



REVIEW OF ENVIRONMENTAL FACTORS

GLENWOOD PEDESTRIAN LINK

April 2018

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Glossary

	Definitions
AHIMS	Aboriginal Heritage Information Management System
ASS	Acid sulfate soils
CBD	Central business district
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CLM Act	<i>Contaminated Land Management Act 1997</i>
CPTED	Crime prevention through environmental design
CSWMP	Construction Soil and Water Management Plan
CTMP	Construction Traffic Management Plan
DDA	<i>Disability Discrimination Act 1992</i>
DCP	Development Control Plan
dB(A)	Decibel
DSAPT	Disability Standards for Accessible Public Transport
EIS	Environmental impact statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPA	Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development
ES Act	<i>Electricity Supply Act 1995</i>
Heritage Act	<i>Heritage Act 1977</i>
ICNG	Interim Construction Noise Guideline
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
MCA	Multi criteria analysis
MNES	Matter of National Environmental Significance
NCA	Noise catchment area
NML	Noise management level
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NSW	New South Wales
NVMP	Noise and Vibration Management Plan
OEH	Office of Environment and Heritage
POEO Act	<i>Protection of the Environment Operations Act 1997</i>

	Definitions
proposal (the)	Refers to all the activities and the ancillary site associated with the shared paths works between Old Windsor Road and Swansea Court, as well as Sharrock Avenue and Cramer Place as shown in Figure 1-4 of this document.
RBL	Rating Background Level
REF	Review of Environmental Factors
Roads Act	<i>Roads Act 1993</i>
SEPP	State Environmental Planning Policy
SHR	State Heritage Register
SIS	Species impact statement
Sydney's Rail Future	Sydney's Rail Future Modernising Sydney's Trains
TCP	Traffic control plan
TEC	Threatened ecological communities
TfNSW	Transport for New South Wales
VMS	Variable message signs
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001</i>

Executive summary

Transport for NSW (TfNSW) is delivering a new metro station at Bella Vista as part of the \$8.3 billion Sydney Metro Northwest project. The new Bella Vista Station is under construction off Celebration Drive and will service the Norwest Business Park, local residential areas and the future Bella Vista station precinct. As part of the Bella Vista station works, TfNSW is constructing a pedestrian bridge to allow pedestrians and cyclists to safely and conveniently cross Old Windsor Road and access the future station.

It is proposed to construct a separate pedestrian and bicycle link between Swansea Court/Sharrock Avenue and the existing shared path along Old Windsor Road to provide walking and cycling access to the new pedestrian bridge and Bella Vista Station from the Glenwood residential area. The construction of the pedestrian link aims to maximise equitable access to Bella Vista Station for Glenwood residents. The proposal is related however does not form part of the existing Sydney Metro Northwest project.

The purpose of this Review of Environmental Factors (REF) is to describe the proposal, to document the likely impacts of the proposal on the environment, to detail mitigation measures to be implemented and to determine whether the project can proceed. For the purposes of these works TfNSW is the proponent and determining authority under Part 5, Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Description of the proposal

The proposal would comprise:

- Acquisition and demolition of one residential property (1 Swansea Court, Glenwood)
- Construction of a new 2.5 metre wide shared path (for pedestrians and cyclists) between the Old Windsor Road shared path and Swansea Court, approximately 50 metres in length
- Regrading a section of the existing shared path along Old Windsor Road (to 1:20 grade)
- Installation of a new 1.5 metre wide footpath on the eastern side of Sharrock Avenue between Swansea Court and Nixon Street
- Installation of a new 1.5 metre wide footpath on the southern side of Cramer Place between Swansea Court and Glenwood Park Drive
- Utility relocations where required
- Installation of retaining walls along Old Windsor Road shared path
- Landscaping and lighting.

Provision for parking management and CCTV would be considered, in consultation with Blacktown City Council.

An artist impression of the proposed pedestrian link is provided below.



Artist impression of the proposal showing the shared path and landscaping, view from Swansea Court towards Old Windsor Road



Artist impression of the proposal, view from the eastern side of the proposal from Old Windsor Road to Swansea Court

Need for the proposal

The NSW Government is committed to facilitating and encouraging the use of public transport by making Sydney Metro stations more accessible, and improving interchange with other modes of transport such as walking, cycling, bus, taxi and private vehicle.

To improve pedestrian access to Bella Vista Station, a pedestrian bridge is being constructed across Old Windsor Road, approximately 100 metres north of Celebration Drive.

The bridge will land adjacent to the southern entry of Bella Vista Station on the eastern side of Old Windsor Road, and adjacent to the Emmanuel Baptist Church and Trades Norwest Anglican Senior College on the western side. The pedestrian bridge will reduce the lengthy crossing times currently experienced by pedestrians crossing Old Windsor Road. This pedestrian bridge was proposed and approved in 2013 under the Sydney Metro Northwest project approval and is currently under construction.

Despite the provision of this pedestrian bridge, pedestrian access between the suburb of Glenwood and Bella Vista Station is still constrained. Formal pedestrian access points exist at Emmanuel Terrace, Arnold Place and Miami Street with fences and noise barriers impeding access for almost one kilometre in between. Despite living in close proximity to Bella Vista Station, the majority of the Glenwood community would have limited options for access to it. Station access would be limited to bus and private vehicle for most Glenwood residents, resulting in further traffic congestion at key intersections such as Old Windsor Road and Miami Street.

This current access situation allows very few residents living to the west of Old Windsor Road (within the Blacktown LGA) to walk to Bella Vista Station and access T-Way bus services. This produces access inequity when compared to residents living to the east of Old Windsor Road (within The Hills Shire LGA). The proposal aims to improve the equity for all residents who live within walking distance of the station.

A number of pedestrians and cyclists currently use informal access through the grounds of the Emmanuel Baptist Church, which creates the potential for safety, security and liability issues. The introduction of Sydney Metro services is likely to see an increased demand for pedestrian and cyclist access between Old Windsor Road and the Glenwood residential area, potentially increasing trespassing through the Emmanuel Baptist Church and other private property. Pedestrian access through the Emmanuel Baptist Church grounds is already restricted at certain times of the day and could potentially be restricted further if impacts increase.

These factors led to the need to investigate opportunities to improve pedestrian access between the Glenwood residential area and Old Windsor Road.

Options considered

Following the identification of access issues between Bella Vista Station and the Glenwood residential area, a number of options to improve access for the Glenwood community were investigated. Details are provided in Chapter 3.

Three options were considered for the proposal location:

- Option 1 – construction of a pedestrian link to the north of the pedestrian bridge over Old Windsor Road, into Swansea Court or Sharrock Avenue
- Option 2 – construction of a pedestrian link to the south of the Old Windsor Road footbridge, into Vanessa Court or Maley Grove
- Option 3 - provide a formalised pedestrian link through the Emmanuel Baptist Church and Trades Norwest Anglican Senior College grounds. Informal access currently occurs through these properties.

A Multi-Criteria Analysis (MCA) was completed to compare the three options against a 'do-nothing' approach taking into account amenity, access, local Impacts and value for money. Option 1 was selected on the basis of providing pedestrian and cyclist access to the widest catchment and maximising equitable access for the greatest number of households.

Properties were then short-listed and a MCA was undertaken to select the preferred property for the location of the pedestrian link taking into account safety, access, neighbourhood

amenity/impacts and design and construction. The results of the MCA assessment determined that 1 Swansea Court would be the most appropriate location for the Glenwood Pedestrian Link.

Eight possible design options were assessed in terms of bicycle/wheelchair access, service impacts, land acquisition, Crime Prevention Through Environmental Design (CPTED) (safety) and landscaping considerations. Three were shortlisted and refined until a preferred concept design was determined.

The selection of the preferred design was based on the need to provide safe and direct access for customers, while minimising impacts on neighbouring properties. The preferred concept design was determined to best meet these requirements.

Statutory considerations

The EP&A Act provides for the environmental impact assessment of development in NSW. Part 5, Division 5.1 of the EP&A Act generally specifies the environmental impact assessment requirements for activities undertaken by public authorities, such as TfNSW, which do not require development consent.

The State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) is the primary environmental planning instrument relevant to the proposed development and is the key environmental planning instrument which determines that this proposal is permissible without consent and therefore is to be assessed under Part 5, Division 5.1 of the EP&A Act.

Clause 79 of ISEPP allows for the development of 'rail infrastructure facilities' by or on behalf of a public authority without consent on any land. Clause 78 defines 'rail infrastructure facilities' as including elements such as 'pedestrian and cyclist facilities'.

As TfNSW is a public authority and the proposal is related to a rail infrastructure facility under the ISEPP, the proposal is permissible without consent. The environmental impacts of the proposal have been assessed under Part 5, Division 5.1 of the EP&A Act and development consent from council is not required.

This REF has been prepared to assess the construction and operational environmental impacts of the proposal. The REF has been prepared in accordance with clause 228 of the Environment Planning and Assessment Regulation 2000 (the EP&A Regulation).

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 proposed activity.

Chapter 7 of this REF presents the environmental impact assessment for the proposal in accordance with these requirements.

Community and stakeholder consultation

TfNSW sought initial feedback on the potential for a Glenwood pedestrian link between October and November 2015. Consultation involved project notification newsletters and community drop in sessions. Community members were invited to provide written feedback on the proposal. Feedback was recorded by TfNSW, and has been incorporated into the selection of the pedestrian link location and site, the design of the pathway and aspects of the pedestrian link scope. TfNSW will continue to incorporate consultation outcomes based on feedback from residents, community and stakeholders during development of the proposal.

TfNSW invites comments on this REF. Submissions received during the public display period will be addressed in a formal submissions report and, if a decision is made to proceed with the proposal, will be considered during detailed design of the proposal.

Environmental impact assessment

This REF assesses the construction and operational environmental impacts of the proposal.

The following key impacts have been identified should the proposal proceed:

- The proposal is likely to result in changes to local traffic and parking conditions in the vicinity of the proposal. As an access point to Bella Vista Station, there may be additional commuter parking and pick-up/drop-off pressures on streets adjacent to the link, including Sharrock Avenue, Swansea Court, Cramer Place, Nixon Street and Adrian Street. These would require appropriate parking management measures to ensure safe access to the link and local residences is maintained, and local amenity is not adversely impacted. There would be temporary diversions in place for pedestrians and cyclists on the Old Windsor Road shared path during construction, requiring diversionary signage.
- During construction the proposal would result in a perceptible but a temporary noise level increase for residential receivers in proximity to the proposal. Construction works would be carried out within standard construction hours where possible.
- During operation two residential receivers were identified with potential for a noise level increase of 6 to 7 dBA due to the increase in road traffic noise levels associated with the removal of existing screening (removal of the residential dwelling and boundary wall along Old Windsor Road). Community updates would be provided and construction and operational noise management controls would be put in place to mitigate potential impacts.
- Temporary visual impacts would occur during construction. The site would be enclosed by fencing, and the removal of street trees and vegetation within the proposal site would open up views between Swansea Court and Old Windsor Road. Construction of the proposal is expected to reduce visual amenity for residents and road/street users in close proximity to the proposal site itself. The change from a residential property to open space would provide some amenity improvements including opening-up views from the upper storey of the adjacent properties, providing green space and landscaping. Once open, the pedestrian link would provide an outlook onto open space where there is currently a residential dwelling. On balance, this would result in no major changes to visual amenity from the adjacent residential area.
- The proposal would be developed within a previously disturbed/developed area. No remnant vegetation would be impacted or removed during the proposal's construction. Several native plantings within the proposal's area would likely require removal and replacement. Up to 20 planted Eucalypts and Lomandras located to the rear of 63 and 67 Sharrock Avenue and 1, 3 and 5 Swansea Court may require removal during the regrading of Old Windsor Road shared path. The area surrounding the pathway would be landscaped and revegetated with native plants. There would be some additional vegetation within the proposal site following construction and more potential habitat and foraging material for fauna. The proposal would have some limited overall benefit on biodiversity once completed.

The proposal would improve access for local residents to Old Windsor Road and Bella Vista Station and reduce travel times.

An assessment of each of the above and other environmental issues is provided in Chapter 7 of this REF.

Benefits of the proposal

The proposal would supplement Sydney Metro Northwest and the Bella Vista Station precinct by improving pedestrian access to and from the active core of the Bella Vista

Precinct. The pedestrian link would facilitate ease of access to the Old Windsor Road shared path, Old Windsor Road pedestrian bridge and Bella Vista Station Precinct for Glenwood residents. The pedestrian link creates direct access in and out of the Glenwood residential area, providing connectivity to the regional active transport corridor, T-Way bus services, schools, the Norwest Business Park and future businesses within the development of the Bella Vista Station precinct.

Construction of the proposal in conjunction with the Old Windsor Road pedestrian bridge would result in reduced walking time for local people within proximity to the future Bella Vista Station. The proposal would mean that 700 Glenwood households and two local schools would be within a 15 minute walk of the new station. An even greater number of households would be within a short cycling distance. Residents who would currently have a 25 to 30 minute walk at average pace would be able to walk to the new Bella Vista Station in less than 15 minutes.

The adverse environmental impacts of the proposed Glenwood pedestrian link would be generally minimal in nature. With the adoption and implementation of the proposed mitigation measures and commitments in Chapter 8, the potential environmental impacts of the proposal could be adequately mitigated and managed, and are not considered to be significant.

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.

The detailed design of the proposal would also be designed in accordance with the *NSW Sustainable Design Guidelines – Version 3.0* (TfNSW, 2013a) taking into account the principles of ecologically sustainable development (ESD).

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 and community.

In considering the overall potential impacts and proposed mitigation measures outlined in this REF, the proposal is not likely to significantly affect the environment including critical habitat or threatened species, populations, ecological communities or their habitats.

Next steps

TfNSW will exhibit the REF for a minimum of a six week period so the community can provide written comments on the proposal.

A range of stakeholder and community consultation activities will be carried out as part of the public exhibition. Additional stakeholder and community consultation will continue to be implemented to inform the community and stakeholders prior to and during the proposal's construction (should it be approved during the proposal's determination phase).

After the close of exhibition, TfNSW will consider submissions received in response to this REF. A Response to Submissions Report will be prepared to respond to the issues raised in the submissions. This report, along with the REF and any other relevant information, will be used by TfNSW to assess and determine the proposal.

Should the proposal be approved, TfNSW will make the Response to Submissions Report and any conditions of approval publicly available. The local community will be notified via

advertisements in local newspapers, community newsletters and the proposal website sydneymetro.info.info/. Correspondence will be sent to people who make a submission which would include contact details for further information and an indication of the anticipated timing of construction work.

1. Introduction

This Chapter describes the background of the proposal, the proposal's need and objectives, overview of the proposal, purpose and an outline of the structure of this Review of Environmental Factors (REF).

1.1. Background

Bella Vista Station is one of the stations being delivered as part of Sydney Metro Northwest (see Figure 1-1 and Figure 1-2). Bella Vista Station is located on the eastern side of Old Windsor Road within the suburb of Bella Vista in The Hills Local Government Area (The Hills LGA). The station is currently under construction and will serve the Norwest Business Park, local schools and surrounding residential areas, and future development within proximity of the station precinct. Due to a historical focus on auto-oriented planning, the station will be delivered into an environment with a number of significant access constraints imposed by the surrounding street network.



Figure 1-1 Aerial view of the construction of Sydney Metro Northwest Bella Vista Station (right), Old Windsor Road (Middle), Glenwood residential area – Swansea Court and Sharrock Avenue (left)



Figure 1-2 Aerial view of the location of the proposal in relation to the construction of Sydney Metro Northwest (top), and Old Windsor Road Pedestrian bridge (due to be installed April 2108) (right)

A pedestrian bridge is being constructed across Old Windsor Road between the southern station entry and the existing shared path on the western side of Old Windsor Road to facilitate improved pedestrian access across Old Windsor Road. The pedestrian bridge is located approximately 100 metres north of Celebration Drive. The bridge will land adjacent to the southern entry of Bella Vista Station on the eastern side of Old Windsor Road, and adjacent to the Emmanuel Baptist Church and Trades Norwest Anglican Technical College on the western side.

It is proposed that a pedestrian and cycle link is designed to link the pedestrian bridge located on the Old Windsor Road shared path to the Glenwood residential area via a new pedestrian link.

1.2. Overview of the proposal

1.2.1. Need

Glenwood is separated from Bella Vista Station by Old Windsor Road, a wide state arterial road. The development of Glenwood as a largely residential community has resulted in few access points between Old Windsor Road and the residential streets in Glenwood. Fencing and noise barriers present pedestrian access constraints for nearly one kilometre along Old Windsor Road, limiting opportunities for Glenwood residents to access the station despite living in close proximity. Formal pedestrian access points between Glenwood and Old Windsor Road currently only exist at Emmanuel Terrace, Arnold Place and Miami Street (refer to Figure 1-3). Despite the access improvements delivered by the new pedestrian bridge, there will be no households within a 10 minute walk of the station. This also produces an inequitable access situation for residents of the Blacktown Local Government Area (Blacktown LGA) in contrast with those residing in The Hills LGA suburb of Bella Vista.

Hence, further work is required to provide better and more convenient access to the pedestrian and cycle bridge across Old Windsor Road from the Glenwood residential area.

Further details on need and objectives is provided in Section 2.

1.2.2. Location

The proposal would be located in Glenwood, within the Blacktown LGA.

The pedestrian link would be constructed to provide a connection between the shared path running adjacent to the western side of Old Windsor Road and Glenwood residential area at Swansea Court/Sharrock Avenue. The proposed location would require the acquisition and demolition of a residential property.

The proposed pedestrian link site is situated approximately 100 metres north of the pedestrian bridge over Old Windsor Road, which lands adjacent to the Emmanuel Baptist Church.

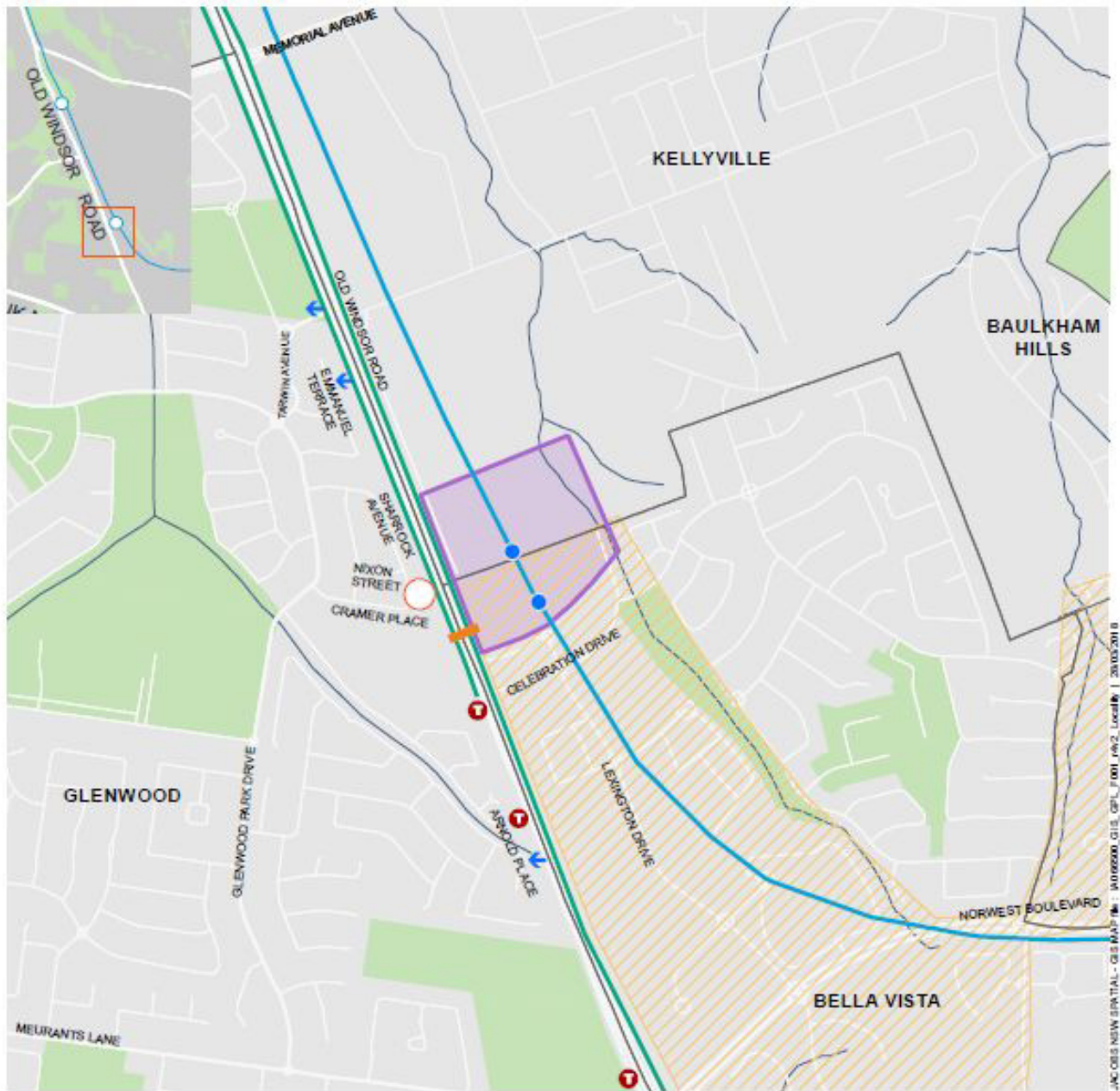
Figure 1-3 outlines the location of the proposal in relation to its surrounding suburbs.

The 'proposal site' refers to the area that would be directly impacted by the proposal. For the purpose of this assessment, the proposal site is defined as:

- 1 Swansea Court, Glenwood
- Approximately 50 metres length of the shared path on the western side of Old Windsor Road
- Approximately 220 metres of grassed nature strip on the southern side of Cramer Place
- Approximately 75 metres of grassed nature strip on the eastern side of Sharrock Avenue.

An overview of the proposal site is shown in Figure 1-4.

The 'study area' comprises the proposal site and the area that may be indirectly impacted by the proposal. This area can vary in size depending on the environmental issue being discussed (e.g. biodiversity, heritage etc.) and the specific area for each issue is described in the relevant section(s) of Chapter 7.



KEY

- Proposed link location
- Bella Vista Station entry locations
- Existing pedestrian access points
- T T-Way stop location
- Glenwood pedestrian bridge
- Sydney Metro Northwest alignment
- Old Windsor Road shared path
- Bella Vista Station Precinct
- Norwest Business Park



Figure 1-3 Location of the proposal

1.2.3. Key features

The proposal is described in Chapter 3 and shown on Figure 1-4. It would occupy about 400 square metres of space and its main features would include:

- Acquisition and demolition of a residential property – 1 Swansea Court, Glenwood
- Construction of a new 2.5 metre wide shared path (for cyclists and pedestrians) between Old Windsor Road shared path and Swansea Court, approximately 50 metres in length
- Regrading a section of the existing shared path along Old Windsor Road (to 1:20 grade)
- Installation of a new 1.5 metre wide footpath on the eastern side of Sharrock Avenue between Swansea Court and Nixon Street
- Installation of a new 1.5 metre wide footpath on the southern side of Cramer Place between Swansea Court and Glenwood Park Drive
- Utility relocations where required
- Installation of retaining walls along Old Windsor Road shared path
- Landscaping and lighting.

Provision for parking management and CCTV would be considered, in consultation with Blacktown City Council.



JACOBS NEW SPATIAL - GIS MAP FILE: W0106500_GIS_GPL_7002_r02_Proposal | 20.10.2018

KEY

- Proposed extent of works
- Proposed pathways
- Pedestrian link
- Glenwood pedestrian bridge
- Old Windsor Road shared path
- Property boundaries



Figure 1-4 Extent of the proposal

1.3. Proponent and delivery

TfNSW is the proponent of this proposal. The proposal would be constructed by a contractor to be engaged by Sydney Metro. The engaged contractor would carry out all activities required (subject to determination) including demolition, site establishment, excavation, relocation of affected utility services (where required), construction of the pedestrian link and all other footpath works and all remaining works such as landscaping.

1.4. Purpose of this Review of Environmental Factors (REF)

This REF describes the proposal (refer to Chapter 3), documents its likely environmental and social impacts (refer to Chapter 7) and details the measures that would be implemented to safeguard and manage against any adverse effects (refer to Chapter 8). The REF has been prepared to meet the environmental assessment requirements of Part 5, Division 5.1 of the EP&A Act (refer to Section 5.2.1).

The description of the proposal and associated environmental impacts have been undertaken in the context of Clause 228(2) of the Environment Planning and Assessment Regulation 2000 (NSW Government, 2000a), the *Biodiversity Conservation Act 2016* (BC Act) and the *Commonwealth Government’s Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth Government, 1999).

The REF helps fulfil the requirements of section 5.5 of the EP&A Act; namely that TfNSW ‘examines and takes into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the [proposed] activity’.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the need for an EIS to be prepared and approval to be sought from the Minister for Planning and Environment under Part 5, Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species, populations and communities as defined by the *Biodiversity and Conservation Act 2016*, in accordance with section 1.7 of the EP&A Act and therefore the requirement to prepare a species impact statement (SIS).
- The potential for the proposal to significantly impact a Matter of National Environmental Significance (MNES) or Commonwealth land and the need to make a referral to the Commonwealth Department of the Environment and Energy for a decision by its Minister on whether assessment and approval is required under the EPBC Act (refer to Section 5.3).

1.5. Structure and content of the REF

The structure and content of the REF is outlined in Table 1-1.

Table 1-1 Structure and content of the REF

Chapter	Description
Chapter 1 – Introduction	Outlines the background of the proposal.
Chapter 2 – Need for the proposal	Outlines the need for the proposal
Chapter 3 – Options development and selection	Provides an overview of the options that were considered during the selection of the location and style of the pedestrian link and its strategic need.

Chapter	Description
Chapter 4 – Description of the proposal	Provides a detailed description of the proposal, including the elements of the proposal, and construction, operation and maintenance requirements.
Chapter 5 – Statutory considerations	Outlines the relevant environmental planning instruments and policies and provides an assessment of their relevance to the proposal.
Chapter 6 – Stakeholder and Community Consultation	Outlines how the community and stakeholders have been, and will continue to be, involved in the proposal’s development, assessment and construction phases. This chapter also summaries the issues raised by stakeholders during the preparation of the REF.
Chapter 7 – Environmental impact assessment	Provides an assessment of the potential impacts of the proposal on traffic and transport, noise and vibration, Aboriginal heritage, non-Indigenous heritage, air quality, biodiversity, soils, hydrology and water quality, sustainability, visual, resource use, utilities and waste management and cumulative impacts.
Chapter 8 – Environmental management and mitigation	Outlines the proposed environmental management systems to be implemented and provides the management and mitigation measures during the construction, operation and maintenance of the proposed substation, to manage the impacts identified in the REF.
Chapter 9 – Justification and conclusion	Provides the justification for the proposal and an outline of the key conclusions of this report.

The REF is supported by Noise and Vibration and Landscape and Visual key technical papers, which provide detailed assessment of specific environmental issues associated with the proposal. These technical papers form appendices to this REF and have been used to inform the REF as follows:

- *Noise and Vibration assessment (SLR, 2018)*
- *Landscape and Visual impact assessment (IRIS, 2018).*

2. Need for the proposal

This Chapter discusses the need and objectives of the proposal.

2.1. Need for the proposal

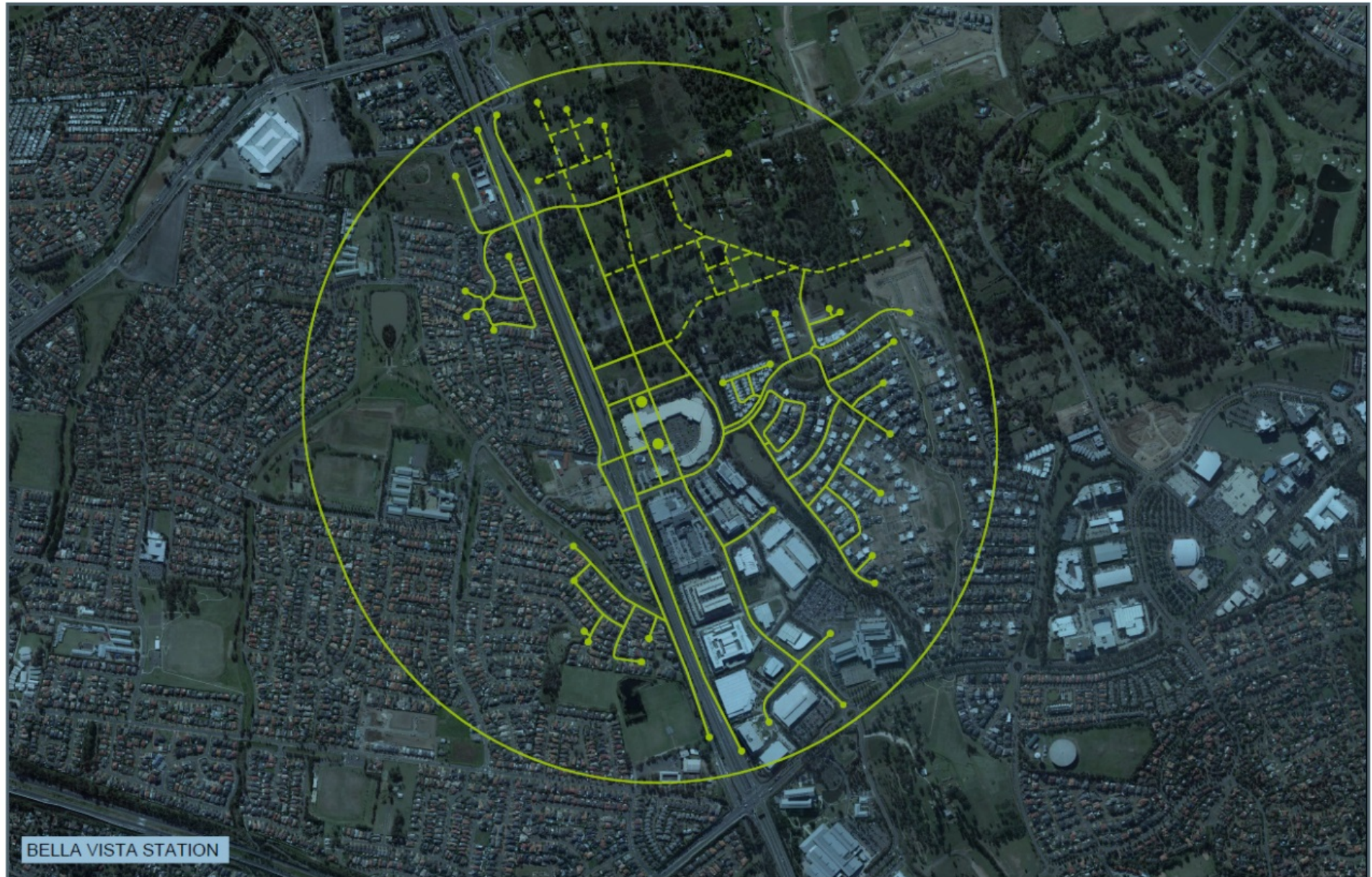
The NSW Government is committed to facilitating and encouraging the use of public Transport by making Sydney Metro stations more accessible, and improving interchange with other modes of transport such walking, cycling, bus, taxi and private vehicle.

To improve pedestrian access to Bella Vista Station, a pedestrian bridge is being constructed across Old Windsor Road, approximately 100 metres north of Celebration Drive. The bridge will land adjacent to the southern entry of Bella Vista Station on the eastern side of Old Windsor Road, and adjacent to the Emmanuel Baptist Church and Trades Norwest Anglican Senior College on the western side. The pedestrian bridge will ameliorate the lengthy crossing times currently experienced by pedestrians crossing Old Windsor Road. This pedestrian bridge was proposed and approved in 2013 under the Sydney Metro Northwest project approval and is currently under construction.

Despite the provision of this pedestrian bridge, pedestrian access between the suburb of Glenwood and the station is still constrained. Formal pedestrian access points exist at Emmanuel Terrace, Arnold Place and Miami Street with fences and noise barriers impeding access for almost one kilometre in between. Despite living in close proximity to Bella Vista Station, the majority of the Glenwood community would have limited options for accessing the station. Station access would be limited to bus and private vehicle for most Glenwood residents, resulting in further traffic congestion at key intersections such as Old Windsor Road and Miami Street. This also produces an inequitable access situation for residents of the Blacktown LGA in contrast with those residing in The Hills LGA suburb of Bella Vista. Existing pedestrian access arrangements are highlighted in Figure 2-1.

A number of pedestrians and cyclists currently use informal access through the grounds of the Emmanuel Baptist Church, which creates the potential for safety, security and liability issues. The introduction of Sydney Metro services is likely to see an increased demand for pedestrian and cyclist access between Old Windsor Road and the Glenwood residential area, potentially increasing trespassing through the Emmanuel Baptist Church and other private property. Pedestrian access through the Emmanuel Baptist Church grounds is already restricted at certain times of the day and could potentially be restricted further if impacts increase.

These factors led to the need to investigate opportunities to improve pedestrian access between the Glenwood residential area and Old Windsor Road. A number of options have been investigated and are detailed in Chapter 3.



BELLA VISTA STATION

LEGEND

- STATION ENTRY
- 1KM RADIUS FROM STATION ENTRIES
- <1000m WALKING ROUTE FROM STATION ENTRY
- - - <1000m WALKING ROUTE FROM STATION ENTRY (FUTURE ROADS)

⊙
A3 SCALE 1:10000

Figure 2-1 Existing one kilometre walking catchment for Bella Vista Station via formal access route

2.2. Proposal objectives

The proposal's specific objectives are:

- Provide a dedicated pedestrian link to improve pedestrian and cyclist access to Bella Vista Station from the Glenwood residential area on the western side of Old Windsor Road. This would minimise private vehicle use to access the station, while seeking to achieve an equitable access outcome for Glenwood residents
- Maximise use of the pedestrian bridge over Old Windsor Road, which is being provided as part of the wider Sydney Metro Northwest project
- Support planned future land use changes and urban growth in the area by improving access to Old Windsor Road and Bella Vista Station, while contributing to the environmental and social sustainability of the area as it continues to expand and develop
- Improve linkages between the existing Glenwood pedestrian network and the broader regional pedestrian and cyclist network.

2.3. Benefits of the proposal

The proposed pedestrian link would provide the Glenwood community with a number of benefits, as follows:

- Improve access to Sydney Metro services, T-Way bus services, Norwest Business Park and the regional shared path network from the Glenwood residential area (refer to Figure 2-2)
- Place more than 700 Glenwood households (or 2500 residents) within a 15 minute walk from Bella Vista Station
- Better connect Glenwood High School and Parklea Public School to T-Way and Sydney Metro services
- Relieve pressure on the local road network, particularly the Miami Street intersection with Old Windsor Road, by providing an option to walk or cycle to the station and allow residents to leave the car at home
- Provide safe access all hours between the Glenwood community and the Old Windsor Road shared path
- Provide opportunities to expand and connect open space networks and the broader pedestrian and cyclist network
- Improve equitable station access for Blacktown LGA residents.



Figure 2-2 Bella Vista Station 15 minute walking comparison, with and without the proposed link

3. Options development and selection

This Chapter outlines the options considered for the development of the Glenwood Pedestrian Link.

3.1. Identified options

Following the identification of access issues between Bella Vista Station and Glenwood residential area, TfNSW investigated options to improve access for the Glenwood community. These options were compared against a “do nothing” scenario.

3.1.1. Do nothing option

The “do nothing” scenario would make no changes to the existing access situation between Glenwood and Old Windsor Road. Glenwood residents living within walking distance of Bella Vista Station would have limited access to the pedestrian bridge being constructed over Old Windsor Road, and subsequently to Bella Vista Station.

There is evidence that a number of pedestrians and cyclists currently access the T-Way stop on Old Windsor Road through private property via the Emmanuel Baptist Church grounds. Without improved access it is expected that this informal usage would increase. This would exacerbate issues around safety, security and liability for the Emmanuel Baptist Church. Traffic and parking impacts around this informal access point would be likely to increase once Sydney Metro services commence. The do nothing scenario would continue to encourage the use of cars to access the new station and Old Windsor Road from Glenwood, contributing to an already congested road network into and out of the Glenwood area.

Without access improvements no area of Glenwood would fall within 600 metres of the station entrance via the existing formal access routes. By not delivering improvements to access, residents of Blacktown LGA will be disadvantaged by poorer access to Sydney Metro and T-Way services than neighbouring suburbs located within The Hills LGA.

3.1.2. Proposal location options

Description

Three options were considered for the proposal location. These are shown on Figure 3-1 and described below.

Option 1: North

This option would comprise the construction of a pedestrian link to the north of the Old Windsor Road pedestrian bridge, into Swansea Court or Sharrock Avenue.

Option 2: South

This option would comprise the construction of a pedestrian link to the south of the Old Windsor Road pedestrian bridge, into Vanessa Circuit or Maley Grove.

Option 3: Church/School

This option would provide a formalised pedestrian link through the Emmanuel Baptist Church and Trades Norwest Anglican Senior College grounds. Informal access currently occurs through these properties.

An overview of the three options considered are shown in Figure 3-1.



KEY

Link options

- 1: North
- 2: South
- 3: Church/School

- Bella Vista Station entry locations
- Bella Vista Station Precinct
- Glenwood pedestrian bridge



Figure 3-1 Locations considered for the Glenwood pedestrian link

Assessment of proposal locations

















A Multi-Criteria Analysis (MCA) was completed to compare the three options against the do nothing approach. The MCA made an assessment taking into consideration the following:

- **Improved Amenity** – Consideration of passive surveillance, sight lines through the pedestrian link for users, lighting impacts, connections to the existing pedestrian network, potential for pedestrian-vehicle conflict, and requirements for property protection
- **Access** – Included both increase in the station walking catchment and the ability of the street network to accommodate increased vehicle numbers
- **Local Impacts** – This included consideration of traffic and parking impacts, noise, and construction impacts on local residents
- **Value** – Acquisition and construction costs, and ongoing maintenance considerations.

The results of the MCA are summarised in Table 3-1, where:

- **Green** indicates minimal issues, or notes issues can be resolved through the project, and maximum benefit from investment
- **Yellow** indicates some issues, which may not be resolvable but are still acceptable, with a compromised benefit from investment
- **Red** indicates prohibitive issues that render this option unsuitable for this criteria and largely unredeemable through further project work.

Table 3-1 Summary of the MCA results for the three proposal locations

Measure of Assessment	Do-Nothing	Option 1 - North	Option 2 – South	Option 3 – Church/School
Improved Amenity				
Access				
Local Impacts				
Value for Money				

The results of the MCA assessment determined Option 1 (North) as the best location, based on its ability to meet the objectives of the proposal. Option 1 would improve pedestrian and cyclist access to the widest catchment, maximising equitable access for the greatest number of households. It also provides access to a broader street network than either Option 2 or 3, which can help offset parking and car access issues that may arise as part of the operation of the proposal. The location of the pedestrian link allows for a design that maximises user and local amenity.

Of the three proposal location options, Option 2 (South) achieved the least improvement in access and would have the worst traffic impacts on local streets.

Formalising the existing informal access through the Emmanuel Baptist Church grounds (Option 3) would have significant utility, gradient and easement hurdles to negotiate, and safety issues regarding fencing and visibility. The church option could not be made compliant with accessibility standards under the *Disability Discrimination Act 1992* (DDA) without prohibitive cost. Parking issues would be likely to have a wider community impact, as

well as specific impacts on local property owners, particularly the Emmanuel Baptist Church. While residential access is improved through this option, it is limited by the existing road network and drainage system within Glenwood.

All options would have local impacts, including implications for parking and access. Not providing a link would have the poorest access outcomes for the community, with parking impacts still driven by the existing informal access route through the Emmanuel Baptist Church grounds. This indicates that, regardless of outcome, parking and traffic management will need to be an integral part of the proposal assessment.

The one kilometre walking catchments via formal access routes for the do nothing option, Option 1 (North), Option 2 (South) and Option 3 (school/church) are shown in Figure 3-2 to Figure 3-5.



