *1:100,000 Soil Landscape Series Sheet* (Chapman et al, 2009) indicates that the soil profile in Warrawee is underlain by the Glenorie Soil Landscape. This is described as an erosional soil landscape, occupying rolling low hills on Wianamatta Group Shales. The landscape comprises predominantly shallow to moderately deep soils, around 100 centimetres thick. Limitations associated with the soil landscape include high soil erosion hazard, localised impermeable highly plastic subsoil and moderate reactivity.

#### *Acid sulfate soils*

A review of the Australian Soil Resource Information System National Acid Sulfate Soils Database on 14 December 2018 indicated that the Proposal study area is classified as 'B4 – low probability/very low confidence' of occurrence acid sulfate soils (CSIRO, 2014).

### **Contamination**

Given the historical use of the station as a rail corridor, there is potential for contaminants to be present within the soils underlying the station. Historic activities associated with rail corridors that have the potential to result in contamination include the introduction of fill materials including ash, fuel or oil spills and accidental leaks or spills from maintenance and operational activities. Given the age of the station building, there is also potential for asbestos materials and lead paint to be encountered.

A search of the public register of notices issued by the NSW EPA under *Contaminated Land Management Act 1997* was conducted on 14 December 2018 and found that there are no sites with notices within 500 metres of the proposal. Therefore, this indicates that there are no sites in the vicinity of Warrawee Station that are identified as contaminated to an extent that warrants regulation.

### **6.8.2 Potential impacts**

#### **a) Construction phase**

The Proposal would require minor excavation work for the installation of the lift foundation and pit. Other minor trenching or excavation may be required for footpath and road work and relocation of services.

#### *Soil disturbance*

Excavation and other earthworks such as trenching and stockpiling activities, if not adequately managed, could result in the following impacts:

- erosion of exposed soil and stockpiled materials
- dust generation from excavation and vehicle movements over exposed soil
- increase in sediment loads entering the stormwater system and/or local runoff.

Such impacts can be a nuisance to community members and/or lead to an adverse environmental impact on biodiversity, for example through the introduction of sediment into waterways. These impacts are expected to be minor due to the limited level of ground disturbance required for the Proposal and the relatively flat topography and stability of the Proposal site.

Erosion risks can be adequately managed through the implementation of standard measures as outlined in *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004) (the Blue Book).

## Contamination

Excavation also has the potential to expose contaminants, which if not appropriately managed, can present a health risk to construction workers and the community. The exposure of contaminants could also pose an environmental risk if they were to enter nearby waterways through the stormwater infrastructure.

The Proposal has the potential to disturb asbestos containing material and other hazardous substances (such as lead paint) from the reconfiguration of the toilets within the station building. There is also potential for construction activities to result in the contamination of soil through accidental fuel or chemical spills from construction plant and equipment.

Appropriate mitigation measures would be implemented to manage any hazardous substances encountered during demolition work. This would include the removal of hazardous materials by appropriately licensed asbestos/hazardous waste removalists (refer to Section 6.8.3 below).

### b) Operational phase

There would be no ongoing operational risks to geology and soils as a result of the Proposal.

#### 6.8.3 Mitigation measures

The following mitigation measures are proposed with respect to potential soil and contamination impacts:

- prior to commencement of work, a site-specific Erosion and Sediment Control Plan would be prepared in accordance with the 'Blue Book' *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004) and updated throughout construction so it remains relevant to the activities. The Erosion and Sediment Control Plan measures would be implemented prior to commencement of work and maintained throughout construction
- erosion and sediment control measures would be established prior to any clearing, grubbing and site establishment activities and would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality. Erosion and sediment control measures would be maintained and left in place until the work is complete and areas are stabilised
- vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks. Construction plant, vehicles and equipment would also be refuelled offsite, or in a designated refuelling area
- all fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and the TfNSW *Chemical Storage and Spill Response Guidelines* (TfNSW, 2015g)
- adequate water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented in accordance with relevant EPA guidelines and the TfNSW *Chemical Storage and Spill Response Guidelines* (TfNSW, 2015g) during the construction phase. All staff would be made aware of the location of the spill kits and be trained in how to use the kits in the case of a spill
- in the event of a pollution incident, work would cease in the immediate vicinity and the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager. The EPA would be notified by TfNSW if required, in accordance with Part 5.7 of the PoEO Act

- the CEMP (or separate Waste Management Plan, if necessary) must address waste management and would at a minimum:
  - identify all potential waste streams associated with the work and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities
  - detail other onsite management practices such as keeping areas free of rubbish
  - specify controls and containment procedures for hazardous waste and asbestos waste
  - outline the reporting regime for collating construction waste data
- an appropriate unexpected contamination finds protocol, considering asbestos containing materials and other potential contaminants, would be included in the CEMP. Procedures for handling asbestos containing materials, including licensed contractor involvement as required, record keeping, site personnel awareness and waste disposal to be undertaken in accordance with SafeWork NSW requirements
- all spoil to be removed from site would be tested to confirm the presence of any contamination. Any contaminated spoil would be disposed of at an appropriately licensed facility
- all spoil and waste must be classified in accordance with the *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014) prior to disposal
- any concrete washout would be established and maintained in accordance with the *TfNSW Concrete Washout Guideline – draft* (TfNSW, 2015i) with details included in the CEMP and location marked on the ECM.

Refer to Table 7.1 in Section 7.2 for a full list of proposed mitigation measures.

## 6.9 Hydrology and water quality

### 6.9.1 Existing environment

#### Surface water

A review of maps of the area indicate that there are no surface water bodies in the vicinity of the station. The nearest water bodies appear to be Lovers Jump Creek to the east and Coups Creek to the west. At their nearest point these surface water bodies are 960 metres and 860 metres from the station respectively.

A review of the Ku-ring-gai LEP indicated that the Proposal study area is not located within a flood planning area due to the elevation and topography of the local area. However, Warrawee Station is a low-lying feature within the local landscape, and as such, may be subject to localised flooding during high rainfall events as a function of the low-lying topography.

It is expected runoff from the rail corridor and station area would generally discharge through to local council-maintained infrastructure.

#### Groundwater

Depth to groundwater within the Proposal study area is unknown. A search of the WaterNSW groundwater database however indicates that there are six registered groundwater bores within 500 metres of the Proposal study area (refer to Table 6.11). Given the Proposal study area is in an area with a reticulated water supply, it is expected that these bores are not used as a drinking water supply.

