

## **Appendix H**

### Biodiversity development assessment report



# Sydney Metro West Clyde Modification Biodiversity Development Assessment Report

FINAL REPORT

Prepared for AECOM on behalf of Sydney Metro

18 November 2021



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**Biosis project no.:** 36175

**File name:** 36175.Sydney.Metro.West.Clyde.Modification.  
BDAR.FIN04.20211112

**Citation:** Biosis 2021. Sydney Metro West Clyde Modification Biodiversity Development Assessment Report. Report for AECOM on behalf of Sydney Metro. C Heenan, R Dwyer, R Gray, Biosis Pty Ltd., Sydney, NSW. Project no. 36175

## Document control

Version	Internal reviewer	Date issued
Draft version 01	Mitchell Palmer	13/10/2021
Draft version 02	Rebecca Dwyer	18/10/2021
Draft version 03	Mitchell Palmer	21/10/2021
Final version 01	Rebecca Dwyer	22/10/2021
Final version 02	Caragh Heenan	29/10/2021
Final version 03	Rebecca Dwyer	2/11/2021
Final version 04	Rebecca Dwyer	12/11/2021

## Acknowledgements

Biosis acknowledges the contribution of the following people and organisations in undertaking this study:

- BD Infrastructure Pty Ltd: Jesse Death, Todd Brookes
- AECOM: Rachel O'Hara, Andrew Cook, Kimberley Skellern
- Sydney Metro: Ari Stypel, Ryan Butler
- Department of Agriculture, Water and the Environment for access to the Protected Matters Search Tool of the Commonwealth
- NSW Environment, Energy and Science Group for access to the BioNet Atlas of NSW Wildlife
- Biosis: Lauren Harley (mapping).

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## Glossary

<b>Additional area required for construction</b>	Additional area required for construction for the proposed modification
<b>Assessment area</b>	All land within 500 metres of a linear development and 1500 metres of a broader development site
<b>Approved project</b>	Concept and major civil construction work for Sydney Metro West between Westmead and The Bays (Stage 1 of the planning approval process for Sydney Metro West).
<b>BAM</b>	NSW Biodiversity Assessment Method
<b>BAM-C</b>	BAM Calculator
<b>BC Act</b>	NSW <i>Biodiversity Conservation Act 2016</i>
<b>BDAR</b>	Biodiversity Development Assessment Report
<b>Biosecurity Act</b>	NSW <i>Biosecurity Act 2015</i>
<b>Construction site</b>	Approved Clyde stabling and maintenance facility indicative construction site
<b>Development footprint</b>	The area of land that is directly impacted by the proposed modification and approved project
<b>Development site</b>	The broader area in which the subject land is located
<b>Ecosystem credit species</b>	A measurement of the value of threatened ecological communities and threatened species habitat for species that can be reliably predicted to occur with a plant community type. Ecosystem credits measure the loss in biodiversity values at a development.
<b>EP&amp;A Act</b>	NSW <i>Environmental Planning and Assessment Act 1979</i>
<b>EPBC Act</b>	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
<b>Locality</b>	Area located within 10 kilometres radius from the subject land
<b>MNES</b>	Matters of National Environmental Significance protected by a provision of Part 3 of the EPBC Act
<b>PCT</b>	Plant Community Type
<b>Proposed modification</b>	Major civil construction work between Westmead and The Bays including a revised location of the Rosehill dive structure and the realignment of Kay Street and Unwin Street.
<b>Project staging</b>	Sydney Metro West is being assessed as a staged infrastructure application under section 5.20 of the EP&A Act. The approved Concept and major civil construction work for Sydney Metro West between Westmead and The Bays (Stage 1 of the planning approval process for Sydney Metro West), application number SSI-10038, were approved on 11 March 2021.
<b>Species credit species</b>	A class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates.
<b>Subject land</b>	The areas within or the combined areas of the development site, and any indirect and prescribed impacts, to which the BAM has been applied.

**TEC**

Threatened Ecological Community

## Certification and Declarations

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I certify that this report has been prepared on the basis of the requirements of, and information provided under, the Biodiversity Assessment Method (DPIE, 2020b) and Section 6.15 of the *Biodiversity Conservation Act 2016*.

In preparing this assessment I have acted in accordance with the Accredited BAM Assessor Code of Conduct.

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

**Signature:** *R. Dwyer*

**Date:** 23/11/2021

**BAM Assessor Accreditation Number:** #BAAS17067



## Summary

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Sydney Metro proposes to develop land at Clyde stabling and maintenance facility in Rosehill New South Wales (NSW, hereafter referred to as the development site) (Figure 1, Figure 2, and Figure 3) as part of Sydney Metro West. The planning approval process for Sydney Metro West is being completed as a staged infrastructure application under section 5.20 of the EP&A Act. The Sydney Metro West project has been declared as state significant infrastructure and critical state significant infrastructure under sections 5.12(4) and 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), respectively (SSI 10038) (Sydney Metro, 2020a).

Planning approval for Sydney Metro West Concept, from Westmead to the Sydney CBD, as well as station excavation and tunnelling between Westmead and The Bays (the approved project), was granted by the Minister for Planning and Public Spaces on 11 March 2020 (SSI-10038). The proposed modification relates to construction work at the Clyde stabling and maintenance facility and would include revised Rosehill drive structure and Kay Street and Unwin Street realignment.

An assessment is required in accordance with the NSW Biodiversity Assessment Method (BAM) (DPIE, 2020b) and the *Biodiversity Conservation Act 2016* (BC Act). This Biodiversity Development Assessment Report (BDAR) has been prepared by Dr Caragh Heenan, Rosie Gray and Accredited Assessor Rebecca Dwyer (#BAAS17067) and reviewed by Accredited Assessor Mitchell Palmer (#BAAS17051) to accompany the modification report. This BDAR describes the outcome of the development assessment case (00028651/BAAS17067/21/00028652) conducted consistent with the BAM.

In summary, the approved project recorded 0.03 hectares of PCT 849 *Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion* and 0.15 hectares of PCT 920 *Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion*. Additionally, the approved project assumed presence for one threatened species and the vegetation integrity score of relevant management zones were 11.4 and 34.6 for PCT 849 and PCT 920, respectively. Therefore offsets are to be secured for the approved project including:

- 0.15 hectares of Southern Myotis *Myotis macropus* habitat (3 credits)
- 0.15 hectares of PCT 920 (3 credits).

Field investigation for the proposed modification, carried out in accordance with the BAM, recorded 0.54 hectares of native vegetation within the subject land, which does not represent a threatened ecological community. This includes 0.53 hectares of PCT 849 within the additional area required for construction and 0.01 hectares of PCT 849 within the approved project area.