BELLA VISTA STATION

LEGEND

- STATION ENTRY
- 1KM RADIUS FROM STATION ENTRIES
- <200m WALKING ROUTE FROM STATION ENTRY
- 200-400m WALKING ROUTE FROM STATION ENTRY
- 400-600m WALKING ROUTE FROM STATION ENTRY
- 600-800m WALKING ROUTE FROM STATION ENTRY
- 800-1000m WALKING ROUTE FROM STATION ENTRY
- <200m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
- 200-400m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
- 400-600m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
- 600-800m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
- 800-1000m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)



A3 SCALE 1:10000

Figure 3-2 one kilometre walking catchment via formal access routes from Bella Vista Station – do nothing option

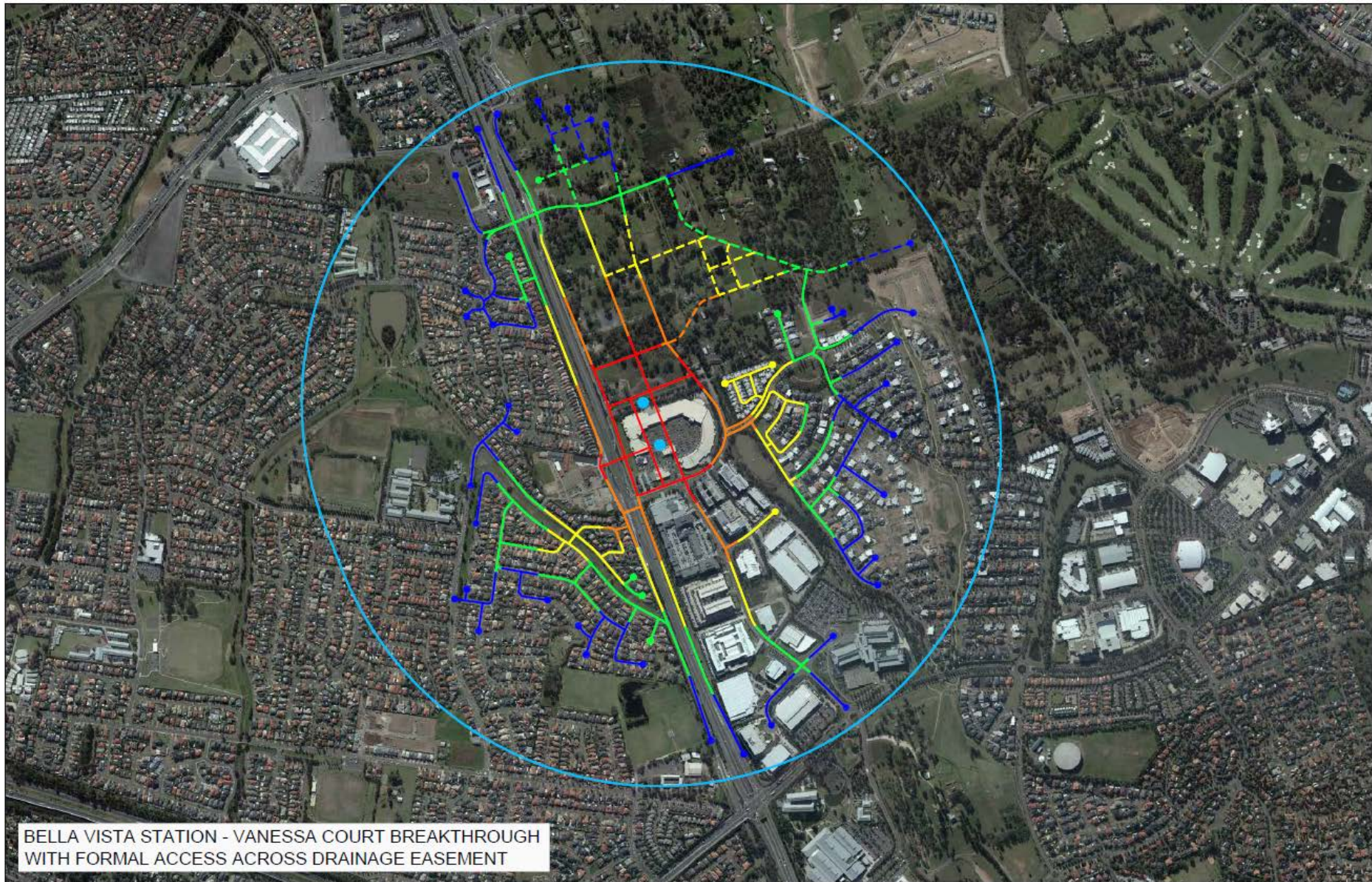


BELLA VISTA STATION - SHARROCK AVENUE BREAKTHROUGH WITH FORMAL ACCESS ACROSS DRAINAGE EASEMENT

LEGEND			
STATION ENTRY	<200m WALKING ROUTE FROM STATION ENTRY	<200m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)	
1KM RADIUS FROM STATION ENTRIES	200-400m WALKING ROUTE FROM STATION ENTRY	200-400m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)	
	400-800m WALKING ROUTE FROM STATION ENTRY	400-800m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)	
	800-1000m WALKING ROUTE FROM STATION ENTRY	800-1000m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)	
	800-1000m WALKING ROUTE FROM STATION ENTRY	800-1000m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)	

A3 SCALE 1:10000

Figure 3-3 one kilometre walking catchment from Bella Vista Station – Option 1 (north)



BELLA VISTA STATION - VANESSA COURT BREAKTHROUGH WITH FORMAL ACCESS ACROSS DRAINAGE EASEMENT

LEGEND					
	STATION ENTRY		<200m WALKING ROUTE FROM STATION ENTRY		<200m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
	1KM RADIUS FROM STATION ENTRIES		200-400m WALKING ROUTE FROM STATION ENTRY		200-400m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
			400-600m WALKING ROUTE FROM STATION ENTRY		400-600m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
			600-800m WALKING ROUTE FROM STATION ENTRY		600-800m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
			800-1000m WALKING ROUTE FROM STATION ENTRY		800-1000m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)

A3 SCALE 1:10000

Figure 3-4 one kilometre walking catchment from Bella Vista Station – Option 2 (south)



BELLA VISTA STATION - SCHOOL/CHURCH BREAKTHROUGH WITH FORMAL ACCESS ACROSS DRAINAGE EASEMENT

LEGEND

● STATION ENTRY

○ 1KM RADIUS FROM STATION ENTRIES

- <200m WALKING ROUTE FROM STATION ENTRY
- 200-400m WALKING ROUTE FROM STATION ENTRY
- 400-800m WALKING ROUTE FROM STATION ENTRY
- 800-1000m WALKING ROUTE FROM STATION ENTRY

- - - <200m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
- - - 200-400m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
- - - 400-800m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)
- - - 800-1000m WALKING ROUTE FROM STATION ENTRY (FUTURE ROAD)



A3 SCALE 1:10000

Figure 3-5 one kilometre walking catchment from Bella Vista Station – Option 3 (School/church option)

3.1.3. Preferred property site

Following confirmation of Option 1 (North) as the preferred general location, the actual location of the new pedestrian link required consideration of a number of private properties located to the north of the pedestrian bridge. A MCA approach was used comprising the following criteria as adopted by TfNSW to select the preferred property:

- Safety
 - Natural surveillance
 - Visibility & sight lines (through site)
 - User conflict (safe crossing points)
- Access
 - Distance from bridge
 - Meets pedestrian and cyclist desire lines
 - Accommodates kiss & ride activity
- Neighbourhood amenity/impacts
 - Traffic impacts
 - Parking impacts
 - Noise impacts
- Design & Construction
 - Site levels
 - Utilities.

The results of the MCA assessment determined that 1 Swansea Court would be the most appropriate location for the Glenwood Pedestrian Link based on the above criteria.

3.1.4. Concept design options

Consultants were engaged by TfNSW to develop a concept design for the preferred site. Eight design options were considered for the pedestrian link. The concept options were developed following consultation with relevant stakeholders. The options covered a range of design solutions to include a variety of construction works, customer experience, compliance and intervention levels. Each option offered a buildable solution to provide a pedestrian link between Glenwood and the existing shared path at Old Windsor Road. The eight design options were reviewed in regards to meeting the objectives of the proposal. Three options were found to meet the proposal's objectives and were shortlisted. Further details of the concept design options considered can be found in Appendix A.

The assessment process to determine a preferred concept design focused on providing a safe and attractive link that provided the required access while minimising impacts to neighbouring properties. Visual impacts to the existing streetscape, along with noise, privacy, safety, passive surveillance, landscaping opportunities and DDA compliance were all taken into consideration.

The preferred concept design was best able to achieve these objectives from the options available. The existing level difference between the Old Windsor Road shared path and the street level of Swansea Court and Sharrock Avenue limited the options available to achieve DDA compliance. Adjusting the gradient of a section of the existing shared path along Old Windsor Road provided scope to minimise overlook into neighbouring properties and

maintain privacy. The final preferred design features adjustments to the existing shared path on Old Windsor Road to incorporate these considerations for neighbouring properties.

Further details of the preferred concept design are provided in Chapter 4.

3.2. Preferred option (the proposal)

The preferred option for the pedestrian link (the proposal) consists of a 2.5 metre wide shared path extending from Swansea Court to the Old Windsor Road shared path. The proposed pedestrian link would feature:

- A 1 in 14 gradient pathway with handrails to comply with accessibility standards
- The pedestrian link would be approximately 50 metres long
- New trees and low plantings would be provided and would be selected to ensure clear visibility through the pedestrian link
- Adjustments to the existing three metre wide shared path on Old Windsor Road. Regrading of the shared path below the existing fence line to reduce privacy impacts on neighbouring properties
- New hedge planting would also provide screening to neighbouring properties
- Kerb ramps would be provided across Swansea Court to provide pram, wheelchair and bicycle access, and footpaths would be extended along the southern side of Cramer Place and the eastern side of Sharrock Avenue to connect into the existing footpath network at safe crossing locations.

An overview of the concept design for the preferred option is provided in Figure 3-6 and described in detail in Chapter 4.



- | | | |
|---|---|--|
| <ol style="list-style-type: none"> 1. New pedestrian footpath 2. Existing trees removed to allow for footpath and clear viewlines 3. 2.5m wide concrete shared path 4. 1:14 ramps and landings with continuous stainless steel handrail to both sides 5. Existing tree retained 6. Turf | <ol style="list-style-type: none"> 7. Mass planting 8. Pedestrian light pole 9. Tree 10. Existing services and pits to be re-aligned where necessary to tie in to proposed levels 11. Existing fence retained with new hedge planting to provide screening to houses | <ol style="list-style-type: none"> 12. Old Windsor Road shared path regraded at max 1:20 13. Retaining wall adjacent existing boundary wall / fence 14. Trees and mass planting to replace existing trees to be removed 15. Retaining wall along Old Windsor Road. Adjacent levels to be battered to ensure max 1m wall height. All trees requiring removal are to be replaced with new trees. |
|---|---|--|

Figure 3-6 Preferred concept design of the pedestrian link

4. Description of the proposal

This Chapter provides a detailed description of the proposal.

4.1. Overview of the proposed activity

The proposal aims to provide a dedicated link to improve pedestrian and cyclist access between the Glenwood residential area and the existing Old Windsor Road shared path, in order to improve pedestrian and cycle access for the Glenwood community to the new Bella Vista station and pedestrian bridge.

The proposal would comprise the following key elements:

- Acquisition and demolition of a residential property (1 Swansea Court, Glenwood)
- Construction of a 2.5 metre wide shared path (for pedestrians and cyclists) between the Old Windsor Road shared path and Swansea Court, approximately 50 metres in length
- Regrading a section of the existing shared path along Old Windsor Road (to 1 in 20 grade)
- Installation of a new 1.5 metre wide footpath on the eastern side of Sharrock Avenue between Swansea Court and Nixon Street
- Installation of a new 1.5 metre wide footpath on the southern side of Cramer Place between Swansea Court and Glenwood Park Drive
- Utility relocations where required
- Installation of retaining walls along Old Windsor Road shared path
- Landscaping and lighting.

Provision for parking management and CCTV would be considered, in consultation with Blacktown City Council.

The proposal would provide new 1.5 metre wide footpaths to provide connections to the existing pedestrian footpath network. These are shown in Figure 4-1. Currently footpaths are only provided on the western side of Sharrock Avenue and the northern side of Cramer Place within the vicinity of the proposed pedestrian link.

An artist's impression of the preferred concept design for the proposed pedestrian link is provided in Figure 4-2 and Figure 4-3.

An indicative cross section of the proposed pedestrian link is provided in Figure 4-4 and Figure 4-5.



Figure 4-1 Extent of existing and proposed footpaths



Figure 4-2 Artist impression of the proposal showing the shared path and landscaping, view from Swansea Court towards Old Windsor Road



Figure 4-3 Artist impression of the proposal, view from the eastern side of the proposal from Old Windsor Road to Swansea Court



Figure 4-4 Indicative cross section of the proposed pedestrian link (looking north)



Figure 4-5 Indicative cross section of the proposed pedestrian link (looking east towards Old Windsor Road Shared path)

4.2. Design

The proposal's concept design is described in this section. The concept design includes sufficient information to:

- Identify the required permanent property acquisition needed for the proposal
- Understand and assess the nature and extent of the proposal's likely impacts
- Provide flexibility in developing the detailed design while having regard to reasonable and feasible safeguards and management measures to minimise environmental and social impacts
- Facilitate community and key stakeholder feedback.

4.2.1. Overall design objectives and principles

The proposal has been designed to be consistent with the principles, standards and criteria adopted.

Objectives

The proposed pedestrian link would provide a new connection between the Glenwood residential area and the shared path on Old Windsor Road, allowing improved pedestrian access between the Glenwood residential area and Bella Vista Station. The project specified objectives are defined in Section 2.2.

Design principles

The pedestrian link should:

- Increase the number of households within a 15 minute walk to Bella Vista Station
- Improve linkages between the existing Glenwood pedestrian network and the broader regional pedestrian and cyclist network
- Provide access for all customers
- Provide a safe and secure environment for customers moving through the pedestrian link
- Offer an urban and landscaping design which is reflective of local characteristics and amenity
- Minimise potential impacts to adjacent residents (privacy, noise, antisocial behaviour).

Safety in design

The following key safe design features would be implemented under the proposal:

- The use of fire-retardant materials in the design
- A lighting design that ensures that the pedestrian link is lit using sensitive directional/zone lighting
- Clear directional signage to ensure pedestrians and cyclists move through the pedestrian link quickly and effectively
- Outside lighting areas to provide a safe environment
- Provision of anti-slip surfaces for pedestrians and cyclists.

The above provisions would be largely provided through installing a range of operations systems and building services as described below.

TfNSW is committed to designing safe places for pedestrians and cyclists through the application of the Crime Prevention Through Environmental Design (CPTED) principle. In 2001, the Department of Planning and Environment (DPE) released the NSW Government's guidelines as to how CPTED should be implemented under the NSW EP&A Act. The guidelines include a number of principles that have been adopted in the proposal's design to allay operational safety concerns. They include:

- For the pedestrian link to have end to end visibility
- For natural observation to be maximised by providing lines of sight throughout the pedestrian link and its connection into Bella Vista Station, including the supporting furniture, while also minimising the use of narrow corridors and hidden corners
- The use of natural access control through considered urban design that guides pedestrians and cyclists to appropriate entries
- The adoption of 'territorial reinforcement' through design that clearly delineates public areas from non-public areas

- The link and entrance being safe and attractive places to travel through, supported by the use of appropriate lighting.

Engineering constraints

The design and construction of the proposal needs to consider a number of issues and constraints. These include:

- Traffic, transport and access: access to the proposal site is narrow and close to neighbouring properties (Swansea Court, Sharrock Avenue and Cramer Place). The local network is narrow with poor connections to major roads. The preferred property is located in a cul-de-sac
- Utilities: utilities may be required to be relocated with potential for impacting underground or above ground services
- Levels: existing level difference between Old Windsor Road and Sharrock Avenue/Swansea Court.

Environmental constraints

The design and construction of the proposal needs to consider a number of environmental constraints. these include:

- Traffic, transport and access: changes to local traffic and parking conditions in the vicinity of the proposal. As an access point to the station, there may be additional commuter parking and pick-up/drop-off pressures on streets adjacent to the link, including Sharrock Avenue, Swansea Court, Cramer Place, Nixon Street and Adrian Street
- Biodiversity: removal of up to 20 planted trees may be required along the Old Windsor Road shared path
- Noise: close proximity to neighbouring properties and the potential noise increase to residents during operation.

4.3. Key components of the proposal

4.3.1. General construction approach

An indicative construction method, staging, plant and equipment requirements, anticipated material requirements and traffic management controls are described below. An indicative construction plan is also provided. The actual construction plan and method may vary from the description provided in this section due to the identification of additional constraints pre-construction, ongoing detailed design refinements, community consultation feedback, and construction contractor requirements/limitations.

4.3.2. Work method

Work on the proposal would only take place within the areas specified and assessed in this REF. It would be completed in accordance with the safeguards and management measures included in Chapter 8 and any refinement to these during the approvals process.

4.3.3. Work method overview

The proposal would be constructed in stages, broadly comprising:

- Stage 1: site establishment (including surface clearance and the demolition of existing structure at 1 Swansea Court)
- Stage 2: construction (on site)

- Earthworks and excavation
- Civil and building work
- Pre-commissioning and commissioning – very minor (i.e. lighting checks)
- Stage 3: treatments and vegetation planting
- Stage 4A: Sharrock/Cramer footpath construction
- Stage 4B: Old Windsor Road shared path modifications and construction
- Stage 5: demobilisation.

4.4. Ancillary facilities

The only supporting ancillary facilities would be a small temporary construction compound and laydown area located within the existing property boundary at 1 Swansea Court. This would be used to temporarily store materials required for immediate use. It would also be used to temporarily store excavated spoil prior to its removal offsite.

4.5. Construction plant and equipment

The proposal would be constructed using various plant and equipment, outlined in Table 4-1.

Table 4-1: Plant and equipment – indicative only

Scenario	Activity	Equipment
Demolition of house	Demolition	Excavator (Breaker)1
		Excavator (30 tonne)
		Hand Tools (electric)
	Removal of rubble	Excavator (30 tonne)
		Truck (Tippers and Bogies)
	Earthworks/Levelling	Excavator (20T tonne)
		Truck (Tippers and Bogies)
		Bobcat
		Hand Tools (electric)
Ute		
Landscaping	landscaping and planting of trees	Bobcat
		Grout Mixer & Pump
		Truck (10 tonne)
		Hand Tools (electric)
		Ute
Low lighting	Install lighting	Ute
		Excavator (1.5 tonne)
		Hand Tools (electric)
		Truck (HIAB)
		Elevated Working Platform
		Franna Crane
Concrete foot path	Earthworks/Preparation	Excavator (15 tonne)
		Truck (Tippers and Bogies)

Scenario	Activity	Equipment
		Compactor
		Hand Tools (electric)
		Ute
	Concrete works	Truck (Tippers and Bogies)
		Concrete Truck / Agitator
		Hand Tools (electric)
		Ute
		Concrete pump
		Concrete vibrator and compressor
Compound	Compound Establishment	Crane (small)
		Truck (HIAB)
		Ute
	Compound Operation	Ute
		AC Unit
Utility relocation	Utility relocation in cycleway	Saw cutting
		Excavator (15 tonne)
		Compactor
Cycleway regrading	earthworks/Preparation	Excavator (15 tonne)
		Truck (Tippers and Bogies)
		Compactor
		Hand Tools (electric)
		Ute
Concrete pathways surrounding the site (Cramer Place and Sharrock Avenue)	Concrete works	Truck (Tippers and Bogies)
		Concrete Truck / Agitator
		Hand Tools (electric)
		Ute
		Concrete pump
		Saw cutting

4.6. Resources and waste

4.6.1. Resources, materials and sourcing

The types and quantities of resources and materials needed to construct the proposal would be confirmed during detailed design. These materials would be obtained through established contractors.

TfNSW's sustainable procurement requirements aim to procure the material locally, that contains a high recycled content and a low embodied energy. Materials that are cost and performance competitive and comparable in environmental performance would be obtained.

Notably, these materials are widely available across the Sydney metropolitan area. They would be transported to the proposal site on an 'as needed' basis.

4.6.2. Waste

While the main waste stream would result from the demolition of the house on 1 Swansea Court, a number of other construction wastes would be generated although to a limited extent.

Waste would be segregated at source where feasible allowing it to be transported offsite either directly to another part of the Sydney Metro Northwest project, to another project site (again for reuse), or to a licenced waste handling or disposal facility.

Any required testing and classification would also take place in situ onsite.

All waste would be appropriately stored within the proposal site prior to its transfer offsite.

4.7. Traffic management, access, controls and signage

The following traffic management and access measures would be developed during the detailed design. They would be implemented under a Construction Traffic Management Plan (CTMP), prepared as part of the overall Construction Environmental Management Plan (CEMP) (refer to Section 8.2.1).

4.7.1. Overall traffic management

In constructing the proposal, the following activities would take place that have associated traffic management implications:

- (a) Site establishment
- (b) Service relocations
- (c) Installation of erosion and sediment controls
- (d) Pedestrian diversions
- (e) Vegetation clearing, grubbing and planting
- (f) Materials and equipment delivery (including low loaders and oversize vehicles)
- (g) Spoil haulage
- (h) Street furniture, fabrications and fittings
- (i) Footpath and pavement reinstatement
- (j) Post work treatments and reinstatement.

4.7.2. Road traffic, pedestrians and cyclists

During an indicative 16 week construction period there would be a requirement for trucks and heavy vehicles to access and leave the site. Primary access would be off Swansea Court, with intermittent access from Old Windsor Road where feasible.

Access to the proposal site may be signal controlled by signals or traffic controllers, either part time or full time. Very occasionally there may be the need for a road or lane closure to carry out work on the Old Windsor Road shared path. Road closures would take place outside of peak periods.

There would also be routine construction material deliveries to, and the removal of waste from, the site. On average up to ten trucks or concrete trucks would arrive and leave the site at regular intervals throughout each working day during peak construction. Construction workers would additionally travel to and from the site during construction. They would be likely to park in surrounding streets and likely walk to site. Community and residential access would be maintained during construction (refer to Section 7.2).

In terms of pedestrians and cyclists, there would be a requirement to implement a temporary diversion around the proposal during temporary closure of the Old Windsor Road shared path. The diversions would be signposted where required.

Emergency vehicle access would be maintained at all times, with a management provision included to allow for this during a major delivery.

4.7.3. Controls and signage

The CTMP would detail traffic management controls required to maintain access, and traffic and pedestrian safety. The plan would also contain specific traffic and pedestrian control plans.

Temporary signage and traffic management controls would be implemented around the proposal site. These signs would describe the changes in traffic and pedestrian conditions, and identify any diversion routes. Given the proposal's location it is not expected that significant traffic controls and signage measures would be needed.

4.7.4. Site access and haul routes

The proposal site would generally be accessed and exited via Swansea Court. As noted above, up to 10 trucks and concrete trucks would need to enter and leave the proposal site at regular intervals across the day. The identified temporary traffic management controls would be implemented to allow these vehicles to safely enter and leave site.

There may be at times a requirement to access the site via Old Windsor Road for utility relocations and retaining wall works.

Construction materials would be transferred to the site by road, primarily by Glenwood Park Drive and Sharrock Ave or Cramer Place.

Equally, generated waste would be transferred offsite using licenced contractors. The location to where the waste would be transferred for reuse, reprocessing or disposal would depend on its nature, type and classification (refer to Section 7.10). The waste would be hauled from the construction compound within 1 Swansea Court and transported to either an intermediary or end-use location. This would be determined and confirmed prior to construction.

4.8. Workforce

During peak construction, there would be expected to be up to 10 people working onsite on average. Workers would be expected to use public transport or travel by car.

4.9. Out of hours work

The NSW Interim Construction Noise Guidelines 2009 (NSW EPA, 2009) have identified 'recommended standard hours for construction work'. They have been established to preserve the local amenity of an area at certain times depending on the surrounding land use.

Works would generally be scheduled during standard construction hours namely:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm Saturday
- No work on Sundays or during public holidays
- Out of Hours Works may be required for utility relocations.

4.10. Operation and maintenance

Once commissioned, the pedestrian link would be regularly maintained. Landscaping would be trimmed and lawns mowed, any litter would be removed.

4.10.1. Operation

The pedestrian link would operate 24 hours a day seven days a week to provide access and connectivity with Glenwood and its surrounding infrastructure. It is expected that peak use would occur during the week between 7.00 am and 9.00 am and 5.00 pm and 6.30 pm.

4.10.2. Ongoing maintenance

The proposal would be placed on a routine cleaning, inspection and maintenance schedule. It is expected that maintenance would be limited to vegetation trimming and care. Maintenance and service vehicles would be able to park within Sharrock Avenue or Swansea Court for maintenance purposes.

4.11. Property acquisition and leasing arrangements

A total of about 400 square metres (0.04 hectares) of land would be needed to construct the proposal. This would affect one residential property. Following appropriate consultation and landowner agreement, TfNSW plans to acquire 1 Swansea Court to construct the pedestrian link between the shared path on Old Windsor Road and Swansea Court. This acquisition would result in the loss of one residency within Glenwood. Table 4-2 provides the property acquisition details.

The additional footpath and utility works are within land managed by Roads and Maritime Services or Blacktown City Council.

Table 4-2 Property acquisition details

Lot and DP	Current land use	Area (m ²)
Lot 546 DP1009539	Residence	400 - approximate

5. Statutory considerations

This chapter outlines the relevant NSW government policies and strategies, statutory requirements and explains the environmental planning process and approvals process for the proposal's construction and operation. The environmental planning instruments relevant to the construction and operation of the proposal are also outlined.

5.1. NSW Government policies and strategies

5.1.1. Sydney Metro Northwest Urban Renewal Corridor – Bella Vista Station Precinct

The Bella Vista Station Precinct is part of the Sydney Metro Northwest Priority Urban Renewal Corridor and has been selected in the NSW Government's 'Priority Precincts program' to create new centres around the Sydney Metro Northwest stations.

Following the NSW Government's Priority Precinct announcement, a structure plan for the precinct has been adopted and the land rezoned for increased urban development, as set out in the structure plan and the Finalisation Report (NSW DPE, 2017). This includes 50 hectares of NSW Government owned land adjacent to the new Bella Vista Station and Metro line.

Most of the change would occur to the east of Old Windsor Road, within The Hills LGA. Rezoning of the Bella Vista Station Precinct will be achieved by amending The Hills Local Environmental Plan 2012 through a State Environmental Planning Policy (SEPP). The SEPP will establish the statutory controls for the precinct, including land use zones, maximum building heights, maximum floor space ratios, minimum allotments sizes, and other statutory controls including nondiscretionary clauses to support the rezoning of the precinct.

A Development Control Plan (DCP) will also be made following the rezoning of the precinct and provide supplementary development controls. The DCP will be informed by the draft DCP that was exhibited with the rezoning proposal.

One of the key principles for delivering the vision of the Bella Vista Precinct by 2036 is:

'Improving access and connections to the new station and throughout the precinct through new local roads, improved bus services, pedestrian and bicycle paths, and crossings over creek corridors' (NSW DPE, 2017).

The Glenwood pedestrian link site is located within the western part of the Bella Vista Station Precinct, between Old Windsor Road and Sharrock Avenue/Swansea Court. The new pedestrian / cycle bridge over Old Windsor Road adjacent to Bella Vista station is set out in the 'Infrastructure Schedule' for the Bella Vista Precinct under 'Local transport measures', as is the associated investigation into a pedestrian and cycle connection between Glenwood and the pedestrian / cycle bridge over Old Windsor Road.

5.1.2. NSW Long Term Transport Master Plan

The NSW Long Term Transport Master Plan (TfNSW, 2012a) is a 20-year plan to improve the NSW transport system. It provides the basis upon which further detailed transport planning, including the proposal, can be undertaken. This includes the development of Sydney's Rail Future (TfNSW, 2012b).

The Transport Master Plan considers the future population growth and employment precincts within the State (including Sydney) and outlines the capabilities and limitations of the transport network for all transport modes (including buses, heavy rail, light rail, ferry and private vehicles) to provide clear direction for future transport investigations. A key element of the Transport Master Plan is the need to address congestion coming into and within the

Sydney CBD and includes a proposal to develop the North West Rail Link (now Sydney Metro Northwest) to provide faster single deck trains every five minutes.

The proposal is relevant to the wider development of the Sydney Metro Northwest and would provide improved pedestrian and cyclist connectivity to the nearby Bella Vista Station, which accords with the overall aims of the Transport Master Plan.

5.1.3. Sydney's Rail Future

Sydney's Rail Future is a long-term plan to increase the capacity of Sydney's rail network through investment in new services and upgrading of existing infrastructure. Sydney's Rail Future aims to expand the public transport network to provide turn up and go services for commuters. The five-stage program has been designed to meet the challenges of a growing population and the needs of customers in the future. The plan aims to modernise and transform Sydney's rail network. Sydney's Rail Future forms part of the NSW Long Term Transport Master Plan.

The proposal is relevant to the wider development of the Sydney Metro Northwest and would provide improved pedestrian and cyclist connectivity to the nearby Bella Vista Station, which accords with the overall aims of Sydney's Rail Future.

5.1.4. Sydney's Walking Future

The NSW Government's goal is to get people in Sydney walking more through actions that make it a more convenient, better connected and safer mode of transport. The more people walk, the more socially engaged the community becomes and the safer people feel when walking for transport.

The actions set out in Sydney's Walking Future will make walking the transport choice for quick trips under two kilometres and will help people access public transport. Increasing the number of people walking will help to reduce the burden of congestion on our roads and free up capacity on key public transport corridors.

The proposal accords with the overall goal of Sydney's Walking Future by providing improved accessibility to public transport and reducing travel times for the local community.

5.1.5. Sydney's Cycling Future

The NSW Government's goal is to make cycling a safe, convenient and enjoyable transport option for short trips that can be an easy 20 to 30 minute ride. Sydney's Cycling Future presents a new direction in the way we plan, prioritise and provide for cycling in Sydney. This supports the change in culture we are seeing in Sydney with more people choosing to ride a bike for transport.

The proposal is relevant to the overall goal of Sydney's Cycling Future by providing improved accessibility to public transport and regional cycle routes.

5.2. NSW Legislation and regulations

5.2.1. Environmental Planning and Assessment Act 1979

The proposal comprises an 'activity' for the purposes of Part 5, Division 5.1 of the EP&A Act by reason of clause 79 of State Environmental Planning Policy (Infrastructure) 2007 (ISEPP). Specifically, Clause 79 of ISEPP outlines that the proposal is permissible without the need for development consent when carried out by a public authority.

As the determining authority for the purposes of Part 5, Division 5.1 of the Act, TfNSW must:

- (a) Examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity, in accordance with section 5.5 of the EP&A Act

- (b) Determine whether or not the activity is likely to significantly affect the environment or is likely to significantly affect threatened species, populations and ecological communities in accordance with section 5.7 of the EP&A Act.

Chapter 7 of this REF assesses the likely effect of the proposal on the environment and threatened species, populations and ecological communities. In considering the provisions of sections 5.5 and 5.7 of the EP&A Act, no significant impact on the environment or threatened species is considered likely and therefore neither an EIS, nor an SIS is required.

Clause 228(2) 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 Part 5, Division 5.1 of the EP&A Act has a significant impact on the environment. Appendix B specifically responds to the factors for consideration under clause 228.

The REF document is anticipated to be exhibited and made publicly available during April 2018. During the exhibition period, the community would be encouraged to make submissions to TfNSW on the proposal and information contained in the REF.

Following the exhibition period, TfNSW will consider issues raised in submissions and respond to community and stakeholder feedback in a Response to Submissions Report. If required, TfNSW may also propose changes to the proposal and detail these in the Response to Submissions Report. These documents will be available to the public via the Sydney Metro website (sydneymetro.info/).

Following the preparation of the Response to Submissions Report, TfNSW will determine whether to proceed with the proposal. If the proposal proceeds, it would be designed, constructed and operated in accordance with the mitigation measures outlined in this REF, the Response to Submissions Report and any additional conditions of approval.

The planning approvals process for the proposal under Part 5, Division 5.1 of the EP&A Act is outlined in Figure 5-1.

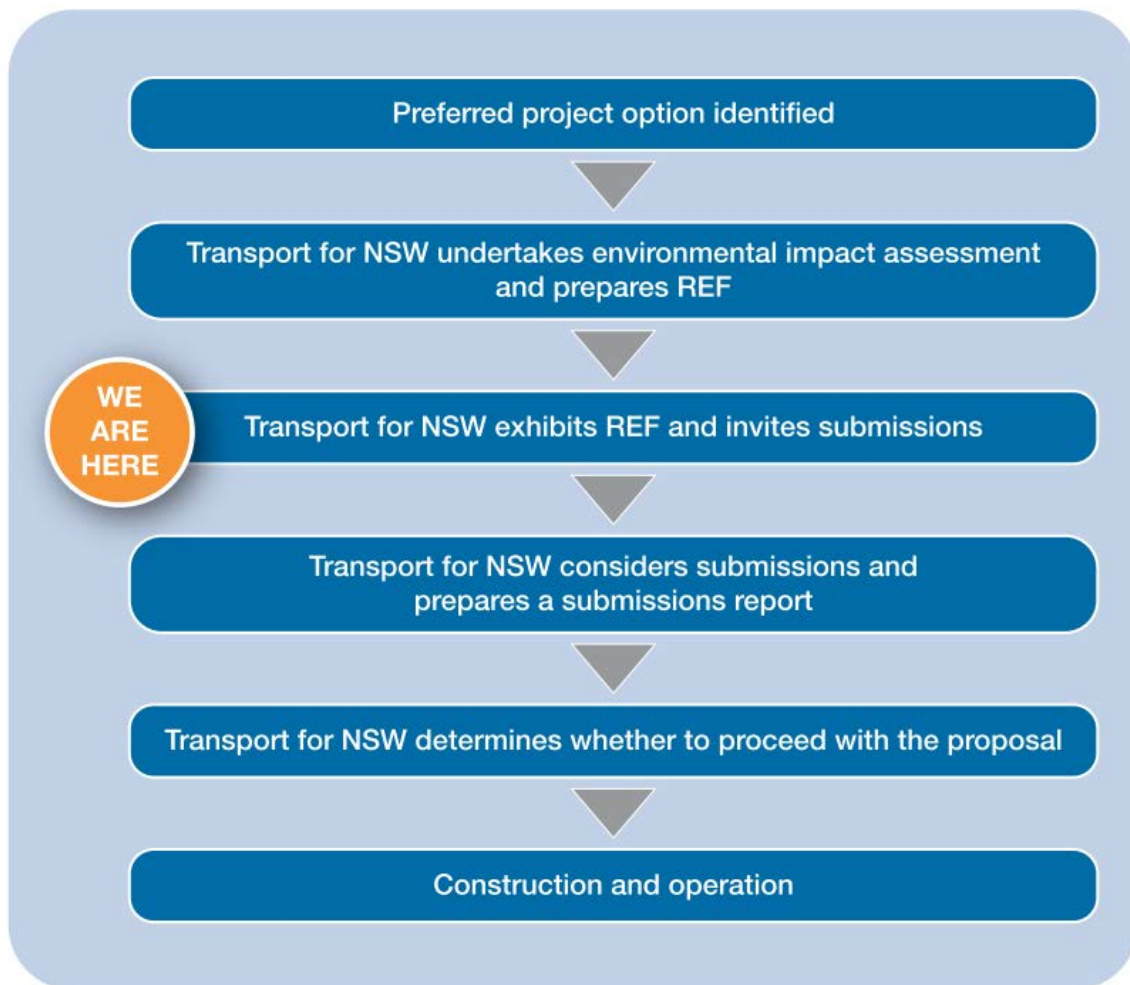


Figure 5-1 Planning approvals process for the proposal

5.2.2. Other relevant NSW legislation

Table 5-1 provides an overview of other relevant NSW legislation that is applicable to the Proposal.

Table 5-1 Other relevant NSW legislation applicable to the proposal

NSW legislation	Requirements for the proposal
<i>Aboriginal Land Rights Act 1983</i>	The <i>NSW Aboriginal Land Rights Act 1983</i> applies to Crown lands that are not lawfully needed for an essential public purpose; referred to as claimable Crown land. No claimable Crown lands would be affected by the proposed modification.
<i>Biodiversity Conservation Act 2016</i>	The <i>Biodiversity Conservation Act 2016</i> provides for the protection of threatened species, populations and ecological communities in NSW. If a threatened species, population or ecological community, or its habitat, is likely to occur in any area that may be affected by the proposal then an assessment of significance (AoS) must be prepared to determine whether the proposal would have a significant impact. If it is concluded that there would be a significant impact, then TfNSW would be required to prepare a SIS for approval by the NSW Office of Environment and Heritage (NSW OEH). Given the highly urbanised and disturbed nature of the proposal site the provisions of this Act would not influence how the proposal would be approved.

NSW legislation	Requirements for the proposal
	<p>The Act has been considered for completeness in accordance with the requirements under Part 5, Division 5.1 of the EP&A Act.</p> <p>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.</p>
<i>Biosecurity Act 2015</i>	<p>The <i>Biosecurity Act 2015</i> and its subordinate legislation commenced on 1 July 2017. The <i>Biosecurity Act 2015</i> replaces wholly or in part 14 separate pieces of biosecurity related legislation including the <i>Noxious Weeds Act 1993</i>. Under the <i>Biosecurity Act 2015</i>, all plants, including weeds are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.</p> <p>The <i>Biosecurity Act 2015</i> and Regulations provide specific legal requirements for high risk activities and State level priority weeds. The State level priority weeds and associated legal requirements relevant to the region are outlined in the <i>Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022</i> (Greater Sydney Local Land Services, 2017) together with the high risk priority weeds from the regional prioritisation process. As such if present, priority weeds on the site should be assessed and controlled to fulfil the General Biosecurity Duty and minimise biosecurity risks.</p>
<i>Contaminated Land Management Act 1997</i>	<p>Section 60 of the <i>Contaminated Land Management Act 1997</i> (CLM Act) imposes a duty on landowners to notify the NSW Office of Environment and Heritage (OEH), and potentially investigate and remediate land if contamination is above EPA guideline levels. Land that would be affected by the proposal has not been declared under the Act as being significantly contaminated. Contamination is assessed in Section 7.9 of this REF.</p>
<i>Crown Lands Management Act 2016</i>	<p>The <i>Crown Land Management Act 2016</i> implements reforms identified through the comprehensive review of Crown land management and follows around four years of engagement with the community on the future of Crown land. Crown land is land owned by the State Government for the people of NSW under the care and control of the Minister for Lands. The primary objectives of the <i>Crown Land Management Act 2016</i> (as amended) relates to the ownership, use and management of Crown land, to provide clarity concerning applicable law, and to ensure environmental, social, cultural heritage and economic considerations are taken into account in decision-making about Crown land.</p> <p>In NSW, Crown land is managed by the Department of Industry (Crown Lands). The department uses several mechanisms to manage Crown land, from issuing licences, permits or long-term leases to delegating care, control and management to local Councils. The proposal site is zoned for low density residential (R2L) land-use in the Blacktown Local Environmental Plan 2015.</p>
<i>Electricity Supply Act 1995</i>	<p>The <i>Electricity Supply Act 1995</i> (ES Act) sets out the licensing regime on electricity network operators and provides a framework for the development and maintenance of electricity infrastructure.</p> <p>The ES Act allows TfNSW, as an operator of a distribution system, to trim and remove trees, carry out works on public roads and acquire land (where required) for the purpose of electricity supply works.</p> <p>The ES Act also requires that works (other than routine repairs or maintenance works) must not be undertaken without a minimum of 40 days' consultation with</p>

NSW legislation	Requirements for the proposal
	relevant local councils. TfNSW will notify Blacktown City Council as part of the proposal and consider any submissions made by the council.
<i>Heritage Act 1977</i>	<p>Sections 57 to 69 of the <i>Heritage Act 1977</i> (Heritage Act) addresses the requirements for items and places listed on the State Heritage Register (SHR), or which are affected by an interim heritage order. Unless an exemption is granted, the demolition, damage or alteration of a heritage item or place requires the approval of the NSW Office of Environment and Heritage (OEH) under section 60 of the Heritage Act. An example of where an exemption may be granted is if the impact to a heritage item is considered to be minor in nature. As outlined in section 7.5 of this REF, there are no items within the proposed pedestrian link site listed on the SHR.</p> <p>Under section 139 of the Heritage Act, approval from OEH is required prior to the disturbance or excavation of land if a project will, or is likely to result in, a relic being discovered, exposed, moved, damaged or destroyed. Section 170 of the Heritage Act requires government agencies to maintain a heritage and conservation register (section 170 register). These registers provide a list of government assets which may have State or local heritage significance.</p> <p>No historic items have been identified within proximity to the proposal. No non-Aboriginal heritage items would be adversely affected in a direct manner by the proposal.</p> <p>Section 7.5 of this REF provides additional details regarding heritage items.</p>
<i>Land Acquisition (Just Terms Compensation) Act 1991</i>	This Act would apply to the acquisition of land required for the proposal.
<i>National Parks and Wildlife Act 1974 (NPW Act)</i>	<p>Sections 86, 87 and 90 require consent from OEH for the destruction or damage of Indigenous objects. The Proposal is unlikely to disturb any Indigenous objects (refer Section 7.6).</p> <p>However, if unexpected archaeological items or items of Indigenous heritage significance are discovered during the construction of the Proposal, all works would cease and appropriate advice sought.</p>
<i>Native Title (New South Wales) Act 1994</i>	This Act provides for native title in relation to land or waters. The proposal would not affect land subject to native title or to which an Indigenous Land Use Agreement applies.
<i>Protection of the Environment Operations Act 1997</i>	<p><i>The Protection of the Environment Operations Act 1997</i> (POEO Act) administers environment protection licences (EPLs) for specific activities relating to air, water and noise pollution, and waste management. The Environment Protection Authority (EPA) and local government, where relevant, administer the POEO Act.</p> <p>Development activities require an EPL under the POEO Act if those activities meet the assessment criteria outlined in Schedule 1 of the Act. Confirmation of the need to obtain a licence for the proposal would be determined prior to the commencement of construction in consultation with the EPA.</p> <p>In addition, the POEO Act would require the construction contractor to manage the proposal to prevent and avoid its potential to cause water, noise and/or air pollution. TfNSW and its contractor would also be required to manage the</p>

NSW legislation	Requirements for the proposal
	<p>proposal's waste streams.</p> <p>This would be achieved through implementing the safeguards and management measures identified in Chapter 8. TfNSW and its contractor would also be required to notify the EPA (as the administrators of this Act) in instances where any pollution incident has the potential to 'cause or threaten material harm to the environment' (refer to section 148 of the Act).</p>
<p><i>Roads Act 1993</i></p>	<p>In accordance with section 138 of the Act, consent from the NSW Roads and Maritime Services would be required for the carrying out of work in, on or over a public road. The Old Windsor Road shared path would be regraded as part of the proposal. Old Windsor Road shared path is within the Old Windsor Road boundary and consent from the appropriate roads authority, being Roads and Maritime Services or the local council as relevant, would be required in accordance with section 138 of the Roads Act in respect of work carried out by a 'public authority' on a classified road i.e. Old Windsor Road.</p> <p>The proposal would impact a classified road. Ongoing consultation would be carried out with the relevant council(s) and/or Roads and Maritime Services as to the potential impacts that may occur to all of the roads along the proposed alignment and to identify any potential consent that may be required.</p>
<p><i>Sydney Water Act 1994</i></p>	<p>The Proposal would not involve discharge of wastewater to the sewer.</p>
<p><i>Waste avoidance and Resource Recovery Act 2011</i></p>	<p>The purpose of the <i>Waste Avoidance and Resource Recovery Act 2001</i> (WARR Act) is to develop and support the implementation of regional and local programs to meet the outcomes of a State-wide strategy for waste avoidance and resource recovery. It also aims to 'minimise the consumption of natural resources and final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste'.</p> <p>Waste generation and disposal reporting would be carried out during the construction and operation of the proposal. Procedures would be implemented during construction in an attempt to promote the objectives of the Act.</p>
<p><i>Water Management Act 2000</i></p>	<p>The Proposal would not involve any water use, water management works, drainage or flood works, controlled activities or aquifer interference.</p>

5.3. Commonwealth Legislation

5.3.1. Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (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 (MNES).