**Table 6.11 Summary of registered groundwater bores in vicinity of the Proposal study area**

<b>Bore ID</b>	<b>Purpose</b>	<b>Location in relation to the Proposal</b>	<b>Depth (metres below ground level)</b>	<b>Standing water level (metres below ground level)</b>
<b>GW111303</b>	Recreation (groundwater)	35 metres west	165	No data
<b>GW053989</b>	Irrigation	60 metres north-west	92	8
<b>GW022935</b>	General use	150 metres north-east	26.8	No data
<b>GW106518</b>	No data	No data	No data	No data
<b>GW016949</b>	Irrigation	290 metres south-west	11.7	No data
<b>GW105743</b>	Stock, domestic	400 metres east	150.5	70

## **6.9.2 Potential impacts**

### **a) Construction phase**

Excavation activities during construction have the potential to impact on local waterways due to increased erosion and sedimentation from exposed soil and stockpiles. However, due to the minor extent of excavation proposed during construction, these impacts are expected to be negligible.

Additionally, fuels, chemicals or wastewater from accidental spills during construction could potentially enter stormwater drains and flow into nearby waterways. However, standard mitigation measures would be implemented during construction to minimise this risk.

There is not expected to be any groundwater impacts during construction as no deep excavations that may encounter the groundwater table are proposed.

### **b) Operational phase**

The Proposal is unlikely to have a major impact on the hydrology of the Proposal site or the surrounding area.

Regrading of the platform surface and upgrading of the footpath and kerb ramps may result in a minor alteration to the surface water flow regime, however the overall impact on hydrology from these alterations is expected to be negligible.

Alterations to the surface water flows would likely be within the capacity of the stormwater network and as such, impacts would be minor. Additionally, given the Proposal would not result in an increase of impervious surfaces, this would also ensure that surface water flows are not impacted during operation.

### 6.9.3 Mitigation measures

As noted in Section 6.8.3, a site-specific Erosion and Sediment Control Plan would be prepared and implemented for the Proposal to manage risks to water quality. Additional mitigation measures that would be required for construction include would include:

- prior to commencement of work, a site-specific Erosion and Sediment Control Plan would be prepared in accordance with the 'Blue Book' *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004) and updated throughout construction so it remains relevant to the activities. The Erosion and Sediment Control Plan measures would be implemented prior to commencement of work and maintained throughout construction
- erosion and sediment control measures would be established prior to any clearing, grubbing and site establishment activities and would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality. Erosion and sediment control measures would be maintained and left in place until the work is complete and areas are stabilised
- vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks. Construction plant, vehicles and equipment would also be refuelled offsite, or in a designated refuelling area
- all fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and the TfNSW *Chemical Storage and Spill Response Guidelines* (TfNSW, 2015g)
- adequate water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented in accordance with relevant EPA guidelines and the TfNSW *Chemical Storage and Spill Response Guidelines* (TfNSW, 2015g) during the construction phase. All staff would be made aware of the location of the spill kits and be trained in how to use the kits in the case of a spill
- in the event of a pollution incident, work would cease in the immediate vicinity and the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager. The EPA would be notified by TfNSW if required, in accordance with Part 5.7 of the PoEO Act
- the existing drainage systems would remain operational throughout the construction phase
- should groundwater be encountered during excavation work, groundwater would be managed in accordance with the requirements of the Waste Classification Guidelines (EPA, 2014) and the TfNSW *Water Discharge and Reuse Guideline* (TfNSW, 2015b).

Refer to Table 7.1 in Section 7.2 for a full list of proposed mitigation measures.

## 6.10 Air quality

### 6.10.1 Existing environment

#### Regional air quality

The broader Sydney East monitoring region provides the most representative air quality monitoring results for Warrawee, which sits roughly in between the Sydney East and Sydney North West air monitoring regions. The Sydney East region includes air quality monitoring sites at Macquarie Park, Chullora, Rozelle, Lindfield, Randwick and Earlwood.

A search of the daily regional air quality index for the Sydney East region for last year (December 2017 to December 2018) showed that the region experienced (OEH, 2018c):

- very good air quality on 4.1 per cent of days
- good air quality on 67.5 per cent of days
- fair air quality on 18 per cent of days
- poor air quality on 5.2 per cent of days
- very poor air quality on 2.5 per cent of days
- hazardous air quality on 2.7 per cent of days.

#### Air pollutant sources

Based on the existing land uses surrounding the Proposal site, the existing air quality is considered to be characteristic of an urban environment. A search of the National Pollutant Inventory undertaken on 14 December 2018 for the 2016 to 2017 reporting period identified no air polluting sources in Ku-ring-gai LGA. Other contributors to air quality within the study area would include emissions from motor vehicles on the surrounding road network, and the diesel trains on the adjoining rail corridor.

#### Sensitive receivers

Sensitive receivers in the vicinity of the Proposal include:

- local residents, particularly on Warrawee Avenue, Hastings Road, Heydon Avenue, Borambi Street and Yosefa Avenue
- school students and staff of Knox Grammar School
- commuters including train passengers using Warrawee station.

### 6.10.2 Potential impacts

#### a) Construction phase

The main air quality impacts that have the potential to occur during construction would be temporary impacts associated with dust particles and emissions of carbon monoxide, sulphur dioxide, particulate matter (PM<sub>10</sub>), nitrous oxides, volatile organic compounds, and polycyclic aromatic hydrocarbons associated with the combustion of diesel fuel and petrol from construction plant and equipment.

Anticipated sources of dust and dust-generating activities include:

- excavation for the foundation and pit of the lift
- stockpiling activities
- loading and transfer of material from trucks
- other general construction activities.

The Proposal would be likely to have a minimal impact on air quality as it would not involve extensive excavation or other land disturbance with the potential to generate significant quantities of dust.

The operation of plant, machinery and trucks may also lead to increases in exhaust emissions in the local area however these impacts would be minor and short-term.

#### **b) Operational phase**

Overall impacts of air quality during the operation of the Proposal are considered minimal as the Proposal would not result in a significant change in land use.

Additionally, as the Proposal would increase access to public transport, the use of public transport is anticipated to increase and subsequently the amount of private vehicle related emissions would be slightly reduced in the long term.