Avoidance of native vegetation, threatened ecological communities and threatened species habitat have been carried out to restrict impacts to 0.44 hectares of native vegetation in the proposed modification development footprint, including 0.43 hectares within the additional area required for construction and 0.01 hectares within the approved project area. Impacts to threatened species in the proposed modification development footprint includes 0.14 hectares of Downy Wattle *Acacia pubescens* habitat, including 0.13 hectares within the additional area required for construction and 0.01 hectares within the approved project area. Consideration has been given to avoiding and minimising impacts to biodiversity where possible in the preliminary design. Existing mitigation and management measures are in place as part of the approved project to address impacts associated with the proposed modification, both direct, indirect and prescribed. One threatened species was recorded within the subject land, and the vegetation integrity score of the vegetation to be impacted was calculated as 14.2. As such, in accordance with Section 10 of the BAM, offsets

are not required for mapped native vegetation. However, species credits are to be secured for the proposed modification including:

- For impacts of up to 27 individuals and 0.14 hectares of Downy Wattle habitat equating to 1 credit.

In accordance with the Significant Impact Criteria (SIC) assessments, the proposed modification is not likely to result in a significant impact to species or communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), that being:

- Downy Wattle, as:
  - based on the Downy Wattle population survey undertaken as part of this assessment, there are at least 4,655 known individual/stems of the species within a 15 kilometre radius of the subject land, which are considered part of the same population within the Cumberland Interim Biogeographic Regionalisation of Australia sub-region
  - the majority of records within the population are located within intact remnant vegetation with many verified and located within Council reserves, with high levels of recruitment observed
  - the individuals within the subject land are highly isolated within urban development. The habitat within the subject land consists of largely unviable urban native/exotic planted vegetation. The soil profile within the location of the species has also undergone historic disturbance from construction of the former rail infrastructure, with limited recruitment observed
  - the removal of 27 stems from a population of at least 4,655, will result in the loss of 0.6 per cent of the overall population and is not likely to constitute a significant impact to an important population.
- Grey-headed Flying-fox *Pteropus poliocephalus*, as:
  - the native vegetation within the subject land is limited to foraging resources only
  - a small area (0.44 hectares) is proposed to be removed as part of the proposed modification.
- Swift Parrot *Lathamus discolor*, as:
  - a small numbers of individuals may occasionally forage within the vegetation within the subject land, however impacts are not considered significant
  - there are higher quality resources located nearby and the removal of vegetation from the subject land is not likely to constitute a significant impact to an important population.

As such a referral to the Commonwealth Minister for the Environment is not required.

## Stage 1 – Biodiversity assessment

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# 1 Introduction

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Biosis Pty Ltd was commissioned by AECOM on behalf of Sydney Metro to undertake a biodiversity assessment of the proposed Clyde Modification (Lot 10 DP 1151784, Lot 12 DP 1271374, Lot 1 DP 126880, Lot 1 DP 506570, and Lot 11 DP 1271374) in Rosehill, NSW.

The purpose of this assessment was to apply the NSW BAM (DPIE, 2021f) to the proposed modification, and provide Sydney Metro with a Biodiversity Development Assessment Report (BDAR). The BDAR is to be submitted to NSW Department Planning Industry and Environment as part of a modification application.

## 1.1 Overview

Sydney Metro is Australia's biggest public transport program. Sydney Metro West is part of the broader Sydney Metro and includes a new 24 kilometre metro line that would connect Greater Parramatta with the Sydney CBD. Stations include Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD). This infrastructure investment would double the rail capacity of the Greater Parramatta to Sydney CBD corridor with a travel time target between the two centres of about 20 minutes.

The planning approval process for Sydney Metro West is being completed as a staged infrastructure application under section 5.20 of the EP&A Act.

## 1.2 The approved project

Planning approval for the Sydney Metro West Concept, from Westmead to the Sydney CBD, as well as station excavation and tunnelling between Westmead and The Bays (the approved project), was granted by the Minister for Planning and Public Spaces on 11 March 2020 (SSI-10038) and is described in the following documents:

- The Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD (Sydney Metro, 2020a)
- The Sydney Metro West Westmead to The Bays and Sydney CBD Submissions Report (Concept and Stage 1) (Sydney Metro, 2020c)
- The Sydney Metro West Westmead to The Bays and Sydney CBD Amendment Report (Concept and Stage 1) (Sydney Metro, 2020b)
- Conditions of Approval for Sydney Metro West – Concept and Stage 1 Construction (SSI 10038) (DPIE, 2021c).

## 1.3 The proposed modification

The proposed modification relates to the major civil construction work at the Clyde stabling and maintenance facility and would include:

- Rosehill dive structure relocation and extension
- Kay Street and Unwin Street realignment.



These changes to the design for the approved project would require:

- additional land required for future planning applications brought forward
- additional impact to heritage not assessed as part of the approved project
- additional impact to biodiversity not assessed as part of the approved project.

There would be no changes proposed to the Concept as described in Chapter 6 (Concept description) of the Environmental Impact Statement (Sydney Metro, 2020a).

### **1.3.1 Rosehill dive structure**

The Rosehill dive structure is required to provide for a future connection from the Clyde stabling and maintenance facility to the mainline tunnels. The proposed modification includes:

- relocation east and extension of the Rosehill dive structure further north-east within the former T6 Carlingford Line
- additional construction area to allow for:
  - enabling works as outlined in Section 9.4.1 of the Environmental Impact Statement (Sydney Metro, 2020a)
  - removal of the Rosehill Railway Station Footbridge which is of local heritage significance, listed under the RailCorp Heritage and Conservation Register under Section 170 of the *NSW Heritage Act 1977* (NSW), and provision for an alternative crossing of the former T6 Carlingford Line prior to removal of the footbridge.
  - removal of the platforms and station furniture at the former Rosehill Railway Station
- minor realignment of the tunnel portal connecting the mainline tunnels to the revised Rosehill dive structure location.

The proposed modification of the Rosehill dive structure is presented in Figure 1 and Figure 3. Further investigation into temporary facilities to support additional access to the tunnels would be considered as part of detailed construction planning. The land pertaining to the Rosehill dive structure has been assessed under the BAM (DPIE, 2020b).