Under the EPBC Act, any action that has, would have, or is likely to have a significant impact on a MNES or on Commonwealth land, triggers the EPBC Act and may require approval from the Commonwealth Minister for Environment. An action may include a project, development, undertaking, activity, or series of activities. If the Commonwealth Minister for Environment determines that an approval is required under the EPBC Act, the proposed action is deemed to be a 'controlled action'. It must then undergo assessment and approval under the EPBC Act before the action is carried out. The Act provides that a proponent of an

action that may be, or is, a controlled action must refer the proposal to the Minister for the Minister's decision as to whether or not the action is a controlled action.

There are no MNES located within the general area of the proposal, as confirmed in Appendix B. An EPBC Act referral is therefore not required.

5.3.2. Disability Discrimination Act 1992

The Commonwealth Government DDA (Commonwealth Government, 1992) aims to eliminate disability discrimination as far as reasonably practical. TfNSW promotes DDA compliance across all its proposals. As such, the proposal has been designed to comply with accessibility standards to provide pedestrian and public transport access for people with mobility issues.

5.4. Other relevant environmental planning instruments

5.4.1. State Environmental Planning Policy – Infrastructure 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) 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 ISEPP allows for the development of 'rail infrastructure facilities' by or on behalf of a public authority without consent on any land (i.e. assessable under Part 5, Division 5.1 of the EP&A Act). Clause 78 defines 'rail infrastructure facilities' as including elements such as 'pedestrian and cyclist facilities'.

Consequently, development consent is not required for the proposal which is classified as a rail infrastructure facility, however the environmental impacts of the proposal are required to be assessed under the provisions of Part 5, Division 5.1 of the EP&A Act.

Part 2 of ISEPP contains provisions for public authorities to consult with local councils and other agencies prior to the commencement of certain types of development. Chapter 3 of this REF discusses the consultation undertaken under the requirements of ISEPP.

It is noted that ISEPP prevails over all other environmental planning instruments except where *State Environmental Planning Policy (Major Development) 2005*, *State Environmental Planning Policy No 14 – Coastal Wetlands* or *State Environmental Planning Policy No 26 – Littoral Rainforest* applies.

The proposal does not require consideration under these SEPPs and therefore they do not require further consideration as part this REF.

5.4.2. Local Environmental Plan (LEP)

The proposal is located within the Blacktown LGA. The operation of ISEPP however means that LEPs would not apply to the extent that they impose controls which are inconsistent with the ISEPP. The provisions of the *Blacktown Local Environmental Plan 2015* (Blacktown LEP), however, have been considered in this REF.

The proposal would fall within the following zones under the Blacktown LEP:

- R2 – Low Density Residential
- SP2 – Infrastructure.

Table 5-2 describes the land use objectives of each zone and the proposal's consistency, or otherwise, with these objectives.

Table 5-2: Consistency with the Blacktown LEP

Land use zone (location) and objectives	Proposals consistency with the objectives
<p>R2L: Low Density Residential</p> <ul style="list-style-type: none"> 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 To enable certain activities to be carried out within the zone that do not adversely affect the amenity of the neighbourhood. 	<p>The proposal forms part of an overall program to provide greater public transport and accessibility for Glenwood residents and to the infrastructure associated with Sydney Metro Northwest. The proposal would permit safe and efficient access to the shared path on Old Windsor Road for residents located in Glenwood. The pedestrian link would provide connectivity and direct access between the Glenwood residential area and infrastructure corridor helping residents with day to day commutes to work, using the T-Way or Sydney Metro.</p>
<p>SP2: Infrastructure</p> <ul style="list-style-type: none"> To provide for infrastructure and related uses To prevent development that is not compatible with or that may detract from the provision of infrastructure To ensure that development does not have an adverse impact on the form and scale of the surrounding neighbourhood. 	<p>The proposal supports the infrastructure uses of Old Windsor Road and Sydney Metro Northwest by enabling pedestrian access from a now restricted residential area. The pedestrian link encourages the use of public transport for residents of Glenwood.</p>

DCPs are non-statutory documents. They support LEPs by providing more detailed planning and design guidelines. Like the Blacktown LEP, the policies and provisions of the Blacktown DCP do not apply to the proposal, however they are relevant in identifying potential land use impacts and planning policy conflicts.

The Blacktown DCP 2015 seeks to provide development guidance and standards to ensure aesthetically pleasing and practical development that relates to adjoining and surrounding areas.

Table 5-3 describes the relevant DCP objectives development principles that are relevant to the proposal. The table also describes the proposal’s consistency, or otherwise, with these objectives and principles.

Table 5-3: Consistency with the Blacktown DCP 2015

Land use zone (location) and objectives	Proposals consistency with the objectives
Provide a comprehensive document that details a framework for the development of land in the Blacktown LGA.	Not applicable – objective is related to the development and maintenance of the DCP.
Clearly set out the processes, procedures and responsibilities for the involvement of the community and key stakeholders in the development of land.	Not applicable – objective is related to the development and maintenance of the DCP.
Promote development that is consistent with Council’s vision of creating a living environment.	The proposal would be designed in consultation with Blacktown City Council and constructed in such a way that would fit with Council’s vision for the Glenwood area.

Land use zone (location) and objectives	Proposals consistency with the objectives
Protect and enhance the natural and built environment, and ensure that satisfactory measures are incorporated to ameliorate any impacts arising from development.	The proposal would not result in impacts that substantially affect the environment. Impacts arising from the proposal would be managed accordingly.
Encourage high quality development that contributes to the existing or desired future character of the area, with particular emphasis on the integration of buildings with a landscaped setting.	The proposal would suit the surrounding environment and enhance accessibility to transport for local residents. As a pedestrian link, the proposal would not be an obtrusive or dominating structure.
Protect and enhance the public domain.	The proposal would not impact significantly upon the public domain.
Encourage a high standard of aesthetically pleasing and functional development that sympathetically relates to adjoining and nearby developments.	The proposal would blend in with the residential environment in which it is situated through quality design standards.
Provide safe and high quality environments, that also promote the health and wellbeing of residents, workers and visitors of the Blacktown LGA.	The proposal would provide safe access for pedestrians from Swansea Court to the Old Windsor Road shared path and improve active transport opportunities.
Ensure that development incorporates the principles of ESD.	The proposal would seek to provide greater motivation for active movement by introducing safe and efficient pedestrian networks to and from Glenwood.

5.5. Ecologically sustainable development

Transport for NSW 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, lack of full scientific uncertainty should not be used as a reason for postponing measures to prevent environmental degradation. Public and private decisions should be guided by careful evaluation to avoid serious or irreversible damage to the environment wherever practicable, and an assessment of the risk-weighted consequences of various options.
- 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 – Conservation of biological diversity and ecological integrity should be a fundamental consideration in environmental planning and decision-making processes. Biodiversity refers to the variety of all life. Environmental and species impact statements are one way that this principle is enacted.
- 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 Transport for NSW throughout the development and assessment of the Proposal. The Proposal is driven by these principles, through the formulation of the Proposal objectives. These objectives would provide the

maximum level of equitable access to Bella Vista Station for Glenwood residents. These principles would be incorporated into TfNSW's management systems for the proposal (refer to Chapter 8).

5.6. Summary of statutory requirements

A summary of the potential licences, permits, approvals and notifications that may be required for the construction, maintenance and operation of the proposal are outlined in Table 5-4 below.

Table 5-4: Summary of potential licences, permits and approvals

Legislation	Authority	Requirement	Comment	Responsibility
EP&A Act	TfNSW	Consideration: clause 79 of the ISEPP outlines that development for the purpose of railways and railway infrastructure facilities which are permissible without the need for development consent under Part 4 of the EP&A Act when undertaken by a public authority.	This REF has been prepared to meet the assessment requirements under the EP&A Act.	TfNSW
EP&A Regulation	TfNSW	Consideration: under clause 228, of the factors to take into account concerning the impact on an activity on the environment.	This REF has considered factors under cl. 228 in Appendix B.	TfNSW
ES Act	Blacktown City Council	Notification: under section 45; 40 days' notice is required for proposed electricity works.	Notification will be given to Blacktown City Council as part of the proposal (refer to Section 6). This will be undertaken at the same time as consultation under the ISEPP.	TfNSW
ISEPP	Blacktown City Council	Notification: under sections 13 to 15, 21 days' notice is required for the following: (a) Substantial impact on council related infrastructure.	Notification will be given to Blacktown City Council as part of the proposal (refer to Section 6) specifically with reference to Section 13, substantial impact on council related infrastructure. This will be undertaken at the same time as consultation under the ES Act.	TfNSW
Roads Act	Roads and Maritime	Approval: under section 138, approval is required for road work on a Classified Road.	The proposal is not likely to require approval under section 138 of the Roads Act, as it would not be located within the road corridor of Old Windsor Road, However, works would interface and impact the northbound Old Windsor Road shared path owned by Roads and Maritime Services. Consultation with Roads and Maritime to determine any Roads Act requirements.	TfNSW contractor

While certain legislative provisions do not apply to this proposal, TfNSW has also committed to working closely with:

- (a) Blacktown City Council to ensure there would be an integrated response to traffic management around the immediate works area during construction
- (b) Utility and service providers to ensure all utilities would remain unaffected by the work
- (c) Blacktown Emergency Services to determine access requirements during construction
- (d) Roads and Maritime Services to ensure there would be an integrated response to traffic management and public transport integration during operation.

6. Stakeholder and Community Consultation

This chapter summarises the planned community and stakeholder engagement activities to be carried out to support the REF exhibition and construction phase. The REF exhibition period will include targeted consultation to provide an opportunity for stakeholders and the community to provide feedback on the proposal.

6.1. Consultation Objectives

The proposal would be delivered under a communications and consultation strategy that describes the key activities that would take place to inform and engage with the local community and key stakeholders across the proposal's lifecycle, including:

- (a) Informing the community and other stakeholders by providing clear, factual and timely information about planned construction and operational work and its associated environmental and social impacts
- (b) Providing a mechanism for prompt issues resolution
- (c) Providing adequate opportunities for community members and other stakeholders to provide feedback
- (d) Ensuring coordinated communications with other relevant agencies and stakeholders including Roads and Maritime Services, Blacktown City Council, Ausgrid, Telstra, Optus and Jemena.

This REF is proposed to be exhibited. Through this process the community and stakeholders will be invited to make submissions, raise issues, seek clarification or ask questions about any aspect of the proposal. All issues that are raised will be considered and responded to in a Response to Submissions Report. This process will constitute the main way in which Transport for NSW will advise the community about the proposal. Where required, community updates would be delivered to local residents and provided online.

6.2. Statutory Notification Requirements

6.2.1. ISEPP Notification

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to commencing work that would affect various infrastructure. This includes the need to notify the council where the proposal is likely to impact on stormwater infrastructure, likely to generate traffic, affect any sewerage infrastructure, involves the connection/use of a water supply, installing a structure in a public place or affects a council-maintained footpath, a local heritage item, or takes place within flood liable land.

There is also a requirement to notify other Government agencies that administer various environmental statutes (where these statutes are impacted).

Blacktown City Council and Roads and Maritime Services will be notified prior to the REF being publically exhibited due to its likely impact on council managed infrastructure and Roads and Maritime Services owned infrastructure (along Old Windsor Road). TfNSW will consider any comments provided by Blacktown City Council and Roads and Maritime and will report this in the Response to Submissions Report (refer to Section 6.3.4).

6.3. Consultation during REF Exhibition

6.3.1. Engagement activities and tools

Table 6-1 lists the key engagement activities and tools and how they will be used to engage with the community and stakeholders during the public exhibition of the REF.

Table 6-1: Key community and stakeholder engagement tools and activities

Engagement tool	Activity
Proposal Website	sydneymetro.info
Community Newsletter	A newsletter will be distributed to surrounding residential, community and commercial properties. It will provide details about the community information sessions (see below)
Stakeholder meetings/briefings	TfNSW will undertake a briefing session with Roads and Maritime Services, Blacktown City Council, and other relevant stakeholders on the proposed works described in this REF.
Advertisements	Advertisements will be placed in the local press. The advertisements will notify the community about the proposal, how to make a submission and details regarding community information sessions.
Community information sessions	Community information sessions are proposed to be held during the public exhibition of the REF. This will be held at local venues (notifications will be issued to the community to inform them of the details).

6.3.2. Consultation with Government Agencies and Key Stakeholders

During the public exhibition of the REF, TfNSW intends to brief Roads and Maritime Services, Blacktown City Council, and other relevant stakeholders regarding the proposed works. Any feedback received from these stakeholders would be considered as part of the detailed design of the proposal.

6.3.3. Consultation Activities Proposed During Public Exhibition

The REF will be displayed for a minimum of six weeks during April/May 2018. During this period, written submissions will be accepted for consideration. The REF will be displayed online at sydneymetro.info and at additional locations to be advised through newsletters and doorknocking.

Community members and stakeholders are invited to submit their feedback on the proposal to TfNSW by emailing info@metronorthwest.com.au or writing to:

- Sydney Metro, PO Box K659, Haymarket NSW 1240 and should be clearly marked 'Comments on Glenwood Pedestrian Link REF'.

During the exhibition period, community members and stakeholders can direct any enquiries to TfNSW:

- Enquiries phone line: 1800 019 989
- Email: info@metronorthwest.com.au.

6.3.4. Submissions Report

Following the REF exhibition, a Response to Submissions Report will be prepared by TfNSW. This report will:

- Summarise the issues raised in the submissions

- Provide responses to each issue raised in the received submissions
- Describe the proposed modifications and describe and assesses the environmental impact of these changes
- Identify any proposed new or revised environmental safeguards and management measures.

TfNSW will write to individuals and organisations that have made submissions advising them that their submission will be addressed in the Response to Submissions Report. The Response to Submissions Report will be published on the Sydney Metro website sydneymetro.info.

6.3.5. Post-determination Consultation Activities

Subject to determination of the proposal, TfNSW would continue to engage with community and stakeholders in the lead up to, and during the proposal’s construction.

Methods used for engaging and providing proposal information to the community and stakeholders before and during the proposal delivery phase are outlined in Table 6-2. These activities would be undertaken by the construction contractor in consultation with TfNSW.

Table 6-2: Key community and stakeholder engagement activities during proposal delivery phase

Tool	Purpose	Frequency
Advertisements	To inform of significant traffic changes, detours and traffic disruptions as required to comply with approvals; in local newspapers.	At least seven days prior to change
Community emails	To allow communication with the Project team and inform the community of progress key milestones or activities including traffic changes.	Monthly
Community information line (1800 019 989)	Access to the Project team via a 1800 number.	24 hours a day, seven days a week
Letterbox notifications	Notification letters to inform identified sensitive receivers (local residents and businesses) affected by changes to road network and traffic conditions.	At least seven days prior to change
Project Website	Documents uploaded to the website (sydneymetro.info) would include copies of the REF, advertisements, traffic alerts, notification letters and other public material related to the works.	To coincide with distribution
Signposting	Information or directional signage at the location of the traffic change to give advice to road users and pedestrians on duration of change of alternative paths. Temporary signage to indicate changes to bus stops or pedestrian paths and crossings.	At least seven days prior to change
Variable Message Signs (VMS)	Electronic variable message signs provide advanced notice to road users of major traffic changes, emergencies, incidents and traffic delays.	At least seven days prior to change, or as required
Doorknocking	Used to discuss potential impacts of the Project on highly impacted stakeholders, especially residents and businesses directly impacted by construction activities.	As required
Meetings with individual/groups	Discuss project activities, including work in progress, upcoming activities and any issues associated. Meetings will also be used to discuss potential impacts and proposed mitigation measures.	As required

7. Environmental Impact Assessment

This chapter provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. For each potential 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.

7.1. Noise and vibration

A Noise and Vibration Impact Assessment addressing construction noise and vibration for the proposal was undertaken by SLR consulting. This assessment is attached as Appendix C of this REF. The results of this assessment are summarised below.

7.1.1. Methodology

Policies and guidelines

The noise and vibration assessment was prepared in line with the following policies and guidelines:

- *Interim Construction Noise Guideline (ICNG)* (DECC, 2009)
- *Assessing Vibration: a technical guideline* (DEC, 2006)
- *Construction Noise Strategy (CNS)* (Transport for NSW, 2012)
- *BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2* (BSI, 1993)
- *DIN 4150: Part 3-1999 Structural vibration – Effects of vibration on structures* (Deutsches Institut für Normung, 1999)
- *NSW Road Noise Policy (RNP)* (DECC, 2011)
- *Sydney Metro City & Southwest Construction Noise and Vibration Strategy (CNVS)* (Transport for NSW, 2016).

Background noise monitoring

Background noise monitoring previously carried out as part of the Noise Impact Assessment for the Major Civil Construction Works (SLR, 2012) for Sydney Metro Northwest was adopted to quantify and characterise the ambient noise environment. Noise monitoring locations are shown in Figure 7-1.

Noise prediction model

A computer noise prediction model was developed using SoundPLAN software to quantify potential construction noise levels. Local terrain was digitised in the noise model to develop a three-dimensional representation of the proposal site and surrounding environment. In accordance with the ICNG, noise levels were predicted at all receivers surrounding the proposal.

7.1.2. Existing environment

Background noise levels

The existing ambient noise environment surrounding the proposal site is primarily dominated by road traffic noise from Old Windsor Road.

The surrounding areas of the proposal site have been divided into Noise Catchment Areas (NCAs). These are detailed in Table 7-1 and shown in Figure 7-1.

Table 7-1 Noise catchment areas

NCA	Area	Description
NCA01	Glenwood	Typically, residential receivers directly surrounding the proposal site.
NCA02	Glenwood	Consists of a school and church located to the south of the proposal site.
NCA03	Glenwood	Generally residential receivers located to the south of the proposal site
NCA04	Bella Vista	Commercial receivers located across Old Windsor Road to the south east
NCA05	Bella Vista	Residential receivers located to the east of the proposal site.

Ambient Noise Monitoring Locations

To quantify and characterise the existing ambient noise environment surrounding the proposal site, background noise monitoring previously carried out as part of the 'Noise and Vibration Technical Paper for Major Civil Construction Works' for the North West Rail Link (Sydney Metro Northwest) has been considered (refer to SLR EIS Technical Paper 2 dated 19 March 2012). The noise monitoring locations used are detailed in Table 7-2 and shown in Figure 7-1.

Table 7-2 Ambient noise monitoring locations

ID	Area	NCA	Noise monitoring location address
BG10	Glenwood	NCA03	8 Maley Grove, Glenwood
BG11	Bella Vista	NCA05	12 Craigend Place, Bella Vista

Background noise monitoring results

The measured levels have been used to establish existing noise levels to assess the proposal's potential noise impacts.

The results of the unattended ambient noise surveys are summarised in Table 7-3 as the Rating Background Level (RBL) and LAeq noise levels for the ICNG daytime, evening and night-time periods.

Table 7-3 Summary of Unattended Noise Logging Results

Noise Monitoring Location	Measured Noise Level (dBA)					
	RBL			L _{Aeq}		
	Daytime	Evening	Night	Daytime	Evening	Night
BG10	46	45	36	53	52	50
BG11	36	35	31	52	46	43

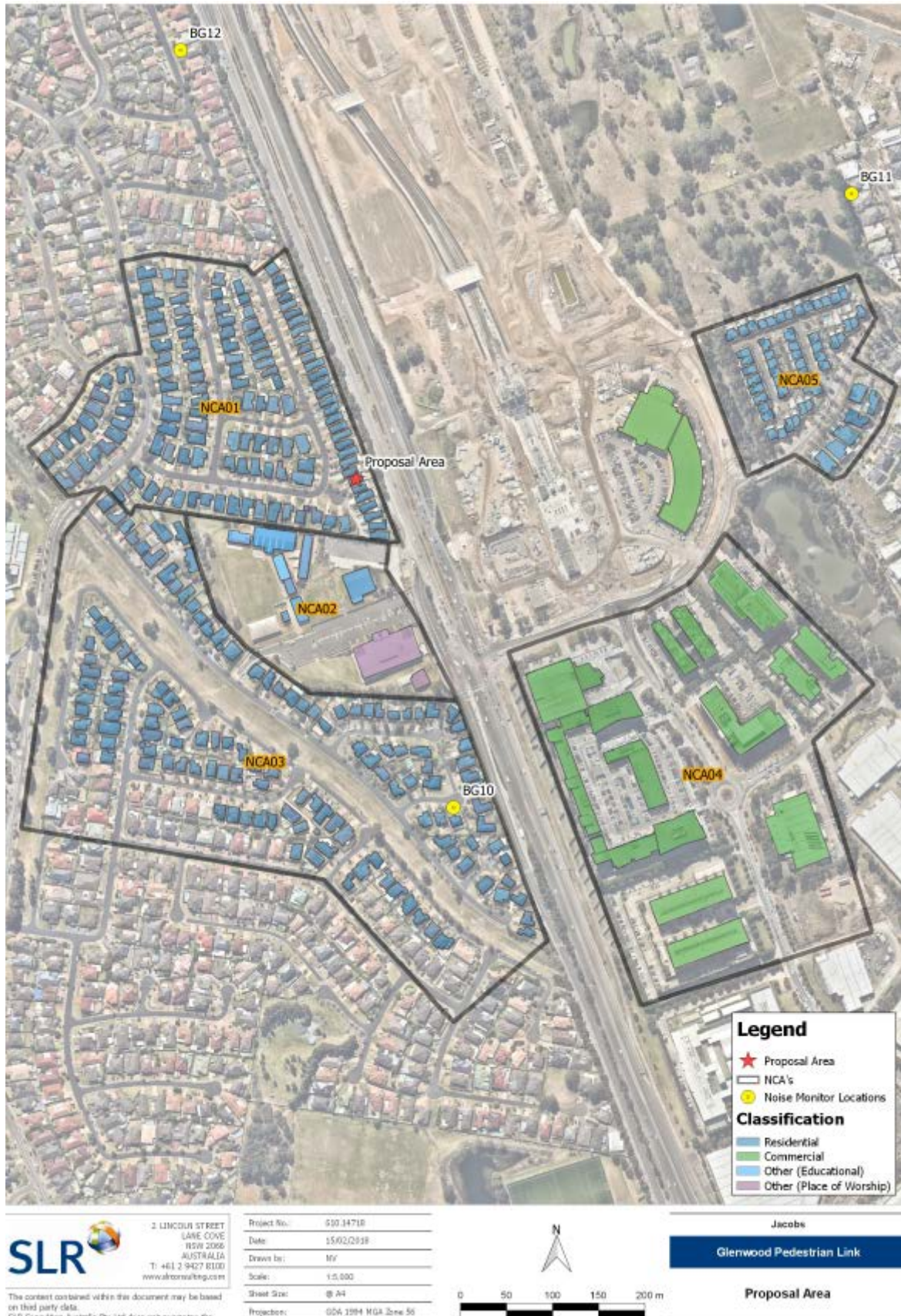


Figure 7-1 Noise catchment areas for Glenwood Pedestrian Link

Vibration-sensitive receivers

Structural building damage can occur up to 15 metres from a vibration source while amenity effects (human comfort) can be experienced up to 100 metres from a vibration source. Construction vibration impacts could affect any noise sensitive receivers and buildings that are located this distance from the proposal site.

7.1.3. Assessment criteria

Noise

Construction noise was assessed in line with the ICNG. The ICNG identifies Noise Management Levels (NMLs), which are the project specific noise criterion used to help manage noise impacts at all receiver locations. NMLs are defined by existing ambient noise levels and the receiver's sensitivity to construction noise. NMLs are categorised for residential and other sensitive land uses.

If construction noise levels are predicted to exceed NMLs, potential noise impacts would be managed through site specific Construction Noise Management Plans.

The construction noise assessment uses the following terms:

- LA1(1minute) is the typical 'maximum noise level for an event', used in the assessment of potential sleep disturbance during night-time periods
- LAeq(15minute) is the 'energy average noise level' considered over a 15-minute period. This parameter is used to assess potential construction noise impacts
- LA90 is the 'background noise level' in the absence of construction activities. This parameter represents the average minimum noise level during the daytime, evening and night-time periods respectively. The LAeq(15minute) NMLs are based on LA90 background noise levels
- Rating Background Level (RBL) is representative of the typical lowest ambient noise level not exceeded for more than 90% of the daytime, evening, or night-time period.

Residential receivers

Table 7-4 identifies NMLs in line with the ICNG for residential receivers.

Table 7-4 Determination of NMLs for residential receivers

Time of day	NML LAeq(15 minute)	How to apply
Standard hours Monday to Friday 7:00am to 6:00pm Saturday 8:00am to 1:00pm No work on Sundays or public holidays	RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq(15minute) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Time of day	NML $L_{Aeq}(15 \text{ minute})$	How to apply
	Highly Noise Affected 75 dBA	<p>The Highly Noise Affected level represents the point above which there may be strong community reaction to noise.</p> <p>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account:</p> <ul style="list-style-type: none"> times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or mid-morning or mid-afternoon for works near residences). if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	RBL + 5 dBA	<p>A strong justification would typically be required for works outside the recommended standard hours.</p> <p>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</p> <p>Where all feasible and reasonable practises have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.</p>

Note: The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the *NSW Industrial Noise Policy*.

For the construction noise and vibration assessment methodology please refer to Appendix C.

7.1.4. Potential impacts

Construction

Sound power levels for typical construction equipment during the proposal are included in the Noise and Vibration assessment in Appendix C (SLR, March 2018).

Impacts would typically be marginal to minor for noise levels 1 to 10 dB above NML, moderate for noise levels 11 dB to 20 dB above NML, and high for noise levels >20 dB above NML. Predicted noise levels in each NCA are listed in Table 7-5. The NCAs for the proposal are shown in Figure 7-1.

It is expected that the construction noise levels would frequently be lower than predicted at the most exposed receiver for most construction activities. This is because predicted noise levels assume a worst-case scenario.

Table 7-5 Predicted worst-case noise levels from the proposal

Noise catchment area	NML (dBA) Standard daytime	Predicted LAeq(15 minute) Noise level (dBA)*												
		W.0001 – Demolition	W.0002 – Removal of rubble	W.0003 – Earthworks/Levelling	W.0004 – Landscaping	W.0005 – Install Lighting	W.0006 – Earthworks/Preparation	W.0007 – Concrete works	W.0008 – Relocation of Utilities	W.0009 – Cycle way Regrading	W.0010 – Earthworks/Preparation	W.0011 – Concrete Works	W.0012 – Compound Establishment/Demobilisation	W.0013 – Compound operation
		Operating period												
		Day	Day	Day	Day	Day	Day	Day	Day	Day	Day	Day	Day	Day
Residential receivers														
NCA01	56	93	82	85	81	82	85	83	69	78	85	82	77	71
NCA02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA03	56	60	49	52	48	49	52	51	45	54	64	61	44	38
NCA04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA05	46	54	43	46	42	43	46	47	41	50	45	42	38	32
Commercial receivers														
NCA01	70	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA02	70	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA03	70	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA04	70	56	45	50	46	47	50	49	43	52	48	45	40	34
NCA05	70	58	47	50	46	47	50	50	44	53	48	45	42	36
Other Sensitive receivers														
NCA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA02	-	66	55	58	54	55	58	56	48	57	66	63	50	44
NCA03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA05	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Red text indicates exceedances of NMLs

The predicted NML exceedances for all receiver types for the proposal are summarised in Appendix C. A summary of the noise impacts during construction of the proposal is provided in Table 7-6.

Table 7-6 Summary of noise impacts during the construction scenario

Noise Catchment Area	Description
NCA01	<p>As shown in Table 7-5, during W.0001, (work activity) exceedances of up to 37 dB are predicted at 88 surrounding receivers (when works are located nearby). This is primarily due to the use of the rock breaker that is proposed to be used during the demolition of the existing concrete foundations. When the rock breaker is not in use, noise impacts are anticipated to be 13dB lower and be closer to the impacts of scenario W.0002. These predicted noise levels in Table 7-5 are also based on the closest point to the worst-affected receiver. As the works move away; these noise level would reduce substantially.</p> <p>As shown in Table 7-5, during W.0010 and W.0011, exceedances of up to 29 dB are predicted at 108 receivers. These exceedances are only anticipated to occur for a short time as the works continue down Cramer Place and Sharrock Avenue. These residences would not be impacted for the full duration of construction.</p> <p>During all other scenarios, exceedances of the NML's are predicted primarily due to the proximity of the works to each of the residential receivers, with exceedances ranging between 13dB and 29 dB at up to 40 surrounding residential receivers.</p> <p>No exceedances above the NML are predicted at commercial or other sensitive receivers within NCA01 while the pedestrian link is under construction.</p>
NCA02	<p>As shown in Table 7-5, during W.0001, exceedances of up to 11dB are predicted at the nearby school and church. Further exceedances are also predicted during W.0003, W.0006, W.0007, W.0009, W.0010 and W.0011 of up to 11 dB depending on the location of the works.</p>
NCA03	<p>As shown in Table 7-5, during W.0010, exceedances of up to 10 dB are predicted at eight nearby residential receivers when installing the footpath along Cramer Place. These works are anticipated to occur for a short duration and so these residents would not be affected by this level of noise for the full duration of construction.</p> <p>There are also up to five exceedances at residential receivers predicted to exceed the NML by up to 4 dB during W.0001.</p>
NCA04	<p>No exceedances above the NML are predicted at sensitive receivers within NCA04 for the duration of the proposal.</p>
NCA05	<p>As shown in Table 7-5, during W.0001, exceedances of up to 8 dB are predicted at sensitive receivers within NCA05. These exceedances are predicted to be mainly from the rock breaker used to demolish the existing concrete foundations. When the rock breaker is not in use the noise level is expected to be 13 dB lower which would result in compliance at these residential receivers.</p> <p>Further exceedances are also predicted during W.0007 and W.0009 during works within the cycleway. Exceedances of up to 4dB are predicted at up to 10 residential receivers and are considered to be minor.</p>

Construction Traffic

Access to the proposal site would be via Glenwood Park Drive and onto Cramer Place or Sharrock Avenue and Swansea Court. Both streets are residential and have sensitive receivers located along them. An increase in traffic noise due to construction traffic associated with the proposal of greater than 2 dBA is considered unlikely.

Sleep disturbance

The construction hours for the proposal are generally during standard working hours. There is a potential for some limited night works associated with utility relocations. If this is required TfNSW would utilise the Out of Hours Works approval form in accordance with Sydney Metro Construction Noise and Vibration Strategy.

Vibration

The neighbouring residential dwellings are in close proximity to the proposed works. During the use of rock breakers for demolition of the concrete foundations of the dwelling currently

on the proposal site there is a potential to exceed the 'cosmetic damage' vibration criteria. The neighbouring residential dwellings are located approximately two to three meters away from the dwelling to be demolished.

Use of reduced capacity and/or damped rock breakers may be required when working close to the site boundary with adjacent buildings in accordance with the nominated safe working distances (refer to Appendix C).

The receivers adjacent to the construction site are likely to perceive vibration impacts when the rock breaker is being used. It should be noted that it is understood that the rock breaker is anticipated to only be used to remove the slab of the existing dwelling currently occupying the site and is anticipated to only be for one to two days.

Operation

The potential increase in road traffic noise levels associated with the removal of existing screening (removal of the residential dwelling and boundary wall), was estimated by comparison of noise levels at adjacent receivers for the following scenarios:

- Existing scenario
- Without the residential dwelling on the proposal site and the existing 1.8 metre boundary fence along Old Windsor Road.

For the purpose of the comparison, the calculations assumed that 10% of traffic comprised of Heavy Vehicles. Two residential receivers were identified with potential for a noise level increase of 6 to 7 dBA as shown in Figure 7-2. The RNP states that '*an increase of up to 2 dBA represents a minor impact that is considered barely perceptible to the average person*'. As such, mitigation limiting the estimated increase to below 2 dBA is considered reasonable.

Mitigation through the implementation of a 1.8 metre barrier on top of the proposed retaining wall along Old Windsor Road was investigated and is not predicted to be sufficient to reduce the noise level increase to less than 2dBA for these two residential receivers. It is therefore recommended that at property treatment be investigated as part of detailed design for the two facades taking into account the use of the rooms in those areas.

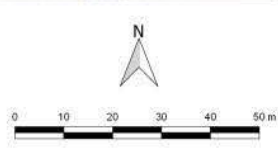
There would be no ongoing vibration impacts associated with the proposal.



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Jacobs
Glenwood Pedestrian Link
Traffic Noise Increase

Figure 7-2 Predicted Noise Level increase

7.1.5. Management and mitigation measures

The ICNG and the Sydney Metro Northwest Construction Noise and vibration Strategy (CNVS) describes strategies for construction noise mitigation and control that are applicable to this proposal. The strategies are designed to minimise, to the fullest extent practicable, noise during construction through the application of all feasible and reasonable mitigation measures.

All construction works associated with the proposal would be managed in accordance with the CNVS (summarised in Appendix C). The CNVS documents the best practice techniques for managing construction noise and vibration, and implementing feasible and reasonable mitigation measures.

Specific safeguards and mitigation measures that would be implemented to address potential impacts of the proposal on noise and vibration are identified in Section 8.3.1.

7.2. Traffic, transport and access

7.2.1. Methodology

The assessment considered the potential for traffic, transport and access impacts during construction and operation as a result of the proposal.

7.2.2. Existing environment

Road networks

Old Windsor Road is classified as a major arterial road that provides direct access to and from the M7 Motorway for the North West region of Sydney.

The Old Windsor Road corridor, north of Celebration Drive intersection, includes two through travel lanes in each direction, the North-West T-way on the eastern side and a shared walking and cycling path on both sides of the road.

The shared path on the western side of Old Windsor Road is three metres wide and runs perpendicular to the proposal site.



Figure 7-3 Old Windsor Road shared path (looking south towards Norwest Boulevard)

The proposed pedestrian link would connect the Old Windsor Road shared path to Swansea Court.

Swansea Court is a cul-de-sac that serves a small number of dwellings and sits within a network of access roads containing approximately 110 residential dwellings, connecting to Glenwood Park Drive. The road network in this area comprises Adrian Street, Cramer Place, Nixon Street, Sharrock Avenue and Swansea Court

The local roads are defined as narrow, with most measuring less than eight metres wide with no signed parking restrictions. The occurrence of on-street parking on these streets is typically low during the day with most vehicles parked off-street on driveways or in garages. Each property has access to at least two parking spaces arranged on driveways and / or within garages.

The streets in the immediate vicinity of Glenwood High School, the Trades Norwest Anglican Senior College and Emmanuel Baptist Church (Shaun Street and Glenwood Park Drive) experience higher levels of parking with limited available spots.

Glenwood Park Drive is classified as a Major Collector Road with a shoulder lane on both sides, where informal street parking activity is observed. Glenwood Park Drive serves as a bus route with bus stops in the vicinity of Sharrock Avenue serviced by the T70 and the T75.

Traffic Movements

The existing traffic conditions in the local street network were surveyed at two tube count stations located in Sharrock Avenue and Cramer Place. The surveys were undertaken for a full week in early December 2017 and recorded traffic volumes, direction of travel and travel speed. The peak hour results of the surveys are shown in Figure 7-4 to Figure 7-6.



Figure 7-4 Average weekday peak hour traffic vehicle counts



Figure 7-5 Average weekend peak hour traffic vehicle counts



Figure 7-6 Average vehicle speeds

In terms of traffic volumes and direction of travel, an assessment of the recorded traffic data resulted in the following:

- Average weekday traffic flow in the vicinity of the proposed pedestrian link was 230 vehicles on a typical weekday and 244 vehicles on a typical Saturday or Sunday

- Weekday AM peak hour occurs from 8am to 9am. The combined two-way traffic volume reached an average of 38 vehicles in the AM peak with the dominant westbound travel, exiting the local network, resulting in 28 vehicles
- Weekday PM peak hour occurs from 3pm to 4pm on Sharrock Avenue and from 6pm to 7pm on Cramer Place. The combined traffic volumes ranged from 21 vehicles per hour to 24 vehicles per hour respectively. The peak direction of travel was eastbound with 13 vehicles entering from Glenwood Park Drive at Sharrock Avenue and 16 entering at Cramer Place.

In relation to travel speeds, Figure 7-6 generally indicates that vehicles are travelling at speeds lower than the posted legal speed limit of 50 kilometres per hour. Average speeds along Cramer Place are slightly higher than Sharrock Avenue, possibly as a result of the longer straight section on the approach to Glenwood Park Drive. However average vehicle speeds recorded on both roads remain below 40 kilometres per hour. In relation to the number of vehicles, Figure 7-7 demonstrates the average weekday hourly traffic volumes on Sharrock Avenue and Cramer Place.

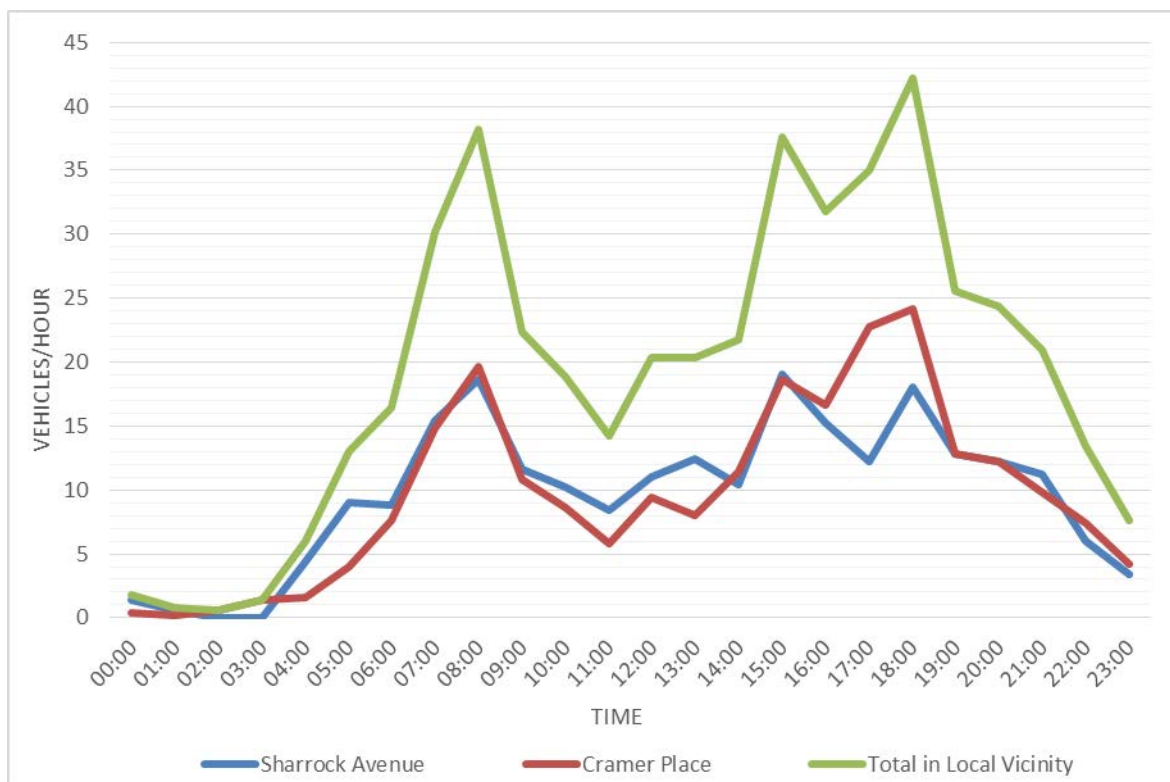


Figure 7-7 Average weekday hourly traffic volumes on Sharrock Avenue and Cramer Place

Pedestrians and bicycle riders

The shared path on the western side of Old Windsor Road is a three metre wide path that provides a regional pedestrian and bicycle route along a main transport arterial road.