#### **6.10.3 Mitigation measures**

The following mitigation measures are proposed with respect to potential air quality impacts:

- air quality management and monitoring for the Proposal would be undertaken in accordance with the *TfNSW Air Quality Management Guideline* (TfNSW, 2015h)
- methods for management of emissions would be incorporated into project inductions, training and pre-start/toolbox talks
- plant and machinery would be regularly checked and maintained in a proper and efficient condition. Plant and machinery would be switched off when not in use, and not left idling
- vehicle and machinery movements during construction would be restricted to designated areas and sealed/compacted surfaces where practicable
- to minimise the generation of dust from construction activities, the following measures would be implemented:
  - apply water (or alternate measures) to exposed surfaces (e.g. unpaved roads, stockpiles, hardstand areas and other exposed surfaces)
  - cover stockpiles when not in use
  - appropriately cover loads on trucks transporting material to and from the construction site and securely fix tailgates of road transport trucks prior to loading and immediately after unloading
  - prevent mud and dirt being tracked onto sealed road surfaces.

Refer to Table 7.1 in Section 7.2 for a full list of proposed mitigation measures.

## 6.11 Other impacts

### 6.11.1 Services/utilities

The Proposal has the potential to impact services such as from direct impact from excavation activities or from operation of other equipment, if services are not appropriately identified and protected or relocated.

A DBYD search identified a number of utilities in the vicinity of the proposed work including:

- electrical services (aboveground)
- telecommunication services (underground)
- stormwater and water
- rail utilities, including signalling cabling and overhead wiring
- gas services.

Key services that may be impacted as part of the Proposal would include communications and low voltage cables in the location of the proposed lift.

The detailed design of the Proposal would be undertaken to avoid services where feasible. Relocation or other work that may affect services would be undertaken in consultation with the respective utility authorities.

### 6.11.2 Waste

#### Construction

The construction of the Proposal would generate a range of waste streams including the following:

- asphalt and concrete
- earthworks spoil
- building material wastes (including metals, timbers, plastics, concrete and carpeting)
- electrical wiring and conduit waste (from electrical connections)
- fuels, liquids and chemicals
- green waste (including weeds)
- demolition waste from the existing footpaths, and from the internal walls of the toilets, including potential asbestos and hazardous materials
- general waste, including food and other wastes generated by construction workers.

Waste management would be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act). A Waste Management Plan would be prepared that would identify all potential waste streams associated with the work and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities along with other onsite management practices such as keeping areas free of rubbish.

The handling, storage, transport and disposal of asbestos and hazardous waste (including lead waste) would be in accordance with the requirements of relevant EPA and Safe Work NSW guidelines.

Waste management targets in consideration of the Infrastructure Sustainability Rating Scheme – Version 1.2 (ISCA, 2018) would be developed for the Proposal and would include reuse and recycling.

## Operation

The Proposal would not result in changes to operational waste management arrangements.

## Mitigation measures

The following mitigation measures are proposed with respect to potential waste impacts:

- the CEMP (or separate Waste Management Plan, if necessary) must address waste management and would at a minimum:
  - identify all potential waste streams associated with the work and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities
  - detail other onsite management practices such as keeping areas free of rubbish
  - specify controls and containment procedures for hazardous waste and asbestos waste
  - outline the reporting regime for collating construction waste data.

Refer to Table 7.1 in Section 7.2 for a full list of proposed mitigation measures.

## 6.12 Cumulative impacts

Cumulative impacts occur when two or more projects are carried out concurrently and in close proximity to one another. The impacts may be caused by both construction and operational activities and can result in a greater impact to the surrounding area than would be expected if each project was undertaken in isolation. Multiple projects undertaken at a similar time/similar location may also lead to construction fatigue, particularly around noise, traffic and air quality impacts, if not appropriately managed.

### 6.12.1 Existing and future projects in the area

A search of the Department of Planning and Environment's Major Projects Register, Sydney North Planning Panel Development and Planning Register, Ku-ring-gai Council Development Application Register and TfNSW's current projects register in December 2018 identified a number of proposals and projects within the Ku-ring-gai Council LGA.

The following current and proposed projects have been identified as the most likely to contribute to cumulative impacts from the Proposal, due to their scale and/or proximity to the Proposal site:

- NorthConnex Tunnel
- Wahroonga Estate and Wahroonga Adventist School Redevelopment
- St Lucy's School alterations and additions
- Wahroonga Station Upgrade.

### NorthConnex Tunnel

The NorthConnex Tunnel is a nine kilometre tunnel that will link the M1 Pacific Motorway at Wahroonga to the Hills M2 Motorway at West Pennant Hills. The aim of the project is to ease congestion by removing approximately 5,000 trucks off Pennant Hills Road each day.

The Northern Interchange, a key part of the NorthConnex project, is located in Wahroonga near the intersection of the Pacific Highway and Pacific Motorway, approximately 1.2 kilometres north-west of the Proposal. The Northern Interchange Compound will be used as a temporary construction compound for NorthConnex until the expected opening of NorthConnex in 2020. Tunnelling at the Northern Interchange was completed in 8 October

2018, however work to install CCTV equipment, signage and traffic information systems is continuing. The Northern Interchange Compound has a temporary acoustic shed to minimise noise, light and dust impacts.

### **Wahroonga Estate and Wahroonga Adventist School Redevelopment**

This is an ongoing development located approximately 2.2 kilometres south-west of the Proposal, and consists of expansions to the existing Sydney Adventist Hospital and Wahroonga Adventist School (stages of which have already been completed) and the construction of a new residential development. The expansions to the school are expected to be completed in January 2019, and construction of the residential development is set to occur in 2019 to 2021.

The project also involves intersection improvement work at Fox Valley Road, which have been delayed due to consideration of the need for traffic signals. Construction of this intersection upgrade on Fox Valley Road is expected to commence in late 2019.

### **St Lucy's School alterations and additions**

This development was approved in December 2018 by the Sydney North Planning Panel and involves alterations and additions to St Lucy's School in Wahroonga. The development involves demolition of existing structures, construction of new two storey classroom buildings and a basement car park, and an increase of student and staff numbers by approximately 45 per cent. St Lucy's School is located approximately 600 metres north of the Proposal.

### **Wahroonga Station upgrade**

Similar to the proposed work associated with the Proposal for Warrawee, an upgrade of Wahroonga Station is also currently in planning as part of the Transport Access Program by TfNSW. The project would involve a typically similar level of work to the current Proposal, including lift and station upgrades as well as some additional station work and refurbishment of the existing overbridge at this site.

Construction is not expected to commence until late 2019 (subject to design development and planning approval).

## **6.12.2 Potential impacts**

### **Traffic**

The overlap of construction activities could potentially result in cumulative traffic impacts for users of the road network and those living and working in and around the Proposal site. Construction vehicles accessing the NorthConnex Northern Interchange construction compound, Wahroonga Estate and Wahroonga Adventist School Redevelopment and St Lucy's School would likely be using the same road network which may increase traffic congestion in the area. Some overlap in construction activities may also occur with the proposed upgrade of Wahroonga Station.