**Figure 1 Clyde stabling and maintenance facility indicative construction site (proposed modification)**

### 1.3.2 Kay Street and Unwin Street realignment

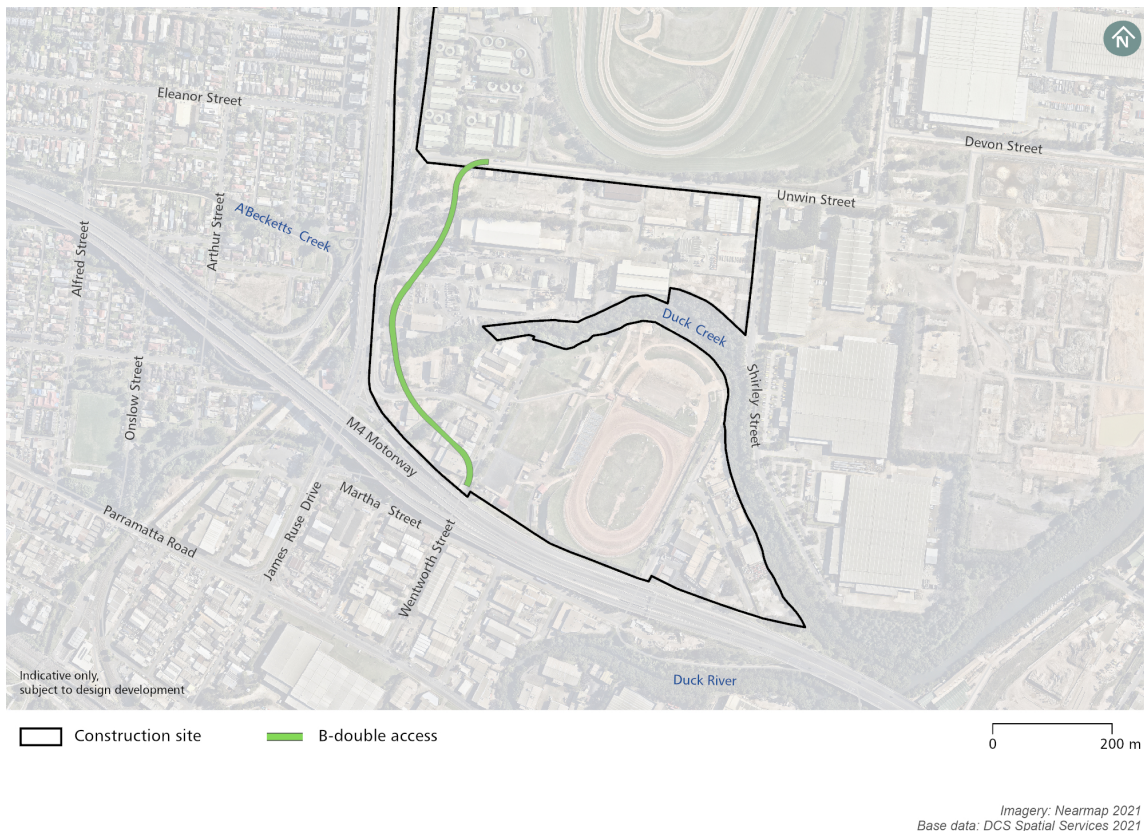
The realignment of Kay Street and Unwin Street is required to provide general traffic and B-double access around the Clyde stabling and maintenance facility construction site. The proposed modification includes the following changes to the Kay Street and Unwin Street realignment:

- a road bridge as opposed to an underpass to cross the future metro rail tracks
- elevation of the Kay Street and Unwin Street realignment for about 250 metres
- minor realignment of the Kay Street and Unwin Street route
- a shared path to accommodate pedestrians and cyclists on one side.

The revised Kay Street and Unwin Street realignment is presented in Figure 2 and Figure 3.

The proposed modification does not include any changes to the culverts located at A'Becketts Creek and Duck Creek assessed as part of the approved project. These structures and the changes to A'Becketts Creek and Duck Creek as part of the approved project are subjective to ongoing design development to ensure project outcomes are met.

The land pertaining to the Kay Street and Unwin Street realignment has not been assessed for the proposed modification, as it is wholly contained within land previously assessed under the BAM (DPIE, 2020b) as part of the approved project (Sydney Metro, 2020a).



**Figure 2 Key Street and Unwin Street route realignment (proposed modification)**

## 1.4 Purpose of this assessment

This assessment provides a BDAR for the proposed modification. It compares the impacts as a result of the proposed modification (Figure 3) with the approved project. Following the submission of the Environmental Impact Statement (Sydney Metro, 2020a), a stand of Downy Wattle within an 'environmentally significant area' was identified in the development footprint (comprising an area required for the proposed modification and the approved project), to the south of the Rosehill dive structure within the approved project area. As such, further assessment is also required to identify the impacts to this vegetation.

A BDAR covering the proposed modification is therefore required to support a modification application to the approved project.

This BDAR will:

- address the BAM (DPIE, 2020b)
- identify how the proponent has avoided and minimised impacts to biodiversity
- identify any potential impact that could be characterised as serious and irreversible.
- describe the offset obligations required to compensate for any unavoidable biodiversity impacts resulting from the proposed development
- consider and assess the proposed modification in accordance with other relevant legislation such as the Commonwealth EPBC Act.

All biodiversity assessments have been carried out in accordance with the BAM, and this BDAR has been prepared by Dr Caragh Heenan, Rosie Gray and Accredited Assessor Rebecca Dwyer (#BAAS17067) and



reviewed by Accredited Assessor Mitchell Palmer (#BAAS17051). This BDAR describes the outcome of the development assessment case (00028651/BAAS17067/21/00028652) conducted consistent with the BAM.

## 1.5 The subject land, development footprint and assessment area

The terms subject land, development footprint and assessment area are used throughout this BDAR and are defined as follows:

- the subject land is defined as Lot 10 DP 1151784, Lot 12 DP 1271374, Lot 1 DP 126880, Lot 1 DP 506570, and Lot 11 DP 1271374, James Ruse Drive in Rosehill NSW and is consistent with the area needed for the relocation of the Rosehill dive structure, as well as the environmentally significant area in the approved project area:
  - the lots are located directly east of James Ruse Drive, north of the Western Motorway and south of Grand Avenue, in Rosehill between Parramatta and Silverwater, about 17 kilometres from Sydney CBD
  - the land is located in the City of Parramatta Local Government Area and the Greater Sydney (Local Land Services) Region
  - the land is zoned as B5 Business Development under the *Parramatta Local Environmental Plan 2011*
- the development footprint comprises all areas to be directly impacted by the above ground features of the proposed modification and approved project, including the locations of any enabling works, construction sites, and civil works
- the development site is the broader area in which the subject land is located and comprises all lots associated with the development footprint of the proposed modification
- the assessment area includes the subject land and the area of land within the 1500 metre buffer zone surrounding the subject land
- the approved project includes the mapped assessed areas as defined in the Environmental Impact Statement (Sydney Metro, 2020a). While the stand of Downy Wattle was included in the approved project assessment area (Sydney Metro, 2020a), it has been re-assessed and forms part of the subject land under the current assessment.

## 1.6 Sources of information

Sources of information used in the assessment included relevant databases, spatial data, literature and previous site reports.

In order to provide a context for the assessment area, records of flora and fauna from within 10 kilometres (the locality) were collated from the following databases and datasets were reviewed:

- Commonwealth Department of Agriculture, Water and Environment Protected Matters Search Tool for matters protected by the EPBC Act
- NSW BioNet - the database for the Atlas of NSW Wildlife, Environment, Energy and Science, for species, populations and ecological communities listed under the BC Act
- NSW BAM Calculator
- Biodiversity values map



- Native vegetation regulatory map
- BAM Important Areas maps
- PlantNET (The Royal Botanic Gardens and Domain Trust)
- BirdLife Australia, the New Atlas of Australian Birds 1998-2015.

Other sources of biodiversity information relevant to the assessment area were sourced from:

- the NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database (DPIE, 2021f)
- relevant vegetation mapping, such as:
  - Southeast NSW Vegetation Native Vegetation Classification and Mapping (SCIVI) (OEH, 2011)
  - The Native Vegetation of the Sydney Metropolitan Area, 2016, VIS\_ID 4489 (OEH, 2016).