Within the local road network surrounding Swansea Court, the pedestrian network generally consists of 1.2 metre wide footpaths provided on one side of the road only. The cycling environment is largely low speed on-road along quiet streets, with a shoulder provided along Glenwood Park Drive. A marked bicycle route consisting of on-road markings and shared paths runs through Glenwood between Tarwin Avenue and the M7 regional cycleway.

As a result of the limited pedestrian and bicycle connections between the Glenwood residential area and the regional shared path on Old Windsor Road a number of residents and students utilise the private Emmanuel Baptist Church property to access Old Windsor

Road. It is assumed that a large number of these movements would access the T-Way services, education and local employment.

To understand the number of people using the regional shared path and passing through the car park a pedestrian and bicycle rider survey was commissioned over a week in early December 2017.

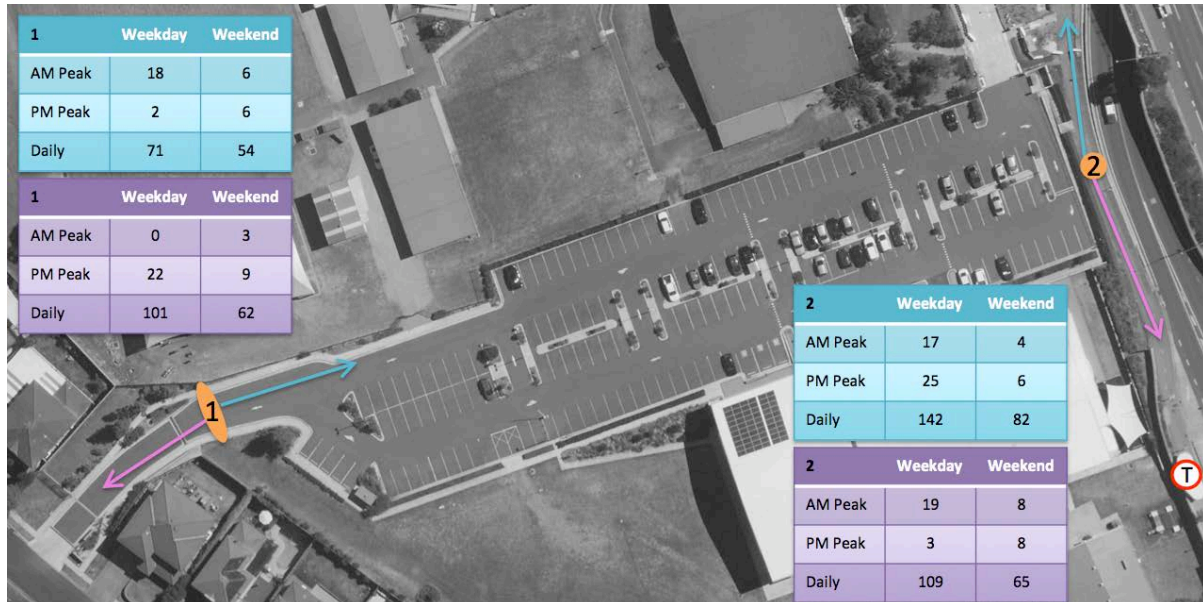


Figure 7-8 Pedestrian volumes through the car park and on the shared path, Dec 2017

As indicated in Figure 7-8, the observed number of pedestrians that walk through the car park were:

- 172 pedestrians through the weekday
- 116 pedestrians during the weekend
- Peak hour flows were reported at 18 pedestrians during the weekday AM peak, travelling toward Old Windsor Road and 22 pedestrians during the weekday PM peak travelling from Old Windsor Road to Glenwood.

Peak pedestrian flows occurred earlier than the reported vehicle flows at Cramer Place and Sharrock Avenue. The weekday AM Peak commenced at 07:30 – 08:30; and in the PM peak at 17:45 – 18:45.

The average daily pedestrian volumes along the Old Windsor Road shared path were recorded as 251 pedestrians on a weekday, reducing to 147 pedestrians on a weekend.

It is likely that pedestrian numbers through the church car park were higher prior to commencement of construction on the Bella Vista Station site as McDonalds and the Homemaker Centre were attractors for both residents and students from Glenwood High School.



Figure 7-9 Bicycle volumes through the car park and on the shared path, Dec 2017

As indicated in Figure 7-9, the number of cyclists observed to travel through the Emmanuel Baptist Church car park is minimal. Average daily volumes were reported at seven on a weekday, increasing to eight on a weekend.

The AM and PM peak bicycle volumes on the shared path were similar to the number passing through the car park, at one or two bikes. However, daily bicycle numbers were much higher reaching an average of 36 during the weekday and 57 on the weekend.

The mode split for users travelling through the Emmanuel Baptist Church car park is 96% pedestrians and 4% cyclists on a weekday and 94% pedestrians and 6% cyclists on a weekend.

The mode split for users travelling along the shared path was 87% pedestrians and 13% bicycle riders on a weekday and 72% pedestrians and 28% bicycle riders on a weekend.

7.2.3. Potential impacts

Construction

A range of plant and equipment would be used during construction. As described in Section 4.7.4 there would be up to 10 trucks and concrete pourers entering and exiting the site at intermittent intervals across the day during the peak construction period. The trucks would either bring construction materials or remove spoil and other waste offsite. The origin and destination of the construction traffic would depend on construction requirements, program, and the requirement to transfer materials and waste from the construction site. Construction traffic would arrive and leave the site directly from Swansea Court and the wider road network. In addition, there would be up to 10 workers servicing the proposal during peak construction.

Due to the low volume of vehicle movements during construction, the proposal's impact on the local and regional road network are expected to be minor. The proposal would not impact on any property access.

Operation

The proposed pedestrian link at 1 Swansea Court would improve the level of pedestrian and cyclist access to the Bella Vista Station for the Glenwood community. This is illustrated in Figure 7-10 and Figure 7-11, which shows the extension to the one kilometre walking

catchment west into Glenwood if the link is provided. This would significantly reduce walking times for local residents seeking to access Bella Vista station, T-way services, Norwest Business Park and future businesses surrounding the station precinct, as well as improve access between transport services and local schools.

Households located in the local street network surrounding the proposed link, such as Sharrock Avenue, are currently outside the one kilometre walking catchment of Bella Vista station (via formal access routes) and would take 25 to 30 minutes to access the station. The provision of the proposed pedestrian link would directly benefit these residents, placing the station within a 5 to 10 minute walk. Increased pedestrian activity is also likely to have some safety benefits through increased passive surveillance and more active streets.

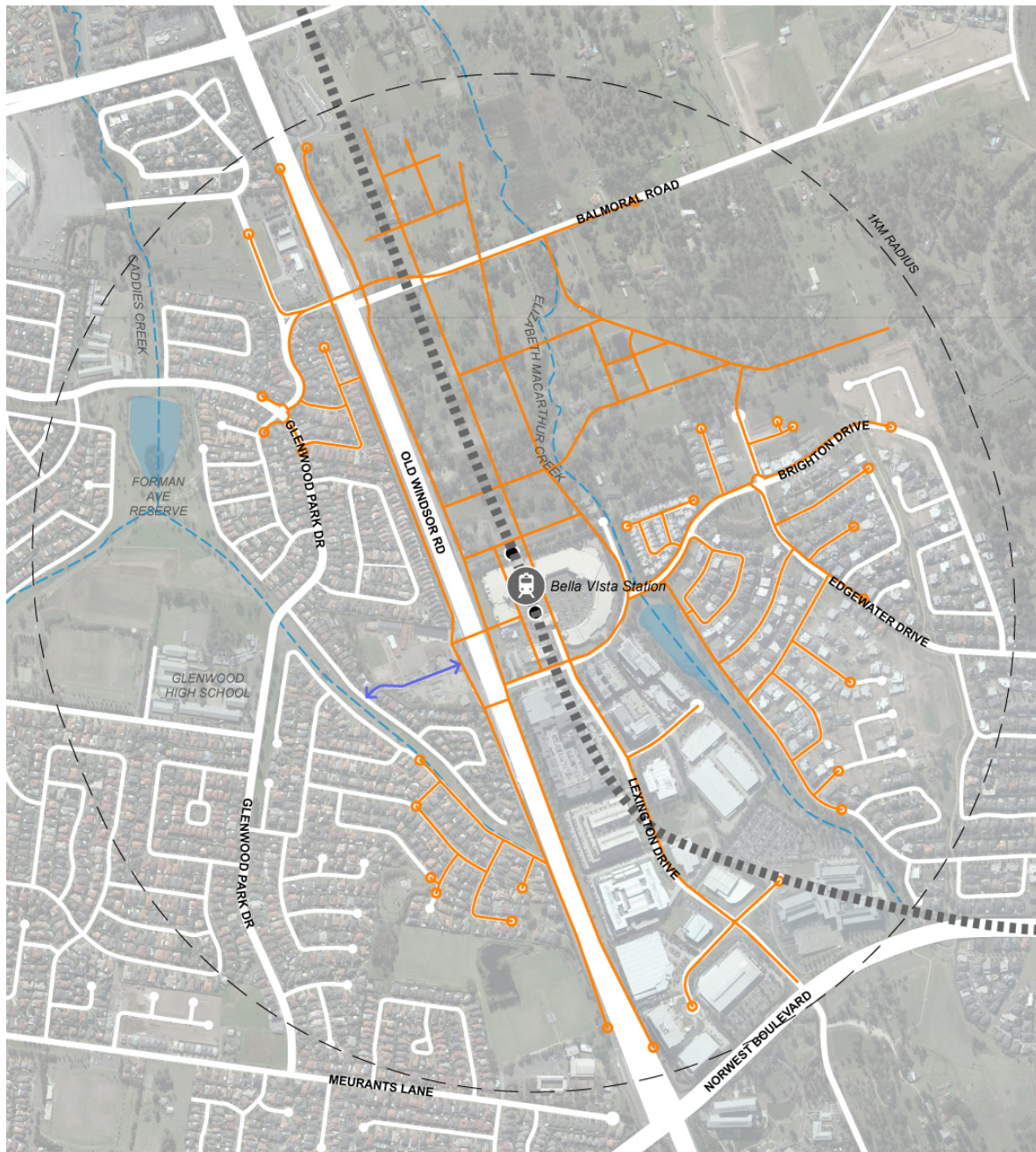


Figure 7-10 Accessibility of Bella Vista Station from Glenwood within a one kilometre walking catchment without the proposed pedestrian link

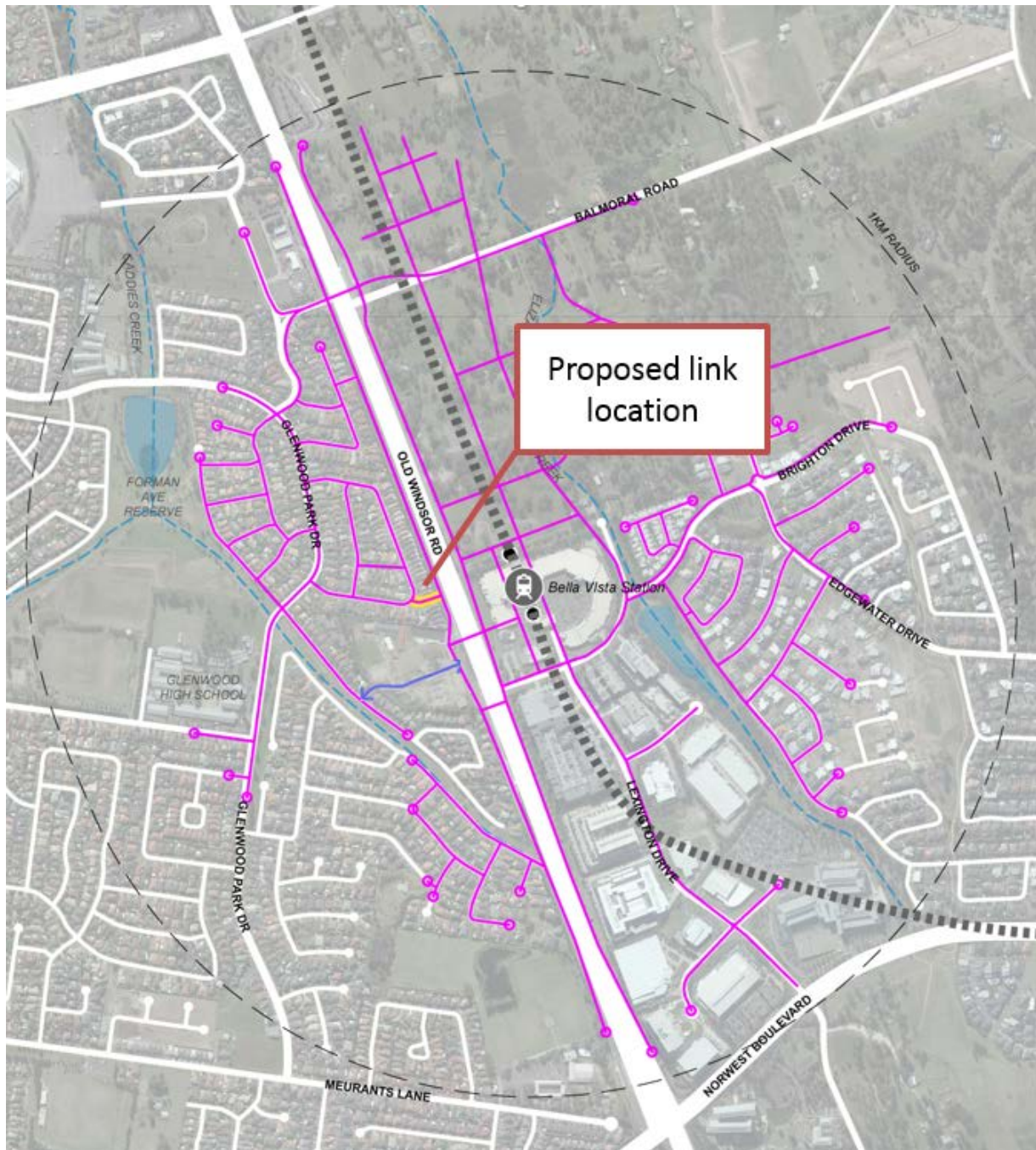


Figure 7-11 Accessibility of Bella Vista Station from Glenwood within a one kilometre walking catchment with the proposed pedestrian link

The improved level of access provided by the proposed link, combined with the existing road network access issues into and out of Glenwood would likely result in changes to local traffic and parking conditions in the vicinity of the new pedestrian link. Potential impacts to local traffic and parking conditions adjacent to the proposed pedestrian link are identified as follows:

- Additional demand for on-street commuter parking, despite an 800 space commuter car park provided as part of the Bella Vista Station. Improved pedestrian access to Bella Vista Station, further access improvements to T-way services and Norwest Business Park along with the existing congestion issues at the Miami Street and Old Windsor Road intersection are likely to contribute to this increased parking demand

- Additional vehicle movements into and out of Sharrock Avenue and Cramer Place as a result of demand for parking and 'kiss and drop' in the vicinity of the proposed pedestrian link:
 - There are approximately 230 vehicle movements on a typical weekday within the local street network between the proposed pedestrian link and Glenwood Park Drive. Based on the existing informal on-street parking capacity within this area, up to 135 additional vehicles could enter and leave this area each day. This assumes that all of the available parking spaces would be used for commuter parking and that no parking management measures are applied
 - While Bella Vista Station will provide 16 spaces for kiss and ride, there may be some increase to kiss and ride activity on local streets such as Sharrock Avenue as a result of congestion at major traffic intersections into or out of Glenwood. However, this is likely to be limited as the proposed pedestrian link would be a 400 to 500 metre walk from the station and the nature of the closed local street network would not easily facilitate passenger drop-off as part of an on-going journey
- Side friction caused by additional on-street parking:
 - This is likely to have a traffic calming (slowing speeds) effect on vehicles using Cramer Place and Sharrock Avenue.

Prior consultation with the community regarding the provision of an additional pedestrian link specifically identified the following issues:

- Streets being too narrow to accommodate parking without interrupting traffic flow, emergency and service vehicle access
- Driveways or sightlines along streets/at intersections being blocked by parked cars, impacting safe access to properties
- Ability of Council to enforce parking provisions
- Traffic impacts of drop-off or parking on quiet residential streets
- Safety of residents and local children in narrow streets if they become busier thoroughfares.

Mitigation measures to manage these impacts are outlined in Section 7.2.4.

7.2.4. Management and Mitigation Measures

Construction

A Construction Traffic Management Plan (CTMP) would be prepared by the contractor in consultation with TfNSW, Blacktown City Council and Roads & Maritime Services as required. The CTMP would be the primary management tool to manage potential traffic impacts associated with construction. The CTMP, at a minimum, would include a description of:

- Procedures for preparing and implementing Traffic Control Plans (TCPs) to manage temporary road disruptions on Swansea Court
- Final construction traffic approach and departure routes, site compound(s) and loading zones
- Access routes to and from the local road network and contractor parking
- Scheduling of works/deliveries to avoid peak times and generally limiting works in the road carriageway as much as practicable
- Measures to:

- Limit temporary parking losses
- Maintain private property access unless otherwise agreed
- Provide details of construction signage, traffic controllers and other community notifications.

Operation

Traffic and parking management on local streets is under the authority of local government. Under the conditions of approval for the Sydney Metro Northwest project, TfNSW is required to develop a Parking Management Strategy to provide recommendations to Councils likely to experience an increase in commuter car parking activity as a result of Sydney Metro Northwest operation.

The parking management principles developed under the draft Parking Management Strategy encourages use of the Bella Vista Station commuter car parking facilities and discourages on-street commuter parking in residential streets in close proximity to the station.

For Bella Vista Station, the application of the parking management measures would include:

- Less than 400 metres from Bella Vista Station – time restricted on-street parking up to a four hour limit and potential longer-term consideration of resident parking schemes
- Between 400 to 800 metres from Bella Vista Station– unrestricted parking would be proposed with longer-term consideration of resident parking schemes or time restricted parking if parking issues arise
- Greater than 800 metres from Bella Vista Station– parking restrictions would not be proposed for streets located outside this area.

An initial discussion with Blacktown City Council officers indicated that the following parking management measures would be considered for the proposal, based on current policy and experience with commuter parking at other railway stations and T-Way stops, and other parking-intensive land uses:

- Time restricted parking
- Resident parking schemes
- Restricting parking to one side of the road where applicable
- Road markings at intersections to delineate statutory no stopping zones
- Council officers advised that any traffic and parking management scheme implemented must consider issues which are raised during the consultation, construction and operational phases of the proposal. This process would be actively monitored and reported by TfNSW.

Sydney Metro Northwest will also be undertaking monitoring of parking conditions for one year, both prior to and following the commencement of metro services. These surveys will be undertaken every four months. This monitoring may lead to further parking mitigation recommendations around the proposed Glenwood Pedestrian Link.

Due to the narrow road widths of the street network surrounding the proposed pedestrian link additional parking management strategies could be considered, including:

- Restricting parking on one or both sides of local streets
- Staggering on-road parking to provide traffic calming benefits and maintain access for emergency vehicles

- Driveway protection markings
- Delineating statutory no stopping zones at intersections.

A number of streets in the road network surrounding the proposed pedestrian link have been nominated for consideration of these parking management measures. The streets identified for consideration include:

- Sharrock Avenue
- Cramer Place
- Nixon Street
- Adrian Street
- Shaun Street (assuming pedestrian access through the church continues).

The application of the parking management framework to these streets would consider a time limit up to four hours to mitigate long-stay commuter parking and associated vehicle trips into the area and/or the staggering or restricting of parking to one-side to maintain access for vehicles (including emergency vehicle access) along the narrow roads, and to encourage slower vehicle movement. Delineation of statutory no stopping zones and driveway access points could also be considered.

Blacktown City Council would be responsible for determining the traffic management measures to be applied, and appropriate timeframes for implementation.

Section 8.3.1 provides a detailed list of proposed mitigation measures.

7.3. Landscape and visual

An assessment was carried out to identify the extent and magnitude of potential visual impacts. The assessment is included in the *Glenwood Pedestrian Link Landscape and Visual Assessment* (Iris, 2018), attached as Appendix D and summarised below.

7.3.1. Methodology

The potential changes to visual amenity impacts were assessed during construction and operation. The assessment methodology includes:

- A description of the existing environment
- Identification of potential landscape and visual receivers and the sensitivity of those receivers
- Identification of potential landscape character and visual amenity impacts
- A general assessment of the potential improvement or reduction in landscape character and visual values
- Identification of any changes to mitigation measures.

Landscape impact assessment

Landscape refers to the overall character and function of a place. It includes all elements within the public realm and the interrelationship between these elements and the people who use them.

To identify these impacts, the assessment identified the sensitivity of the element to change and the magnitude of change expected from the proposal, and then made an overall assessment of the level of impact expected.

The degree of sensitivity of each landscape element to change was identified as either neighborhood, local, regional, State or National.

The magnitude of modification to landscape quality of each landscape element was identified as either considerable reduction, noticeable reduction, no perceived change, noticeable improvement, or considerable improvement.

Visual impact assessment

Day-time assessment

The assessment of these impacts involved identifying the existing visual conditions, views that are representative of these conditions, the sensitivity of the views and the magnitude of change expected. An overall assessment was then made of the level of impact expected (based on the matrix in Table 7-7).

Table 7-7 Daytime visual impact matrix

		Visual sensitivity				
		National	State	Regional	Local	Neighbourhood
Visual modification	Considerable reduction	Very high adverse	Very high adverse	High adverse	Moderate adverse	Minor adverse
	Noticeable reduction	High adverse	High adverse	Moderate adverse	Minor adverse	Negligible
	No perceived change	Negligible	Negligible	Negligible	Negligible	Negligible
	Improvement	Beneficial	Beneficial	Beneficial	Beneficial	Beneficial

Night-time assessment

The assessment of night-time impact has been carried out with a similar methodology to the daytime assessment. However, the assessment also draws upon the guidance of the Institution of Lighting Engineers (UK) and the Guidance for the reduction of obtrusive light (2005), as well as AS4282 Control of the obtrusive effects of outdoor lighting (1997).

The night-time assessment assessed sensitivity and visual modification change and was then combined for each element to identify a level of visual impact based on the matrix in Table 7-8.

Table 7-8 night-time visual impact matrix

		Visual sensitivity			
		E1: Intrinsically dark landscapes	E2: Low district brightness	E3: Medium district brightness	E4: High district brightness
Visual modification	Considerable reduction	Very high adverse	High adverse	Moderate adverse	Minor adverse
	Noticeable reduction	High adverse	Moderate adverse	Minor adverse	Negligible
	No perceived change	Negligible	Negligible	Negligible	Negligible
	Improvement	Beneficial	Beneficial	Beneficial	Beneficial

7.3.2. Existing environment

The existing visual environment of the proposal consists of a mix of typical urban, commercial, and parkland land uses adjoining various sections of the proposal. This visual environment consists of a range of low, medium and high levels of existing development.

The existing landscape of the proposal site is typical of an urban landscape including infrastructure land uses (arterial and local roads) and urban residential land uses (including both residential properties and community facilities). Swansea Court, Sharrock Avenue and Cramer Place are enclosed by residential properties and has been extensively cleared of trees. The visual envelope of the proposal is limited due to the landform, vegetation and built elements that exist along the Swansea Court, Sharrock Avenue, Cramer Place and Old Windsor Road corridor within the proposal site.

The main viewers of the proposal would be users of Swansea Court, Sharrock Avenue, Cramer Place and Old Windsor Road shared path and road corridor including residents, workers, visitors of nearby properties, pedestrians, cyclists and construction personnel associated with the construction of Bella Vista Station.

The view catchment for the majority of the proposal would be generally contained to within the road corridor and residential properties on Swansea Court, Sharrock Avenue and Cramer Place. Views from the local residential streets and the users of Old Windsor Road shared path are shown in Figure 7-12 and Figure 7-13.

7.3.3. Potential impacts

Landscape impacts

During construction there would be direct impacts on the landscape of the proposal site and adjacent areas as vegetation within the site, and trees along the Old Windsor Road shared path would be removed. Due to the removal of the mature and semi-mature trees and other vegetation, there would be a noticeable reduction in the character of a neighbourhood sensitivity landscape, which would result in a negligible landscape impact during construction.

The introduction of new open space, and access for community use would result in an improvement in character of a neighbourhood sensitivity landscape, resulting in a minor beneficial landscape impact during operation.

A summary of the potential landscape impacts of the proposal is provided for construction and operation in Table 7-9.

Table 7-9 Summary of landscape impacts

Location	Sensitivity	Construction		Operation	
		Modification	Impact	Modification	Impact
The site and surrounds	Neighbourhood	Noticeable reduction	Negligible	Noticeable improvement	Minor beneficial

Visual impacts

Daytime visual impacts

The anticipated daytime visual impacts of the proposal are summarised in Table 7-11, with further details provided in Appendix D.

Existing views are provided in Figure 7-12 and Figure 7-13.



Figure 7-12 View from Cramer Place (looking southeast)



Figure 7-13 View of old Windsor road shared pathway (looking north)

Construction would result in mostly minor adverse visual impacts at the views assessed. There would be a moderate adverse impact on the view from Old Windsor Road and shared pathway. This impact would result from the proposal site being enclosed by site fencing, and the removal of street trees and vegetation within the site, opening up views between the site and Old Windsor Road. Construction of the proposal is expected to generate a considerable reduction in visual amenity from streets and residences in close proximity to the proposal site.

Operation of the pedestrian link itself would result in mostly minor beneficial visual impacts at the views assessed. There would be a negligible visual impact on the views from adjacent properties overlooking the proposal site. Views to a residential lot would be replaced with an open space, including a pathway and ramps with handrails, rising from the corner of Swansea Court and Sharrock Avenue to the shared pathway beside Old Windsor Road. Whilst the movement of pedestrians and conversion of the proposal site to public use would increase activity in this view, overall, the replacement of a residential property with leafy open space, would result in a considerable improvement in visual amenity from streets and residences in close proximity to the site.

Whilst the transformation of the site from private to public use would expose neighbouring properties to additional activity and potential overlooking, the introduction of fencing and planting would aim to minimise these potentially adverse changes. The change from a residential property to an open space would also offer some amenity improvements including opening-up views from the upper storey of these properties and providing an outlook onto open space where currently there is built form. On balance, this would result in no perceived change in visual amenity from the adjacent residential area, which is of neighbourhood sensitivity. A summary of the potential daytime visual impacts of the proposal is provided for construction and operation in Table 7-10.

Table 7-10 Summary of daytime visual impacts

Location	Sensitivity	Construction		Operation	
		Modification	Impact	Modification	Impact
Viewpoint 1 Views from Cramer Place, Glenwood	Neighbourhood	Considerable reduction	Minor adverse	Noticeable improvement	Minor beneficial
Viewpoint 2 Views from adjacent properties overlooking proposal site	Neighbourhood	Considerable reduction	Minor adverse	Noticeable improvement	Negligible
Viewpoint 3 Views from Old Windsor Road and shared pathway	Local	Noticeable reduction	Moderate adverse	Noticeable improvement	Minor beneficial

Night-time visual impact

No night works are proposed, however, it is expected that there would be some low-level security lighting required within the site and along the Old Windsor Road shared path. This lighting would be cut-off and directed towards the site so that there is no direct light spill on adjacent private properties. Existing lighting from Old Windsor Road, including street lights and moving traffic, may be more visible from properties directly opposite, due to the removal of vegetation along a 50 metre length of the shared path adjacent to the property boundaries. It is expected that there would be no perceived change in the amenity of views from these areas, which are of E3: medium district brightness, resulting in a negligible visual impact at night.

A summary of the potential night-time visual impacts of the proposal is provided for construction and operation in Table 7-11.

Table 7-11 Summary of night-time visual impacts

Location	Sensitivity	Construction		Operation	
		Modification	Impact	Modification	Impact
Areas surrounding the site	E3: Medium district brightness	No perceived change	Negligible	Noticeable reduction	Minor adverse

During construction, there would be a negligible visual impact. The visual setting of this area is an E3: Medium district brightness area, as it includes brightly lit areas including the Old Windsor Road corridor (a major arterial route) and the Bella Vista Station Precinct (currently under construction), across a general backdrop of lighting from local streets and illuminated windows in surrounding residential, commercial and industrial properties.

There would be a minor adverse visual impact during operation from adjacent residential streets. The open space would include a lit pathway and ramps linking Swansea Court and the Old Windsor Road shared pathway. This lighting would be cut-off style and directed away from adjacent residences to avoid light spill on adjacent private properties. Lighting from moving traffic and street lights along the Old Windsor Road corridor may have increased visibility from neighbouring properties and from the corner of Swansea Court, Cramer Place and Sharrock Avenue, as the residence and trees along Old Windsor Road are removed. This would be mitigated somewhat by new tree planting within the site and along the Old Windsor Road shared path, as well as remaining existing mature trees between the shared path and Old Windsor Road. Overall, there would be a noticeable reduction in visual amenity in these areas at night.

7.3.4. Management and mitigation measures

Measures to mitigate visual impacts during construction would be included in a CEMP for the proposal and would include measures such as minimising light spill during night works, screening of compounds and minimising tree removal.

Refer to Section 8.3.1 for a list of proposed mitigation measures.

7.4. Biodiversity

7.4.1. Methodology

The biodiversity study area was limited to the proposal site. A site visit provided familiarity with potential biodiversity constraints. A desktop review was carried out of background reports, databases and mapping relating to the biodiversity of the bioregion and the study locality. These included:

- NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife Database within a 10 kilometre radius of the proposal site
- EPBC Protected Matters Search Tool NSW Department of Primary Industries Noxious Weeds.

7.4.2. Existing environment

The proposal site, including 1 Swansea Court, contains planted garden and roadside vegetation. There are street planted Callistemons at the front of 1 Swansea Court as well as a Banksia (Figure 7-14). Non-native vegetation is also present on the property. At the rear of the property adjacent to the Old Windsor Road shared path are a number of planted Eucalypts and Lomandras, situated in a garden bed just over a metre wide (Figure 7-15). On the southern side of Cramer Place and the eastern side of Sharrock Avenue there are a number of planted trees on the grass verge.

The vegetation identified during the site visit would be of residual interest as they may provide foraging resources to migratory birds. There are no records of nearby noxious weeds.

A search of the EPBC Protected Matters Search Tool on 13 November 2017 identified five listed Threatened Ecological Communities (TEC) as occurring or potentially occurring within one kilometre of the proposal site.



Figure 7-14 Native vegetation including Callistemons and a Banksia at 1 Swansea Court



Figure 7-15 Planted vegetation at the rear of 1 Swansea Court

7.4.3. Potential impacts

Flora, vegetation and habitat loss

The proposal would impact a previously disturbed area and no remnant vegetation would be impacted during construction. Several native plantings occur within the proposal site and would likely require removal during construction works. As noted above, the Callistemons would only provide a foraging resource for native fauna that can survive in a highly modified urban environment. The impact of the proposal upon flora, vegetation and habitat loss would be negligible. Up to 20 planted Eucalypts and Lomandras located at the rear of 63 – 67

Sharrock Avenue and 1 to 5 Swansea Court may require removal during the regrading of Old Windsor Road shared path.

Direct loss of fauna

Any mobile species (e.g. birds and bats) potentially affected by the proposal would be able to temporarily move from the area. This would not be the case for less mobile species. Consequently, the species most at risk of injury or death from construction works would be small mammals or reptiles that use any vegetation for habitat on-site. As the vegetation to be removed is mostly juvenile plantings, fauna habitat is unlikely and impacts to fauna limited.

With regards to the local presence of grey-headed flying fox, this species is unlikely to roost or breed in the immediate area. The one remaining residual risk would be the low potential for echolocation bats (including the grey-headed flying fox) to become disorientated immediately following vegetation removal at the site. However, bat species are generally adaptive and find alternative routes. This would be assisted by the widespread presence of alternative structures to echolocate off. The potential impact is considered to be negligible.

Potential habitat fragmentation impacts

The potential habitat situated on 1 Swansea Court and immediately behind the property is highly fragmented (Figure 7-14 and Figure 7-15). Potential impacts to habitat fragmentation would be negligible. The proposal would result in new plantings and landscaping and this is expected to potentially improve the habitat value of the area.

Biodiversity impacts during operation

On completion of the proposal the area surrounding the pathway would be landscaped and revegetated with native plants. There would be some additional vegetation within the proposal site following construction and more potential habitat and foraging material for fauna. The proposal would have some limited overall benefit on biodiversity once completed.

7.4.4. Management and mitigation measures

As part of CEMP, a Vegetation Management Plan would be developed to address potential biodiversity impacts. Weed species within the study area would be managed in order to control them from further spread.

Refer to Section 8.3.1 for a list of proposed mitigation measures.

7.5. Non-indigenous heritage

A desktop assessment of non-Indigenous heritage was undertaken as part of the proposal. A summary of the assessment is provided in this section.

7.5.1. Methodology

A search of the following non-Indigenous heritage registers was carried out in November 2017 to identify heritage places within and near the proposal site. The following data registers and databases were searched:

- NSW State Heritage Register
- *Blacktown Local Environmental Plan 2015*
- *The Hills Local Environment Plan 2012*
- Section 170 heritage and conservation registers
- National Heritage List
- Commonwealth Heritage List.

7.5.2. Existing environment

Early European settlement in the study area was shaped by the construction of the Windsor and Old Windsor Roads connecting farms in Parramatta with those in the Hawkesbury. This allowed clusters of farms to be developed along these roads from as early as the 1790s (TfNSW, 2013a).

With regards to the proposal site and its immediate environs it remained largely farmed or undeveloped until the 1960s at which point it was developed as part of the rapid post-war expansion of Sydney's outer suburbs. This expansion and development continued until the 1980s at which point the business park was established. Over the intervening 35 years, the area has continued to develop. As a consequence, the study area contains no historic heritage values as can be seen by the absence of recorded heritage items or archaeological potential.

There are no heritage items located in the proposal site itself. There is one listed heritage item, the original section of road and culvert, situated near to the proposal site (within the road reserve of Old Windsor Road) listed as Item A2 under The Hills Local Environmental Plan 2012. Nearby heritage items are also located within the Blacktown LGA including a house located 300 metres to south of the proposal site (Item 27 under the Blacktown LEP) and another house located approximately 1km north west of the proposal site (Item 25 under the Blacktown LEP).

7.5.3. Potential impacts

The proposal would be contained to land previously disturbed for the establishment of residential housing within Glenwood. There are no anticipated non-Aboriginal heritage impacts that would result from the proposal's construction or operation. Also, the potential for encountering any archaeology during construction is minimal.

7.5.4. Management and mitigation measures

Due to their distance from the proposal site, and generally minor nature of the works, it is unlikely that the proposal would result in any substantial impact to the identified heritage sites or properties. Should any potential non-Aboriginal artefacts be uncovered during the demolition works, work would cease, and the NSW Department of Planning and Environment/Office of Environment and Heritage would be contacted in accordance with the requirements of the Heritage Act. No specific safeguards and management measures are considered necessary.

7.6. Aboriginal heritage

This section assesses the proposal's potential impact on Aboriginal heritage.

7.6.1. Methodology

The assessment uses the following terms:

- The 'study area' refers to the Aboriginal Heritage Information Management System (AHIMS) search area which encompasses a buffer of 200 metres from the proposal site.

The following database was reviewed:

- Aboriginal Heritage Information Management System (AHIMS) Web Services (Office of Environment and Heritage, 2016).

7.6.2. Existing environment

The proposal site is located in the territory of the Darung/Dharung Aboriginal community and more specifically the Bidjigal/Bediagal clan (wood tribes). The Darung subsisted on fishing, possums and yams supplemented by various native plants and animals. They assumed an extensive hunter-gatherer existence, making tools using pieces of rock found on the Cumberland Plain. They were attracted to places where there was an abundance of resources (both physical and spiritual) including:

- Fresh water (including associated plants and animals)
- Hinterland resources (e.g. tall open forest, woodland and sheltered gullies)
- Woodland where there were the available resources needed for fuel, shelter and material culture
- Overhanging sandstone, which provided shelter or were used to create art
- Sandstone platforms used for axe grinding
- Exposed areas of stone (lithic areas) to make tools
- None of these features are associated with the environment of the study area. Moreover, the area has been heavily disturbed during residential development. Consequently, there is considered to be no potential for Aboriginal heritage to occur across the study area.

7.6.3. Potential impacts

An AHIMS search conducted in November 2017 recorded no Aboriginal sites and no Aboriginal places within 200 metres of the proposal site. There are no anticipated Aboriginal heritage impacts that would result from the proposal's construction or operation. Also, the potential for encountering any unforeseen subsurface archaeology during construction is assessed as negligible.

7.6.4. Management and mitigation measures

No specific safeguards and mitigation measures are considered necessary.

7.7. Socio-economic, land use and property

This section presents an assessment of the proposal's potential socio-economic, land use and property impacts due to anti-social behaviour. It is anticipated that the construction of the pedestrian link would have a positive impact on businesses located on the eastern side of Old Windsor Road due to increased pedestrian traffic and connectivity to Glenwood. Due to the predicted positive business impact, this assessment has focused on land use and property impacts due to anti-social behaviour.

7.7.1. Methodology

This assessment was based on a desktop assessment of land use zoning, aerial photography, property boundaries and socio-economic characteristics.

7.7.2. Existing environment

Land use zoning

The proposal site is located on and under land whose local development control is provisioned under the Blacktown LEP. As mentioned in Section 1.4, the approval pathway means that the proposal is not subject to the development controls contained in the LEP, however, the LEP zoning is relevant in identifying land use conflict.

Table 5-2 describes the land use objectives of each zone and the proposal's consistency with these controls.

In summary, components of the proposal site are located on land zoned as low density residential; an area which permits other land uses that provide facilities or services to meet the day to day needs of residents. The proposal is also not located in any area that contains active subsurface mineral, mining or petroleum rights.

General land use characteristics

The main land use characteristics in the study area comprise:

- Glenwood low density residential area
- Old Windsor Road corridor to the east
- The construction of Bella Vista Station to the east
- Trades Norwest Anglican Senior College about 65 metres to the south
- Emmanuel Baptist Church about 120 metres to the south.

Proposal site land uses

The proposal site, approximately 400 square metres would be located on 1 Swansea Court Glenwood which currently contains a single two storey dwelling. The proposal site is located on Lot 546 DP1009539.

Socio-economic characteristics

The proposal is located at 1 Swansea Court, Glenwood which is currently occupied by a residential dwelling. Across Old Windsor Road in The Hills LGA, are several businesses including Sydney Animal Hospital Norwest, Metricon Homes and Elite Fitness which are located over 250 metres to the southeast of the proposal. Trades Norwest Anglican Senior College and Emmanuel Baptist Church are located about 65 metres and 120 metres south of the proposal site respectively.

7.7.3. Potential impacts

Construction

The proposal would involve the acquisition and demolition of the dwelling at 1 Swansea Court, Glenwood. The proposal would not inhibit, conflict with, or affect land use development. During construction, the use of Old Windsor Road shared path would be temporarily impacted. A detour would be provided for users.

The following socio economic impacts are anticipated during the proposal's construction:

- Short-term access delays along Sharrock Avenue and Swansea Court
- The temporary loss of some street parking along Sharrock Avenue and Swansea Court
- Amenity impacts from the construction site's visibility, noise and vibration, dust, and construction traffic. It is anticipated that these amenities impacts would be similar to that of a typical dwelling building site.

The proposal's location does not front any active businesses. It is unlikely to reduce the viability of any businesses in the area.

Operation

The proposal on its own would not generate any major economic impacts, however, there would be some local economic stimulus as a result of the letting of a demolition and

construction contract. By improving access across Old Windsor Road, residents of Glenwood would be able to more easily access businesses located near Bella Vista Station providing economic stimulation through increased access and connectivity.

As a result of the increased connectivity from the pedestrian link, it is anticipated that traffic and parking would increase on surrounding streets, affecting the amenity of the residential area. Should on-street parking become an issue for local residents, TfNSW would consult further with Blacktown City Council to establish the need or otherwise for parking restrictions and/or other controls such as resident parking scheme. Further discussion is provided in Section 7.2.

As a result of the increased activity from the pedestrian link, it is anticipated that pedestrians and cyclist movements would increase on Sharrock Avenue, Cramer Place and Swansea Court, with minor effects on the amenity of the residential area. While there could be the perception that increased anti-social behaviour could potentially result from potential users congregating in proximity to the link, the design intent would include CPTED principles to deter such behaviour.

During initial community consultation, residents near the proposal raised concerns regarding property and personal safety due to increased pedestrian traffic into currently limited access streets. The proposal has been designed to provide natural surveillance through the design of lighting, landscaping and consideration of potential CCTV in consultation with Blacktown City Council. The proposal has been designed so it would deter people from stopping or loitering. The pedestrian link is short and is a direct thoroughfare. No street furniture would be provided that would encourage pedestrians to stop.

The proposal would not inhibit, conflict with, or affect land use development when in operation.

7.7.4. Management and mitigation measures

A Community Liaison Plan (to be developed by the Contractor prior to construction) would 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 possible.

The community would be kept informed of construction progress, activities and impacts in accordance with the Community Liaison Plan.