However, the traffic generated by the construction of the Proposal is not anticipated to have a significant impact on the surrounding road network. Operational traffic and transport impacts would have a minimal impact on the performance of the surrounding road network. Based on this assessment, it is anticipated that the cumulative traffic impacts would be minor, provided that consultation with relevant stakeholders and mitigation measures in Chapter 7 are implemented.

## **Noise and vibration and air quality**

It is highly unlikely that the community, residential, and commercial receivers near the Proposal site would be affected by noise or vibration from NorthConnex, due to the distance from the alignment, the conclusion of the tunnelling work at the Northern Interchange and the temporary acoustic shed erected at the compound.

There is potential for cumulative noise and vibration and air quality impacts on surrounding residential receivers if construction work associated with St Lucy's School, Wahroonga Station and the Proposal occur simultaneously. However, these cumulative impacts are unlikely given the distance between the various Proposal's.

### **6.12.3 Mitigation measures**

In addition to the mitigation measures designed to reduce the environmental impacts of the Proposal itself, the following mitigation measures would be implemented to ensure cumulative impacts from other construction work is minimised:

- consultation and liaison would occur with Ku-ring-gai Council, Sydney Trains, St Lucy's School and other relevant stakeholders, in order to seek to minimise cumulative construction impacts such as traffic and noise
- the potential cumulative impacts associated with the Proposal would be further considered as the design develops and as further information regarding the location and timing of potential surrounding developments is released.

## **6.13 Climate change and sustainability**

### **6.13.1 Greenhouse gas emissions**

An increase in greenhouse gas emissions, primarily carbon dioxide, would be expected during construction of the Proposal due to exhaust emissions from construction machinery and vehicles transporting materials and personnel to and from site.

Projects are required to establish a baseline footprint using the Carbon Estimate and Reporting Tool (CERT) and demonstrate a reduction of construction related greenhouse gas emissions of at least five per cent from the established project baseline (*Note: The project baseline is automatically generated within the CERT tool, refer to CERT user manual for details*).

Due to the small scale of the Proposal and the short term temporary nature of the individual construction work, it is considered that greenhouse gas emissions resulting from the construction of the Proposal would be minimal. Furthermore, greenhouse gas emissions generated during construction would be kept to a minimum through the implementation of the standard mitigation measures detailed in Table 7.1.

It is anticipated that, once operational, the Proposal may result in an increase in use of public transport and a relative decrease in use of private motor vehicles by commuters to travel to and from Warrawee. A modal shift in transport usage may reduce the amount of fuel consumed by private motor vehicles with a corresponding relative reduction in associated greenhouse gas emissions in the local area.

### **6.13.2 Climate change**

The dynamic nature of our climate system indicates a need to focus attention on how to adapt to the changes in climate and understand the limitation of adaptation. The effects of climate on the Sydney region can be assessed in terms of weather changes, storm intensity, flooding and increased risk of fire.

Climate change could lead to an increase in the intensity of rainfall events, whereby the rainfall expected to occur in a 100-year average recurrence interval flood event would occur more frequently. Such changes in weather in the region are unlikely to impact on the operation of the Proposal with respect to issues such as increased flooding (for more information on flooding refer to Section 6.9).

Climate change could lead to an increase in frequency and severity in bushfires. The Proposal is not situated on land mapped as bush fire prone, but would be designed with appropriate fire protection measures.

### **6.13.3 Sustainability**

The design of the Proposal would be based on the principles of sustainability, including aiming for an excellent rating as a program under the Infrastructure Sustainability Council of Australia's (ISCA) Infrastructure Sustainability (IS) Rating Tool Version 1.2 and the TfNSW Environmental Management System (EMS). These guidelines require a number of mandatory and discretionary initiatives to be applied. Refer to Section 3.1.4 for more information regarding the application of these guidelines.

Further positive impacts in relation to climate change and sustainability associated with the Proposal include encouraging a reduction in private vehicle use and increase the accessibility of public transport services.

## 7 Environmental management

This chapter of the REF identifies how the environmental impacts of the Proposal would be managed through environmental management plans and mitigation measures. Section 7.2 lists the proposed mitigation measures for the Proposal to minimise the impacts of the Proposal identified in Chapter 6.

### 7.1 Environmental management plans

A CEMP for the construction phase of the Proposal would be prepared in accordance with the requirements of the TfNSW Environmental Management System (EMS). The CEMP would provide a centralised mechanism through which all potential environmental impacts relevant to the Proposal would be managed, and outline a framework of procedures and controls for managing environmental impacts during construction.

The CEMP would incorporate as a minimum all environmental mitigation measures identified below in Section 7.2, any conditions from licences or approvals required by legislation, and a process for demonstrating compliance with such mitigation measures and conditions.

### 7.2 Mitigation measures

Mitigation measures for the Proposal are listed below in Table 7.1. These proposed measures would minimise the potential adverse impacts of the Proposal identified in Chapter 6 should the Proposal proceed.

**Table 7.1 Proposed mitigation measures**

No.	Mitigation measure
	<b>General</b>
1.	A Construction Environmental Management Plan (CEMP) would be prepared by the Contractor in accordance with the relevant requirements of <i>Guideline for Preparation of Environmental Management Plans</i> , Department of Infrastructure, Planning and Natural Resources, 2004) for approval by TfNSW, prior to the commencement of construction and following any revisions made throughout construction.
2.	A project risk assessment including environmental aspects and impacts would be undertaken by the Contractor prior to the commencement of construction and documented as part of the CEMP.
3.	An Environmental Controls Map (ECM) would be developed by the Contractor in accordance with TfNSW's <i>Guide to Environmental Controls Map</i> (TfNSW, 2015c) for approval by TfNSW, prior to the commencement of construction and following any revisions made throughout construction.
4.	Prior to the commencement of construction, all contractors would be inducted on the key project environmental risks, procedures, mitigation measures and conditions of approval.
5.	Site inspections to monitor environmental compliance and performance would be undertaken during construction at appropriate intervals.
6.	Service relocation would be undertaken in consultation with the relevant authority. Contractors would mark existing services on the ECM to avoid direct impacts during construction.