The following reports were also reviewed and relied on to provide additional information:

- The Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD (Sydney Metro, 2020a), Technical Paper 10 Biodiversity Development Assessment Report (Jacobs, 2020)
- Conditions of Approval for Sydney Metro West – Concept and Stage 1 Construction (SSI 10038) (DPIE, 2021c).

Basemap data was obtained from NSW Land and property information 1:25,000 digital topographic databases, with cadastral data obtained from NSW Land and Property Information digital cadastral database.

The following spatial datasets were utilised during the development of this report:

- Catchment Boundaries of New South Wales dataset
- Mitchell Landscapes Version 3.0
- Interim Biogeographic Regionalisation of Australia Version 7
- Directory of Important Wetlands
- Spatial data associated with Native Vegetation of the Sydney Metropolitan Area, 2016, VIS\_ID 4489 (OEH, 2016)
- NSW Soil and Land Information System.
- mapping has been produced using a Geographic Information System. The following maps and data have been provided:
  - digital mapping with aerial photography showing 1:1000 or finer
  - site map as described in subsection 3.1.1 of the BAM
  - location map as described in subsection 3.1.2 of the BAM
  - landscape map with features including 1500 metre buffer, as described in section 3.1.3 of the BAM.

## 1.7 Legislative requirements

The proposed modification has been assessed against relevant biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999* (Cth)
- *Environmental Planning and Assessment Act 1979*
- *Biodiversity Conservation Act 2016*
- *Biosecurity Act 2015*.

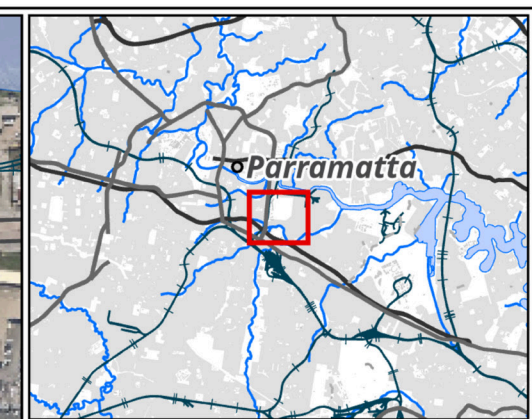
The Secretary's environmental assessment requirements were issued for Stage 1 on 11 December 2019. Although the Secretary's environmental assessment requirements are not specifically related to the proposed modification, they provide an appropriate set of requirements to for this assessment. The requirements specific to biodiversity, and where these requirements are addressed in this BDAR, are outlined in Table 1.

**Table 1 Sydney Metro West Stage 1 Secretary's environmental assessment requirements – Biodiversity**

Reference	Requirement	Where addressed
1.	Biodiversity impacts in accordance with section 7.9 of the BC Act, the BAM, and be documented in a BDAR.	<p>This report is the BDAR as required under Section 7.9 of the BC Act for the proposed modification. The BDAR was prepared in accordance with the BAM (DPIE, 2020b) and guidance provided in the BAM Operation Manual (DPIE, 2020a).</p> <p>The BAMC-C case associated with this BDAR is 00028651/BAAS17067/21/00028652.</p> <p>The biodiversity surveys carried out during preparation of this BDAR were guided by the Department of Planning, Industry and Environment's Threatened Species Survey and Assessment Guidelines (DECC, 2009).</p>
2.	Impacts on biodiversity values not covered by the BAM. This includes a threatened aquatic species assessment (Part 7A of the <i>Fisheries Management Act 1994</i> [FM Act]) to address whether there are likely to be any significant impact on listed threatened species, populations or ecological communities listed under the FM Act.	<p>Biodiversity values not normally assessed under the BAM include:</p> <ul style="list-style-type: none"> <li>• marine mammals</li> <li>• wandering sea birds</li> <li>• biodiversity that is endemic to Lord Howe Island</li> <li>• biodiversity values associated with the assessment of the impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the <i>Local Land Services Act 2013</i>), other than the additional biodiversity impacts in accordance with clause 6.1 of the BC regulation.</li> </ul> <p>The BDAR addresses potential impacts to wandering marine birds through habitat assessment, where relevant (see Appendix 2).</p> <p>Biodiversity that is endemic to Lord Howe Island and category 1-exempt land are not applicable to Sydney</p>

Reference	Requirement	Where addressed
		<p>Metro West as it is on mainland Australia and category 1-exempt land would not be affected.</p> <p>This BDAR does not include a threatened aquatic species assessment addressing species listed under the <i>Fisheries Management Act 1994</i> (FM Act), as there are no waterways in the subject land. The approved project Environmental Impact Statement (Sydney Metro, 2020a) includes an aquatic species assessment.</p>
3.	If the project, or any component of the project, would be classified as a Key Threatening Process (KTP) in accordance with the listings in the BC Act, FM Act and EPBC Act.	Refer to Section 6.4, addressing KTPs.





- Legend**
- Subject land
  - Approved project area
- Rosehill dive structure**
- Additional area required for construction
  - Proposed dive structure
- Key Street and Unwin Street realignment**
- B-double access
- Development footprint**
- Development footprint - Proposed modification
  - Development footprint - Approved project
- Development site**
- Development site - Proposed modification
  - Development site - Approved project

**Figure 3 Subject land**

0 50 100 150 200 250

Metres

Scale: 1:6,000 @ A3

Coordinate System:

GDA 1994 MGA Zone 56



Matter: 36175, Date: 25 October 2021,  
 Drawn by: LH, Checked by: CBH, Last edited by: lharley  
 Location: P:\36100s\36175\Mapping\36175\_SydneyMetroWestBDAR.aprx  
 Layout: BDAR\_F3\_SubjectLand



## 2 Landscape Context

This chapter describes the landscape and site context of the subject land, describing the landscape features present within the subject land and within a 1500 metre buffer, as required by the BAM (DPIE, 2021f). Figure 5 shows the location of the subject land and landscape features within the 1500 metre buffer.

### 2.1 Subject land description

The subject land is located directly east of James Ruse Drive, north of the M4 Western Motorway and south of Grand Avenue, in Rosehill between Parramatta and Silverwater, about 17 kilometres from Sydney CBD. The land is located in the City of Parramatta Local Government Area and the Greater Sydney (Local Land Services) Region and is zoned as B5 Business Development under the *Parramatta Local Environmental Plan 2011*.

The surrounding land use is primarily industrial and urban residential, with Rosehill Gardens Racecourse located to the east. The subject land contains former rail lines and planted vegetation. Vegetation connectivity within and surrounding the subject land is poor, with the subject land mostly cleared of native vegetation. The subject land contains native planted vegetation and Urban Native/exotic vegetation that has been subjected to disturbance and weed ingress.