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

Further discussion on keeping the community informed is provided in Chapter 6.

7.8. Water quality, hydrology, drainage

This section assesses the proposal's impact on water quality, hydrology and drainage.

7.8.1. Methodology

The assessment:

- Confirmed the flood risk potential across the proposal site. The Blacktown LEP was used to check for flood prone areas
- Identified and described the surface and groundwater characteristics of the study area
- Confirmed the current drainage arrangements and discharge pathways across the study area focussing on the proposal site
- Identified key activities that could potentially affect surface or groundwater values

- Identified adverse impacts that would need safeguarding or managing under the proposal.

7.8.2. Existing environment

The study area accounted for the likely effects across the proposal site, within the local surface and groundwater catchment and to the underlying soil landscape and geology. Regional characteristics were used to provide wider context and reference.

Surface water

The nearest surface watercourse is Caddens Creek located about 280 metres to the west of the proposal site. It is classified as a lower-order creek and forms a tributary of Cattai Creek, which in turn drains into the Nepean River. Caddens Creek in the vicinity of Glenwood has been heavily altered as a floodway for the residential area and flows into an artificial waterbody located next to Glenwood Park Drive. This artificial waterbody is located approximately 600 metres north west of the proposal.

Drainage

Stormwater drains capture runoff from the property on Swansea Court as shown in Figure 7-16. It is likely that these drains discharge to the trunk main sewer and then possibly the Caddens Creek, however, this has not been confirmed.

Flood risk

The study area is not classified as being at risk of major flooding; however localised flooding may occur adjacent to the creek lines following significant rainfall. As the proposal site is located a notable distance from any creek line it would be exceptionally unlikely that it would be at risk of flooding.



Figure 7-16 Street drain in front of 1 Swansea Court

Groundwater

The base regional groundwater unit is contained within the Hawkesbury Sandstone. Typically, groundwater levels and flows within the sandstone follow the area's topography. The mean water table depth can vary by up to 130 metres. The water table depth can also change by up to 10 metres due to the effects of inundation, drawdown and rainfall.

7.8.3. Potential impacts

Surface and ground water and drainage- construction

Surface water bodies in the study area would not be directly affected by the proposal. There is however a residual potential risk for construction related runoff and sediment to be discharged to stormwater drains on Swansea Court which would drain to local creeks (refer to Section 7.8.2). Demolition and any potential regrading would expose surface soils to water runoff. Overall, the likelihood of such impacts occurring is assessed as low given the proposal's limited size, and proposed erosion and sediment controls. No impacts to groundwater are expected as limited excavation is planned.

Surface and ground water and drainage - operation

The proposal would result in the demolition and removal of the existing residence at the proposal site. This would result in a higher permeable area than what is currently on the site. As the land surrounding the pedestrian link would be landscaped appropriately with vegetation, no substantial impacts to water quality and drainage are expected during operation. There is also no proposal to alter the existing stormwater drainage infrastructure other than minor realignments to support kerb extension alterations. As such, the catchment of each drain would be unaffected and so there would be no operational impact. All drainage would continue to be managed under the current management and maintenance program. Drainage for the proposal site could include vegetated swales and grates and would be developed during the detailed design process.

Groundwater

As the proposal involves the demolition and removal of the existing house and construction of a pedestrian link, which involves surface works, no groundwater impacts are anticipated.

7.8.4. Management and mitigation measures

A Construction Soil and Water Management plan (CSWMP) would be prepared to manage soil, surface water and ground water. Further safeguards and mitigation measures that would be implemented to address potential impacts of the proposal on water quality, hydrology and drainage are identified in Section 8.3.1.

7.9. Soils, geology and contamination

This section assesses the proposal's impact on geology and soils.

7.9.1. Methodology

The following databases and documents were reviewed in preparing the assessment:

- *Blacktown Local Environmental Plan 2015*
- Contaminated land records of notices (NSW EPA)
- Australian Soil Resource Information System
- Salinity Potential in Western Sydney 2002 Map (NSW OEH)
- eSPADE Webapp (NSW OEH).

7.9.2. Existing environment

Soils and geology

The broadest geological classification in the area is that of the Sydney Basin, which covers a large expanse of the metropolitan area. The basin is characterised by the sequential layering of sediments of different sizes.

The landform has been locally influenced by a number of meandering lower-order creeks and watercourses, the closest of which is Caddens Creek and Elizabeth Macarthur Creek. Within the proposal site, the topography gently slopes west towards Swansea Court.

The study area is located on the interface of the Blacktown and Luddenham soil landscapes.

Blacktown soil landscape: The associated soils occur on the low undulating terrain of the Wianamatta Group shales. The soils are generally about one metre deep, red-brown, and podzolic (iron-rich). Typically, they are moderately reactive, highly plastic and poorly draining.

Luddenham soil landscapes: These soils are sub-set of the Blacktown soil landscape. They are characterised by being highly erosive.

Acid sulfate soils

Acid sulphate soil (ASS) is present across many areas of Sydney. It occurs in areas rich in iron sulphide, which generate sulphuric acid if exposed to the air (oxygen). The acid is an issue in its own right as well as causing the mobilisation of metals (e.g. aluminium, iron, manganese), which can also have a detrimental environmental impact. ASS can also decrease the amount of dissolved oxygen in surface waters, leading to eutrophic conditions.

According to regional mapping, there is no known risk of (potential) acid generating soils being present across the proposal site. However, the iron-rich bands that occur in Ashfield Shale can contain iron-sulphide material. The risk of encountering ASS cannot be fully discounted.

Contamination

A search of official databases did not reveal any known contaminated sites within the proposal site. The following databases were searched on the 13 November 2017:

- The EPA contaminated land record for the suburbs of Glenwood, Bella Vista and Baulkham Hills: This showed there are no contaminated sites recorded within the proposal site
- The *Protection of the Environment Operations Act 1997* public register: This showed that no licences or notices are for properties or operations within and/or next to the proposal site.

The review of potential contamination therefore indicates minimal potential for widespread contamination in the study area.

7.9.3. Potential impacts

Construction

Construction activities would have the following potential impacts on soils and contamination:

- Topography: The earthworks would result in a minor change to the topography of the proposal site. However, this change is consistent with the existing topography and would not be expected to be significant
- Soil erosion and loss of topsoil: This could result from the removal of vegetation (clearing and grubbing) and disturbance of the ground surface during site preparation, earthwork, excavation and other construction activities. Earth-moving activities could also expose loose soils and mobilise these materials
- Disturbance of contaminated soil: If contamination is present in the proposal site excavations would have the potential to disperse contaminated materials. Contaminated materials that have the potential to occur within the proposal site would likely be associated with utilities and road use. Disturbance of potentially contaminated materials may also expose construction workers and/or the general public to these contaminants if appropriate controls are not put in place. However, in light of the potential areas of environmental contamination identified, contamination is considered to be a low risk to the proposal
- Spills of contaminating materials: There is potential for construction activities to result in contamination of soil and/or water due to leaks and spills of potentially contaminating materials
- Stockpile runoff: Materials would be stockpiled as a result of the planned grading, utility adjustments and drainage modifications.

These impacts would generally be temporary, and mitigation measures to reduce the impacts are summarised in Table 8-1.

Operation

The pedestrian link would be maintained once operational. There would be no equipment within the proposal site that would present an operational maintenance risk in terms of leaks and spills.

The only operational risk would be an accidental spillage occurring from undertaking the maintenance activities that require the use of potentially contaminating/polluting materials. Any materials would be used in exceptionally small quantities such that the associated impact is regarded as negligible.

7.9.4. Management and mitigation measures

Management and mitigation measures would be implemented to minimise impacts on soils and from contamination during construction of the proposal. These management measures would be consistent with, and incorporated into, the CSWMP. Further safeguards and mitigation measures that would be implemented to address potential impacts of the proposal on soils, geology and contamination are identified in Section 8.3.1.

7.10. Waste and resource management

This section assesses the proposal's potential waste management and resource use impacts.

7.10.1. Methodology

The study considered the generation of waste across the proposal site, its temporary storage onsite and its disposal offsite. It also considered the availability and ability to obtain construction materials locally.

NSW waste management legislation and planning policy governs waste generation and management, materials reuse and recycling, transportation and disposal and establishes a waste minimisation hierarchy that prioritises waste solutions according to how successfully they conserve natural resources. The hierarchy advocates:

- Avoidance, in preference to recovery, including reuse, recycling, reprocessing and energy recovery, in preference to responsible disposal
- The Waste Reduction and Purchasing Policy (WRAPP) sets objectives to minimise government-sector waste by employing the above hierarchy as well as providing waste segregation at source and the purchase of recycled materials or materials with a high recycled content
- Where disposal remains the only option, the Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014) provide for classifying six types of waste in NSW: special, liquid, hazardous, restricted solid waste, general solid (putrescible) and general solid (non-putrescible). The classifications define how the materials are to be stored, transported, managed and disposed of.

7.10.2. Existing environment

Sydney is well-placed to manage waste and to source materials due to its population, its construction industry and its commerce. The major materials required to construct the pedestrian link are likely available or manufactured within the metropolitan area.

Equally, there is ample provision within the metropolitan area to reuse and recycle materials, and if required, dispose of restricted and controlled waste.

7.10.3. Potential impacts

Waste sources – construction

Table 7-12 lists the likely materials that would be generated during construction. They would primarily comprise:

- Concrete
- Bricks
- Timber
- Gyprock
- Vegetation.

Table 7-12 Waste generation – indicative only

Waste (and waste stream)	Principal generating activity	Preferred management
Demolition concrete	Stage 1: Site establishment	Recovery under exemption for reuse offsite
Building rubble and structural element demolition waste	Stage 1: Site establishment	Recovery under exemption for reuse offsite
Waste metal	Stage 1: Site establishment	Recovery under exemption for reuse offsite
Timber waste	Stage 1: Site establishment	Recovery under exemption for reuse offsite
Adhesives, lubricants, waste fuels and oils, engine coolant	Build	Recovery under exemption for reuse offsite
Excavated soil	Stage 1: Site establishment	Recovery under exemption for reuse offsite
Green waste – vegetation grubbing and clearing	Stage 1: site establishment	Recovery and reuse onsite/ offsite (mulch or composting)
Food waste	All stages	Recovery and reuse onsite/ offsite (mulch or composting)
Slurries, sludge, paint and solvent washout	Stage 1: Site establishment to Stage 4B: Old Windsor Road shared path modifications and construction	Disposal to a licenced facility offsite
Wastewater from other sources including dust suppression and vehicle wash-down	All stages	Disposal to a licenced facility offsite
Contaminated spoil (including potential acid sulphate soils and actual acid sulphate soils)	Stage 1: Site establishment and Stage 2: Construction	Stage 1: Site establishment and Stage 2: Construction

Generated waste has the potential to affect the local environment if it is not managed appropriately. Appropriate management would be in place to prevent the following potential impacts including:

- Accidental spillages
- Stockpile mismanagement and runoff
- Waste transfer
- Poor waste storage
- Sedimentation and erosion
- Ground contamination resulting from spillages
- Amenity impacts through littering
- Potential waste misclassification
- Excessive waste being diverted to landfill
- Vermin risk due to the poor storage of putrescible waste.

Resource use

Section 4.6 describes the indicative resources and materials required to construct the proposal. Material and resource types and quantities would be confirmed during the proposal's detailed design. This is consistent with TfNSW's requirement for its contractors to propose the use of recycled materials where they are cost and performance competitive and comparable in environmental performance.

In addition, the contractor(s) would be able to propose the use of low embodied-energy alternatives (e.g. materials that require less energy to produce) for items such as concrete and paint where they are cost and performance competitive and comparable in environmental performance.

The required construction materials are commonly used and can be supplied locally. Again, the contractor would be able to propose obtaining locally-sourced and manufactured/recycled materials to reduce associated transportation impacts.

As a result, the resource consumption and demand impacts are rated as minor adverse as they would be typical of what is expected for developments that are similar in nature and size.

Operational impacts

Once constructed, the pedestrian link would be managed and maintained. It would require ongoing landscaping and maintenance generating small volumes of waste and require small amounts of resources. This would result in a negligible impact.

The greatest resource use during operation would be electricity to maintain lighting for security reasons within the pedestrian link. This would have a minor impact and consistent with any small public space.

7.10.4. Management and mitigation measures

All waste would be assessed, classified, managed and disposed of in accordance with the Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014). Further safeguards and mitigation measures that would be implemented to address potential impacts of the proposal on waste and resources are identified in Section 8.3.1.

7.11. Air quality

A qualitative assessment of potential air quality impacts resulting from the proposal has been undertaken. A summary of the potential air quality impacts is provided below.

7.11.1. Methodology

The assessment considered the potential for dust generation as well as emissions generated through changes in traffic flows and the use of equipment. It was concluded that as the volume of construction traffic would be negligible in air quality impact terms, this factor was not considered in this assessment.

7.11.2. Existing environment

Existing background air quality

The air quality local to the proposal site is representative and typical of a suburban environment. It is largely governed by regional factors such as seasonal variations, wind and temperature effects, varying pollutant sources, such as changing traffic volumes and industrial output, and natural sources such as bushfires.

The primary air pollutants in the area are traffic generated, as supplemented by key commercial activities such as service stations and garages. It is also affected to some degree by domestic activities (e.g. backyard burning).

Sensitive receivers

The proposal is located within a residential area with sensitive receivers adjacent to the proposal site.

7.11.3. Potential impacts

Construction

Activities with the highest potential to result in the generation of dust during construction of the proposal include:

- Demolition of the property
- Clearing and levelling of the proposal site
- Minor earthworks and ground preparation activities for areas to be concreted
- Importation of materials to be used to level the site, and removal of cleared waste materials from the site.

Operation

There is not expected to be any air quality impacts during operation of the proposal.

7.11.4. Management and mitigation measures

Details on the management of air quality would be provided in the CEMP. A Demolition Management Plan would also be prepared as part of the CEMP and would include mitigation measures to manage and monitor dust emissions.

Further safeguards and mitigation measures that would be implemented to address potential impacts of the proposal on air quality are identified in Section 8.3.1.

7.12. Climate change and greenhouse gases

The proposal's contribution to NSW's greenhouse gas emissions and the wider effects of climate change has been considered.

The *NSW Climate Change Policy (NSW 2021: A Plan to Make NSW Number One* (NSW Department of Premier and Cabinet, 2011b)) focusses on building resilience to extreme climatic events and hazards by 'helping understand and minimise the impacts of climate change'. The policy contains climate change targets focussing on increasing renewable energy use, reducing energy consumption, increasing public transport use, promoting walking and cycling and encouraging the development of sustainable communities.

7.12.1. Existing environment

TfNSW's climate change adaptation plan is to build climate change resilience into its infrastructure to prevent flooding, improve runoff and drainage, improve asphalt durability against temperature extremes, ensure wind-damage protection and provide pedestrian shading.

7.12.2. Potential impacts

Greenhouse gas emissions - construction

Greenhouse gas emissions would result from the following activities:

- Construction traffic and equipment emissions
- Emissions generated in producing construction materials (termed embodied energy)
- Electricity-generated emissions in response to the power requirements to service the proposal
- Upstream and downstream lifecycle emissions (e.g. fuel extraction, processing, production, transport, disposal) including emissions at the construction compounds/laydown areas
- Emissions resulting from the breakdown of cleared vegetation.

The proposal is of such a scale that would only generate minor greenhouse gas emissions from the above sources over its construction period. Consequently, the emissions have not been quantified suffice to note that the proposal would have negligible contribution to the State's annual greenhouse gas emissions.

The greatest contribution, which would be likely to be over half of the total emissions, would come from the embodied energy associated with the energy-intensive production of the concrete, other construction materials needed for the proposal, as concluded by referring to the quantified assessments undertaken for similar projects.

This percentage and the overall emissions generated by the proposal may decrease by using a higher proportion of recycled materials.

Climate change - operation

Overall, the proposal is expected to have a positive impact on climate change in that it encourages residents of Glenwood to walk rather than drive, lowering greenhouse gas emissions through the encouraged use of public transport such as the T-Way and Sydney Metro services.

7.12.3. Management and mitigation measures

Where possible, construction services and materials will be sourced locally to minimise the distance travelled and therefore emissions of vehicles accessing the site.

Opportunities to reduce operational greenhouse gas emissions would be investigated during detailed design.

7.13. Sustainability

The National Strategy for Ecologically Sustainable Development (Department of Environment and Heritage 1992) defines ESD as 'using, conserving and enhancing the community's resources so that the ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased'. The concept of ESD gives formal recognition to environmental and social considerations in decision-making to ensure that current and future generations enjoy an environment that functions as well as, or better than, the environment they inherit.

The Glenwood Pedestrian Link would be delivered within the environmental and sustainability framework established by TfNSW.

7.14. Cumulative impacts

7.14.1. Methodology

The assessment:

- Identified the proposal's impacts
- Identified committed projects that are likely to be under construction and/or operation in the area at the same time as the proposal, by referring to:
 - The NSW DPE major projects assessments register
 - The Australian Government Department of Environment public notices and the invitation to comment register
 - Public agency websites that are progressing development under Part 5, Division 5.1 of the EP&A Act, with a particular focus on TfNSW and Roads and Maritime websites.
- Identified the potential impacts of the above projects where known
- Assessed if the proposal's impacts would combine with the impacts of these projects to create a cumulative effect
- Assessed if the safeguards and management measures considered in this REF would be affected sufficient to need modifying or supplementing.

7.14.2. Potential impacts

Bella Vista Station is currently under construction and the proposal is expected to be constructed at the same time. Bella Vista Station is located about 100 metres east of the proposal. There is potential for cumulative noise impacts to occur. However, these impacts will be short term and limited in terms of the proposal's contribution to existing background noise. Part of the construction of Bella Vista Station is the construction of a pedestrian bridge over Old Windsor Road. The Old Windsor Road pedestrian bridge is located approximately 100 metres south of the proposal. There is also potential for this project to overlap with the construction of the Glenwood pedestrian link.

7.14.3. Management and mitigation measures

Consultation with relevant stakeholders would be undertaken during construction planning, where required, to ensure that potential cumulative impacts are minimised. Any additional mitigation measures from consultation would be included in the CEMP.

During construction, the works would be co-ordinated with any other construction activities in the area as required. Consultation and liaison would occur with other contractors to minimise cumulative construction impacts such as traffic and noise as far as practicable.

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 and implemented as appropriate.

8. 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 8.3.1 lists the proposed mitigation measures for the proposal to minimise the impacts of the proposal identified in Chapter 7.

8.1. Environmental management systems

TfNSW's ISO 14001 accredited environmental management system elements would be used to manage the construction of the proposal. The management system would provide the framework for implementing the environmental management measures documented in this REF, and any conditions of other approvals, licences or permits.

8.2. Environmental Management Plans

8.2.1. Construction Environmental Management Plan

Sydney Metro has a Construction Environmental Management Framework (CEMF). The framework sets out the environmental, stakeholder and community management documentation to be developed by the contractors relevant to their scope of works. It provides a linking document between the planning approval documentation and the construction environmental management documentation to be developed by the contractor. It is envisaged that this document would form the basis of the proposed CEMP for the proposal. The CEMP would provide a centralised mechanism through which all potential environmental impacts would be managed. The CEMP would document mechanisms for demonstrating compliance with the commitments made in this REF, the Response to Submissions Report (to be prepared following the public exhibition of the REF) and other relevant statutory approvals.

The proposed contractor would be appointed to undertake the construction of the proposal during detailed design and would undertake a CEMP based on the requirements of the CEMF.

8.3. Management and mitigation measures

8.3.1. Construction management

Environmental management measures to be implemented during the construction phase of the proposal are listed in Table 8-1.

Table 8-1 Construction environmental management measures (compiled from Section 7 mitigation measures)

No.	Impact	Safeguard/management measure	Responsibility	Timing
NV1	Noise and Vibration	Investigation of at property treatment for two residential receivers, identified in Figure 7-2 for the facades taking into account the use of the rooms in those areas.	TfNSW	Detailed design
NV2	Noise and Vibration	A CEMP should be prepared prior to construction activities commencing and implemented through all construction activities. A Construction Noise and Vibration Management Plan (CNVMP) would be included in the CEMP to provide the framework and mechanisms for the management and mitigation of all potential noise and vibration impacts from the project. The CNVMP would be expected to include procedures for dealing with potential impacts during out of hours works.	Construction contractor	Pre-construction
NV3	Noise and Vibration	The project should apply all feasible and reasonable work practices to meet the NMLs, where possible, and inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels, duration of noise generating construction works, and contact details during construction.	Construction contractor	Pre-construction, construction
NV4	Noise and Vibration	Avoid the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receptors to reduce noise emissions.	Construction contractor	Construction
NV5	Noise and Vibration	Equipment which is used intermittently is to be shut down when not in use.	Construction contractor	Construction
NV6	Noise and Vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: <ul style="list-style-type: none"> ▪ All relevant project specific and standard noise and vibration mitigation measures ▪ Relevant licence and approval conditions ▪ Permissible hours of work ▪ Any limitations on high noise generating activities ▪ Location of nearest sensitive receivers ▪ Construction employee parking areas ▪ Designated loading/unloading areas and procedures ▪ Site opening/closing times (including deliveries) ▪ Environmental incident procedures. 	Construction contractor	Construction
NV7	Noise and Vibration	<ul style="list-style-type: none"> ▪ No swearing or unnecessary shouting or loud stereos/radios on site. ▪ No dropping of materials from height; throwing of metal items; and slamming of doors. ▪ No excessive revving of plant and vehicle engines ▪ Controlled release of compressed air. 	Construction contractor	Construction
NV8	Noise and Vibration	A noise monitoring program is to be carried out for the duration of the works in accordance with the CNVMP and any approval and licence conditions.	Construction contractor	Construction
NV9	Noise and Vibration	Attended vibration measurements are required at the commencement of vibration	Construction	Construction

No.	Impact	Safeguard/management measure	Responsibility	Timing
		<p>generating activities to confirm that vibration levels satisfy the criteria for that vibration generating activity.</p> <p>Where there is potential for exceedances of the criteria further vibration site law (ie the site-specific reduction in vibration level with distance) investigations would be undertaken to determine the site-specific safe working distances for that vibration generating activity. Continuous vibration monitoring with audible and visible alarms would be conducted at the nearest sensitive receivers whenever vibration generating activities need to take place inside the applicable safe-working distances.</p>	contractor	
NV10	Noise and Vibration	High noise and vibration generating activities may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block.	Construction contractor	Construction
NV11	Noise and Vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.	Construction contractor	Construction
NV12	Noise and Vibration	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours' work.	Construction contractor	Construction
NV13	Noise and Vibration	Stationary noise sources would be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained where necessary.	Construction contractor	Construction
T1	Traffic, transport and access	<p>Implement a CTMP developed in consultation with and to meet the reasonable requirements of the relevant road authority and transport operator(s). The plan shall include but not be limited to:</p> <ul style="list-style-type: none"> ▪ A routine CTMP ▪ A Parking Management Plan ▪ An Incident Response Plan ▪ Mechanisms for monitoring, reviewing and amending this plan. 	Construction contractor	Pre-construction
T2	Traffic, transport and access	<p>Construction vehicles (including staff vehicles) shall be managed to:</p> <ul style="list-style-type: none"> ▪ Minimise parking or queuing on public roads and non-associated sites ▪ Minimise the use of local roads (through residential streets and town centres) to gain access to construction sites and compounds ▪ Minimise traffic past schools and child care centres, particularly during opening and closing periods ▪ Adhere to the nominated heavy vehicle routes identified in the CTMP. 	Construction contractor	Construction
V1	Landscape and visual	Retain and protect hedges along east and west neighbouring property boundaries where possible.	Contractor	Detailed design
V2	Landscape and visual	Reinstate the vegetated corridor along the Old Windsor Road shared path with semi-mature tree stock to ensure timely establishment and visual screening	Contractor	Detailed design
V3	Landscape and visual	Trees within the site to be semi-mature tree stock to ensure timely establishment and visual screening	Contractor	Detailed Design

No.	Impact	Safeguard/management measure	Responsibility	Timing
V4	Landscape and visual	Design of property fencing to be designed to screen views and reduce the potential for overlooking into private property.	Contractor	Detailed Design
V5	Landscape and visual	All works equipment and materials will be contained within designated boundaries of the worksite	Contractor	Construction
V6	Landscape and visual	Location of a site toilet to be located with consideration of views from key living and entertaining areas of adjacent properties	Contractor	Construction
V7	Landscape and visual	The construction area will be left tidy at the end of each day	Contractor	Construction
V8	Landscape and visual	Dust and dirt will be regularly cleaned from the road surface.	Contractor	Construction
B1	Biodiversity	As a precautionary measure, ensure a qualified ecologist would be on call during the removal of the amenity vegetation to identify any manage wildlife that may be disturbed and/or injured. The ecologist would assess the species and then release them to the nearest suitable habitat if uninjured.	Construction contractor	Construction
B2	Biodiversity	As part of CEMP, a Vegetation Management Plan would be developed to address potential biodiversity impacts. Weed species within the study area would be managed in order to control them from further spread. Management techniques may include immediate weed removal and disposal without stockpiling, disposal of weed-contaminated soils at appropriate weed disposal facilities and to ensure that all equipment is cleaned prior to and on completion of works to ensure weeds are not introduced or spread to other locations.	TfNSW/ Construction contractor	Construction
B3	Biodiversity	Where possible, the vegetation removed would be replaced.	TfNSW/Construction contractor	Detailed design/ construction
S1	Socio-economic, land use and property	Community Liaison Plan (to be developed by the Contractor prior to construction) would 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 possible.		
WQ1	Water quality, hydrology and drainage	Stormwater management controls would be implemented to: <ul style="list-style-type: none"> ▪ Manage runoff volumes through the use of measures to promote stormwater infiltration ▪ Minimise increases in peak flows through the use of detention and retention measures as appropriate. ▪ Treat stormwater through a range of at source and end point measures that are integrated with the urban landscape. 	TfNSW	Detailed design

No.	Impact	Safeguard/management measure	Responsibility	Timing
WQ2	Water quality, hydrology and drainage	<p>A CSWMP would be prepared to manage soil, surface water and ground water in accordance with:</p> <ul style="list-style-type: none"> NSW Water Management Act 2000 Applicable Environment Protection Licences. <p>Appropriate erosion control measures would be installed such as sediment fencing, temporary ground stabilisation, diversion berms or site regrading. Inspection of water quality mitigation controls (e.g. sediment fences, sediment basins) would be carried out regularly and following significant rainfall to detect any breach in performance.</p>	TfNSW/construction contractor	Pre-construction
WQ3	Water quality, hydrology and drainage	<p>Procedures to quickly address any contaminant spill or accident would be developed and implemented during the proposal's operation.</p>	Construction contractor	Construction
WQ4	Water quality, hydrology and drainage	<ul style="list-style-type: none"> Storage of hazardous materials such as oils, chemicals and refuelling activities would occur in bunded areas. All fuels, chemicals and hazardous liquids would be stored in accordance with Australian standards and EPA Guidelines Any refuelling undertaken on site would be undertaken in designated areas only Spill kits would be available as part of any worksite for use in case of fuels, chemical or other spill(s) which may occur during construction All spills or leakages would be immediately contained and absorbed. 	Construction contractor	Construction
C1	Soils, Geology and contamination	<p>An Erosion and Sedimentation Control Plan would be developed and maintained for the site in accordance with Managing Urban Stormwater, Soils and Construction Guidelines (Landcom, 2004) (the Blue Book).</p>	Construction contractor	Pre-construction
C2	Soils, Geology and contamination	<p>Excavated material would be reassessed for reuse as backfill material, prior to removal. If all material unable to be used as backfill material would to be appropriately tested and classified against the <i>Waste Classification Guidelines Part 1: Classifying Waste</i> (NSW EPA, 2014) prior to being disposed of off-site (DECC, 2008).</p>	Construction contractor	Construction
C4	Soils, Geology and contamination	<p>Should any signs of contamination be identified during work within the site, the material would be tested against the National Environment Protection Council's National Environment Protection (Assessment of Site Contamination) Measure 1999, and managed accordingly.</p>	Construction contractor	Construction
WR1	Waste and Resource Management	<p>All waste would be assessed, classified, managed and disposed of in accordance with the <i>Waste Classification Guidelines Part 1: Classifying Waste</i> (NSW EPA, 2014).</p>	Construction contractor/TfNSW	Construction/operation
WR2	Waste and Resource Management	<p>Excavated material and spoil would be beneficially reused on the project site or other sites, where feasible and reasonable, in accordance with the waste hierarchy. Recyclable wastes, including paper at site offices, would be stored separately from other wastes. Storage facilities would be secure and recyclables collected on a regular basis.</p>	Construction contractor	Construction

No.	Impact	Safeguard/management measure	Responsibility	Timing
WR3	Waste and Resource Management	Initial and ongoing education would be provided to staff and sub-contractors regarding the importance of appropriately managing waste.	Construction contractor/	Construction/
AQ1	Air Quality	A Demolition Management Plan would also be prepared as part of the CEMP and would include mitigation measures to manage and monitor dust emissions.	Construction contractor	Pre-construction
AQ1	Air Quality	Dust minimisation measures would be developed and implemented prior to commencement of construction.	Construction contractor	Pre-construction
AQ2	Air Quality	A mechanism for responding to complaints from the community should be put in place for the duration of the construction phase.	Construction contractor	Construction
AQ3	Air Quality	Ensure that all construction vehicles are tuned to not release excessive level of smoke from the exhaust and are compliant with OEH's Smokey Vehicles Program under the NSW POEO Act and NSW Protection of the Environment and Operations Regulations 2010.	Construction contractor	Construction
AQ4	Air Quality	<ul style="list-style-type: none"> ▪ All vehicles carrying loose or potentially dusty material to and/or from the site would be covered. ▪ Waste or any other material would not be burnt on construction sites. ▪ Dust generating activities would be assessed during periods of strong winds and rescheduled, where required. ▪ Wind breaks, which may include site hoardings, hoardings or shade cloth wrapped temporary fencing, would be constructed, where construction works are in close proximity to sensitive receivers and where feasible and reasonable. ▪ Re-vegetating or stabilising disturbed areas would occur as soon as feasible. ▪ The proposal shall be constructed in a manner that minimises dust emissions from the site, including windblown and traffic generated dust and tracking of material onto public roads. All activities on the site shall be undertaken with the objective of minimising visible emissions of dust from the site. Should such visible dust emissions occur at any time, all feasible and reasonable dust mitigation measures shall be identified and implemented including cessation of relevant works, as appropriate, such that emissions of visible dust cease. 	Construction contractor	Construction
AQ4	Air Quality	A street-cleaning regime would be implemented to remove any dirt tracked onto roads.	Construction contractor	Construction
CC1	Climate change and greenhouse gases	Where possible, construction services and materials will be sourced locally to minimise the distance travelled and therefore emissions of vehicles accessing the site.	Construction contractor	Construction

8.3.2. Operational management

During operation of the proposal, it is likely that traffic and parking management measures will need to be applied to minimise impacts on residents living within the vicinity of the proposed pedestrian link. TfNSW will monitor traffic and parking conditions in surrounding streets and will provide recommendations to Council regarding appropriate management measures. These recommendations will be included in the forthcoming Sydney Metro Parking Management Strategy. It will be the responsibility of Blacktown Council to determine the measures and timeframes for implementation.

Operational noise impacts are proposed to be addressed during the design and construction of the pedestrian link.

Periodic maintenance of the lawns, vegetation and footpath would occur. Maintenance would be undertaken through the implementation of similar mitigation measures to those proposed for the construction of the proposal.

9. Justification and conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objects of the NSW EP&A Act, including the principles of ESD as defined in Schedule 2 of the NSW EP&A Regulation.

This REF seeks to assess the environmental impacts of the construction, operation and maintenance of the Glenwood Pedestrian Link.

9.1. Justification

The proposal would supplement Sydney Metro Northwest and the Bella Vista Station precinct by improving pedestrian access to and from the active core of the Bella Vista Precinct. The pedestrian link would facilitate ease of access to the shared path, Old Windsor Road pedestrian bridge and Bella Vista station for Glenwood residents. The pedestrian link creates direct access in and out of the Glenwood residential area, providing connectivity to the transport corridor.

The current access situation allows very few residents living to the west of Old Windsor Road (within the Blacktown LGA) to walk to Bella Vista Station and access T-Way bus services. This produces access inequity when compared to residents living to the east of Old Windsor Road (within The Hills Shire LGA). The proposal aims to improve the equity for all residents who live within walking distance of the station.

Construction of the proposal in conjunction with the Old Windsor Road pedestrian bridge would result in reduced walking time for local people within proximity to the future Bella Vista Station. The proposal would mean that 700 Glenwood households and two local schools would be within a 15-minute walk of the new station. An even greater number of households would be within a short cycling distance. Residents who would currently have a 25-30-minute walk at average pace would be able to walk to the new Bella Vista Station in less than 15 minutes. By not progressing with the pedestrian link the above benefits would not be realised.

Some additional environmental impacts would occur as a result of the proposal during construction and when operational. However, the long-term benefits of the proposal are considered to provide an appropriate balance against the environmental and social impacts and is therefore justifiable and in the public interest.

9.2. Conclusion

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:

- Introduce a number of socio-economic benefits in reducing travel times, improving pedestrian safety, enhancing public transport access and connectivity from the Glenwood residential area to Old Windsor Road and Bella Vista Station and improving access equity for residents living on both sides of Old Windsor Road
- The investment in the area's urban landscape would also further reinforce and enhance the character of the area.

The likely key impacts of the proposal are as follows:

- The proposal is likely to result in changes to local traffic and parking conditions in the vicinity of the proposal. As an access point to the station, there may be additional

commuter parking and pick-up/drop-off pressures on streets adjacent to the link, including Sharrock Avenue, Swansea Court, Cramer Place, Nixon Street and Adrian Street. These would require appropriate parking management measures to ensure safe access to the link and local residences is maintained, and local amenity is not adversely impacted. There would be temporary diversions in place for pedestrians and cyclists on the Old Windsor Road shared path during construction, requiring diversionary signage.

- During construction the proposal would result in a perceptible but a temporary noise level increase for residential receivers in proximity to the proposal. Construction works would be carried out within standard construction hours where possible. Two residential receivers were identified with potential for a noise level increase of 6 to 7 dBA during operation. The potential increase in road traffic noise levels associated with the removal of existing screening (removal of the residential dwelling and boundary wall). Community updates would be provided and construction and operational noise management controls would be put in place to mitigate potential impacts.
- Temporary visual impacts would occur during construction. The site would be enclosed by fencing, and the removal of street trees and vegetation within the proposal site would open up views between Swansea Court and Old Windsor Road. Construction of the proposal is expected to reduce visual amenity for residents and road/street users in close proximity to the proposal site itself. The change from a residential property to an open space would provide some amenity improvements including opening-up views from the upper storey of the adjacent properties, providing green space and landscaping. Once open, the pedestrian link would provide an outlook onto open space where there is currently a residential dwelling. On balance, this would result in no major changes to visual amenity from the adjacent residential area.
- The proposal would be developed within a previously disturbed/developed area. No remnant vegetation would be impacted or removed during the proposal's construction. Several native plantings within the proposal's area would likely require removal and replacement. Up to 20 planted Eucalypts and Lomandras located to the rear of 63 and 67 Sharrock Avenue and 1, 3 and 5 Swansea Court may require removal during the regrading of Old Windsor Road shared path. The area surrounding the pathway would be landscaped and revegetated with native plants. There would be some additional vegetation within the proposal site following construction and more potential habitat and foraging material for fauna. The proposal would have some limited overall benefit on biodiversity once completed.

The proposal would improve access for local residents to Old Windsor Road and Bella Vista Station and reduce travel times.

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 7, Appendix A). 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 or SIS is not required.

The proposal has also taken into account the principles of ESD (Section 5.5) and the objects of the EP&A Act (refer to Appendix A). The proposal would be delivered to the maximum benefit for the community to the west of Old Windsor Road equivalent to that on the east of Old Windsor Road, be cost effective and minimise any adverse impacts on the environment. The proposal is considered to be in the public interest.

10. References

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- Commonwealth Department of Environment (2013). *Significant Impact Guidelines 1.1: Matters of National Environmental Significance*
- Commonwealth Government (1992). *Disability Discrimination Act 1992*
- Commonwealth Government (1999). *Environment Protection and Biodiversity Conservation Act 1999*
- Commonwealth Government (2015). *EPBC Act protected matters search tool*
- Department of Environment and Climate Change (DECC) (2006). *Environmental Noise Management, Assessing Vibration: A Technical Guideline*
- Department of Environmental and Conservation (DEC) (2006). *Assessing Vibration: A Technical Guideline*
- Deutsches Institut für Normung (DIN) (1999). *Standard 4150-2 Part 2: Human Exposure to Vibration in Buildings*
- Hills Shire Council (2012). *The Hills Development Control Plan 2012*
- Hills Shire Council (2012). *The Hills LEP Acid Sulphate Soil mapping, 2012*
- Hills Shire Council (2012). *The Hills Local Environmental Plan 2012*
- IRIS (2018) *Landscape and visual assessment*
- Landcom and NSW Government (2004 and 2006). *Managing Urban Stormwater – Soils and Construction Volumes 1 and 2*
- NSW DECC (2007). *Threatened Species Assessment Guidelines: The Assessment of Significance*
- NSW Department of Planning and Environment (DPE) (2002). *Guidelines to Accompany Map of Salinity Potential in Western Sydney*
- NSW Department of Planning and Environment (DPE) (2017). *Bella Vista Station Precinct Finalisation Report*
- NSW Environment Protection Authority (2009). *Interim Construction Noise Guidelines*
- NSW Environment Protection Authority (2014). *Waste Classification Guidelines Part 1: Classifying Waste*
- NSW Office of Environment and Heritage (2015). *NSW National Parks and Wildlife Services Wildlife Atlas*
- SLR (2018) *Glenwood Pedestrian Link Noise and Vibration Assessment*
- TfNSW (2012a) *Traffic Master Plan*
- TfNSW (2012b) *Sydney's Rail Future*
- TfNSW (2012d). *NSW Long Term Transport Master Plan*

Appendix A: Consideration of draft concept design options


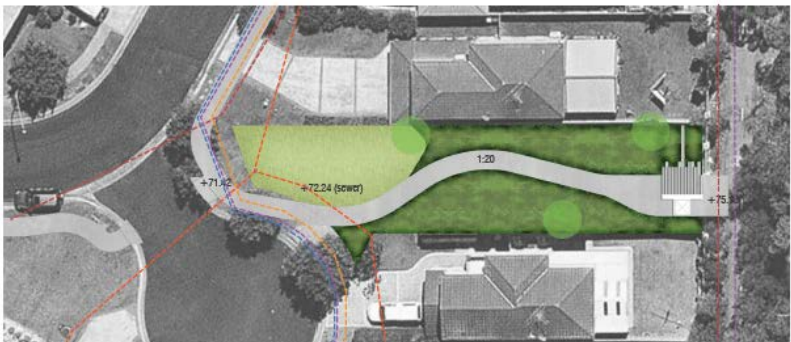
Consultants were engaged by TfNSW to develop a concept design for the preferred site. Eight design options were considered for the pedestrian link proposal.


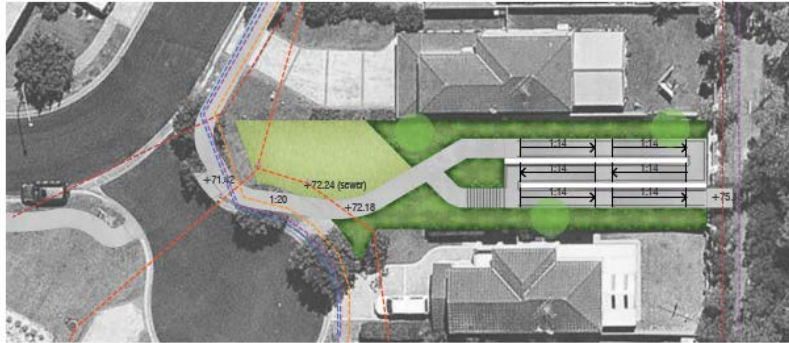
Options for the pedestrian link included:



- Option 1 – a 42 metre pedestrian link at 1 in 20 gradient terminating with a flight of 15 stairs at the boundary with the Old Windsor Road shared path
- Option 2 – a 42 metre pedestrian link at 1 in 20 gradient terminating with a flight of 15 stairs at the boundary with the Old Windsor Road shared path. This is complemented with a lift to offer a DDA compliant solution
- Option 3 – a 115 metre pedestrian link at 1 in 20 gradient with six pairs of zig-zag
- Option 4 – a 90 metre pedestrian link comprising a 1 in 20 gradient from Sharrock Avenue. The pedestrian link splits midblock to lead into i) a 1 in 14 ramp with three switch backs ii) a set of stairs to leading into the final 1 in 14 ramp
- Option 5 – a 36 metre pedestrian link at 1 in 20 gradient connecting two routes:
 - DDA compliant 1 in 14 ramp arranged in eight lengths and aligned north-south across the site
 - Two sets of stairs along the southern boundary of the site. The stairs are separated by a landing which forms part of the ramp series.
- Option 6 – a 36 metre pedestrian link at a 1 in 20 gradient. Requires adjusting levels along Old Windsor Road shared path to tie into the proposed pedestrian link (48 metres)
- Option 7 - a 61.5 metre ramp arranged into four pairs of zig-zag ramps. Complemented with an alternative non-DDA compliant path running parallel to the site boundary with four intervals of stairs separated by landings
- Option 8 – an 80 metre pedestrian link at a 1 in 20 gradient complemented by a direct path comprising four series of stairs. This option includes acquisition of a second property.