No.	Mitigation measure
7.	Any modifications to the Proposal, if approved, would be subject to further assessment and approval by TfNSW. This assessment would need to demonstrate that any environmental impacts resulting from the modifications have been minimised.
<b>Traffic and site access</b>	
8.	<p>Prior to the commencement of construction, a Construction Traffic Management Plan would be prepared as part of the CEMP and would include at a minimum:</p> <ul style="list-style-type: none"> <li>• ensuring adequate road signage at construction work sites to inform motorists and pedestrians of the work site ahead to ensure that the risk of road accidents and disruption to surrounding land uses is minimised</li> <li>• ensuring access to railway stations, businesses, recreational premises and residential properties (unless affected property owners have been consulted and appropriate alternative arrangements made)</li> <li>• managing impacts and changes to on and off street parking and requirements for any temporary replacement provision</li> <li>• ensuring parking locations for construction workers are away from the station and busy residential areas and providing details of how this will be monitored for compliance</li> <li>• designating routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and businesses</li> <li>• undertaking consultation with the relevant roads authorities during preparation of the construction TMP and obtaining necessary Road Occupancy Licences for temporary road closures. The performance of all project traffic arrangements must be monitored during construction.</li> </ul>
9.	Communication would be provided to the community and local residents via notifications and signage to inform them of changes to parking, pedestrian access and/or traffic conditions including vehicle movements and anticipated effects on the local road network relating to site work.
10.	Suitable vehicle and pedestrian provisions would be maintained throughout construction to ensure that pedestrian connectivity is not impacted as a part of the work and that suitable and safe paths are provided
11.	Qualified traffic controllers would be used during construction work to ensure safe and efficient movement of vehicle and pedestrian traffic on the external road as well as in and out of the construction site.
12.	Fencing and barriers would be installed between the construction site and outside the construction zone to ensure safe and easy navigation of pedestrians and cyclists
13.	All work with the potential to impact pedestrian movements such as lifting should be carried out during scheduled rail shutdown periods.

No.	Mitigation measure
	<b>Urban design, landscape and visual amenity</b>
14.	<p>An Urban Design Plan (UDP) is to be submitted to TfNSW and endorsed by the Precincts and Urban Design team prior to construction commencement. The Urban Design Plan is to address the fundamental design principles as outlined in <i>'Around the Tracks' – urban design for heavy and light rail</i>, TfNSW, Interim 2016. The Urban Design Plan shall:</p> <ul style="list-style-type: none"> <li>• demonstrate a robust understanding of the site through a comprehensive site analysis to inform the design direction, demonstrate connectivity with street networks, transport modes, active transport options, and pedestrian distances</li> <li>• identify opportunities and challenges</li> <li>• establish site specific principles to guide and test design options</li> <li>• demonstrate how the preferred design option responds to the design principles established in <i>'Around the Tracks'</i>, including consideration of Crime Prevention through Environmental Design Principles</li> </ul> <p>The Urban Design Plan is to include the Public Domain Plan for the chosen option and will provide analysis of the:</p> <ul style="list-style-type: none"> <li>• landscape design approach including design of pedestrian and bicycle pathways, street furniture, interchange facilities, new planting and opportunities for public art</li> <li>• materials Schedule including materials and finishes for proposed built work, colour schemes, paving and lighting types for public domain, fencing and landscaping</li> <li>• an Artist's Impression or Photomontage to communicate the proposed changes to the precinct</li> </ul> <p>The following design guidelines are available to assist and inform the Urban Design Plan for the Proposal:</p> <ul style="list-style-type: none"> <li>• <i>TAP Urban Design Plan, Guidelines</i>, TfNSW, Draft 2018</li> <li>• <i>Commuter Car Parks, urban design guidelines</i>, TfNSW, Interim 2017</li> <li>• <i>Managing Heritage Issues in Rail Projects Guidelines</i>, TfNSW, Interim 2016</li> <li>• <i>Creativity Guidelines for Transport Systems</i>, TfNSW, Interim 2016</li> <li>• <i>Water Sensitive Urban Design Guidelines</i> for TfNSW Projects, 2016</li> </ul> <p>Endorsement of the Urban Design Plan will demonstrate compliance with the Conditions of Approval in the Review of Environmental Factors (REF) Determination Report.</p>
15.	All permanent lighting would be designed and installed in accordance with the requirements of standards relevant to <i>AS 1158 Road Lighting</i> and <i>AS 4282 Controlling the Obtrusive Effects of Outdoor Lighting</i> .
16.	The detailed design of the Proposal would comply with Crime Prevention Through Environmental Design principles.
17.	Worksite compounds would be screened with shade cloth (or similar material, where necessary) to minimise visual impacts from key viewing locations.
18.	Temporary hoardings, barriers, traffic management and signage would be removed when no longer required.
19.	During construction, graffiti would be removed in accordance with TfNSW's Standard Requirements.
20.	All trees to be retained should be protected prior to the commencement of construction in accordance with AS4970 the <i>Australian Standard for Protection of Trees on Development Sites and Adjoining Properties</i> .

No.	Mitigation measure
21.	Temporary access arrangements should be well signed and provide a visually legible route for pedestrians.
22.	Site equipment and facilities should be consolidated to maximise the area of useable public realm and maintain pedestrian permeability.
23.	A colour palette which is complementary to the heritage character of the station should be selected.
<b>Noise and vibration</b>	
24.	Prior to commencement of work, a Construction Noise and Vibration Management Plan (CNVMP) would be prepared and implemented in accordance with the requirements of the <i>Interim Construction Noise Guideline</i> (Department of Environment and Climate Change, 2009), <i>Construction Noise and Vibration Strategy</i> (TfNSW, 2018b) and the <i>Noise and Vibration Impact Assessment</i> for the Proposal (WSP, 2019). The CNVMP would take into consideration measures for reducing the source noise levels of construction equipment by construction planning and equipment selection where practicable.
25.	Work would generally be carried out during standard construction hours (i.e. 7.00 am to 6.00 pm Monday to Friday; 8.00 am to 1.00 pm Saturdays). Any work outside these hours may be undertaken if approved by TfNSW and the community is notified prior to these work commencing. An Out of Hours Work application form would need to be prepared by the Contractor and submitted to the TfNSW Environment and Planning Manager for any work outside normal hours as per the TfNSW Construction Noise Strategy.
26.	Where the $L_{Aeq}$ (15minute) construction noise levels are predicted to exceed 30 dBA above the Rating Background Level and/or 75 dBA (total including RBL) at nearby affected sensitive receivers, respite periods would be observed, where practicable, and in accordance with the TfNSW <i>Construction Noise and Vibration Strategy</i> (TfNSW, 2018b). This would include restricting the hours that very noisy activities can occur.
27.	To avoid structural impacts as a result of vibration or direct contact with structures, the proposed work would be undertaken in accordance with the safe work distances outlined in the <i>Noise and Vibration Assessment</i> (WSP, 2018) and attended vibration monitoring or vibration trials would be undertaken where these distances are required to be challenged. This would include undertaking a pre-construction building condition survey of heritage structures within 50 metres of construction works prior to commencement of works.
28.	During site establishment, temporary barriers should be erected to ensure that work would be conducted behind temporary hoardings/screens wherever practicable. The installation of construction hoarding would take into consideration the location of sensitive receivers to ensure that 'line of sight' is broken, where feasible. This has the potential to reduce noise levels between 5 and 10 dB.
29.	During site establishment, lift, stairs and station building and platform work, use of the concrete saw is the main contributor to construction noise. It is recommended that the use of concrete saws is limited where possible, and work is undertaken during standard hours. Where work is required outside of standard hours, the use of this equipment is to avoid sensitive periods such as after midnight and before 7am.