The subject land is within the Central and Eastern NSW, Sydney 1:100k soil landscape (Chapman et al., 2009; DPIE, 2020c; *ESPADE*, 2021). Regional soil landscape mapping indicates that the south of the subject land occurs on the Glenorie landscape and the north of the subject land occurs on the Disturbed Terrain landscape of the Central and Eastern NSW region (Chapman et al., 2009).

The Glenorie soils landscape is characterised by undulating to rolling low hills on Wianamatta Group shales. Soils are shallow to moderately deep Red Podzolic Soils and Red to Brown Podzolic Soils, deep Yellow Podzolic Soils and Greyed Podzolic Soils. Vegetation is extensively cleared tall open-forest (wet sclerophyll forest) dominated by Sydney Blue Gum *Eucalyptus saligna* and Blackbutt *E. pilularis*. *Pittosporum undulatum* and Coffee Bush *Breynia oblongifolia* are common understorey species (Chapman et al., 2009).

The Disturbed Terrain soils landscape is characterised by level plain to hummocky terrain, extensively disturbed by human activity, including complete disturbance, removal or burial of soil. Turfed fill areas are commonly capped with sandy loam or compacted clay over fill or waste materials. This unit has been completely cleared and therefore disturbed terrain may be bare or covered with opportunist weeds such as Cobbler's Peg *Bidens pilosa*, Purple Top *Verbena bonariensis* and Ribwort *Plantago lanceolata* (Chapman et al., 2009).

#### 2.1.1 Native vegetation cover

Vegetation within the assessment area was assessed using aerial photographic interpretation, field survey results and existing vegetation mapping. Figure 6 provides the list of PCTs identified from existing vegetation mapping, and the current assessment, as occurring within the assessment area. Conservation status of the communities is also provided.

The total assessment area around the subject land is 933.91 hectares, with the area of native vegetation mapped within the buffer being 27.10 hectares. This is a native vegetation cover of 2.90 per cent (<10 per cent class as defined in Section 3.2.3 of the BAM) and this value was entered into the BAM calculator.

Cleared areas within the assessment area include 906.81 hectares.

Southeast NSW Vegetation Native Vegetation Classification and Mapping (SCIVI) (OEH, 2011) and The Native Vegetation of the Sydney Metropolitan Area, 2016, VIS\_ID 4489 (OEH, 2016) defines the subject land as 'Not assessed'. Field assessment identified the presence of mapped PCT communities and the distribution was consistent with aerial imagery.

### **2.1.2 Bioregions**

The assessment area occurs within the Sydney Basin Interim Biogeographic Regionalisation of Australia bioregion and the Cumberland Interim Biogeographic Regionalisation of Australia subregion. The Sydney Basin Bioregion lies on the central east coast of NSW and covers an area of about 3,624,008 hectares. It occupies about 4.53 per cent of NSW and is one of two bioregions contained wholly within the state. The bioregion extends from just north of Batemans Bay to Nelson Bay on the central coast, and almost as far west as Mudgee. The bioregion is bordered to the north by the North Coast and Brigalow Belt South bioregions, to the south by the South East Corner Bioregion and to the west by the South Eastern Highlands and South Western Slopes bioregions. The Sydney Basin Bioregion is one of the most species diverse in Australia. This is a result of the variety of rock types, topography and climates in the bioregion (DPIE, 2016).

### **2.1.3 Rivers and streams**

The development site is located within the Greater Sydney Local Land Services Region and the Sydney Metro (Port Jackson) catchment. The closest river-mouth is the Parramatta River (Sydney Harbour) located about 24 kilometres to the east of the subject land. The closest major waterbody is Parramatta River, located about 600 metres to the north of the subject land.

A'Becketts Creek and Duck Creek are mapped within the development footprint, south of the subject land, which are first and second Strahler Order watercourses (Strahler, 1964), respectively (Figure 3). Neither tributary occurs within the subject land. They are described in detail in the approved project BDAR (Sydney Metro, 2020a) however no impacts to waterways are likely as part of the proposed modification.

There are no Key Fish Habitats as mapped by the NSW Department of Primary Industries (DPI) within the subject land (DPI, 2013), however there are some mapped Key Fish Habitats within proximity of the subject land, as mapped and described in the approved project BDAR (Sydney Metro, 2020a).

### **2.1.4 Wetlands**

There are no wetlands, included in the Directory of Important Wetlands of Australia (DAWE, 2004), within the subject land.

### **2.1.5 Connectivity**

The riparian habitats form the most obvious habitat corridors within the assessment area, particularly vegetation along A'Becketts Creek, Duck Creek and Duck River (Figure 4 and Figure 5). This corridor is located in the southern portion of the assessment area, but is not within the subject land. There is no remnant vegetation associated with the first and second order streams within the subject land and therefore little connection through riparian vegetation to higher order streams. Connectivity is fragmented and severed by roadways at Kay Street, the M4 Western Motorway, Unwin Street and James Ruse Drive. Parts of the development footprint contains a section of Duck Creek and A'Becketts Creek and the tunnel would pass beneath Duck River, as described in the approved project BDAR (Sydney Metro, 2020a).

The patchwork of planted trees and gardens surrounding the subject land allows for some landscape permeability for disturbance tolerant and transient species such as bats and birds that can exploit the resources available in urban areas.

### 2.1.6 Geological features

There were no recorded karst, caves, crevices, cliffs or other areas of geological significance within the subject land or within the assessment area.

### 2.1.7 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity or biodiversity values mapped within the subject land.

### 2.1.8 NSW (Mitchell) Landscape

The subject land occurs within the Port Jackson Basin (Poj) Mitchell Landscape to the north and Ashfield Plains (Asp) Mitchell Landscape to the south (Mitchell, 2002).

The Port Jackson Basin landscape consists of a deep elongated harbour with steep cliff margins on horizontal Triassic quartz sandstone, small pocket beaches, Quaternary estuary fill of muddy sand, with a general elevation of 0 to 80 metres and a local relief of 10 to 50 metres. The landscape consists of sandstone slopes and cliffs with patches of uniform or gradational sandy soil on narrow benches and joint crevices. Vegetation includes forest and woodland of Sydney Peppermint *Eucalyptus piperita*, Smooth-barked Apple *Angophora costata*, Red Bloodwood *Corymbia gummifera*, Blackbutt *Eucalyptus pilularis*, Turpentine *Syncarpia glomulifera*, Coachwood *Ceratopetalum apetalum*, Water Gum *Tristanopsis laurina* and Grey Mangrove *Avicennia marina* (Mitchell, 2002).

The Ashfield Plains landscape consists of undulating hills and valleys on horizontal Triassic shale and siltstone, occasional quartz sandstones, with a general elevation of 0 to 45 metres and a local relief to 20 metres. The landscape consists of Red and brown texture-contrast soils grading to yellow harsh texture-contrast soils. Vegetation includes open forest of Broad-leaved Ironbark *Eucalyptus fibrosa* ssp. *fibrosa*, Grey Box *Eucalyptus moluccana*, Tea-tree *Leptospermum* sp., Turpentine *Syncarpia glomulifera*, Red Mahogany *Eucalyptus resinifera*, Grey Gum *Eucalyptus punctata*, Sydney Blue Gum *Eucalyptus saligna*, Blackbutt *Eucalyptus pilularis* and Kangaroo Grass *Themeda triandra* (Mitchell, 2002).