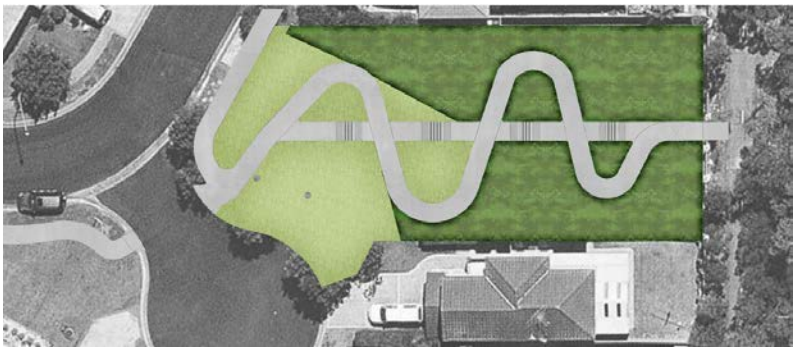
A summary of each option is shown in Table A1-1.

Table A1-1 Summary of pedestrian link concept options

Option	Overview of options	Key features
1		<ul style="list-style-type: none"> ▪ A 1 in 20 gradient pathway from Swansea Court to Old Windsor Road shared path ▪ Stairs to connect walkway with existing shared path along Old Windsor Road (at level +75.13) ▪ The proposed pedestrian link would be approximately 42 metres. <p>Stakeholders agreed to discount this option as the design does not meet the Disability Standards for Accessible Public Transport (DDA).</p>
2		<ul style="list-style-type: none"> ▪ A 1 in 20 gradient pathway from Swansea Court to Old Windsor Road shared path ▪ Stairs to connect pathway with existing shared path along Old Windsor Road (at level +75.13) ▪ The proposed pedestrian link would be approximately 42 metres ▪ This option is complemented with a lift to offer a DDA compliant solution. <p>Stakeholders agreed the provision of a lift is not a suitable option and was discounted for the following reasons:</p> <ul style="list-style-type: none"> ▪ The lift will add on-going maintenance and operational costs ▪ Susceptible to vandalism and anti-social behaviour ▪ Deemed to be over-engineering the constraint.

Option	Overview of options	Key features
3		<ul style="list-style-type: none"> A 1 in 20 gradient pathway with six pairs of zig-zag / switch-back ramps and landings to connect to the existing shared pathway along Old Windsor Road (at level +75.13) The proposed pedestrian link would be approximately 115 metres <p>Stakeholders agreed this option should be discounted for the following reasons:</p> <ul style="list-style-type: none"> The ramp arrangement limits the available open space The length of the ramp more than doubles the walking distance and users will take the shortest route through the middle of the site an avoid using the ramps.
4		<ul style="list-style-type: none"> A 1 in 20 gradient pathway splits midblock to lead into: <ul style="list-style-type: none"> a 1 in 14 ramp with three switch backs a set of stairs leading into the final 1 in 14 ramp. The proposed pedestrian link would be approximately 90 metres <p>Stakeholders agreed this option should be discounted for the following reasons:</p> <ul style="list-style-type: none"> The ramps with handrails and retaining walls create an enclosed space (impacts personal security) The ramp switch-backs are aligned with the neighbouring gardens. This is likely to increase the degree of exposure residents will experience from users over-looking into their property The psychological impact of the ramp arrangement which directs users to 'walk back' to the start will discourage the use of the connection.

Option	Overview of options	Key features
5		<ul style="list-style-type: none"> ▪ A 1 in 20 gradient pathway connecting to two routes: <ul style="list-style-type: none"> – DDA compliant 1 in 14 ramp arranged in eight lengths and aligned north-south across the site – Two sets of stairs along the southern boundary of the proposal site. The stairs are separated by a landing which forms part of the ramp series. ▪ The proposed pedestrian link would be approximately 36 metres <p>Stakeholders agreed this option should be discounted for the following reasons:</p> <ul style="list-style-type: none"> ▪ The ramps are located alongside the garden which increases potential for users to over-look into residential back gardens ▪ The potential difficulties in manoeuvring prams and the size of mobility scooters around the ramp switch-backs ▪ The ramp intervals are short between each switch-back. The frequency of turning and short periods between each impacts usability ▪ Significant impacts to the existing shared path along the eastern boundary of the proposal site due to: <ul style="list-style-type: none"> – Construction of new retaining wall – Potential impacts to tree roots and requirement to remove the trees – Potential impacts to the sewer main running along the length of the ramp.
6		<ul style="list-style-type: none"> ▪ A 1 in 20 gradient pedestrian link ▪ Adjusting levels along Old Windsor Road shared path to tie into the proposed pathway (approximately 24 metres each side of the proposed pathway to achieve 1 in 20 gradient on the existing Old Windsor Road shared path). ▪ The proposed pedestrian link would be approximately 49 metres <p>This option was shortlisted for further investigation with the following refinements to the design:</p> <ul style="list-style-type: none"> ▪ A section of 1 in 14 gradient pathway approaches to the intersection with Old Windsor Road shared path; would reduce the length of remediation works required on Old Windsor Road ▪ Update this option to include 1 in 14 gradient ramps within the acquired block and increase the pathway width to 2.5 metres.

Option	Overview of options	Key features
7		<ul style="list-style-type: none"> ▪ A ramp arranged into four pairs of zig-zag ramps ▪ Complemented with an alternative non-DDA compliant path running parallel to the site boundary with four intervals of stairs separated by landings ▪ The proposed pedestrian link would be approximately 61.5 metres <p>Stakeholders agreed this option should be taken forward for the following reasons and with refinements to the design:</p> <ul style="list-style-type: none"> ▪ The proposed ramp arrangements reduced dead zones and provided opportunities to create tiered planting beds ▪ This option presented the best of the ramp options ▪ Update this option to increase pedestrian link width to 1.8 metres to increase accessibility, acknowledging this will increase the area taken up by ramps.
8		<ul style="list-style-type: none"> ▪ A 1 in 20 gradient pathway ▪ Complemented with a direct pathway comprising four series of stairs ▪ This option includes acquisition of a second property ▪ The proposed pedestrian link would be approximately 80 metres <p>Stakeholders agreed this option should be taken forward for the following reasons and refinements to the design:</p> <ul style="list-style-type: none"> ▪ This option presents opportunity to give back open space to the community by creating valuable public space ▪ Update this option to increase the pedestrian link width to 2.5 metres.

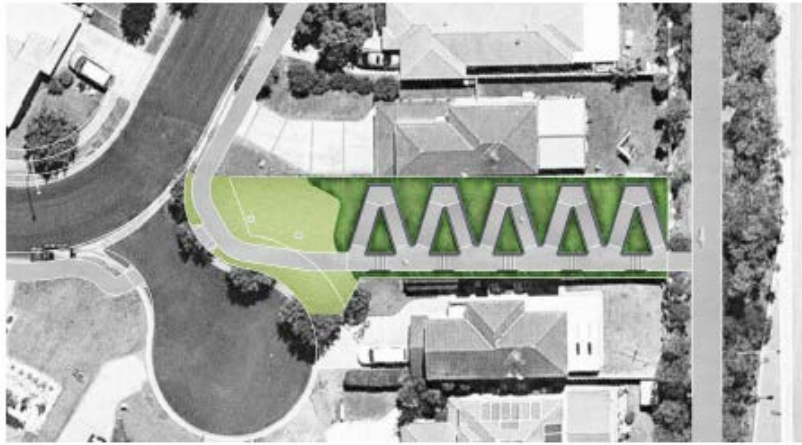

Short listed options


The eight concept options were reviewed in regards to meeting the objectives of the proposal.

Options 6, 7 and 8 were found to best meet the objectives and were further refined.

A summary of the refined short listed options are shown in Table A1-2.

Table A1-2 Summary of shortlisted options with initial refinement

Option	Overview of options	Key features
Option 7		<ul style="list-style-type: none"> ▪ 1.8 metre wide pedestrian pathway (cyclists dismount) ▪ A combination of a 1 in 14 gradient ramps and stairs with handrails ▪ Level changes contained within site boundary ▪ The proposed pedestrian link via ramps would be approximately 96 metres ▪ The approximate distance of pathway to adjacent boundary would be approximately 700 millimetres. <p>Further consultation with stakeholders confirmed that this option is not preferred for the following reasons:</p> <ul style="list-style-type: none"> ▪ Potential conflict points at the ramp landings ▪ 1.8 metre wide pathway only (does not achieve minimum shared path standard) ▪ Excessive retaining walls ▪ Relatively more expensive, if acquisition costs are not considered.
Option 6		<ul style="list-style-type: none"> ▪ 2.5 metre wide pathway ▪ A 1 in 14 gradient ramps with handrails ▪ Existing shared path along Old Windsor Road regraded (1 in 14 gradient ramps) below existing level ▪ The proposed pedestrian link would be approximately 50 metres ▪ Distance of pathway to adjacent boundary would be approximately 700 to 800 millimetres. <p>Further consultation with stakeholders confirmed that this option should be further refined to maximise distance from neighbouring properties and reduce opportunities for conflict between pedestrians and cyclists:</p> <ul style="list-style-type: none"> ▪ Change bottom section of ramp from 1 in 14 to 1 in 20 gradient ▪ Change Old Windsor Road shared path from 1 in 14 to 1 in 20 gradient to reduce potential for conflict between pedestrians and cyclists.



Option	Overview of options	Key features
Option 8		<ul style="list-style-type: none"> ▪ A 2.5 metre wide pathway ▪ A combination of a 1 in 20 gradient shared path (2.5 metre wide) and stairs with handrails (1.5 metre wide) ▪ Requires acquisition of two blocks ▪ The proposed pedestrian link would be approximately 90 metres ▪ Distance of pathway to adjacent boundary would be approximately 700 to 1200 millimetres <p>Further consultation with stakeholders confirmed that this option should be further refined as follows:</p> <ul style="list-style-type: none"> ▪ Adopt the path alignment from Option 6, including a combination of a 1 in 20 gradient and 1 in 14 gradient ramps and regrading of Old Windsor Road shared path to a maximum of a 1 in 20 gradient.

Refined options

Two concept design options (Option 6 and Option 8) were refined further to minimise impacts on neighbouring properties, with the final options presented in Table E1-3. Option 6 was determined to be the preferred option as it achieved the same outcome for the project without requiring the acquisition of a second property, providing better value for money for the community. It also created fewer impacts on the existing streetscape and lower long-term maintenance requirements and costs. As the design of the link aimed to discourage gathering or loitering, Option 6 was determined to achieve this better than Option 8.

A comparison of the two refined options are shown in Table A1-3.

Table A1-3 Summary of final refined options

Options	Overview of options	Key features
<p>Refined Option 6</p>		<p>Key design features of Refined Option 6:</p> <ul style="list-style-type: none"> ▪ A 2.5 metre wide pathway ▪ Bottom section of the ramp at Swansea Court at a 1 in 20 gradient ▪ A 1 in 14 gradient ramp with handrails ▪ Existing shared path along Old Windsor Road regraded (1 in 20 gradient ramps) below existing level ▪ The proposed pedestrian link would be approximately 50 metres ▪ Distance of pathway to adjacent boundary would be approximately 2 meters.
<p>Refined Option 8</p>		<p>Key design features of Refined Option 8:</p> <ul style="list-style-type: none"> ▪ A 2.5 metres wide pathway ▪ Bottom section of the ramp at Swansea Court at a 1 in 20 gradient ▪ A 1 in 14 gradient ramp with handrails ▪ Existing shared path along Old Windsor Road regraded (1 in 20 gradient ramps) below existing level ▪ The proposed pedestrian link would be approximately 50 metres ▪ Distance of pathway to adjacent boundary would be approximately 6.2 to 6.7 metres.

Further investigated option – Emmanuel Baptist Church

The Emmanuel Baptist Church was previously discounted through the MCA process (refer to Section 3) as it would require:

- Fencing to control access into the Emmanuel Baptist and Trades Norwest Anglican Senior College which would create a confined pedestrian environment creating security issues for vulnerable users
- Significant utility adjustments, in particular, the existing stormwater lines, entry pits and Telstra conduits
- Loss of car parking spaces within the Emmanuel Baptist Church site
- Management of vehicle access across the pedestrian link into the Trades Norwest Anglican Senior College and Emmanuel Baptist Church car park
- Impacts on existing access arrangements that exist between the Emmanuel Baptist Church and Trades Norwest Anglican Senior College.

Community consultation conducted in 2015 identified that the community considered access through the Emmanuel Baptist Church grounds as a favourable option. Subsequently, a link through the Emmanuel Baptist Church car park was developed to review the preliminary constraints identified as part of this project.

Key features of this option:

- The option comprises a 2.5 metre wide pathway from Shaun Street along the northern property boundary of the Emmanuel Baptist Church (refer to Figure E1-1)
- The pathway would be bound by a fence, which would restrict access to/from the Emmanuel Baptist Church and Trades Norwest Anglican Senior College to prevent trespassing
- The provision of a pathway requires the removal of 38 parking spaces. These could be replaced / offset by extending the car park into the south-west pocket of the Emmanuel Baptist Church property
- The existing ramp on the eastern boundary is removed and replaced to orientate pedestrians towards the new pedestrian bridge.

The following issues were identified by the stakeholders:

- The Emmanuel Baptist Church and the Trades Norwest Anglican Senior College have an informal access arrangement allowing students to use the car park. Restricted access to/from the car park and the campus would impact this arrangement
- The 210 metre long pathway with fencing on both sides would have significant CPTED (safety) issues, particularly after dark
- The existing storm water services and pits located near Shaun Street impact on opportunities to regrade the site. This has resulted in a footway that does not meet DDA gradient standards, limiting access for all users.

Further consultation with Blacktown City Council confirmed that this option through the Emmanuel Baptist Church car park would result in a long narrow pathway that is problematic and does not align with the appropriate CPTED approach to deterring criminal behaviour. It could also not be made DDA compliant. This option has been discounted based on the above identified issues.

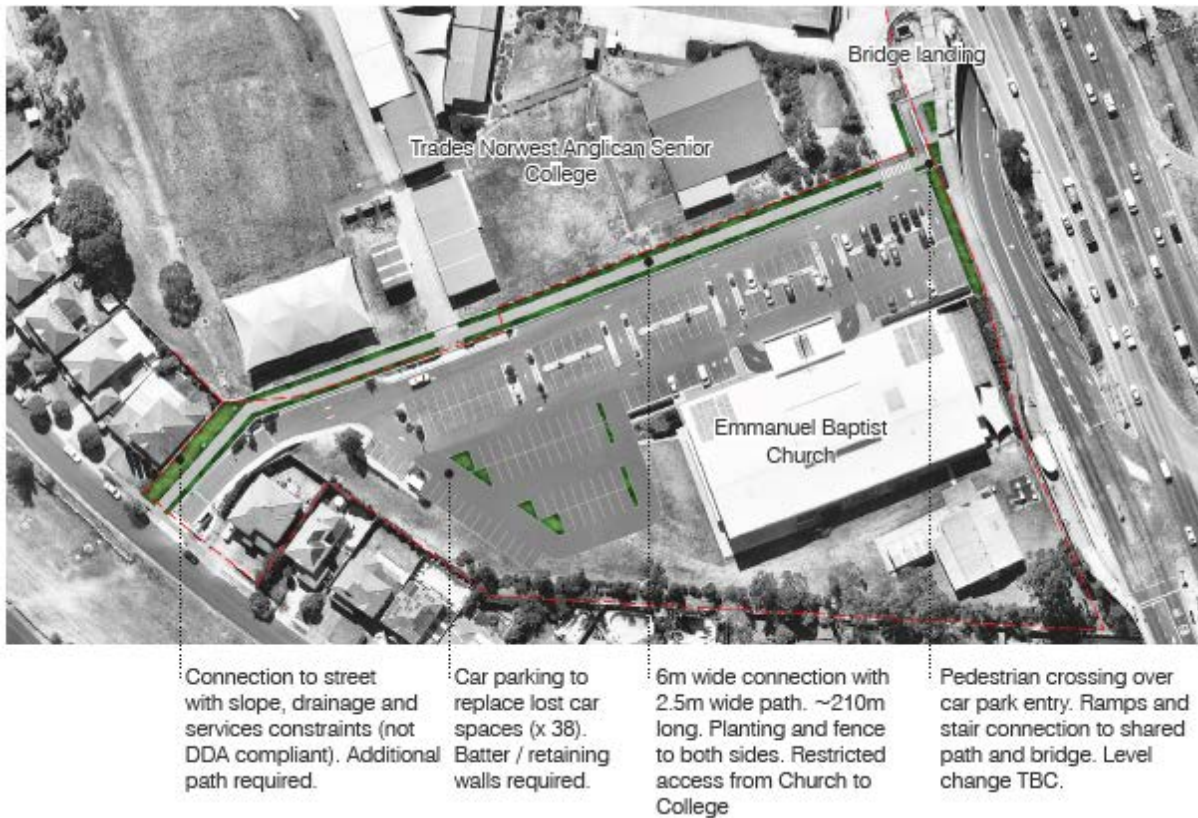


Figure A1-1 Overview of church option

Appendix B: Consideration of Environmental Factors and Matters

Consideration of clause 228(2) factors and matters of national environmental significance

In addition to the requirements of the *Is an EIS required?* guideline as detailed in the REF, the following factors, listed in Cause 228(2) of the EP&A Regulation have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Table B1-1: Review of clause 228(2) environmental factors

Clause 228 considerations	Impact
a) Any environmental impact on a community.	
Construction of the proposal would result in some short-term negative impacts on noise and vibration, traffic, transport and access, visual amenity and biodiversity. These issues could impact negatively on the identified sensitive receivers and community as described in Section 7.1 (noise and vibration), Section 7.2 (traffic, transport and access), Section 7.3 (visual impacts) and Section 7.4 (Biodiversity). These impacts would be managed according to the safeguards outlined in Section 8.3.	Short term negative impact during construction
b) Any transformation of a locality.	
During construction the proposal would result in impacts on the existing locality, which would be predominantly through negative visual amenity impacts associated with the demolition of a residential property, presence of construction plant and equipment and construction vehicles movements within the proposal site. Once open, the pedestrian link would provide open space and accessibility to Old Windsor Road and Bella Vista Station. Any impacts would be managed according to the safeguards outlined in Section 8.3.	Short term, minor, negative followed by long term positive.
c) Any environmental impact on the ecosystems of the locality.	
The proposal would not impact on the ecosystems of the locality.	Nil.
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality.	
The construction of the proposal would result in temporary visual impacts to sensitive receivers (residential dwellings) identified adjacent to the property. Visual impacts would be associated with the presence of construction plant and equipment, construction vehicles movements within the proposal site and demolition waste from the proposal. Negative visual impacts as a result of the proposal would be temporary and limited to the duration of construction. At the completion of construction, all plant and equipment would be removed from site and it is expected that the pedestrian link would improve the visual and recreational amenity of the area, improve accessibility and reduce walking distances.	Short term, minor, negative followed by long term positive.
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?	
The construction of the proposal would result in temporary moderate-low visual impacts to identified sensitive receivers (residential dwellings) identified adjacent to the impacted Swansea Court property. Visual impacts would be associated with construction activities, presence of construction plant and equipment and construction vehicles movements. Visual impacts would be temporary and limited to the duration of construction. At the completion construction works the site would be returned to its existing state.	Short term, minor, negative followed by long term positive.
f) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks & Wildlife Act 1974</i>).	
The proposal would not impact on the habitat of protected fauna.	Nil.

Clause 228 considerations	Impact
g) Any endangering of any species of animal, plant or other form of life, whether living on land, water or air.	
The proposal would not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air.	Nil.
h) Any long-term effects on the environment.	
The proposal would encourage pedestrian access to Old Windsor Road and improve circulation and reliance on public transport.	Long-term, moderate, positive
i) Any degradation of the quality of the environment.	
The proposal has the potential to degrade the quality of the environment as a result of temporary noise and vibration impacts. These impacts would be managed according to the safeguards outlined in Section 8.3.	Short-term, minor, negative
j) Any risk to the safety of the environment.	
Occupational health and safety hazards include stockpiled waste and demolition materials. These impacts would be managed according to the safeguards outlined in Section 8.3.	Short-term, minor, negative
k) Any reduction in the range of beneficial uses of the environment.	
The proposal is located on the land that is currently used for residential purposes. The area is highly disturbed and is considered to be a suitable location for a pedestrian link, noting the extensive options' assessment undertaken.	Nil.
l) Any pollution of the environment	
During construction, the proposal has the potential to result in short-term noise, traffic, air and visual pollution. These impacts would be managed in accordance with the mitigation measures outlined in Table 8-1.	Short-term, moderate, negative
m) Any environmental problems associated with the disposal of waste	
The proposal is unlikely to result in any environmental problems associated with waste. All waste requiring off-site disposal would be classified in accordance with the Waste Classification Guidelines (EPA 2014) prior to disposal at an appropriate waste facility licensed to accept waste of the relevant classification.	Nil.
n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply.	
The proposal would require resources including limited quantities of concrete, gravel and water, which are common construction materials. The proposal would not create a substantial demand on these resources.	Nil.
o) Any cumulative environmental effect with other existing or likely future activities.	
Operation of the proposal may overlap with construction of the Old Windsor Road pedestrian bridge and Bella Vista Station. Given the nature of the proposal, cumulative impacts as a result of concurrent development is anticipated to be minor and would be managed according to safeguards outlined in Section 8.3.	Nil.
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions.	
The proposal would not result in any impact on coastal processes and coastal hazards including those under projected climate change conditions	Nil.

Consideration of Matters of National Environmental Significance

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government's Department of Energy and the Environment. These issues are considered in Table B1.2.

Table B1-2: Checklist of EPBC Act matters

Matters of national environmental significance	Impact
(a) World heritage properties.	
There are no items within the proposal site listed on the World Heritage List.	Nil.
(b) National heritage places.	
There are no items within the proposal site listed on the National Heritage List.	Nil.
(c) Wetlands of international importance.	
There are no wetlands of international importance in the proposal site or likely to be affected by the proposal.	Nil.
(d) Nationally threatened species and ecological communities.	
The proposal would be located within existing, disturbed areas including existing residential area and road reserve. The proposal would have no impact on a listed threatened species or community.	Nil.
(e) Migratory species	
The proposal would have no impact on a listed migratory species.	Nil.
(f) Commonwealth marine areas.	
The proposal would have no impact on a Commonwealth marine area.	Nil.
(g) The Great Barrier Reef Marine Park	
The proposal would have no impact on a The Great Barrier Reef Marine Park.	Nil.
(h) Protection of water resources from coal seam gas development and large coal mining development	
The proposal would have no impact on water resources from coal seam gas development and large coal mining development.	Nil.
(i) Nuclear actions (including uranium mining).	
The proposal does not involve a nuclear action.	Nil.
(j) Any impact (direct or indirect) on Commonwealth land?	
The proposal would have no impact (direct or indirect) on Commonwealth land.	Nil.

Appendix C Noise Assessment (SLR, March 2018)



global environmental solutions

Glenwood Pedestrian Link Noise and Vibration Assessment

Report Number 610.14718-R04

27 March 2018

Jacobs Group (Australia) Pty Ltd

177 Pacific Highway

North Sydney NSW 2060

Australia

Version: -v3.0

Glenwood Pedestrian Link

Noise and Vibration Assessment

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This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

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APPENDICIES

Appendix A Acoustic Terminology

1 INTRODUCTION

1.1 Project Background

Sydney Metro will deliver a metro station at Bella Vista as part of the first stage of the Sydney Metro network. The new Bella Vista Station is under construction off Celebration Drive and will service the Norwest Business Park as well as local residential areas. As part of the Bella Vista station works TfNSW are constructing a footbridge to allow pedestrians and cyclists to safely and conveniently cross Old Windsor Road and access the future Bella Vista Station.

The footbridge will be located about 100m north of the Celebration Drive and Old Windsor Road intersection, providing a direct connection between the southern station entrance and the western side of Old Windsor Road, adjacent to the Trades Norwest Anglican Senior College and Emmanuel Baptist Church.

Transport for NSW have reviewed options to further improve pedestrian and cyclists access to and from the new Bella Vista Station, particularly for the residents of Glenwood. Glenwood residents currently have pedestrian access points to Old Windsor Road from Arnold Place, Emmanuel Terrace and Miami Street. These points are used to access the shared path along Old Windsor Road and several crossing points into Bella Vista and Norwest Business Park. They are also key paths to access the Celebration bus stop on the North West T-Way.

Apart from these points, pedestrian access is currently blocked by 1km of continuous property fences and noise barriers along Old Windsor Road, restricting the number of residents able to walk to the new Bella Vista Station, despite living in such close proximity. Restricted access has led to the development of informal paths between Glenwood streets and Old Windsor Road, either through public land or private properties.

Installing a pedestrian link north of the pedestrian bridge over Old Windsor Road (currently under construction) would provide maximum equitable access to residents in Glenwood to Bella Vista Station. A pedestrian link would also help provide equitable access to Bella Vista Station to the Blacktown Local Government Area (Blacktown LGA).

1.2 Project Description

The proposal consists of a pedestrian and cycle link designed to link the existing shared user path on Old Windsor Road to the Glenwood residential area via a new breakthrough located at 1 Swansea Court, Glenwood (Lot 546, DP 1009539).

The pedestrian link would have significant benefits in terms of improved pedestrian and cyclist safety and accessibility, giving more residents the option to leave their car at home and walk or cycle to the station.

The proposal would comprise of:

- 2.5m wide shared user path connection
- Bottom section of the ramp at Swansea Court at 1:20
- 1:14 ramps with handrails
- Existing shared user path along Old Windsor Road regraded (1:20 ramps) below existing level
- Path length = 50m
- Distance of link to adjacent boundary = 2.0 to 2.1m
- Installation of new footpath on the eastern side of Sharrock Avenue between the link and Nixon Street

- Installation of new footpath on the southern side of Cramer Place between Swansea Court and Glenwood Park Drive.
- Installation of Retaining walls along Old Windsor Road shared user path
- Landscaping.

Footpaths are currently only provided on one side of Sharrock Avenue and Cramer Place. The proposal would provide new 1.5m wide footpaths along the eastern side of Sharrock Avenue between Swansea Court and Nixon Street and also along the southern side of Cramer place between Swansea Court and Glenwood Park Drive

The proposed location for the pedestrian is identified in **Figure 1**.

Figure 1 Proposed Pedestrian Link



1.3 Terminology

The assessment has used specific acoustic terminology. An explanation of common terms is included in **Appendix A**.

2 DESCRIPTION OF THE EXISTING ENVIRONMENT

2.1 Existing Environment

The proposed pedestrian link is to be located at 1 Swansea Court, Glenwood (Lot 546, DP 1009539). The proposal is currently occupied by a residential dwelling, and is bounded by other residential dwellings to the north and south, Old Windsor Road to the East and residents across Sharrock Avenue to the west.

The existing ambient noise environment surrounding the proposal area is primarily dominated by road traffic noise from Old Windsor Road.

The surrounding areas of the proposal area have been divided into Noise Catchment Areas (NCAs) to represent the changes in ambient noise levels. These are detailed in **Table 1** and presented in **Figure 2**.

Table 1 Noise Catchment Areas and Surrounding Land Uses

NCAs	Area	Description
NCA01	Glenwood	Typically residential receivers directly surrounding the proposal area.
NCA02	Glenwood	Consists of a school and church located to the south of the proposal area.
NCA03	Glenwood	Generally residential receivers located to the south of the proposal area
NCA04	Bella Vista	Commercial receivers located across Old Windsor Road to the south East
NCA05	Bella Vista	Residential receivers located to the east of the proposal area.

2.2 Ambient Noise Monitoring Locations

To quantify and characterise the existing ambient noise environment surrounding the proposal, background noise monitoring previously undertaken as part of the 'Noise and Vibration Technical Paper for Major Civil Construction Works' for the North West Rail Link (Sydney Metro) have been adopted (refer to SLR EIS Technical Paper 2 dated 19 March 2012). The noise monitoring locations used are detailed in **Table 2** and depicted in **Figure 2**.

Table 2 Ambient Noise Survey Locations

ID	Area	NCA	Noise Monitoring Location Address
BG10	Glenwood	NCA03	8 Maley Grove, Glenwood
BG11	Bella Vista	NCA05	12 Craigend Place, Bella Vista

2.3 Noise Monitoring Results

The measured levels have been used to establish existing noise levels as a basis for assessing potential noise impacts of the proposal.

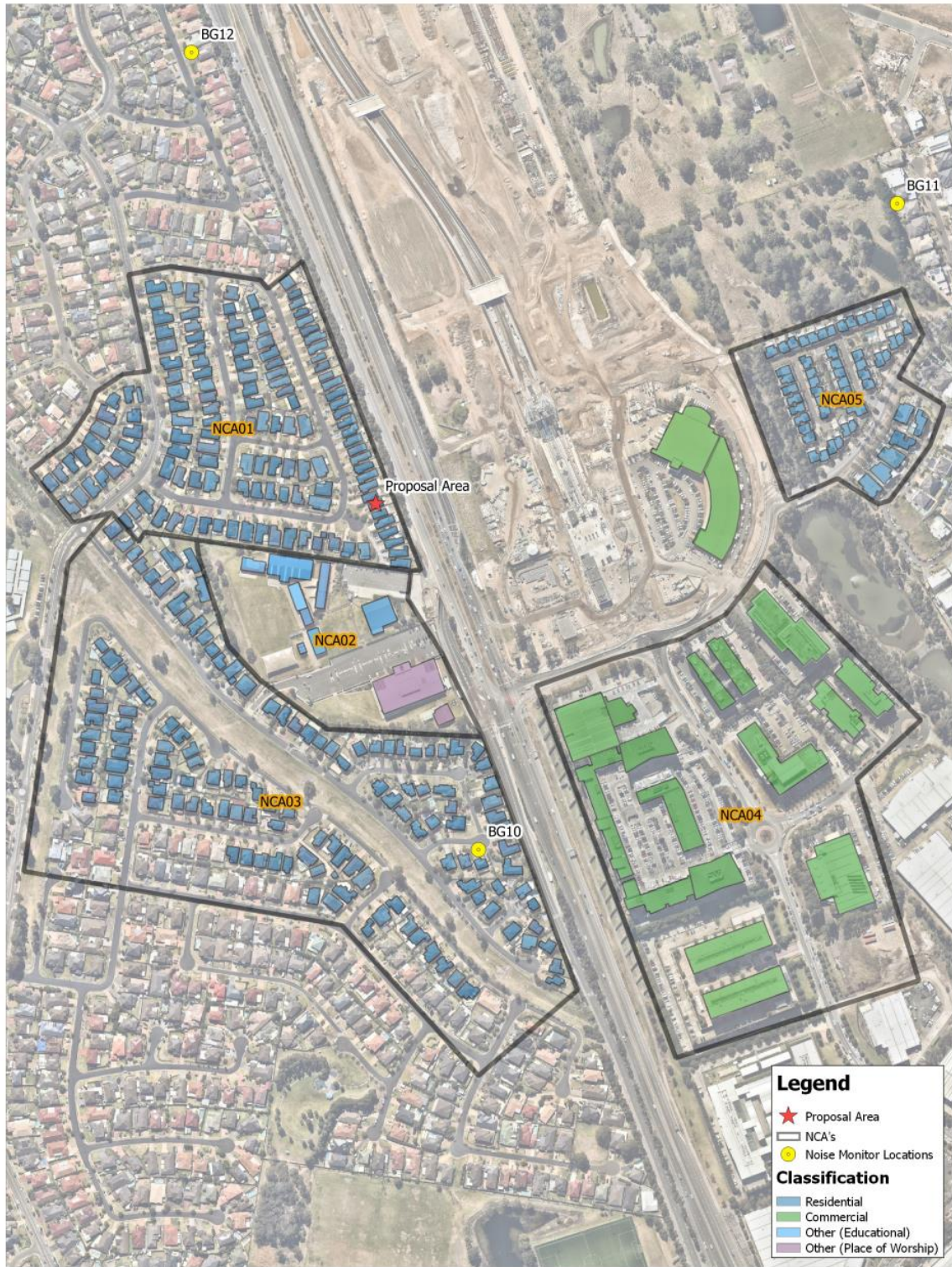
The results of the unattended ambient noise surveys are summarised in **Table 3** as the Rating Background Level (RBL) and LAeq noise levels for the ICNG daytime, evening and night-time periods where available.

Table 3 Summary of Unattended Noise Logging Results

Noise Monitoring Location	Measured Noise Level (dBA) ¹					
	RBL			LAeq		
	Daytime	Evening	Night	Daytime	Evening	Night
BG10	46	45	36	53	52	50
BG11	36	35	31	52	46	43

Note 1: ICNG Governing Periods – Day: 7.00 am to 6.00 pm Monday to Saturday, 8.00 am to 6.00 pm Sunday; Evening: 6.00 pm to 10.00 pm; Night: 10.00 pm to 7.00 am Monday to Saturday, 10.00 pm to 8.00 am Sunday.

Figure 2 Proposed Glenwood Pedestrian Link



Legend

- ★ Proposal Area
- ▭ NCA's
- Noise Monitor Locations

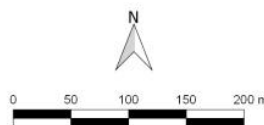
Classification

- Residential
- Commercial
- Other (Educational)
- Other (Place of Worship)

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Jacobs
Glenwood Pedestrian Link
Proposal Area

3 CONSTRUCTION AIRBORNE NOISE AND VIBRATION ASSESSMENT

People are usually more tolerant to noise and vibration impacts during the construction phase of a project than during normal long-term operation, due to the recognition that the construction emissions are of a temporary nature. For this reason, acceptable noise and vibration levels are normally higher during construction than during operations.

Construction often requires the use of heavy machinery which can generate high noise and vibration levels at nearby buildings and receivers. For some equipment, there is limited opportunity to mitigate the noise and vibration levels in a cost-effective manner and hence the potential disturbance impacts are typically minimised as much as practicable through management techniques.

At any particular location, the potential impacts can vary greatly depending on factors such as the relative proximity of sensitive receivers, the overall duration of the construction works, the intensity of the noise and vibration levels, the time at which the construction works are undertaken and the character of the noise or vibration emissions.

3.1 List of Applicable Guideline Documents

All guidelines referenced in this construction noise and vibration assessment are listed in **Table 4**.

Table 4 Construction Noise and Vibration Guidelines and Policies

Construction Noise and Vibration Guidelines and Policies	
Guideline/Policy Name	When Guideline is Used
<i>Interim Construction Noise Guideline (ICNG)</i> , DECC, 2009	Assessment of airborne noise and ground-borne noise impacts on sensitive receivers
<i>Assessing Vibration: a technical guideline</i> , DEC, 2006	Assessment of vibration impacts on sensitive receivers
<i>Construction Noise Strategy (CNS)</i> , Transport for NSW, 2012	Assessment and management protocols for airborne noise, ground-borne noise and vibration impacts of rail infrastructure projects
<i>BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2</i> , BSI, 1993	Assessment of vibration impacts (damage) to non-heritage sensitive structures
<i>DIN 4150:Part 3-1999 Structural vibration – Effects of vibration on structures</i> , Deutsches Institute fur Normung, 1999	Screening assessment of vibration impacts (damage) to heritage sensitive structures, if structure is found to be unsound
<i>NSW Road Noise Policy (RNP)</i> , DECC 2011	Assessment of traffic noise impacts on sensitive receivers from construction vehicles on public roads
<i>Sydney Metro City & Southwest Construction Noise and Vibration Strategy (CNVS)</i> , Transport for NSW, 2016	Assessment and management protocols for airborne noise, ground-borne noise and vibration impacts for the Sydney Metro Project.

3.2 Noise Guidelines

This section describes the guidelines used for the assessment of potential noise impacts from on-site works during construction of the proposal.

3.2.1 Noise Metrics

The primary noise metrics used to describe construction noise emissions in construction assessments are:

LA1(1minute)	The typical 'maximum noise level for an event', used in the assessment of potential sleep disturbance during night-time periods. Alternatively, assessment may be conducted using the LAF _{max} or maximum noise level.
LAeq(15minute)	The 'energy average noise level' evaluated over a 15-minute period. This parameter is used to assess the potential construction noise impacts.
LA90	The 'background noise level' in the absence of construction activities. This parameter represents the average minimum noise level during the daytime, evening and night-time periods respectively. The LAeq(15minute) construction Noise Management Levels are based on the LA90 background noise levels.
RBL	The 'Rating Background Level' representative of the typical lowest ambient noise level not exceeded for more than 90% of the daytime, evening, or night-time period.
NML	The construction 'Noise Management Level' is defined by the existing ambient noise levels and the receiver's sensitivity to construction noise.

The subscript 'A' indicates that the noise levels are filtered to match normal hearing characteristics (A-weighted).

3.2.2 NSW Interim Construction Noise Guideline

The *Interim Construction Noise Guideline* (ICNG) (DECC 2009) sets out ways to assess and manage the impacts of construction noise on residences and other sensitive land uses. It does this by presenting assessment approaches that are tailored to the scale of the construction works.

The ICNG requires project specific Noise Management Levels (NMLs) to be established for potentially noise affected receivers. In the event construction noise levels are predicted to be above the NMLs, feasible and reasonable work practices are to be investigated to minimise noise emissions.

Having investigated all feasible and reasonable work practices, if construction noise levels are still predicted to exceed the NMLs then the potential noise impacts would be managed via site specific construction noise management plans.

3.2.2.1 Residential Receivers

The ICNG provides an approach for determining LAeq(15minute) NMLs at adjacent residential receivers based on the measured LA90(15minute) Rating Background Level (RBL), as described in **Table 5**.

Table 5 Determination of NMLs for Residential Receivers

Time of Day	NML LAeq(15minute)	How to Apply
Standard hours Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or public holidays	RBL + 10 dBA	<ul style="list-style-type: none"> The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq(15minute) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practises to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly Noise Affected 75 dBA	<ul style="list-style-type: none"> The Highly Noise Affected (HNA) level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account: <ul style="list-style-type: none"> Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or mid-morning or mid-afternoon for works near residences). If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	RBL + 5 dBA	<ul style="list-style-type: none"> A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practises have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

Note 1 The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW *Industrial Noise Policy*.

3.2.2.2 Commercial and Industrial Premises

The ICNG notes that due to the broad range of sensitivities that commercial or industrial land can have to noise from construction, the process of defining management levels is separated into three categories:

- Industrial premises: external LAeq(15minute) 75 dBA
- Offices, retail outlets: external LAeq(15minute) 70 dBA
- Other businesses that may be very sensitive to noise, where the noise level is project specific as discussed below.

The external noise levels should be assessed at the most-affected occupied point of the premises.

Potentially noise and vibration sensitive small business receivers (ie childcare centres, cafes/bars/restaurants, etc), which have been identified in the proposal area have been assessed against specific criteria as detailed in the following section.

3.2.2.3 Other Sensitive Land Uses

The ICNG's quantitative assessment method provides NMLs for other sensitive land uses, such as educational institutes, hospitals, medical facilities and outdoor recreational areas. These land uses are considered potentially sensitive to construction noise only when the properties are in use.

The ICNG does not however provide an NML for all classifications of sensitive land use. Where sensitive land uses with no classification are identified within a construction noise catchment, the following guidance is given:

The proponent should undertake a special investigation to determine suitable noise levels on a project-by-project basis; the recommended 'maximum' internal noise levels in AS 2107 Acoustics – Recommended design sound levels and reverberation times for building interiors may assist in determining relevant noise levels (Standards Australia 2000).

The project specific LAeq(15minute) NMLs for other non-residential noise sensitive receivers from the ICNG are provided in **Table 6**.

Table 6 ICNG NMLs for Other Sensitive Receivers

Land Use	NML LAeq(15minute) (Applied when the property is in use)
Classrooms at schools and other education institutions	Internal noise level 45 dBA
Hospital wards and operating theatres	Internal noise level 45 dBA
Places of Worship	Internal noise level 45 dBA
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dBA
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, eg reading, meditation)	External noise level 60 dBA
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses.

For sensitive receivers such as hospitals, schools and places of worship, the NMLs presented in **Table 6** are based on internal noise levels. For the purpose of this assessment, it is conservatively assumed that all schools and places of worship have openable windows. On the basis that external noise levels are typically 10 dB higher than internal noise levels when windows are open, an external NML of 55 dBA LAeq(15minute) has been adopted.

Other noise-sensitive receivers require separate project specific noise goals and, as per the guidance in the ICNG, NMLs for these receivers have been derived from the internal levels presented in AS 2107. The project specific NMLs for other sensitive receivers are presented in **Table 7**.

Table 7 NMLs for Project Specific Other Sensitive Receivers

Land Use	NML LAeq(15minute)		NML Derived From
	Internal	External	
Childcare Centre	60 dBA play areas	70 dBA ² play areas	ICNG outdoor passive recreation
	40 dBA sleeping area	50 dBA ² sleeping area	AS2107 for residential sleeping areas near to major roads
Library	45 dBA	55 dBA ²	AS2107 for reading areas

Land Use	NML LAeq(15minute)		NML Derived From
	Internal	External	
Public Building	50 dBA	60 dBA ²	AS2107 for public space
Café/bar/restaurant	50 dBA	60 dBA ²	AS2107 for coffee bar

Note 1: These receivers are typically well insulated from external noise break-in. For the purpose of this assessment, a minimum (conservative) outside-to-inside attenuation of 20 dB has been assumed. The corresponding external noise goal is therefore the internal NML +20 dB.