No.	Mitigation measure
30.	Due to the exceedances for all stages of construction at the educational receiver E1 (Knox Grammar School) and the place of worship receiver W1, where possible, it is recommended that a temporary screen or enclosure (10 – 15 dB reduction) is placed around the work in conjunction with temporary barriers. Further consultation should also be undertaken to determine feasible construction periods and inform construction staging with respect to minimising the impacts on receivers E1 and W1. As much as reasonably possible, noise intensive construction work near affected education buildings are to be minimised. It is also recommended that where reasonable and feasible the use of the concrete saw is limited to standard hours or when the premises are not in use.
<b>Aboriginal heritage</b>	
31.	All construction staff would undergo an induction in the recognition of Aboriginal cultural heritage material. This training would include information such as the importance of Aboriginal cultural heritage material and places to the Aboriginal community, as well as the legal implications of removal, disturbance and damage to any Aboriginal cultural heritage material and sites.
32.	If unforeseen Aboriginal objects are uncovered during construction, the procedures contained in the TfNSW <i>Unexpected Heritage Finds Guideline</i> (TfNSW, 2015a) would be followed, and work within the vicinity of the find would cease immediately. The Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager so they can assist in co-ordinating next steps which are likely to involve consultation with an Aboriginal heritage consultant, the OEH and the Local Aboriginal Land Council.
33.	If human remains are found, work would cease, the site secured and the NSW Police and the OEH notified. Where required, further archaeological investigations and an Aboriginal Heritage Impact Permit would be obtained prior to work recommencing at the location.
<b>Non-Aboriginal heritage</b>	
34.	<p>Opportunities to reduce the heritage impact of the Proposal on the Warrawee Railway Station Group should be investigated during detailed design including consideration of (refer to Section 9.2.1 in Technical Paper 3):</p> <ul style="list-style-type: none"> <li>• the size, form and materials chosen for the proposed lift, canopy and landing structure</li> <li>• the methodology for the platform regrading, installation of conduits or electrical items and reconfiguration of the toilets.</li> </ul>
35.	A heritage induction would be provided to workers prior to construction, informing them of the location of known heritage items and guidelines to follow if unanticipated heritage items or deposits are located during construction.
36.	In the event that any unanticipated archaeological deposits are identified within the project site during construction, the procedures contained in the TfNSW <i>Unexpected Heritage Finds Guideline</i> (TfNSW, 2015a) would be followed, and work within the vicinity of the find would cease immediately. The Construction Contractor would immediately notify the TfNSW Project Manager and the TfNSW Environment and Planning Manager so they can assist in co-ordinating the next steps which are likely to involve consultation with an archaeologist and OEH. Where required, further archaeological work and/or consents would be obtained for any unanticipated archaeological deposits prior to work recommencing at the location.
37.	Where it is identified during detailed design that ground disturbance may impact Phase 3 archaeological remains, a Work Method Statement (WMS) would need to be prepared by a suitably qualified heritage specialist to guide archaeological monitoring and recording where required.

No.	Mitigation measure
38.	if archaeological 'relics', as defined under the Heritage Act, are encountered during any ground disturbing works associated with the Proposal, a Section 146 notification would be prepared and submitted to the NSW Heritage Division, Office of Environment and Heritage prior to their removal.
39.	A copy of the SoHI report should be provided to Sydney Trains and Ku-ring-gai Council for their review and comment.
40.	A Photographic Archival Recording (PAR) should be prepared for the station, in accordance with relevant guidelines issues by the NSW Heritage Division prior to work commencing.
41.	Consideration should be given to the provision of interpretation as part of the Proposal, which would outline the history, associations and significance of Warrawee Station and the wider Warrawee area. Interpretive measures could involve interpretive signage, panels or displays at entry/exit points to the station, including on the proposed lift and platform-level canopy structure.
<b>Socio-economic</b>	
42.	Feedback through the submissions process would be encouraged to facilitate opportunities for the community and stakeholders to have input into the Proposal, where practicable.
43.	A Community Management Liaison Plan would be prepared prior to construction to identify all potential stakeholders and best practice methods for consultation with these groups during construction. The Plan would also encourage feedback and facilitate opportunities for the community and stakeholders to have input into the Proposal, where practicable.
44.	Contact details for a 24-hour construction response line, Project Infoline and email address would be provided for ongoing stakeholder contact throughout the construction phase.
45.	The community would be kept informed of construction progress, activities and impacts in accordance with the Community Liaison Management Plan to be developed prior to construction.
<b>Biodiversity</b>	
46.	The removal of trees T8, T11, T12, T15 and T16 should be carried out by an experienced tree surgeon in accordance with the NSW WorkCover <i>Code of Practice for the Amenity Tree Industry</i> (1998). Care shall be taken to avoid damage to other trees during the felling operation.
47.	All workers would be provided with an environmental induction prior to commencing work onsite. This induction would include information on the protection measures to be implemented to protect vegetation, penalties for breaches and locations of areas of sensitivity.
48.	Disturbance of vegetation would be limited to the minimum amount necessary to construct the Proposal. Trees nominated to be removed in the <i>Arboricultural Impact Assessment Report</i> (Earthscape Horticultural Services, 2019) would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal. Trees to be retained would be protected through temporary protection measures discussed below.