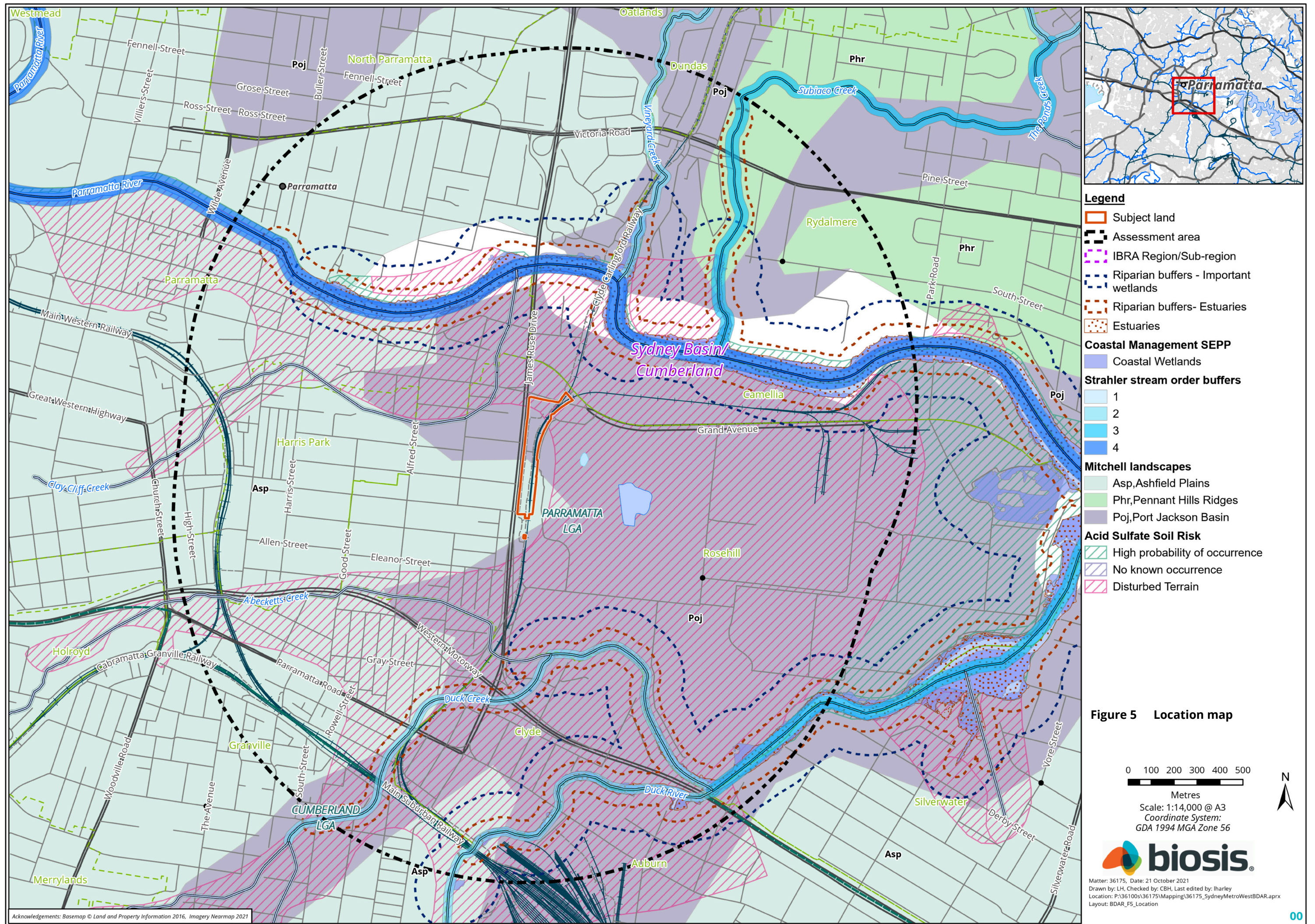
### 2.1.9 Hydrology

The site is not mapped as having Groundwater Vulnerability (*Parramatta Local Environmental Plan 2011*).











## 3 Native vegetation

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The subject land supports:

- 0.54 hectares of native vegetation with high levels of disturbance, including:
  - 0.53 hectares within the additional area required for construction
  - 0.01 hectares within the approved project area
- 0.67 hectares of Urban Native/Exotic vegetation, located within the additional area required for construction (does not occur within the subject land coinciding with the approved project area).

Additional vegetation in the approved project area that is not within the subject land and therefore not assessed further in this BDAR, includes:

- 0.05 hectares of native vegetation
- 0.36 hectares of Urban Native/Exotic vegetation

### 3.1 Native vegetation and habitat assessment

#### 3.1.1 Native vegetation extent

The extent of native vegetation, threatened ecological communities and vegetation integrity within the subject land was determined using the results of site investigations and Section 4 of the BAM (DPIE, 2020b).

Figure 6 provides a map of the native vegetation extent recorded within the development site and development footprint, as assessed during field investigations carried out in October 2021. The figure includes all areas of native vegetation (native ground cover and areas with canopy) within the subject land. Areas not shown as native vegetation cover within Figure 6, are considered cleared/non-native vegetation, and are addressed further below.

#### 3.1.2 Review of existing information

Existing information regarding native vegetation was reviewed to inform field investigations including:

- regional vegetation mapping (OEH, 2011, 2016)
- The Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD (Sydney Metro, 2020a), Technical Paper 10 Biodiversity Development Assessment Report (Jacobs, 2020)
- database searches.

Based on the results of the background review and the requirements of the BAM with respect to this BDAR, appropriate surveys were designed for the subject land and development footprint.

#### 3.1.3 Field investigation of biodiversity values

A systematic biodiversity assessment was conducted 11 October 2021 by Rebecca Dwyer (Team Leader Ecology and accredited BAM Assessor #BAAS17067).

The subject land was surveyed in accordance with the BAM (DPIE, 2020b), which involved:

- the identification and mapping of PCTs according to the structural definitions held in the BioNet Vegetation Classification database

- undertaking floristic plots within each vegetation zone in accordance with Section 4 of the BAM (DPIE, 2020b), considering varying condition states and avoidance of ecotones, areas of disturbance, and edges
- the identification of native and exotic plant species, according to the Flora of NSW (Harden, 1992, 1993, 2000, 2002) with reference to recent taxonomic changes
- targeted searches for plant species of conservation significance according to the Surveying threatened plants and their habitats (DPIE, 2020d)
- incidental observations using the “random meander” method (Cropper, 1993)
- identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the development site
- an assessment of the natural resilience of the vegetation of the site
- identifying and mapping fauna habitats (e.g. hollow-bearing trees, rock outcropping etc.), assessing their condition and value to threatened fauna species, and considering threatened species’ habitat constraints
- observations of animal activity and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches and diggings).