Note 2: Receiver conservatively assumed to have openable windows and a 10 dB outside to inside facade performance.

3.2.3 Residential NML Summary

Using the background noise levels in **Table 3**, the residential NMLs derived for the proposal are detailed in **Table 8**.

The noise monitoring locations used are considered to be the typically most affected residential locations surrounding the proposal area.

Whilst background noise levels may reduce for receivers which are further back from the construction works (and nearby roads), the construction noise predictions are likely to drop off at a quicker rate meaning the level of impact would be lower than the most affected 'front row' receivers.

Table 8 Residential Receiver NMLs for Construction

NCA	Logger ID	Standard Construction (RBL+10dB)
		Daytime
NCA01	BG10	56
NCA02	BG10	56
NCA03	BG10	56
NCA04	BG10	56
NCA05	BG11	46

3.3 Road Traffic Noise Guidelines

When trucks and other vehicles are operating within the boundaries of construction sites, road vehicle noise contributions are included in the predicted LAeq(15minute) noise emissions and assessed against the ICNG criteria in **Section 3.2.2**.

When construction related traffic moves onto the public road network a different noise assessment methodology is appropriate, as vehicle movements are regarded as 'additional road traffic' rather than as part of the works and are assessed under the Roads and Maritime Services' *Road Noise Policy* (RNP).

As required by the RNP, an initial screening test should first be applied by evaluating whether noise levels would increase by more than 2 dB (an increase in the number vehicles of approximately 60%) due to construction traffic or a temporary reroute due to a road closure.

Where noise levels increase by more than 2 dB (ie 2.1 dB or greater) further assessment is required using the criteria presented in the RNP, as reproduced below to in **Table 9**.

Table 9 RNP Criteria for Assessing Construction Vehicles on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am - 10 pm)	Night-time (10 pm - 7 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq(15hour) 60 (external)	LAeq(9hour) 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	LAeq(1hour) 55 (external)	LAeq(1hour) 50 (external)

3.4 Construction Vibration Guidelines

The effects of vibration on buildings can be divided into three main categories:

- Those in which the occupants or users of the building are inconvenienced or possibly disturbed
- Those where the building contents may be affected
- Those in which the integrity of the building or the structure itself may be prejudiced.

3.4.1 Human Comfort Vibration

The Department of Environment and Conservation's (DEC) *Assessing Vibration: a technical guideline* (2006) provides guideline values for continuous, transient and intermittent events that are based on a Vibration Dose Value (VDV) rather than a continuous vibration level. The VDV is dependent upon the level and duration of the vibration event, as well as the number of events occurring during the daytime or night-time period.

The VDV's recommended in the guideline for vibration that is intermittent nature are presented in **Table 10**.

Table 10 Preferred and Maximum Vibration Dose Values for Intermittent Vibration

Building Type	Vibration Dose Value (m/s ^{1.75})	
	Preferred	Maximum
Critical Working Areas (eg hospital operating theatres, precision laboratories)	0.10	0.20
Residential Daytime	0.20	0.40
Residential Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80
Workshops	0.80	1.60

Note: Daytime is 7:00 am to 10:00 pm and night-time is 10:00 pm to 7:00 am.

3.4.2 Effects on Building Contents

People can perceive floor vibration at levels well below those likely to cause damage to building contents or affect the operation of typical equipment found in most buildings that is not particularly vibration sensitive. For most receivers, the controlling vibration criterion is the human comfort criterion, and it is therefore not normally required to set separate criteria in relation to the effect of construction vibration on typical building contents.

Where appropriate, objectives for the satisfactory operation of vibration sensitive critical instruments or manufacturing processes should be sourced from manufacturer's data and/or other published objectives.

3.4.3 Structural Damage Vibration

Structural damage vibration limits are based on Australian Standard AS 2187: Part 2-2006 *Explosives - Storage and Use - Part 2: Use of Explosives* and British Standard BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2*. These standards provide frequency-dependent vibration limits related to cosmetic damage, noting that cosmetic damage is very minor in nature, is readily repairable and does not affect the structural integrity of the building.

The recommended vibration limits from BS 7385 for transient vibration for minimal risk of cosmetic damage to residential and industrial buildings are shown in **Table 11**.

Table 11 Transient Vibration Guide Values – Minimal Risk of Cosmetic Damage

Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

3.5 Works Description

3.5.1 Proposed Construction Activities

A number of scenarios have been developed to assess potential impacts associated with the construction of the proposal area. **Table 12** outlines the construction scenarios and corresponding activities, as well as noting the periods that the various works would be required to be completed in. The anticipated durations of activities are also summarised, noting that the activities are intermittent during this period and would not be expected to be undertaken every day during the scheduled activity.

Table 12 Construction Activities and Period of Operation

Scenario	Works ID	Indicative Duration (Weeks) ¹	Activity	Hours of Works		
				Std. Day	Possession / Closedown Works	
					Day OOH	Eve
Demolition of House	W.0001	1	Demolition	✓		
	W.0002	1	Removal of Rubble	✓		
	W.0003	1	Earthworks/Levelling	✓		
Landscaping	W.0004	1	Landscaping	✓		
Lighting	W.0005	1	Install Lighting	✓		
Concrete Footpath	W.0006	1	Earthworks/Preparation	✓		
	W.0007	1	Concrete works	✓		
Utility Works in Cycle way	W.0008	2	Relocation of Utilities	✓		
Cycleway regrading	W.0009	1	Cycle Way Regrading	✓		
Concrete works along Cramer Pl and Sharrok Ave	W.0010	2	Earthworks/Preparation	✓		
	W.0011	2	Concrete Works	✓		
Compound	W.0012	1	Compound Establishment/ Demobilisation	✓		
	W.0013	16	Compound Operation	✓		

3.5.2 Project Construction Hours and Duration

The proposed pedestrian link is anticipated to take 4 months to complete.

The construction works would be undertaken in accordance with the ICNG during the standard daytime working hours of:

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

3.6 Overview Construction Noise Modelling

3.6.1 Source Location

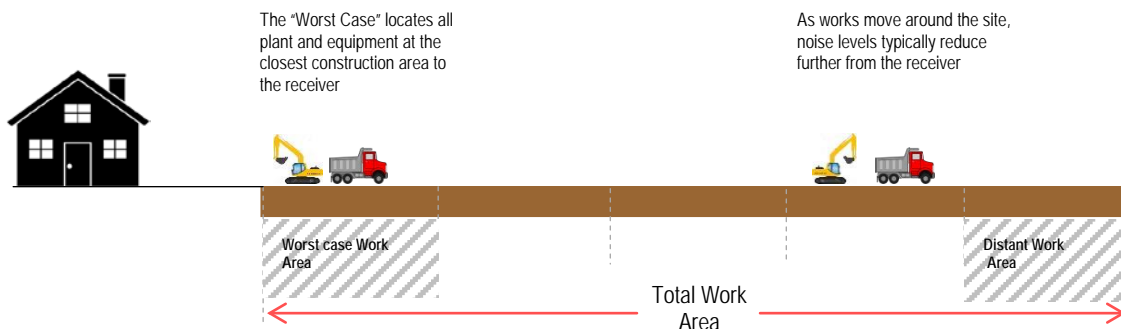
Consistent with the requirements of the ICNG, this assessment provides a 'realistic worst-case' noise impact assessment based on the required construction works within a 15-minute period. This is typically associated with works located nearest to a particular receiver.

In reality, the potential construction noise impacts at any particular location can vary greatly depending on factors including the following:

- The position of the works within the site and distance to the nearest sensitive receiver
- The overall duration of the works
- The intensity of the noise levels
- The time at which the works are undertaken
- The character of the noise.

Noise levels at sensitive receivers can also be significantly lower than the worst-case scenario when the construction works move to a more distant location in a works area. This concept is shown in **Figure 3**.

Figure 3 Illustration of Works Areas



The above figure illustrates that when works move away from a receiver the noise levels from the operation of the construction equipment would reduce accordingly.

3.6.2 Calculation Type

To quantify noise levels from the construction activities a computer noise prediction model using the ISO 9613 algorithms was developed using SoundPLAN software.

Local terrain has been digitised in the noise model to develop a three-dimensional representation of the proposal area and surrounding environment. In accordance with the ICNG, noise levels are predicted at all receivers in the catchment areas surrounding the works.

3.6.3 Construction Activity Source Noise Levels

Sound power levels for the typical operation of construction equipment applied in the modelling are listed in **Table 13**. These noise levels have been taken from verified test data and global standards that form part of SLR's noise database.

Table 13 Sound Power Levels for Construction Equipment

ID	Construction Activity	Equipment	Operating minutes in 15-min period	No of items in same location	Sound Power Level LWA (dB)	
					Item	Activity
W.0001	Demolition	Excavator (Breaker)1	7.5	1	121	118
		Excavator (30 tonne)	15	1	104	
		Hand Tools (electric)	15	2	96	
W.0002	Removal of Rubble	Excavator (30 tonne)	15	1	104	107
		Truck (12-15 tonne)	15	1	103	
W.0003	Earthworks/Levelling	Excavator (20 tonne)	15	1	99	110
		Truck (12-15 tonne)	15	1	103	
		Bobcat	15	2	104	
		Hand Tools (electric)	15	2	96	
		Ute (5mins)	5	2	98	
W.0004	Landscaping	Bobcat	15	1	104	106
		Truck (10 tonne)	15	1	98	
		Hand Tools (electric)	15	1	96	
		Ute (5mins)	5	1	98	
W.0005	Install Lighting	Ute (5mins)	5	1	98	107
		Excavator (1.5 tonne)	15	1	84	
		Hand Tools (electric)	15	1	96	
		Truck (HIAB)	15	1	98	
		Elevated Working Platform	15	1	97	
		Franna Crane	15	1	99	
		Concrete Truck / Agitator	7.5	1	106	
W.0006	Concrete Footpath Onsite - Earthworks/Preparation	Excavator (15 tonne)	15	1	96	110
		Truck (12-15 tonne)	15	1	103	
		Compactor	15	1	108	
		Hand Tools (electric)	15	2	96	
		Ute (5mins)	5	1	98	
W.0007	Concrete Footpath Onsite - Concrete works	Truck (12-15 tonne)	15	1	103	108
		Concrete Truck / Agitator	7.5	1	106	
		Hand Tools (electric)	15	2	96	
		Ute (5mins)	5	1	98	
		Concrete Vibrator	15	1	102	

ID	Construction Activity	Equipment	Operating minutes in 15-min period	No of items in same location	Sound Power Level LWA (dB)	
					Item	Activity
W.0008	Relocation of Utilities in Cycle way	Crane (small)	15	1	98	102
		Truck (HIAB)	15	1	98	
		Ute (5mins)	5	1	98	
W.0009	Cycle Way Regrading	Bobcat	15	1	104	111
		Truck (12-15 tonne)	15	1	103	
		Compactor	15	1	108	
		Hand Tools (electric)	15	2	96	
		Ute (5mins)	5	1	98	
W.0010	Concrete Footpath along Cramer Pl and Sharrok Ave - Earthworks/Preparation	Concrete Saw1	5	1	115	111
		Truck (12-15 tonne)	15	1	103	
		Hand Tools (electric)	15	2	96	
		Ute (5mins)	5	1	98	
W.0011	Concrete Footpath along Cramer Pl and Sharrok Ave - Concrete Works	Truck (12-15 tonne)	15	1	103	108
		Concrete Truck / Agitator	7.5	1	106	
		Hand Tools (electric)	15	2	96	
		Ute (5mins)	5	1	98	
		Concrete Vibrator	15	1	102	
W.0012	Compound Establishment/ Demobilisation	Crane (small)	15	1	98	102
		Truck (HIAB)	15	1	98	
		Ute (5mins)	5	1	98	
W.0013	Compound Operation	Ute (5mins)	5	2	98	96
		AC Unit	15	2	75	

3.7 Predicted Worst-case Noise Levels – Project Overview

A summary of the predicted noise levels (without mitigation) in each of the NCAs for the various work activities is presented in **Table 14**.

The following tables colour the predicted noise levels based on the exceedance of the NML during that period and for that receiver type. A qualitative description of the NML exceedance bands is given below, noting that the impact of these potential exceedances would depend on the period in which they were to occur (ie the night-time period is typically more sensitive than the daytime or evening for most people):

- Noise levels 1 to 10 dB above NML – impacts would typically be marginal to minor
- Noise levels 11 dB to 20 dB above NML – impacts would typically be moderate
- Noise levels >20 dB above NML – impacts would typically be high

For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted at the most-exposed receiver, as the noise levels presented in this report are based on a realistic worst-case assessment.

Table 14 Predicted Worst-Case 15-minute Noise Levels from the Project

NCA	NML (dBA)	Predicted LAeq(15minute) Noise Level (dBA) ¹												
		W.0001 - Demolition	W.0002 - Removal of Rubble	W.0003 - Earthworks/Levelling	W.0004 - Landscaping	W.0005 - Install Lighting	W.0006 - Earthworks/Preparation	W.0007 - Concrete works	W.0008 - Relocation of Utilities	W.0009 - Cycle Way Regrading	W.0010 - Earthworks/Preparation	W.0011 - Concrete Works	W.0012 - Compound Establishment/ Demobilisation	W.0013 - Compound Operation
NML_Standard Daytime		Operating Period												
		D	D	D	D	D	D	D	D	D	D	D	D	D
Residential Receivers														
NCA01	56	93	82	85	81	82	85	83	69	78	85	82	77	71
NCA02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA03	56	60	49	52	48	49	52	51	45	54	64	61	44	38
NCA04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA05	46	54	43	46	42	43	46	47	41	50	45	42	38	32
Commercial Receivers														
NCA01	70													
NCA02	70													
NCA03	70													
NCA04	70	56	45	50	46	47	50	49	43	52	48	45	40	34
NCA05	70	58	47	50	46	47	50	50	44	53	48	45	42	36
Other Sensitive Receivers														
NCA01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA02	-	66	55	58	54	55	58	56	48	57	66	63	50	44
NCA03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCA05	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Shaded cells indicate predicted noise level exceedances of NML

3.8 Predicted Noise Level NML Exceedances

The predicted NML exceedances across the proposal area for all receiver types are summarised in **Table 15**. The assessment presented takes into consideration all construction scenarios associated with the project in this area. The number of receivers predicted to experience exceedances of the NMLs are summarised in bands of 10 dB and are separated into daytime, evening and night-time periods, as appropriate.

Table 15 Predicted Noise Level NML Exceedances – All Receivers

Activity ID	Scenario	Activity	No. Weeks ¹	Duration within Project Program ²				Number of Receivers				
				%				Total	HNA ³	With NML Exceedance ⁴		
				25	50	75	100			1-10 dB	11-20 dB	>20 dB
W.0001	Demolition of House	Demolition	1					354	13	104	22	9
W.0002		Removal of Rubble	1					354	3	18	9	2
W.0003		Earthworks/Levelling	1					354	6	27	12	3
W.0004	Landscaping	Landscaping	1					354	2	19	6	2
W.0005	Lighting	Install Lighting	1					354	3	18	9	2
W.0006	Concrete Footpath	Earthworks/Preparation	1					354	6	27	12	3
W.0007		Concrete works	1					354	3	22	10	2
W.0008	Utility Works in Cycle way	Relocation of Utilities	2					354	-	8	3	-
W.0009	Cycleway regrading	Cycle Way Regrading	1					354	3	31	8	3
W.0010	Concrete Footpath along Cramer Pl and Sharrok Ave	Earthworks/Preparation	2					354	37	61	23	35
W.0011		Concrete Works	2					354	32	48	23	24
W.0012	Compound	Compound Establishment/	1					354	1	13	5	1
W.0013		Compound Operation	16					354	-	5	2	-

Note 1: Durations should be regarded as indicative and represent a typical worksite. There would be locations within each category that require works to be shorter or longer than shown. The duration of these impacts is less than the overall duration, and depends on the rate of progress in the works areas.

Note 2: Approximate percentage (rounded to the nearest 10%) of activity duration within overall project program.

Note 3: Highly Noise Affected, based on ICNG definition (ie predicted LAeq(15minute) noise at residential receiver is 75 dBA or greater).

Note 4: Based on worst case predicted noise levels.

The information shown in **Table 15** indicates that exceedances of the NML's are predicted during all phases of construction activities with the worst being when the rock breaker is being used during the demolition of the existing dwelling located at the proposal area. It is understood that during this activity, the rock breaker is only anticipated to be used to break up the concrete foundations. During the remainder of the activity, the noise impact is anticipated to be 13 dB lower when only the excavator and hand tools are being used.

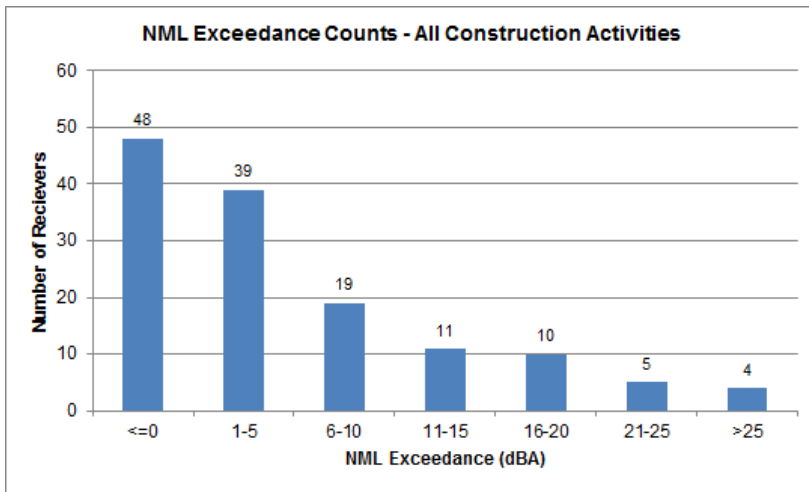
It is however noted that during most activities, it is expected that the construction noise levels would frequently be lower than the worst-case predicted noise levels for significant periods of time. This would be apparent as works move around the site and are therefore more distant from receivers, and when less noisy activities are being undertaken. This is particularly the case during concrete works along Cramer Place and Sharrok Avenue when the works will be moving along the street continuously.

3.9 Discussion

3.9.1 NCA01

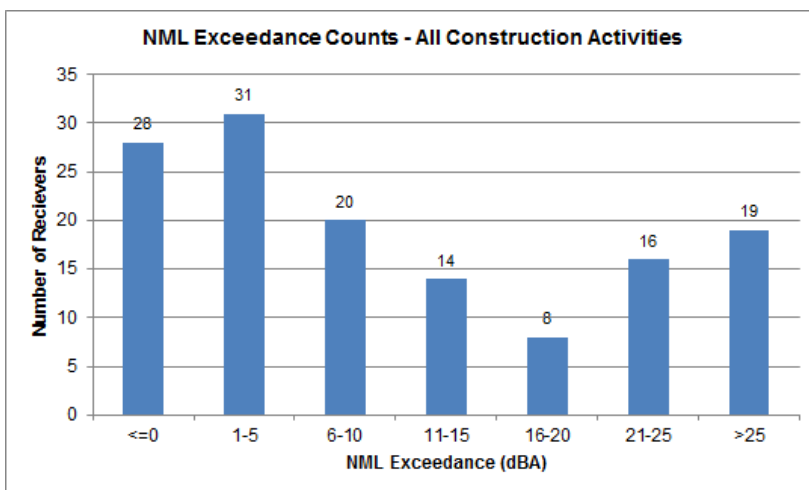
During W.0001, exceedances of up to 37 dB are predicted at 88 surrounding receivers (when works are located nearby) as depicted in **Figure 4**. This is primarily due to the use of the rock breaker that is proposed to be used during the demolition of the existing concrete foundations. When the rock breaker is not in use, the noise impacts are anticipated to be 13dB lower and be closer to the impacts of scenario W.0002. It should also be noted that these predicted noise levels presented in **Table 14** are also based on the closest point to the worst-affected receiver. As the works move away; these noise level will reduce substantially.

Figure 4 NCA01 - W.0001 Noise Management Level Exceedances



During W.0010 and W.0011, exceedances of up to 29 dB are predicted at 108 receivers as depicted in **Figure 5**. These exceedances are only anticipated to occur for a short duration of time as the works continue down Cramer Place and Sharrok Avenue. Therefore these residence will not be impacted for the full duration of the works.

Figure 5 NCA01 – W.0010 Noise Management Level Exceedances

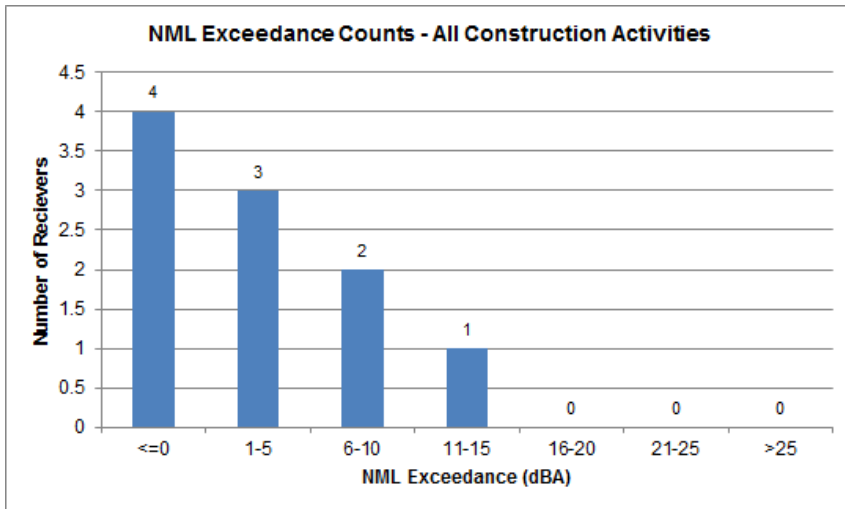


During all other scenarios, exceedances of the NML's are predicted primarily due to the proximity of the works to each of the residential receivers, with exceedances ranging between 13dB and 29 dB at up to 40 surrounding residential receivers.

3.9.2 NCA02

During W.0001, exceedances of up to 11dB are predicted at the nearby school and church as depicted in **Figure 6**. Further exceedances are also predicted during W.0003, W.0006, W.0007, W.0009, W.0010 and W.0011 of up to 11 dB depending on the location of the works.

Figure 6 NCA02 – W.0001 Noise Management Level Exceedances

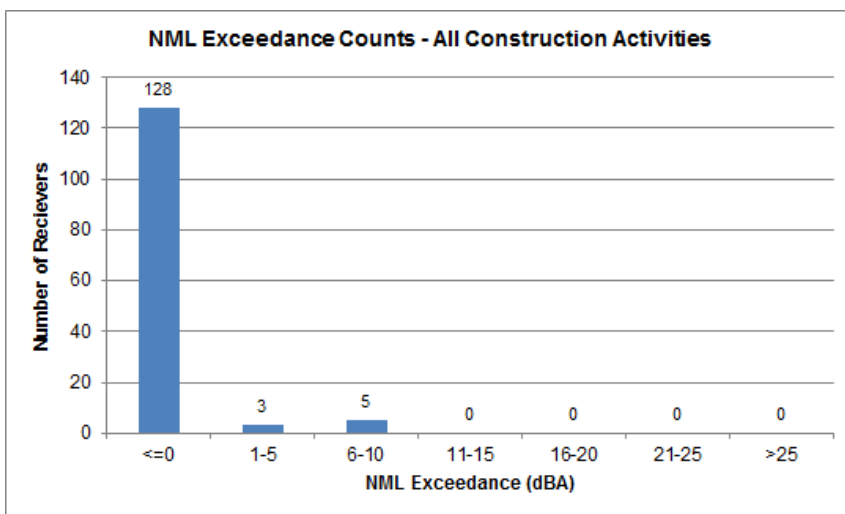


3.9.3 NCA03

During W.0010, exceedances of up to 10 dB are predicted at eight nearby residential receivers when installing the footpath along Cramer Place. These works are anticipated to occur for a short duration and therefore these residents will not be affected by this level of noise for the full duration of the works.

There are also up to five exceedances at residential receivers predicted to exceed the NML by up to 4 dB during W.0001.

Figure 7 NCA03 – W.0010 Noise Management Level Exceedances



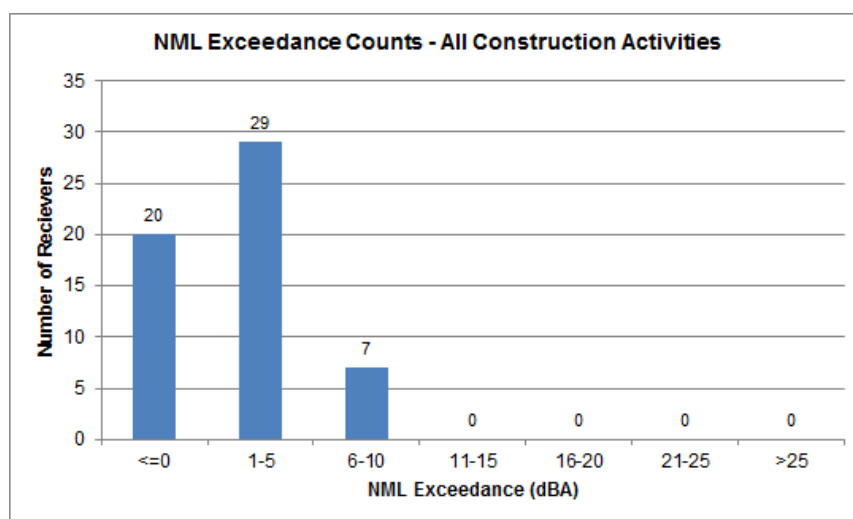
3.9.4 NCA04

No exceedances above the NML are predicted at any sensitive receivers within NCA04 for the duration of the project.

3.9.5 NCA05

Although receivers in this area are around 425 m from the proposed works, the criteria in this NCA (refer to **Section 3.2.3**) is considerably lower than the adjacent areas, reflecting lower levels of background noise in NCA05. During W.0001, exceedances of up to 8 dB are predicted at sensitive receivers within NCA05 as depicted in **Figure 8**. These exceedances are predicted to occur primarily due the use of the rock breaker associated with the demolition of the existing concrete foundations. When the rock breaker is not in use the noise level is expected to be 13 dB lower which would result in compliance at these residential receivers.

Figure 8 NCA05 – W.0001 Noise Management Level Exceedances



Further exceedances are also predicted during W.0007 and W.0009 during works within the cycleway. Exceedances of up to 4dB are predicted at up to 10 residential receivers and are considered to be minor.

3.10 Mitigation

The ICNG acknowledges that due to the nature of construction activities in urban areas it is inevitable that there will be noise impacts from construction sites. The NMLs identified in this report have been applied to determine measures for the control of potential construction noise impacts at sensitive receivers.

The project should apply all feasible and reasonable work practices to meet the NMLs, where possible, and inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels, duration of noise generating construction works, and contact details during construction.

A Construction Environmental Management Plan (CEMP) should be prepared prior to construction activities commencing and implemented through all construction activities. A Construction Noise and Vibration Management Plan (CNVMP) would be included in the CEMP to provide the framework and mechanisms for the management and mitigation of all potential noise and vibration impacts from the project. The CNVMP would be expected to include procedures for dealing with potential impacts during out of hours works.

3.10.1 Standard Mitigation

Particular effort should be directed towards the implementation of all feasible and reasonable noise mitigation and management strategies as per the standard mitigation measures detailed in the ICNG.

Reference can also be made to the Transport for NSW (TfNSW) *Construction Noise Strategy* (CNS) and the *Sydney Metro – Construction Noise and Vibration Strategy* (CNVS) which detail a number of standard mitigation measures for construction activities likely to result in adverse noise or vibration impacts associated with infrastructure projects.

Where identified in the impact assessment, particular effort should be directed towards the implementation of all feasible and reasonable noise mitigation and management strategies, noting that additional site specific measures may also be recommended.

Standard mitigation measures which may be considered appropriate for the project, as taken from the CNVS, are shown in **Table 16**.

Table 16 Recommended Standard Noise Mitigation Measures

Action Required	Applies To	Details
Management Measures		
Implementation of any project specific mitigation measures required.	Airborne noise. Ground-borne noise and vibration.	In addition to the measures set out in this table, any <i>project specific</i> mitigation measures identified in the environmental assessment documentation (eg Environmental Impact Statement, Review of Environmental Factors, submissions or representations report) or approval or licence conditions must be implemented.
Implement community consultation measures.	Airborne noise. Ground-borne noise and vibration.	Periodic Notification (monthly letterbox drop) ¹ . Website. Project information and construction response telephone line. Email distribution list. Place Managers.
Register of Noise Sensitive Receivers.	Airborne noise Ground-borne noise and vibration.	A register of all noise and vibration sensitive receivers (NSRs) would be kept on site. The register would include the following details for each NSR: <ul style="list-style-type: none"> • Address of receiver. • Category of receiver (eg Residential, Commercial etc.). • Contact name and phone number.
Site inductions	Airborne noise Ground-borne noise and vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: <ul style="list-style-type: none"> • All relevant project specific and standard noise and vibration mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Any limitations on high noise generating activities • Location of nearest sensitive receivers • Construction employee parking areas • Designated loading/unloading areas and procedures • Site opening/closing times (including deliveries) • Environmental incident procedures

Action Required	Applies To	Details
Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height; throwing of metal items; and slamming of doors. No excessive revving of plant and vehicle engines Controlled release of compressed air.
Monitoring	Airborne noise Ground-borne noise and vibration	A noise monitoring program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.
Attended vibration measurements	Ground-borne vibration	Attended vibration measurements are required at the commencement of vibration generating activities to confirm that vibration levels satisfy the criteria for that vibration generating activity. Where there is potential for exceedances of the criteria further vibration site law (ie the site-specific reduction in vibration level with distance) investigations would be undertaken to determine the site-specific safe working distances for that vibration generating activity. Continuous vibration monitoring with audible and visible alarms would be conducted at the nearest sensitive receivers whenever vibration generating activities need to take place inside the applicable safe-working distances.
Source Controls		
Construction hours and scheduling	Airborne noise Ground-borne noise and vibration	Works are only proposed to occur during Standard Construction Hours. Work generating high noise and/or vibration levels would be scheduled during less sensitive time periods.
Construction respite period	Ground-borne noise and vibration Airborne noise	High noise and vibration generating activities ² may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block ³ .
Equipment selection	Airborne noise Ground-borne noise and vibration	Use quieter and less vibration emitting construction methods where feasible and reasonable.
Maximum noise levels	Airborne-noise	The noise levels of plant and equipment must have operating Sound Power Levels compliant with the criteria in Table 11 (of the CNVS).
Rental plant and equipment	Airborne-noise	The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 11 (of the CNVS).
Plan worksites and activities to minimise noise and vibration	Airborne noise Ground-borne vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.
Non-tonal reversing alarms	Airborne noise	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.

Action Required	Applies To	Details
Path Controls		
Shield stationary noise sources such as pumps, compressors, fans etc	Airborne noise	Stationary noise sources would be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained where necessary. Appendix F of AS 2436: 1981 lists materials suitable for shielding.
Shield sensitive receivers from noisy activities	Airborne noise	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where necessary) and consideration of site topography when siting plant.
Note 1	Detailing all upcoming construction activities at least 14 days prior to commencement of relevant works.	
Note 2	Includes jack and rock hammering, sheet and pile driving, rockbreaking and vibratory rolling.	
Note 3	"Continuous" includes any period during which there is less than a 60 minutes respite between ceasing and recommencing any of the work.	

3.10.2 Additional Noise Mitigation Measures

Additional noise mitigation measures to be explored in the CNVMPs in the event of predicted exceedances of the noise goals, particularly during Out of Hours Works (OOHWs), are described in the Transport for NSW *Construction Noise Strategy* (CNS). This strategy includes definition of the level of noise impact which triggers consideration of each additional mitigation measure (reproduced in **Table 17**).

The additional mitigation measures described in the CNS are summarised below, with discussion of their potential applicability to these works. The objective of these additional noise mitigation measures is to engage, inform and provide project-specific messages to the community, recognising that advanced warning of potential disruptions can assist in reducing the impact.

- **Periodic Notifications** – Periodic notifications include regular newsletters, letterbox drops or advertisements in local papers to provide an overview of current and upcoming works and other topics of interest.
- **Website** – The project website would form a resource for members of the community to seek further information, including noise and vibration management plans and current and upcoming construction activities.
- **Project Info-line and Construction Response Line** – Transport for NSW operate a Construction Response Line and Project Info-line. These numbers provide a dedicated 24 hour contact point for any complaints regarding construction works and for any project enquiries. All complaints require a verbal response within two hours. All enquiries require a verbal response within 24 hours during standard construction hours, or on the next working day during out of hours work (unless the enquirer agrees otherwise).
- **Email Distribution List** – An email distribution list would be used to disseminate project information to interested stakeholders.
- **Signage** – Signage on construction sites would be provided to notify stakeholders of project details and project emergency or enquiry information.
- **Specific Notifications (SN)** – Specific notifications would be letterbox dropped or hand distributed to the nearby residences and other sensitive receivers no later than seven days ahead of construction activities that are likely to exceed the noise objectives. This form of communication is used to support periodic notifications, or to advertise unscheduled works.
- **Phone Calls (PC)** – Phone calls may be made to identified/affected stakeholders within seven days of proposed work.

- **Individual Briefings (IB)** – Individual briefings may be used to inform stakeholders about the impacts of high noise activities and mitigation measures that would be implemented. Communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities.
- **Monitoring (M)** – Ongoing noise monitoring during construction at sensitive receivers during critical periods would be used to identify and assist in managing high risk noise events. Monitoring of noise would also be undertaken in response to complaints. All noise monitoring would be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.
- **Project Specific Respite Offer (RO)** – Residents subjected to lengthy periods of noise or vibration may be eligible for a project specific respite offer. The purpose of such an offer is to provide residents with respite from an ongoing impact.
- **Alternative Accommodation (AA)** – As described in the Transport for NSW *Construction Noise Strategy*, provision of alternative accommodation for residents would be considered in the event that highly intrusive noise impacts are predicted during the night-time period (between 10:00 pm and 7:00 am).

Table 17 Additional Mitigation Measures Matrix – Airborne Construction Noise

Time Period		Mitigation Measure			
		LAeq(15minute) Noise Level above Background (RBL)			
		0 to 10 dBA Noticeable	10 to 20 dBA Clearly Audible	20 to 30 dBA Moderately Intrusive	>30 dBA Highly Intrusive
Standard	Mon-Fri (7am - 6pm)	-	-	LB, M	LB, M
	Sat (8am - 1pm)				
	Sun/Pub Hol. (Nil)				
OOHW Period 1	Mon-Fri (6pm - 10pm)	-	LB	M, LB	M, IB, LB, RO, PC, SN
	Sat (7am - 8am) & (1pm - 10pm)				
	Sun/Pub Hol. (8am - 6pm)				
OOHW Period 2	Mon-Fri (10pm - 7am)	LB	M, LB	M, IB, LB, PC, SN	AA, M, IB, LB, PC, SN
	Sat (10pm - 8am)				
	Sun/Pub Hol. (6pm - 7am)				

Note: The following abbreviations are used: Alternative accommodation (AA), Monitoring (M), Individual briefings (IB), Letter box drops (LB), Project specific respite offer (RO), Phone calls (PC), Specific notifications (SN).

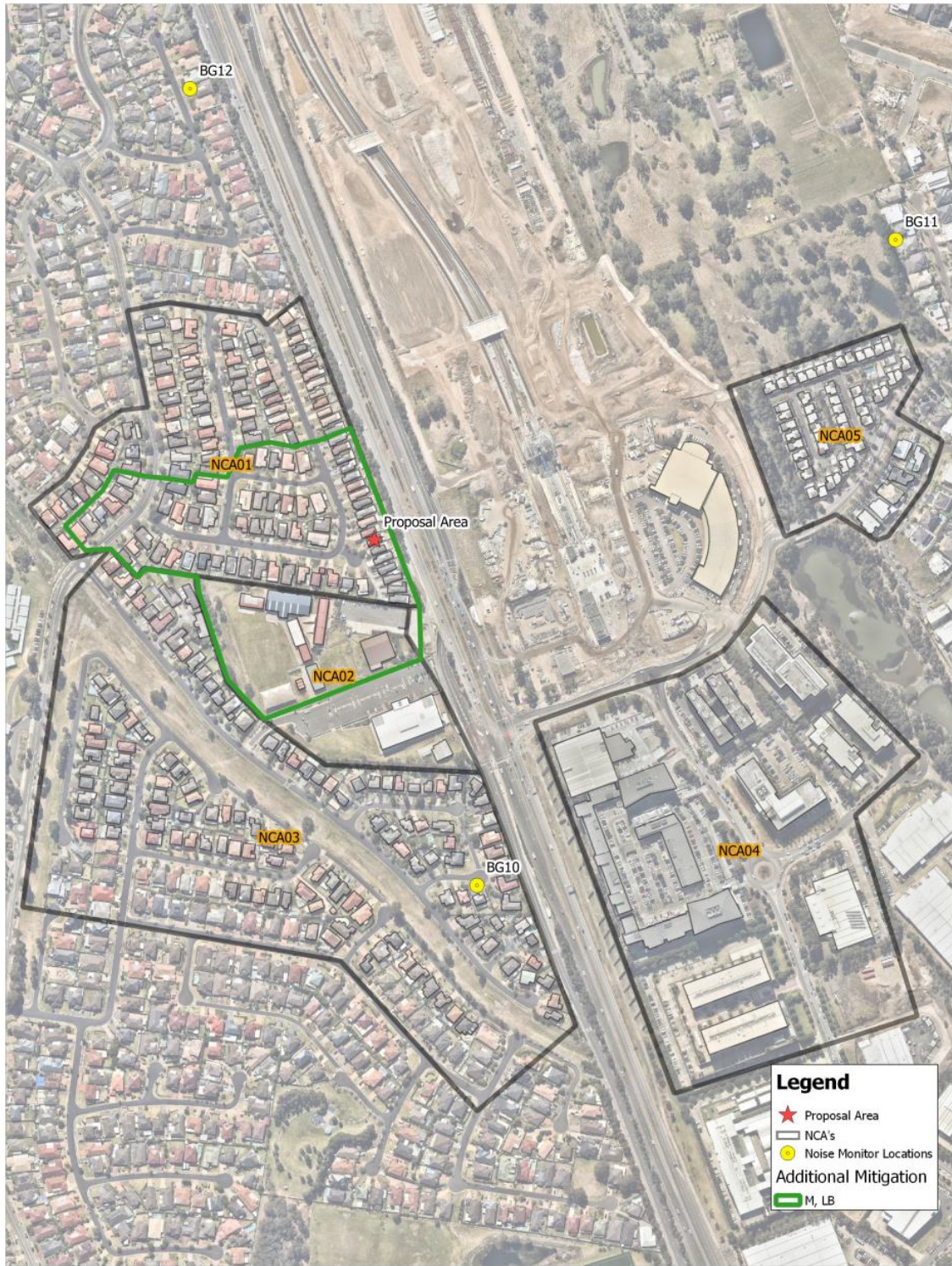
3.10.3 Summary of Additional Mitigation

Based on the predicted noise levels in **Section 3.7** additional mitigation measures as per the requirements shown in **Table 17** have been determined for works during the proposed standard daytime construction hours. The counts presented in **Table 18** are for the worst-case site scenario from construction activities with the affected receiver areas depicted in **Figure 9**.

Table 18 Receivers Identified for Additional Mitigation

NCA	Number of Receivers Eligible
	Standard Daytime
	LB, M
NCA01	61
NCA02	-
NCA03	-
NCA04	-
NCA05	-

Figure 9 Mitigation Summary



Legend

- ★ Proposal Area
- NCA's
- Noise Monitor Locations
- Additional Mitigation
- ▭ M, LB

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Jacobs
Glenwood Pedestrian Link
Mitigation Summary

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4 CONSTRUCTION VIBRATION ASSESSMENT

4.1 Safe Working Distances

As a guide, safe working distances for the proposed items of vibration intensive plant are provided in the CNS and are reproduced below in **Table 19**.

Table 19 Recommended Safe Working Distances for Vibration Intensive Plant

Plant Item	Rating/Description	Safe Working Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Vibration Guideline)
Vibratory Roller	< 50 kN (Typically 1-2t)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4t)	6 m	20 m
	< 200 kN (Typically 4-6t)	12 m	40 m
	< 300 kN (Typically 7-13t)	15 m	100 m
	> 300 kN (Typically 13-18t)	20 m	100 m
	> 300 kN (Typically > 18t)	25 m	100 m
Small Hydraulic Hammer	300 kg - 5 to 12t excavator	2 m	7 m
Medium Hydraulic Hammer	900 kg - 12 to 18t excavator	7 m	23 m
Large Hydraulic Hammer	1600 kg - 18 to 34t excavator	22 m	73 m
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

Note: More stringent conditions may apply to heritage or other sensitive structures.