No.	Mitigation measure
49.	A Tree Protection Plan and tree protection measures has been prepared for the Proposal (refer to the <i>Arboricultural Impact Assessment</i> report by Earthscape, 2019, in Technical Paper 5). Tree Protection Zones (TPZs) would be established around trees to be retained, as nominated in the <i>Arboricultural Impact Assessment</i> (Eandscape, 2019). Tree protection would be undertaken in line with <i>AS 4970-2009 Protection of Trees on Development Sites</i> and would include exclusion fencing of TPZs.
50.	Where the loss of trees is unable to be mitigated, Transport for NSW would replace trees removed as a result of the project in accordance with the TfNSW's <i>Vegetation Offset Guide</i> (2016) (refer to Section 11 in Technical Paper 5).
51.	In the event of any tree to be retained becoming damaged during construction, the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager to coordinate the response which may include contacting an arborist to inspect and provide advice on remedial action, where possible.
52.	Should the detailed design or onsite work determine the need to remove or trim any additional trees, which have not been identified in the REF, the Contractor would be required to complete TfNSW's Tree Removal Application Form and submit it to TfNSW for approval.
53.	No stockpiling of materials or storage of machinery is to be undertaken within non-paved grass areas within the Blue Gum High Forest adjacent to Heydon Avenue. These areas would be shown on the Environmental Control Maps for the Proposal.
54.	For new landscaping work, mulching and watering would be undertaken until plants are established. New plantings shall be maintained for a minimum period of twelve (12) months from the date of installation to ensure successful establishment. The maintenance regime shall include regular watering, replenishment of mulch, weed control, adjustment of any stakes or ties used for temporary support and monitoring of the general health and condition of the trees. Any of the trees that fail within the first 12 months shall be replaced with new tree stock of equivalent species. Replacement trees shall be maintained for a further 12 months from planting to ensure successful establishment.
55.	Weed control measures, consistent with TfNSW's <i>Weed Management and Disposal Guideline</i> , would be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during the construction phase of the Proposal. This would include the management and disposal of weeds in accordance with the <i>Noxious Weeds Act 1993</i> .
<b>Soils and water</b>	
56.	Prior to commencement of work, a site-specific Erosion and Sediment Control Plan would be prepared in accordance with the 'Blue Book' <i>Managing Urban Stormwater: Soils and Construction Guidelines</i> (Landcom, 2004) and updated throughout construction so it remains relevant to the activities. The Erosion and Sediment Control Plan measures would be implemented prior to commencement of work and maintained throughout construction.
57.	Erosion and sediment control measures would be established prior to any clearing, grubbing and site establishment activities and would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality. Erosion and sediment control measures would be maintained and left in place until the work is complete and areas are stabilised.
58.	Vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks. Construction plant, vehicles and equipment would also be refuelled offsite, or in a designated refuelling area.

No.	Mitigation measure
59.	All fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and the TfNSW <i>Chemical Storage and Spill Response Guidelines</i> (TfNSW, 2015g).
60.	Adequate water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented in accordance with relevant EPA guidelines and the TfNSW <i>Chemical Storage and Spill Response Guidelines</i> (TfNSW, 2015g) during the construction phase. All staff would be made aware of the location of the spill kits and be trained in how to use the kits in the case of a spill.
61.	In the event of a pollution incident, work would cease in the immediate vicinity and the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager. The EPA would be notified by TfNSW if required, in accordance with Part 5.7 of the PoEO Act.
62.	The existing drainage systems would remain operational throughout the construction phase.
63.	Should groundwater be encountered during excavation works, groundwater would be managed in accordance with the requirements of the <i>Waste Classification Guidelines</i> (EPA, 2014) and the TfNSW <i>Water Discharge and Reuse Guideline</i> (TfNSW, 2015b).
<b>Air quality</b>	
64.	Air quality management and monitoring for the Proposal would be undertaken in accordance with the TfNSW <i>Air Quality Management Guideline</i> (TfNSW, 2015h).
65.	Methods for management of emissions would be incorporated into project inductions, training and pre-start/toolbox talks.
66.	Plant and machinery would be regularly checked and maintained in a proper and efficient condition. Plant and machinery would be switched off when not in use, and not left idling.
67.	Vehicle and machinery movements during construction would be restricted to designated areas and sealed/compacted surfaces where practicable.
68.	<p>To minimise the generation of dust from construction activities, the following measures would be implemented:</p> <ul style="list-style-type: none"> <li>• apply water (or alternate measures) to exposed surfaces (e.g. unpaved roads, stockpiles, hardstand areas and other exposed surfaces)</li> <li>• cover stockpiles when not in use</li> <li>• appropriately cover loads on trucks transporting material to and from the construction site and securely fix tailgates of road transport trucks prior to loading and immediately after unloading</li> <li>• prevent mud and dirt being tracked onto sealed road surfaces.</li> </ul>

No.	Mitigation measure
<b>Waste and contamination</b>	
69.	<p>The CEMP (or separate Waste Management Plan, if necessary) must address waste management and would at a minimum:</p> <ul style="list-style-type: none"> <li>• identify all potential waste streams associated with the work and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities</li> <li>• detail other onsite management practices such as keeping areas free of rubbish</li> <li>• specify controls and containment procedures for hazardous waste and asbestos waste</li> <li>• outline the reporting regime for collating construction waste data.</li> </ul>
70.	<p>An unexpected contamination finds protocol, considering asbestos containing materials and other potential contaminants, would be included in the CEMP. Procedures for handling asbestos containing materials, including licensed contractor involvement as required, record keeping, site personnel awareness and waste disposal to be undertaken in accordance with SafeWork NSW requirements.</p>
71.	<p>All spoil to be removed from site would be tested to confirm the presence of any contamination. Any contaminated spoil would be disposed of at an appropriately licensed facility.</p>
72.	<p>All spoil and waste must be classified in accordance with the <i>Waste Classification Guidelines Part 1: Classifying waste</i> (EPA, 2014) prior to disposal.</p>
73.	<p>Any concrete washout would be established and maintained in accordance with the TfNSW <i>Concrete Washout Guideline – draft</i> (TfNSW, 2015i) with details included in the CEMP and location marked on the ECM.</p>
<b>Climate change and sustainability</b>	
74.	<p>Detailed design of the Proposal would target a rating of ‘Excellent’ using the ISCA Infrastructure Sustainability Rating Scheme (v1.2)</p>
<b>Cumulative impacts</b>	
75.	<p>Consultation and liaison would occur with Ku-ring-gai Council, Sydney Trains, St Lucy’s School and other relevant stakeholders, in order to seek to minimise cumulative construction impacts such as traffic and noise.</p>
76.	<p>The potential cumulative impacts associated with the Proposal would be further considered as the design develops and as further information regarding the location and timing of potential developments is released. Environmental management measures would be developed in the CEMP, and implemented as appropriate.</p>

## 8 Conclusion

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This REF has been prepared in accordance with the provisions of Section 5.5 of the EP&A Act, taking into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the Proposal.

The Proposal would provide the following benefits:

- a station that provides improved accessibility to people with a disability, limited mobility, parents/carers with prams and customers with luggage
- modernisation of the existing station building and facilities that meet the needs of a growing population
- improved interchange and access facilities for all customers utilising Warrawee Station.