The conservation significance of plant species and plant communities was determined according to:

- BC Act for significance within NSW
- EPBC Act for significance within Australia.

Areas of native vegetation for which a PCT could validly be assigned were identified and delineated in the field, and their condition determined and assigned. Identification of PCTs within the subject land was confirmed with reference to the community profile descriptors (and diagnostic species tests) held within the NSW BioNet Vegetation Classification database (DPIE, 2021f). Locations of floristic plots surveyed are shown on Figure 8.

Further details of targeted survey for threatened flora and fauna species are provided in Section 4.2 below.

#### **3.1.4 Permits and licences**

Flora and fauna assessments were conducted under the terms of Biosis' Scientific Licence issued by the NSW Environment, Energy and Science Group under the *National Parks and Wildlife Act 1974* (SL100758, expiry date 31 March 2022). Fauna survey was conducted under approval 11/355 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2022).

#### **3.1.5 Mapping**

Detailed field mapping and collection of GPS point locations were conducted using hand-held (uncorrected) tablet units (Samsung Galaxy Tab X) running the ArcGIS Field Maps application, using the inbuilt GPS, and aerial photo interpretation. Spatial locations are therefore considered to have an accuracy of generally  $\pm 5$  metres.

#### **3.1.6 Local data**

No local data has been used for native vegetation assessment.

### 3.1.7 Non-native vegetation

Vegetation within the northern and southern extent of the subject land is mapped as Urban Native/Exotic with no indigenous native over storey or mid storey cover, and therefore meet the definition of non-native vegetation/cleared land and is not mapped as native vegetation (Figure 7).

Areas not shown as native vegetation cover within Figure 7, and which do not provide habitat for threatened species, are not included for further assessment in accordance with Section 5.1.1.5 of the BAM (DPIE, 2020b). Non-native vegetation which does provide habitat for threatened species is required to be assessed.

The majority of exotic species within the subject land are associated with built up urban areas and areas of disturbance, via introduction through human activity and vehicular movement. A number of priority weeds are well-established on-site, including Camphor Laurel *Cinnamomum camphora*, Castor Oil *Ricinus communis*, Lantana *camara*, and African Love Grass *Eragrostis curvula*.

Non-native vegetation has been assessed for threatened species, however it is highly disturbed and subjected to weed ingress, and does not provide habitat features suitable for threatened species.

Table 2 provides detailed descriptions of the non-native vegetation recorded within the subject land. Urban Native/Exotic recorded within the subject land is shown on Figure 7.

**Table 2 Urban Native/Exotic**

Urban Native/Exotic	
<b>Common name</b>	Urban Native/Exotic
<b>Extent within subject land</b>	<p>Subject land – 0.67 hectares, including:</p> <ul style="list-style-type: none"> <li>• Additional area required for construction – 0.67 hectares</li> <li>• Approved project area – 0 hectares.</li> </ul> <p>Development footprint – 0.18 hectares to be impacted, including:</p> <ul style="list-style-type: none"> <li>• Additional area required for construction – 0.18 hectares</li> <li>• Approved project area – 0 hectares.</li> </ul>
<b>Description</b>	<p>Urban Native/Exotic vegetation occurs across the subject land, with planted rows of vegetation within the northern and southern extent of the subject land. The Urban Native/Exotic vegetation is characterised by a canopy consisting of Silky Oak <i>Grevillea robusta</i>, Lemon Scented Gum <i>Corymbia citriodora</i>, Camphor Laurel, and Brush Box <i>Lophostemon confertus</i>. The midstorey consisted of Crimson Bottlebrush <i>Callistemon citrinus</i>, Sweet Pittosporum <i>undulatum</i> and exotic species including Lantana, African Olive <i>Olea europaea</i> subsp. <i>cuspidata</i>, Castor Oil, Green Cestrum <i>parqui</i> and <i>Bougainvillea</i> spp. The ground cover consisted of exotic grasses and forbs including African Love Grass, Dallis Grass <i>Paspalum dilatatum</i>, Kikuyu Grass <i>Pennisetum clandestinum</i>, Farmers Friend <i>Bidens pilosa</i>, Black Nightshade <i>Solanum nigrum</i>, Paddy's Lucerne <i>Sida rhombifolia</i> and Scotch Thistle <i>Onopordum acanthium</i>. This community does not conform to any NSW PCTs.</p>

## Urban Native/Exotic

### Urban Native/Exotic Vegetation



**Photo 1** Urban Native/Exotic vegetation, looking east within the subject land.



**Photo 2** Urban Native/Exotic vegetation, looking south within the subject land.

### 3.1.8 Plant community types

The following Plant Community Types (PCT) were assessed as present within the subject land:

- PCT 849 Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Table 3).


Table 3 provides a detailed descriptions of the PCT recorded within the subject land. The PCT recorded within the subject land is shown on Figure 7.

**Table 3 PCT 849 Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion**

PCT 849 Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	
<b>Common name</b>	Cumberland Shale Plains Woodland
<b>Vegetation formation</b>	Grassy Woodlands
<b>Vegetation class</b>	Coastal Valley Grassy Woodlands
<b>Extent within subject land</b>	<p>Subject land – 0.54 hectares, including:</p> <ul style="list-style-type: none"> <li>• Additional area required for construction – 0.53 hectares</li> <li>• Approved project area – 0.01 hectares.</li> </ul> <p>Development footprint – 0.44 hectares to be impacted, including:</p> <ul style="list-style-type: none"> <li>• Additional area required for construction – 0.43 hectares</li> <li>• Approved project area – 0.01 hectares.</li> </ul>
<b>Condition</b>	<p>This community at the subject land was recorded in a low condition state with non-indigenous and exotic species dominating all strata's. The vegetation has been previously planted as part of the landscaping works for the Rosehill Railway Station which was established in about 1888 and decommissioned in 2020. The soil profile has also undergone historic disturbance from construction of the rail infrastructure, and along the adjacent property boundaries.</p>
<b>Description</b>	<p>Cumberland Shale Plains Woodland typically exists as an open grassy woodland dominated by Grey Box <i>Eucalyptus moluccana</i>, Forest Red Gum <i>Eucalyptus tereticornis</i> and Ironbarks such as Narrow-leaved Ironbark <i>Eucalyptus crebra</i> and Red Ironbark <i>Eucalyptus fibrosa</i>. The lower strata is typified by a sparse to moderate cover of shrubs such as Blackthorn <i>Bursaria spinosa</i> and a high percentage of ground covers such as Kidney Weed and Weeping Grass <i>Microlaena stipoides</i>.</p> <p>PCT 849 within the subject land was found to comprise two small linear patches within the centre of the subject land, located parallel to the decommissioned station (Figure 5).</p> <p>The PCT within the subject land consists of planted canopy consisting of Lemon Scented Gum, Rough-barked Apple <i>Angophora floribunda</i> and Spotted Gum <i>Corymbia maculata</i>. The midstorey is dominated by African Olive with scattered occurrences of Blackthorn <i>Bursaria spinosa</i>, Black Wattle <i>Acacia decurrens</i> and Downy Wattle <i>Acacia pubescens</i>. The ground cover is dominated by African Love Grass, Paddy's Lucerne, Farmer's Friend and Panic Veldtgrass <i>Ehrharta erecta</i>, with scattered occurrences of native grasses and forbs including Weeping Meadow Grass <i>Microlaena stipoides</i> var. <i>stipoides</i>, Couch <i>Cynodon dactylon</i>, Fishweed <i>Einadia trigonos</i>, Variable Glycine <i>tabacina</i> and Slender Flat Sedge <i>Cyperus gracilis</i>.</p>
<b>Survey effort</b>	One BAM plot/transect (Figure 8).
<b>Justification of PCT</b>	<p>Given the presence of Downy Wattle <i>Acacia pubescens</i> (Vulnerable, BC Act and EPBC Act) within the subject land, a PCT is required to be allocated to the native vegetation within the subject land in order to calculate offsets for the species.</p> <p>The vegetation within the subject land consists of planted native vegetation, and the species composition does not meet the definition of a PCT using the BioNet PCT identification tool, therefore previous vegetation mapping was reviewed to allocate the most suitable PCT for the subject land.</p> <p>Previous vegetation mapping (OEH, 2016) identified three potential PCT's within the locality, being PCT 849 Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, PCT 725 Broad-leaved Ironbark – <i>Melaleuca decora</i> shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin and PCT 1281 Turpentine - Grey Ironbark open forest on shale in the lower. Blue Mountains, Sydney Basin Bioregion.</p>