The safe working distances presented in **Table 19** are quoted for both cosmetic damage (refer to BS7385:2 *Evaluation and Measurement for Vibration in Buildings Part 2: Guide to Damage Levels from Ground-borne Vibration*, 1993) and human comfort (refer to NSW EPA *Assessing Vibration: a technical guideline*, 2006).

The safe working distances for building damage should be complied with at all times. The distances are noted as being indicative and would vary depending on the particular item of plant and local geotechnical conditions. They apply to addressing the risk of cosmetic (minor – easily repairable) damage of typical buildings under typical geotechnical conditions.

Where vibration intensive works are required to be undertaken within the specified safe working distances, vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied.

In relation to human comfort, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are allowed.

4.2 Cosmetic Damage Assessment

For most sources of intermittent vibration during construction, such as rock breakers, the predominant vibration energy occurs at frequencies usually in the 10 Hz to 100 Hz range. On this basis, and with reference to BS7385:2 and **Section 3.4**, a vibration damage screening level of 7.5 mm/s has been adopted for the purpose of assessing potential impacts from continuous vibration.

The separation distance(s) between the proposed works is likely to exceed the 'cosmetic damage' at the neighbouring residential dwellings in close proximity to the area of works (refer to **Table 19**) due to the use of the rock breakers that are proposed to be used on the concrete foundations of the dwelling currently on the proposal area. The neighbouring residential dwellings are located approximately 2 to 3 meters away from the dwelling to be demolished.

Use of reduced capacity and/or damped rock breakers would likely be required when working close to the site boundary with adjacent buildings in accordance with the nominated safe working distances summarised in **Table 19**.

The assessment has not considered structures such as underground utilities. The distance to these structures along with deriving an appropriate criterion will be required to be determined by the contractor prior to vibration intensive works being undertaken.

It is also recommended that the contractor undertake measurements to determine an appropriate site law to confirm the site specific vibration propagation. It is also recommended to undertake dilapidation surveys where buildings are identified to be within the safe working distance or appear to be sensitive to vibration damage.

4.3 Human Response

In relation to human comfort (response), the safe working distances in **Table 19** relate to continuous vibration and apply to residential receivers. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are permitted, as discussed in *Assessing Vibration – a technical guideline*.

For rock breaking works, where the nearest affected residential receiver is located within 10 m from the site boundary, the time to reach the day-time VDV criterion of $0.4 \text{ m/s}^{1.75}$ is anticipated to be within 20 minutes for a heavy rock breaker (assuming a crest factor of 10) operating continuously near the adjacent site boundary.

The receivers adjacent to the construction site are likely to perceive vibration impacts when the rock breaker is being used. It should be noted that it is understood that the rock breaker is anticipated to only be used to remove the slab of the existing dwelling currently occupying the site and is anticipated to only be for 1 to 2 days.

4.4 Vibration Assessment Summary

The separation distance(s) between the construction works and nearest sensitive receivers would generally be sufficient for most of the construction equipment. However, during activities involving the rock breaker, this has the potential to operate within the safe working distances and defined limits.

The assessment does not take into account structures such as underground utilities. The distance to these structures along with deriving an appropriate criterion will be required to be determined by the contractor prior to vibration intensive works being undertaken.

It is also recommended that the contractor undertake a site law to confirm the site specific vibration propagation and undertake dilapidation surveys where buildings are identified to be within the safe working distance and predicted to exceed the criteria.

4.5 Vibration Mitigation

Dependent upon the equipment to be used, where vibration intensive construction activities are proposed within 100 m of sensitive receivers, these works should be confined to less sensitive periods in consultation with the nearest receivers, where practicable.

The potential impacts from vibration are to be considered in the site-specific CNVMs, to be developed during the detailed design phase when more information is available on the schedule for the works, the equipment to be used and the localised geotechnical conditions.

In general, mitigation measures that should be considered are summarised as follows:

- Relocate vibration generating plant and equipment to areas within the site in order to lower the vibration impacts.
- Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment.
- Use lower vibration generating items of excavation plant and equipment, such as smaller capacity rockbreakers or concrete crushers/pulverisers in place of rockbreakers.
- Minimise consecutive works in the same locality (if applicable).
- Use dampened rockbreakers and/or “city” rockbreakers to minimise the impacts associated with rockbreaking works.
- If vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration trials would be undertaken to ensure that levels remain below the cosmetic damage criterion.
- Building condition surveys should be completed, where necessary, both before and after the works to identify existing damage and any damage due to the works.

In all cases it is anticipated that vibration impacts would be able to be controlled to avoid cosmetic damage to any structures.

5 OPERATIONAL ASSESSMENT

5.1 Assessment

The potential increase in road traffic noise levels associated with the removal of existing screening (removal of the residential dwelling and boundary wall), was estimated by comparison of noise levels at adjacent receivers for the following scenarios:

- existing scenario
- without the residential dwelling on the proposal area and the existing 1.8 meter boundary fence along Old Windsor Road.

For the purpose of the comparison, the calculations assumed that 10% of traffic comprised of Heavy Vehicles.

Two residential receivers were identified with potential for a noise level increase greater than 2 dB as shown in **Figure 10**. The predicted noise increase at these receivers is shown in **Table 20**.

Table 20 Predicted Noise Level Increase

Address	Facade	Predicted Increase
67 Sharrock Avenue, Glenwood	South	6.6 dB
	East	0.9 dB
3 Swansea Court, Glenwood	North	6.2 dB
	East	0.2 dB

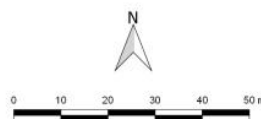
Figure 10 Predicted Noise Level Increase



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Jacobs
Glenwood Pedestrian Link
Traffic Noise Increase

5.2 Discussion and Mitigation

In assessing feasible and reasonable mitigation measures, the RNP states that *'an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person'*. As such, mitigation limiting the estimated increase to below 2 dB is considered reasonable.

Mitigation through the implementation of a 1.8 meter barrier on top of the proposed retaining wall along Old Windsor Road was investigated and is not predicted to be sufficient to reduce the noise level increase to less than 2dB for these two residential receivers. It is therefore recommended that at property treatment be investigated as part of detailed design for the two facades taking into account the use of the rooms in those areas.

1 Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that in common usage 'noise' is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or L_p are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3 Sound Power Level

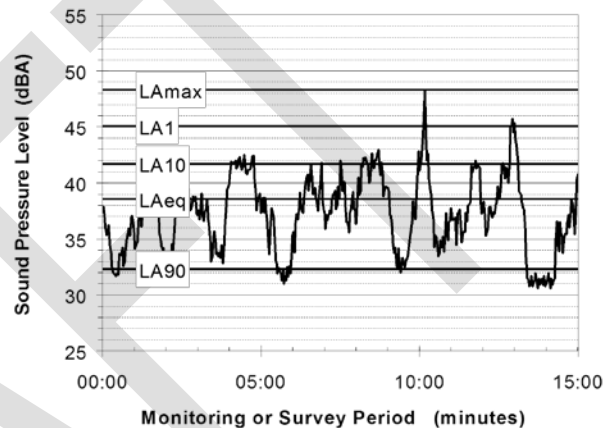
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or L_w , or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN} , where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Aeq} The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the 'repeatable minimum' L_{A90} noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or 'average' levels representative of the other descriptors (L_{Aeq} , L_{A10} , etc).

5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than 'broad band' noise.

6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

7 Frequency Analysis

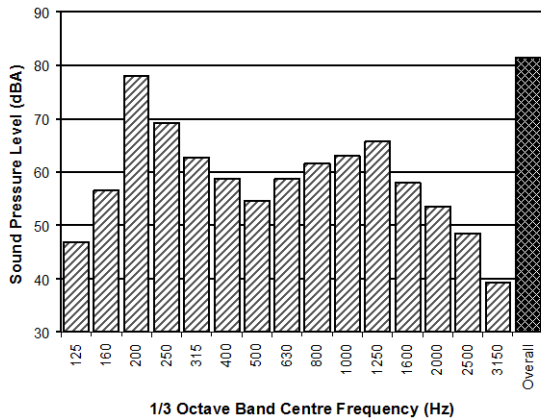
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



8 Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse.

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V , expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_0)$, where V_0 is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organizations.

9 Human Perception of Vibration

People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

10 Over-Pressure

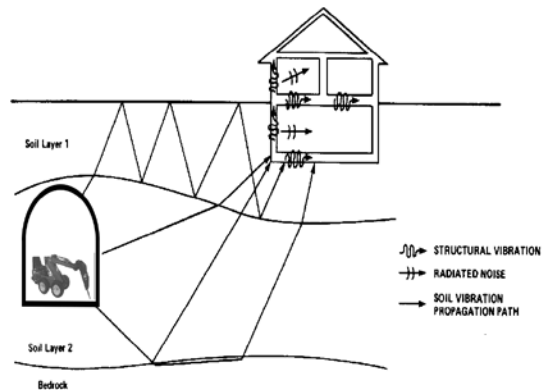
The term 'over-pressure' is used to describe the air pressure pulse emitted during blasting or similar events. The peak level of an event is normally measured using a microphone in the same manner as linear noise (ie unweighted), at frequencies both in and below the audible range.

11 Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise

Appendix D Visual Assessment (IRIS, March 2018)



IRIS Visual Planning + Design

Glenwood Pedestrian Link

Landscape and Visual Assessment

Transport for NSW

March 2018

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1. Introduction

1.1 Purpose and scope

The purpose of this assessment is to assess the potential landscape and visual impacts of the Glenwood pedestrian link project.

1.2 Methodology

1.2.1 Assessment of landscape impact

The assessment of landscape impact will be undertaken in the following steps:

- Identify the **sensitivity** of the landscape (Refer table 1.1)
- Identify the **modification** to the landscape as a result of the proposal (Refer table 1.2)
- Combine these characteristics to assign a level of **likely landscape impact** (Refer table 1.7)
- Identify opportunities for **mitigation** to reduce the impact where possible.

The **sensitivity** of a landscape may reflect the frequency and volume of users in a location but may also be valued for other characteristics such as tranquillity, visual relief and contribution to microclimate. Valued landscapes may be protected by legislation and recognised in planning documents.

TABLE 1.1 LANDSCAPE SENSITIVITY LEVELS

Landscape sensitivity	Description
National	Landscape feature protected with national or international legislation.
State	Landscape feature or urban place that is heavily used and / or is iconic to the state.
Regional	Landscape feature that is heavily used and valued by residents of a major portion of a city or a non-metropolitan region.
Local	Landscape feature valued and experienced by concentrations of residents and/or local recreational users. Provides a considerable service to the community. For example, it provides a place for local gathering, recreation, sport, street use by cafes and/or shade and shelter in an exposed environment.
Neighbourhood	Landscape feature valued and appreciated primarily by a small number of residents e.g. street trees in a local street. Provides a noticeable service to the community. For example, it provides a seat or resting place, passive recreation and/or some shade and shelter in a local street.

Landscape **modification** refers to the change to the landscape that would occur as a result of the project. This includes direct impact such as the removal of trees or parkland, as well as indirect impact, such as the functional change of an area of open space due to changing land use and access. Landscape modification can be adverse or beneficial. Table 1.2 lists the terminology used to describe the level of landscape modification.

TABLE 1.2 LANDSCAPE MODIFICATION LEVELS

Landscape modification	Description
Considerable reduction	Substantial portion of the landscape is changed. This may include substantial changes to the level of comfort, vibrancy, safety, walkability, connectivity, and diversity of the landscape.
Noticeable reduction	A portion of the landscape is changed. This may include some alteration to the level of comfort, vibrancy, safety, walkability, connectivity, and diversity of the landscape.
No perceived reduction	Either the landscape quality is unchanged or if it is, it is largely mitigated by proposed public realm improvements. Does not alter or not noticeably alter the level of comfort, vibrancy, safety, walkability, connectivity, and diversity of the landscape.
Improvement	A portion of the landscape is changed and improves the level of comfort, vibrancy, safety, walkability, connectivity, and diversity of the landscape.

1.2.2 Day time visual impact

The assessment of visual impact will be undertaken in the following steps:

- Identify the **sensitivity** of the viewer (Refer table 1.3)
- Identify the **modification** to the view as a result of the proposal (Refer table 1.4)
- Combine these characteristics to assign a level of **likely visual impact** (Refer table 1.7)
- Identify opportunities for **mitigation** to reduce the impact where possible.

Sensitivity refers to the susceptibility of a view to accommodate change without losing valued attributes. The values of a view refers any aspect of landscape or views people consider to be important. Visual values may be reflected in local, state or federal planning regulations, other published documents or be established through community consultation and engagement, or as professionally assessed. (refer table 1.3)

TABLE 1.3 VISUAL SENSITIVITY LEVELS

Visual sensitivity level	Description
Regional	Heavily experienced view to a feature or landscape that is iconic to a major portion of a city or a non-metropolitan region, or an important view from an area of regional open space.
Local	View of high quality or experienced by concentrations of residents and/or local recreational users, and/or large numbers of road or rail users.
Neighbourhood	Views where visual amenity is important at a neighbourhood scale, such as views seen from local roads, briefly glimpsed views to landscape features, and views from small groups of residences.

Modification refers to the extent of change that will be experienced by receptors. This change can be adverse or beneficial. Factors that could be considered in assessing modification are: the proportion of the view / landscape affected; extent of the area over which the change occurs; the size and scale of the change; the rate and duration of the change; the level of contrast and compatibility (refer table 1.4).

TABLE 1.4 MODIFICATION LEVELS

Visual modification level	Description
Considerable reduction in visual amenity	Changes the amenity of the view fundamentally, a substantial part of the view is altered and / or the change is not visually compatible with the character of the view.
Noticeable reduction in visual amenity	Changes the amenity of the view somewhat, the alteration to the view is clearly visible, and / or the change is somewhat visually compatible with the character of the view.
No perceived change in visual amenity	Either the view is unchanged or if it is changed, the change in the view is generally unlikely to be perceived by viewers, and / or it is absorbed into the character of the view.
Noticeable improvement in visual amenity	Changes the amenity of the view somewhat, the alteration to the view is clearly visible, and / or the change somewhat enhances the view.

1.2.3 Assessment of night time visual impact

The assessment of night-time impact has been carried out with a similar methodology to the daytime assessment. However, the assessment also draws upon the guidance of the Institution of Lighting Engineers (UK) and the *Guidance for the reduction of obtrusive light* (2005), as well as *AS4282 Control of the obtrusive effects of outdoor lighting* (1997).

1.2.3.1 Night-time visual sensitivity

The visual setting of the proposal site and surrounding area have an inherent level of sensitivity, as described in Table 1-5.

TABLE 1-5 SENSITIVITY LEVELS – NIGHT TIME

Sensitivity	Description
E1: Intrinsically dark landscapes	Very high sensitivity visual settings at night including national parks, state forests etc.
E2: Low district brightness areas	Highly sensitive visual settings at night including rural, small village, or relatively dark urban locations.
E3: Medium district brightness areas	Moderately sensitive visual settings at night including small town centres or urban locations.
E4: High district brightness areas	Low sensitivity visual settings at night including town/city centres with high levels of night-time activity.

1.2.3.2 Night-time visual modification

Following the sensitivity assessment, the level of modification that would be expected within the study area is then identified. These changes are described, as relevant, in terms of:

- Sky glow – the brightening of the night sky above our towns, cities and countryside.
- Glare – the uncomfortable brightness of a light source when viewed against a dark background.
- Light trespass – the spilling of light beyond the boundary of the property or area being lit.

Table 1-6 describes the levels of visual modification at night.

TABLE 1-6 VISUAL MODIFICATION LEVELS – NIGHT TIME

Visual modification	Description
Considerable reduction	Substantial change to the level of skyglow, glare or light trespass would be expected. The lighting of the project contrasts substantially with surrounding landscape at night.
Noticeable reduction	Minor change to the level of skyglow, glare or light trespass. Minimal contrast with the surrounding landscape at night.
Negligible	Either the level of skyglow, glare and light trespass is unchanged or if it is altered, the change is generally unlikely to be perceived by viewers. The project does not contrast with the surrounding landscape at night.
Improvement	Changes to the level of skyglow, glare or light trespass seen, and or the lighting contrasts with the surrounding landscape at night, however this is a designed feature or improves the safety of the area.

1.2.4 Assigning impact levels

Impact is the combined result of sensitivity together with the magnitude of the change. The landscape and visual impact may be adverse or beneficial and at a level of *very high* through to *negligible* (refer Table 1.7).

TABLE 1.7 LANDSCAPE AND DAYTIME VISUAL IMPACT LEVELS

		Sensitivity				
		National	State	Regional	Local	Neighbourhood
Modification	Considerable reduction	Very high adverse	Very high adverse	High adverse	Moderate adverse	Minor adverse
	Noticeable reduction	High adverse	High adverse	Moderate adverse	Minor adverse	Negligible
	No perceived change	Negligible	Negligible	Negligible	Negligible	Negligible
	Noticeable improvement	High benefit	Moderate benefit	Moderate beneficial	Minor benefit	Minor benefit
	Considerable improvement	Very high benefit	Very high benefit	High benefit	Moderate benefit	Minor benefit

Likewise, night time **Visual impact** is the combined result of sensitivity together with the magnitude of the change. The visual impact may be adverse or beneficial and at a level of *very high* through to *negligible* (refer Table 1.6).

TABLE 1-8 NIGHT-TIME VISUAL IMPACT LEVELS

Magnitude of change	Sensitivity level			
	E1: Intrinsically dark landscapes	E2: Low district brightness	E3: Medium district brightness	E4: High district brightness
Considerable reduction	Very high adverse	High adverse	Moderate adverse	Minor adverse
Noticeable reduction	High adverse	Moderate adverse	Minor adverse	Negligible
No perceived change	Negligible	Negligible	Negligible	Negligible
Improvement	Beneficial	Beneficial	Beneficial	Beneficial

1.2.5 Mitigation measures

Following the assessment of landscape and visual impact, measures to further mitigate potential impacts have been identified. These measures include opportunities for mitigation on and off site, during construction and operation of the project, both day and night.

1.2.6 Limitations and assumptions

The following technical limitations were experienced in the course of undertaking this study:

- Desk-based assessment with site photos provided by others
- Assumptions are based on day time site photographs.

2. Planning context

The following review identifies key documents which provide the planning context for the landscape and visual assessment of the Glenwood pedestrian link.

2.1 State planning context

Sydney Metro Northwest Urban Renewal Corridor – Bella Vista Station Precinct

The Bella Vista Station Precinct is part of the Sydney Metro Northwest Priority Urban Renewal Corridor and has been selected in the NSW Government’s ‘Priority Precincts program’ to create new centres around the Sydney Metro Northwest stations.

Following the NSW Government’s Priority Precinct announcement, a structure plan for the precinct has been adopted and the land rezoned for increased urban development, as set out in the structure plan and the Finalisation Report (NSW DPE, 2017). This includes 50 hectares of NSW Government owned land adjacent to the new Bella Vista Station and Metro line.

Most of the change will occur to the east of Old Windsor Road, within The Hills Shire Council LGA. Rezoning of the Bella Vista Station Precinct will be achieved by amending *The Hills Local Environmental Plan 2012* through a State Environmental Planning Policy (SEPP). The SEPP will establish the statutory controls for the precinct, including land use zones, maximum building heights, maximum floor space ratios, minimum allotments sizes, and other statutory controls including nondiscretionary clauses to support the rezoning of the precinct.

A Development Control Plan will also be made following the rezoning of the precinct and provide supplementary development controls. The DCP will be informed by the draft DCP that was exhibited with the rezoning proposal.

One of the key principles for delivering the vision of the Bella Vista Precinct by 2036 is:

‘Improving access and connections to the new station and throughout the precinct through new local roads, improved bus services, pedestrian and bicycle paths, and crossings over creek corridors’ (DPE, 2017, p.7).

The Glenwood pedestrian link site is located within the western part of the Bella Vista Station Precinct, between Old Windsor Road and Sharrock Avenue/Swansea Court. The new pedestrian / cycle bridge over Old Windsor Road adjacent to Bella Vista station is set out in the *‘Infrastructure Schedule’* for the Bella Vista Precinct under *‘Local transport measures’* (Table 6, p.53). As is the associated investigation into a pedestrian and cycle connection between Glenwood and the proposed pedestrian / cycle bridge over Old Windsor Road (Table 6, p.53).

Relevant provisions for amendments to the DCP covering the site and surrounds include:

Public domain: Street network and design

To create an attractive and comfortable streetscape for pedestrians and cyclists that comprises consistent and high quality paving, bike racks/stands, street furniture and street tree plantings

Significant individual trees in streets or on sites are to be retained and protected where possible and appropriate (DPE, 2015, s.4.1).

2.2 Local planning context

The proposal site is located at the junction of two local authorities, Blacktown LGA (including the site footprint) and The Hills Shire LGA. Planning controls for the site are now covered by the Bella Vista Station Precinct, as outlined in Section 2.1.

3 Existing environment

3.1 Site conditions

The proposal site is located on a relatively flat suburban lot, consisting of a detached two storey dwelling on a 418 square metre block, at 1 Swansea Court. Land surrounding the site is mostly low density residential, typically one and two storey detached dwellings, interspersed with community facilities, including Trades Norwest Anglican Senior College, Emmanuel Baptist Church and Glenwood High School.

Old Windsor Road and the adjacent shared pathway are located to the rear (east) of the site, on slightly elevated land. Mature trees and steel sheet fencing currently screen views between the proposal site and Old Windsor Road.

Glenwood residents currently have an informal pedestrian access to Old Windsor Road from Arnold Place, Emmanuel Terrace and Miami Street, to access the shared path along Old Windsor Road and several crossing points to Bella Vista, Norwest Business Park and North West T-Way. Apart from these locations, pedestrian access is currently blocked by one kilometre of continuous property fences and noise barriers along Old Windsor Road. Restricted access has led to the development of informal paths

between Glenwood streets and Old Windsor Road, either through public land or private properties, including through the grounds of Emmanuel Baptist Church, south of the proposal site.

The future footbridge is located approximately 120 metres north of the Celebration Drive and Old Windsor Road intersection. It will provide a direct connection between the southern entrance of Bella Vista station and the western side of Old Windsor Road. The proposal is located approximately 100 metres north of the proposed footbridge.

East of Old Windsor Road, the landscape is undergoing rapid change. This includes new medium and high density residential, commercial development, and Bella Vista Station which is under construction. Residential land to the east of the station is mostly low density residential with small pockets of medium density townhouse development. Land to the north and north east of the station is currently rural in character or vacant and will be developed for low to medium density residential uses as part of the Balmoral Road Release Area.

4 Project scope

The project consists of a new pedestrian link to improve walking and cycling access between Glenwood residential area and the new pedestrian bridge across Old Windsor Road to Bella Vista station, which is being delivered by the Sydney Metro project.

Construction would include:

- Demolition of the residential property at 1 Swansea Court
- Establishment of a construction compound within the boundaries of 1 Swansea court (equipment laydown and storage)
- Removal of all vegetation on the site
- Removal of trees between the rear property boundaries and the Windsor Road shared path extending 25 metres north and south of the site
- Removal of street trees on Swansea Court along the site frontage and along Cramer Place and Sharrock Avenue to allow for a 1.5 m shared path extending to Nixon street and Glenwood Park Drive
- Earthworks to grade the site from a low point at Swansea Court to Old Windsor Road shared path
- Earthworks to regrade the shared path for a 50-metre length, dropping the level by approximately 800mm.

This work would be undertaken over an approximate four-month period. Construction activity would include the use of excavators during demolition of the house for several days. Other equipment used at different times during the works would include excavators, trucks (including concrete trucks), grout mixers and pumps, franna cranes and elevated platforms.

During operation the proposed link would include:

- a new walkway and series of ramps (1:14) with handrails, approximately 2.5 metres wide and 49 metres long, linking Swansea Court with the existing shared path on Old Windsor Road
- lighting along the path (directed and cut-off to reduce light spill)

- new open space on the site of 1 Swansea Court including new tree planting along the northern and southern property boundaries
- new street trees on Swansea Court alongside the site
- new fences along the north and south boundaries of the property
- new 50 metre section of Old Windsor road shared path (800mm lower) connected to the new proposed pedestrian link
- new vegetation between the site and the Windsor Road shared path (50 metres length)
- New footpaths on the eastern side of Sharrock Avenue extending to Nixon Street and on the southern side of Cramer Place extending to Glenwood Park Drive.

5 Landscape impact assessment

Construction impact: There would be direct impacts on the landscape of the site and adjacent areas as several street trees on Swansea Court and Cramer Place, vegetation within the site, and trees along the Old Windsor Road footpath would be removed. 50 metres of the shared path along Old Windsor Road would also be removed, and access diverted temporarily. The landform of the site would be adjusted, to grade the site from a low point at Swansea Court to a high point at the Old Windsor Road shared path. This adjustment would reflect a natural landform. Overall, due to the removal of the mature and semi-mature trees and other vegetation, there would be a noticeable reduction in the character of a neighbourhood sensitivity landscape, which would result in a **negligible** visual impact during construction.

Operational impact: A residential lot would be replaced with an open space, including a pathway and ramps providing improved local pedestrian and cycle access. This open space would include small lawn areas and newly planted garden areas providing amenity, shade and a new area for passive recreation. New street trees would be added to the street, replacing those removed. the proposed trees would be less mature than the existing vegetation and provide less shade. Overall, the introduction of new open space, and access for community use would result in an improvement in character of a neighbourhood sensitivity landscape, resulting in a **minor beneficial** landscape impact during operation.

6 Visual impact assessment

6.1 Daytime visual impact



FIGURE 6-1 VIEW EAST FROM CRAMER PLACE

View from Cramer Place, Glenwood

Existing conditions: The proposal site is located in the centre of this view, glimpsed through a group of four low branching street trees. The site includes a two-storey brick detached house and driveway which rises from Swansea Court to a platform above street level. This house is consistent in character with the other residential properties seen along Cramer Place, Sharrock Avenue and Swansea Court. The streetscape character consists of narrow curved streets and cul-de-sacs with small native street trees. The existing detached houses are set back from the street by unfenced front gardens. The trees between the shared pathway and Old Windsor Road are visible in the background, beyond the proposal site. This is a view of **neighbourhood sensitivity**.

Construction impact: Construction activity and traffic would be visible from Swansea Court, Cramer Place and Sharrock Avenue. The site would be enclosed by site fencing, and the removal of street trees and vegetation within the site would be seen, opening up views between Glenwood's residential streets and Old Windsor Road. The demolition of structures within the proposal site, including the residence, driveway and boundary fences would also be seen, beyond the perimeter site hoarding. Construction vehicles are expected to be seen accessing the site including heavy vehicles and plant machinery, intermittently during earthworks, utility works, pavement and concrete works. Earthworks (i.e. grading to shape the finished surface level in accordance with the design), including installing retaining walls, a pathway and ramps through the site from Swansea Court (low point) to Old Windsor Road shared pathway (high point) would be clearly seen. Installation of lighting, handrails and soft landscape works,

including screen planting along the northern and southern site boundaries would also be seen. This activity is expected to generate a considerable reduction in visual amenity from streets and residences in close proximity to the site. This would result in a **minor adverse** visual impact during construction.

Operational impact: Views to a residential lot would be replaced with an open space, including a pathway and ramps with handrails, rising from the corner of Swansea Court and Sharrock Avenue to the Old Windsor Road shared path. Lawn areas and planting either side of the pathway would be seen, providing amenity, shade and screening. Street trees would be seen on the street, framing views to the site. Whilst the movement of pedestrians and conversion of the proposal site to public use would increase activity in this view, overall, the replacement of a residential property with leafy open space, would result in a considerable improvement in visual amenity from streets and residences in close proximity to the proposal. Overall, there would be a **minor beneficial** visual impact during operation.

View from properties overlooking the proposal site

Existing conditions: The properties along Sharrock Avenue and are slightly elevated from street, with driveways rising to garages and front entrance doors. To the north and south of the site, a dense hedge along the driveway provides a visual buffer between the properties. The houses are in close proximity to the property boundaries at the front of the property and beyond the garage brick walls, steel sheet fences (approximately 1.8 metres high) define the property boundaries. These fences screen views to and from the ground floor of the properties. There are several windows on the façades facing the site on both properties, which vary in location and size. These windows overlook the site and are at close proximity to neighbouring property walls and upper level windows. These upper level windows and are screened by internal curtains and blinds. To the rear of each property there is a covered outdoor living space which extends east from the ground floor. The rear of these properties is slightly lower than Old Windsor Road, with small retaining walls, pier and timber panel fencing, and mature trees defining the eastern property boundary. These elements provide a visual buffer between the property, the shared pathway and adjacent road corridor. Views from these adjacent residences are of **neighbourhood sensitivity**.

Construction impact: Demolition of the residence, driveway, boundary fences and retaining wall (along the eastern property boundary) would be seen from upper windows of the two properties overlooking the site, and over property fences from both rear entertaining areas and front gardens. Removal of street trees and vegetation within the proposal site, as well as the striping and stockpiling of topsoil would be visible. Construction vehicles would be seen accessing the site include trucks. Bulk earthworks (i.e. grading to shape the finished surface level in accordance with the design), including installing a pathway and ramps through the site from Old Windsor Road shared pathway (high point) to Swansea Court (low point) would be visible. Finishing works including the installation of soft landscape, signage, park furniture and lighting would also be seen. This activity is expected to generate a considerable reduction in visual amenity from residences at times due to the proximity to the site, particularly the upper storey of adjacent properties at 67 Sharrock Avenue and 3 Swansea Court. Overall, a **minor adverse visual impact** is expected during construction.

Operational impact: The residential lot would be replaced with open space. The close proximity, views between the upper windows of neighbouring residences and the residence on the site, would be replaced with a more open outlook, across a parkland block, to the neighbouring residence in the middle distance. The new open space would include a pathway and ramps with handrails, rising from the corner of Swansea Court and Sharrock Avenue to the shared pathway along Old Windsor Road. There would be lawn areas and planting either side of the pathway, to provide amenity, shade and screening. The

proposed pedestrian link would be visible from the driveways and overlooked from the second storey windows of the adjacent residences, somewhat filtered through new trees. Views from the ground level of these properties would, however, be screened by boundary fences and new plantings. Retaining walls would be installed, and the site would be regraded to rise from the street up to the level of the Old Windsor Road shared pathway, bringing path users to a level above the adjacent entertaining areas of the neighbouring properties. However, new fences and trees would be designed to limit overlooking.

Whilst the transformation of the site from private to public use would expose neighbouring properties to additional activity and potential overlooking, the introduction of fencing and planting would aim to minimise these potentially adverse changes. The change from a residential property to an open space would also offer some amenity improvements including opening-up views from the upper story of these properties and providing an outlook onto open space where currently there is built form. On balance, this would result in no perceived change in visual amenity from the adjacent residential area, which is of neighbourhood sensitivity, resulting in a **negligible visual impact** during operation.



FIGURE 6-2 VIEW NORTH FROM OLD WINDSOR ROAD SHARED PATHWAY

Views from Old Windsor Road and shared pathway

Existing conditions: This view includes Old Windsor Road, right of view, a busy four lane divided road extending between Kellyville in the north and Cumberland Highway and James Ruse Drive in the south. A corridor of mature native trees along the western side of the road (centre of view) provide a visual buffer between the road and shared path. A narrow garden with mature trees further filter views to the adjacent residential properties of Glenwood, which are enclosed by timber pier and panel fencing. The upper storey and roof of the house at 1 Swansea Court (proposal site) can be glimpsed between the trees, rising above the rear property fence. These views are from a major arterial route in Sydney's north west and an adjacent well used shared pathway, and therefore of **local visual sensitivity**.

Construction impact: Works to demolish, regrade and reconstruct the Old Windsor Road shared path would be seen in the foreground of this view, and may require temporary closures of this section of the

path. At other times, temporary pedestrian and cyclist diversions along the Old Windsor Road shared pathway would be seen in the foreground whilst work is staged. On the site, and extending along the path, demolition works would be seen, including removal of the property fence, trees and retaining wall along the eastern property boundary. This would open up views to the demolition of the residence. Views to the proposal site would include construction plant and machinery during bulk excavation, cutting, filling and grading to shape the finished surface level in accordance with the design. Installation of the pedestrian link would be seen within the site and extending into the centre, foreground of the view where the landform would be reshaped, and the shared path replaced at new, lower, surface levels. This work would be followed by the installation of soft landscape works, including trees within the site. This activity would create a considerable reduction in visual amenity from the Old Windsor Road corridor and shared pathway, resulting in a temporary **moderate adverse** visual impact during construction.

Operational impact: A new open space area would be seen to the left of this view, including a ramp with handrails descending from the shared pathway, which would have been upgraded. This footpath would be slightly lower, and new planting would be located along the property boundaries, providing some filtering of views between the rear of the residential properties, the path and Old Windsor Road. The movement of pedestrians and cyclists along the shared path and entering the site would be seen in the centre of this view. Although the mature leafy character of the vegetation to the east (left of view) would have been lost, opening up views to the residential properties beyond, new tree planting would be provided, and would soften the eastern portion of this view over time. On balance there would be a noticeable improvement in views from the shared path due to the landscape treatment of the site, breaking up the visual monotony of the residential roofscape. This would result in a **minor beneficial** visual impact during operation.

6.2 Night-time visual impact

The visual setting of this area is an **E3: Medium district brightness area**, as it includes brightly lit areas including the Old Windsor Road corridor (a major arterial route) and the Bella Vista Station Precinct (currently under construction), across a general backdrop of lighting from local streets and illuminated windows in surrounding residential, commercial and industrial properties.

Construction impact: There are no night works proposed, however, it is expected that there would be some low-level security lighting required within the site and along the Old Windsor Road shared path. This lighting would be cut-off and directed towards the site so that there is no direct light spill on adjacent private properties. Existing lighting from Old Windsor Road, including street lights and moving traffic, may be more visible from properties directly opposite, due to the removal of vegetation along a 50-metre length of the shared path adjacent to the property boundaries. This may also result in some additional visibility of the brightly lit Old Windsor Road for a small section of the adjacent streets including the corner of Swansea Court, Cramer Place and Sharrock Avenue. On balance, it is expected that there would be no perceived change in the amenity of views from these areas, which are of E3: medium district brightness, resulting in a **negligible visual impact** at night.

Operational impact: The proposal site would change from a suburban dwelling, with interior and exterior lighting typical of adjacent residences, to a publicly accessible open space. The open space would include a lit pathway and ramps linking Swansea Court and the Old Windsor shared pathway. This lighting would be cut-off style and directed away from adjacent residences to avoid light spill on adjacent private properties. Lighting from moving traffic and street lights along the Old Windsor Road corridor may have increased visibility from neighbouring properties and from the corner of Swansea Court, Cramer Place

and Sharrock Avenue, as the residence and trees along Old Windsor Road are removed. This would be mitigated somewhat by new tree planting within the site and along the Old Windsor Road footpath, as well as remaining existing mature trees between the shared path and Old Windsor Road. Overall, there would be a noticeable reduction in visual amenity in these at night. As this is a medium district brightness environment, this would result in a **minor adverse visual impact**.

7 Summary of impact

The following tables summarise the potential landscape and visual impacts of the project.

TABLE 7.1 LANDSCAPE AND VISUAL IMPACT

No.	Location	Sensitivity	Construction		Operation	
			Modification	Impact	Modification	Impact
Landscape						
	The site and surrounds	Neighbourhood	Noticeable reduction	Negligible	Noticeable improvement	Minor beneficial
Daytime visual						
1	Views from Cramer Place, Glenwood	Neighbourhood	Considerable reduction	Minor adverse	Noticeable improvement	Minor beneficial
2	Views from adjacent properties overlooking proposal site	Neighbourhood	Considerable reduction	Minor adverse	Noticeable improvement	Negligible
3	Views from Old Windsor Road and shared pathway	Local	Noticeable reduction	Moderate adverse	Noticeable improvement	Minor beneficial
Night time visual						
	The site and surrounds	E3: Medium district brightness	No perceived change	Negligible	Noticeable reduction	Minor adverse

8 Mitigation measures

This section addresses the mitigation measures developed to avoid, reduce and manage the identified potential adverse construction and operational landscape and visual impact. These mitigation measures would inform detail design and ultimately form part of the Operational Environmental Management Plan and Construction Environmental Management Plan.

Mitigation measures include:

- All works equipment and materials to be contained within designated boundaries of the worksite
- Location of a site toilet to be located with consideration of views from key living and entertaining areas of adjacent properties
- The construction area to be left tidy at the end of each day
- Dust and dirt to be regularly cleaned from the road surface
- Retain and protect hedges along east and west neighbouring property boundaries
- Trees within the site and along the Old Windsor Road shared path to be semi-mature tree stock to ensure timely establishment and visual screening
- Property fencing to be designed to screen views and reduce the potential for overlooking into private property.

9 References

NSW Department of Planning and Environment (DPE), 2015, *Bella Vista Station Precinct: Recommended Development Control Plan Amendments - The Hills*, URL: <http://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Sydney-Metro-Northwest-Priority-Urban-Renewal-Corridor/Bella-Vista> (accessed 04/12/2017).

NSW Department of Planning and Environment (DPE), 2017, *Bella Vista Station Precinct Finalisation Report*, URL: <http://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Sydney-Metro-Northwest-Priority-Urban-Renewal-Corridor/Bella-Vista> (accessed 04/12/2017).

Transport for NSW, 2017, November Construction Update: Bella Vista Station, URL: <https://www.sydneymetro.info/station/bella-vista-station> (accessed 14/12/2017).

Appendix E: Objects of the Environmental Planning and Assessment Act 1979

Section 1.3 of the EP&A Act describes a number of 'objects'. Table E1-1 reviews the proposal's consistency with these objects.

Table E1-1 Planning and assessment objectives and outcomes

Object	Comment
<p>1.3(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resource.</p>	<p>This object describes how environmental and social resources and values can be best used and preserved for the community now and in the future. In the case of the proposal, it would achieve this objective by supporting TfNSW's objectives to focus on promoting, managing and developing the area's transport infrastructure in a sustainable and integrated manner.</p> <p>The proposal would impact on an existing developed area and it would therefore have no impact on either natural or artificial resources. The design and construction of the proposal is committed to implementing a number of resource management and conservation measures that focus on material reduction, reuse and recycling. The proposal would have no impact on agricultural land, natural areas, forests or minerals.</p>
<p>1.3(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.</p>	<p>ESD is considered in Section 5.5.</p>
<p>1.3(c) to promote the orderly and economic use and development of land.</p>	<p>The proposal would develop land that is currently zoned residential and occupied by a dwelling. The required permanent loss of a dwelling from the suburb of Glenwood would be offset by the immediate and long term benefit of creating the pedestrian link to improve the overall connectivity of Glenwood to public transport. The proposal would service the local community and others wishing to access the amenity and services in the Norwest Precinct. The pedestrian link would improve the level of pedestrian and cyclist access to the Bella Vista Metro Station for the Glenwood community.</p>
<p>1.3(d) to promote the delivery and maintenance of affordable housing.</p>	<p>This objective is not relevant to the proposal.</p>
<p>1.3(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.</p>	<p>The REF has 'examined and taken into account to the fullest extent possible all matters affecting, or likely to affect, the environment by reason of that activity'. In doing so it has identified a number of safeguards and management measures to protect the environment. Principal to these are pollution prevention controls, waste management controls, resource conservation and the protection of environmental and social values and resources. These measures are deemed sufficient to avoid the potential for any significant residual impacts to occur as a result of the proposal's construction or operation. This consequently means that the environment would be adequately protected. The environment of the proposal site does not contain any important biological value or sensitive habitats.</p> <p>During construction there would be some short-term impacts to local residents, however, once operational it is expected that the proposal would reduce impacts to local community services, particularly where Emmanuel Baptist Church is used</p>

Object	Comment
	for informal access to the shared path on Old Windsor Road. Once operational the proposal would provide improved pedestrian access between Glenwood High School transport services such as the T Way and Bella Vista Station. As such, the proposal is provisioned for providing improved access to community services and facilities.
1.3(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposal would not impact on any items of built or cultural heritage.
1.3(g) to promote good design and amenity of the built environment.	The design philosophy has been to provide good design and to improve the amenity of the built environment through enhanced connectivity between Glenwood, Old Windsor Road and Bella Vista Station. Landscaping of the streetscape has also been considered in the design. The proposal would also benefit the Glenwood community and wider environs by improving pedestrian and cyclist access to Bella Vista Station.
1.3(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	This objective is not relevant to the proposal.
1.3(i) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	<p>Sharing the responsibility of environmental planning is interpreted under two principal planning approval pathways in the EP&A Act. The Act also describes who is responsible for managing and coordinating these pathways. Part 5, Division 5.1 of the Act describes the responsibilities for public agencies undertaking development without consent.</p> <p>These provisions are supported by the provisions of State Environmental Planning Policy (Infrastructure) 2007 (NSW Government, 2007). Collectively they describe the sharing responsibilities across all levels of Government in delivering public infrastructure. In delivering the proposal under the above pathway TfNSW has fulfilled its obligations in this regard under the EP&A Act.</p>
1.3(j) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	<p>The REF commits TfNSW to ongoing consultation as the detailed design is developed, as the pre-construction work takes place, while the proposal is being constructed, and once construction is complete. As such, the public would be involved at all stages of the proposal's lifecycle.</p> <p>The display of the REF and the submissions response process will provide an opportunity for the public to raise concerns and comments about the proposal. TfNSW will respond to these query submissions and undertake additional environmental assessment or design refinements if and where required.</p>



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