The likely key impacts of the Proposal are as follows:

- temporary impacts on local traffic flow associated with construction traffic along Heydon Avenue and Warrawee Avenue
- minor impacts to the heritage fabric of the existing station building and visual environment from the introduction of new elements, such as the lifts
- temporary disruptions to station facilities and amenities during construction, including potential weekend closures during scheduled closures of Warrawee Station
- temporary changes to vehicular, bus, bicycle and pedestrian access to, through and movements around the station during construction
- removal of five trees including one tree on the station platform to accommodate the proposed lift and four trees at the station entrance along Warrawee Avenue
- temporary noise impacts to adjacent residential areas during construction, including periods of weekend work
- potential sediment mobilisation, dust generation and erosion risk during construction.

This REF has considered and assessed these impacts in accordance with clause 228 of the EP&A Regulation and the requirements of the EPBC Act (refer to Chapter 6, Appendix A and Appendix B). Based on the assessment contained in this REF, it is considered that the Proposal is not likely to have a significant impact upon the environment or any threatened species, populations or communities. Accordingly, an EIS is not required, nor is the approval of the Minister for Planning.

The Proposal would also take into account the principles of ESD (refer to Section 3.1.4 and Section 4.6). These would be considered during the detailed design, construction and operational phases of the Proposal. This would ensure the Proposal is delivered to maximum benefit to the community, is cost effective and minimises any adverse impacts on the environment.

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## Appendix A Consideration of matters of National Environmental Significance

The table below demonstrates TfNSW's consideration of the matters of NES under the EPBC Act to be considered in order to determine whether the Proposal should be referred to Commonwealth Department of the Environment.

Matters of NES	Impacts
<p><b>Any impact on a World Heritage property?</b> No World Heritage properties occur within a one-kilometre radius of the site.</p>	Nil
<p><b>Any impact on a National Heritage place?</b> No National Heritage places occur within a one-kilometre radius of the site.</p>	Nil
<p><b>Any impact on a wetland of international importance?</b> No wetlands of international importance are located within a one-kilometre radius of the site.</p>	Nil
<p><b>Any impact on a listed threatened species or communities?</b> Based on available habitat and the potential impacts of the Proposal, it is unlikely that any threatened species or community will be impacted.</p>	Nil
<p><b>Any impacts on listed migratory species?</b> No listed migratory species are likely to utilise the habitat within the study area.</p>	Nil
<p><b>Does the Proposal involve a nuclear action (including uranium mining)?</b> The Proposal does not involve a nuclear action.</p>	Nil
<p><b>Any impact on a Commonwealth marine area?</b> The Proposal would not impact on a Commonwealth marine area.</p>	Nil
<p><b>Does the Proposal involve development of coal seam gas and/or large coal mine that has the potential to impact on water resources?</b> The Proposal is not related to coal seam gas or mining,</p>	Nil
<p><b>Additionally, any impact (direct or indirect) on Commonwealth land?</b> The Proposal would not impact on Commonwealth land.</p>	Nil

## Appendix B Consideration of clause 228

The table below demonstrates TfNSW's consideration of the specific factors of clause 228 of the EP&A Regulation in determining whether the Proposal would have a significant impact on the environment.

Factor	Impacts
<p><b>(a) Any environmental impact on a community?</b> There would be some temporary impacts to the community during construction, particularly in relation to noise, traffic and access and visual amenity. Mitigation measures outlined in Table 7.1 would be implemented to manage and minimise adverse impacts.</p>	Minor
<p><b>(b) Any transformation of a locality?</b> The Proposal would involve the introduction of new visible elements in the landscape (a new lift, canopy and minor adjustments/relocation of existing infrastructure). The appearance of the new elements would be consistent with the existing station elements and are considered to be common features in urban areas.  The Proposal would have a positive contribution to the locality by creating accessible entrances to the station and station platforms.</p>	Minor
<p><b>(c) Any environmental impact on the ecosystem of the locality?</b> The Proposal would require minor vegetation removal. However, given the Proposal's location within an urbanised environment and the low habitat value of the trees to be removed, impacts to biodiversity and ecosystems are expected to be negligible.</p>	Nil
<p><b>(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</b> There would be some temporary impacts during construction particularly in relation to noise, traffic and access and visual amenity. The Proposal would not result in any substantial reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality.</p>	Minor
<p><b>(e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</b> Warrabee Railway Station Group is listed on the RailCorp Section 170 Heritage and Conservation Register. The Proposal would retain the overall heritage values of the existing station.</p>	Minor
<p><b>(f) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</b> The Proposal is unlikely to have any impact on the habitat of protected fauna.</p>	Nil
<p><b>(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</b> The Proposal is unlikely endanger any species of animal, plant or other form of life, whether living on land, in water or in the air.</p>	Nil
<p><b>(h) Any long-term effects on the environment?</b> The Proposal is unlikely to have any long-term effects on the environment.</p>	Nil

Factor	Impacts
<p><b>(i) Any degradation of the quality of the environment?</b> The Proposal is unlikely to have any degradation on the quality of the environment.</p>	Nil
<p><b>(j) Any risk to the safety of the environment?</b> The Proposal is unlikely to cause any pollution or safety risks to the environment provided the recommended mitigation measures are implemented.</p>	Nil
<p><b>(k) Any reduction in the range of beneficial uses of the environment?</b> The Proposal is unlikely to have any reduction in the range of beneficial uses of the environment.</p>	Nil
<p><b>(l) Any pollution of the environment?</b> The Proposal is unlikely to cause any pollution or to the environment provided the recommended mitigation measures are implemented.</p>	Nil
<p><b>(m) Any environmental problems associated with the disposal of waste?</b> The Proposal is unlikely to cause any environmental problems associated with the disposal of waste. All waste would be managed and disposed of with a site-specific Waste Management Plan. Mitigation measures would be implemented to ensure waste is reduced, reused or recycled where practicable.</p>	Nil
<p><b>(n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</b> The Proposal is to unlikely increase demands on resources that are, or are likely to become, in short supply.</p>	Nil
<p><b>(o) Any cumulative environmental effect with other existing or likely future activities?</b> Cumulative effects of the Proposal are described in Section 6.12. Where feasible, environmental management measures would be co-ordinated to reduce any cumulative construction impacts. The Proposal is unlikely to have any significant adverse long-term impacts.</p>	Minor
<p><b>(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?</b> The Proposal would not affect or be affected by any coastal processes or hazards.</p>	Nil