**PCT 849 Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion**

	<p>The BioNet PCT identification tool also identified these three PCT's as potential habitat for Downy Wattle.</p> <p>Given the absence of Turpentine <i>Syncarpia glomulifera</i> and Ironbarks <i>Eucalyptus fibrosa</i>, <i>E. crebra</i> and <i>E. paniculata</i>, PCT 1281 and 725 were discounted as a potential PCT.</p> <p>When considering the open forest vegetation within the site, Spotted Gum and Blackthorn are the most common indigenous species in the community on-site. Therefore PCT 649 represents the best floristic match with 2 of the 26 (8 per cent) of the species listed in the BioNet Vegetation Classification database recorded within the BAM plot.</p>
<b>TEC Status</b>	<p>Not listed under State or Commonwealth legislation.</p> <p>The PCT does not meet the definition for the TEC <i>Cumberland Plain Woodland in the Sydney Basin Bioregion</i> listed under the BC Act based on the following:</p> <ul style="list-style-type: none"> <li>the vegetation community is dominated by planted non-indigenous species</li> <li>the soil profile has undergone historic disturbance from construction of the rail infrastructure, and does not consist of the original soil profile</li> <li>the VI score for the vegetation zone was 14.2 and the BAM Plot consisted of only 2 of the 26 (8 per cent) of the species listed in the BioNet Vegetation Classification database for PCT 849.</li> </ul> <p>This PCT does not meet the listing criteria for the TEC, <i>Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest</i>, listed under the Commonwealth EPBC Act, based on the following:</p> <ul style="list-style-type: none"> <li>the vegetation community is highly degraded and does not meet the minimum patch size requirement of 0.5 hectares</li> <li>the vegetation community contains &gt;30 per cent exotic perennial understory species.</li> </ul>
<b>Estimate of percent cleared value of PCT (BioNet)</b>	93 per cent (DPIE, 2021f).
<b>PCT 849 - Low</b>	 <p><b>Photo 3 PCT 849, looking north within the subject land</b></p>





**Photo 4 PCT 849, looking west within the subject land**

### **3.1.9 Threatened ecological communities**

Vegetation within the subject land is not consistent with any TECs listed under the NSW BC Act or Commonwealth EPBC Act, as described in Table 3.

## **3.2 Vegetation integrity assessment**

### **3.2.1 Vegetation zones and patch size class**

PCTs within the subject land were assessed and stratified, based on broad condition state, into vegetation zones in accordance with Section 4.3 of the BAM. This resulted in one vegetation zone identified within the development footprint. Table 4 describes each of the zones, and provides details on the numbers of BAM floristic plots carried out in each zone.

Patch size classes for each vegetation zone present within the subject land were assessed as per Section 4.3.2 of the BAM (DPIE, 2020b) using a select process in ArcGIS. All native vegetation with a gap of less than 100 metres from the next area of native vegetation (or  $\leq 30$  metres for non-woody ecosystems), is considered a single patch, with a patch able to extend onto adjoining land.

Native vegetation within the subject land was mapped sequentially and it was found to form part of a very small patch of connecting vegetation with an area of about 0.62 hectares. The connected vegetation comprises all vegetation in a low condition within the subject land, which does not connect to vegetation outside of the subject land.

The minimum patch size that was able to be entered into the BAM-C was 1 hectare.

Patch size classes for each vegetation zone are also outlined in Table 4 below.

**Table 4 Vegetation zones within the subject land**

Vegetation zone	Plant Community Type	Condition (vegetation integrity score)	BAM plots completed	Area (hectares) in subject land	Max. patch size development footprint
<b>VZ 1 - 849_Low</b>	849 Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.	Low: <ul style="list-style-type: none"> <li>composition condition score: 22.2</li> <li>structure condition score: 3.9</li> <li>function condition score: 32.9</li> </ul> Presence of hollow-bearing trees: No	1	0.54	<5 hectares

### 3.2.2 Vegetation integrity

Vegetation integrity, or condition, was assessed using data obtained from undertaking BAM plots within the vegetation zones, as per Section 4.3.4 of the BAM (DPIE, 2020b). Plot data was collected via:

- A 20 metre x 50 metre quadrat and 50 metre transect for assessment of site attributes and function.
- A 20 metre x 20 metre quadrat, nested within the larger quadrat for full floristic survey to determine composition and structure of the PCT.

The minimum number of BAM plots per vegetation zone was determined using Table 3 of the BAM (DPIE, 2020b). A total of one BAM plot has been completed within the vegetation zones present in the development footprint, details are provided in Table 5 and shown on Figure 8.

**Table 5 BAM plots completed within the subject land**

BAM plot reference	Vegetation zone
<b>36175_01</b>	849_Low

Assessment of vegetation integrity was carried out using standard benchmark data as outlined in the BAM and held in the BioNet Vegetation Classification database. A list of flora species was compiled for each BAM plot completed and is included in Appendix 3. Records of all flora species would be submitted to NSW Environment, Energy and Science Group for incorporation into the Atlas of NSW Wildlife.

### 3.2.3 Vegetation integrity score

Plot data was entered into the BAM calculator to determine vegetation integrity score. Plot data are presented in Appendix 3, with vegetation integrity scores for each vegetation zones provided in Table 6.

**Table 6 Vegetation zone integrity scores**

Vegetation zone	Composition score	Structure score	Function score	Vegetation integrity score*	Interim Biogeographic Regionalisation of Australia subregion
<b>849_Low</b>	22.2	3.9	32.9	14.2	Cumberland

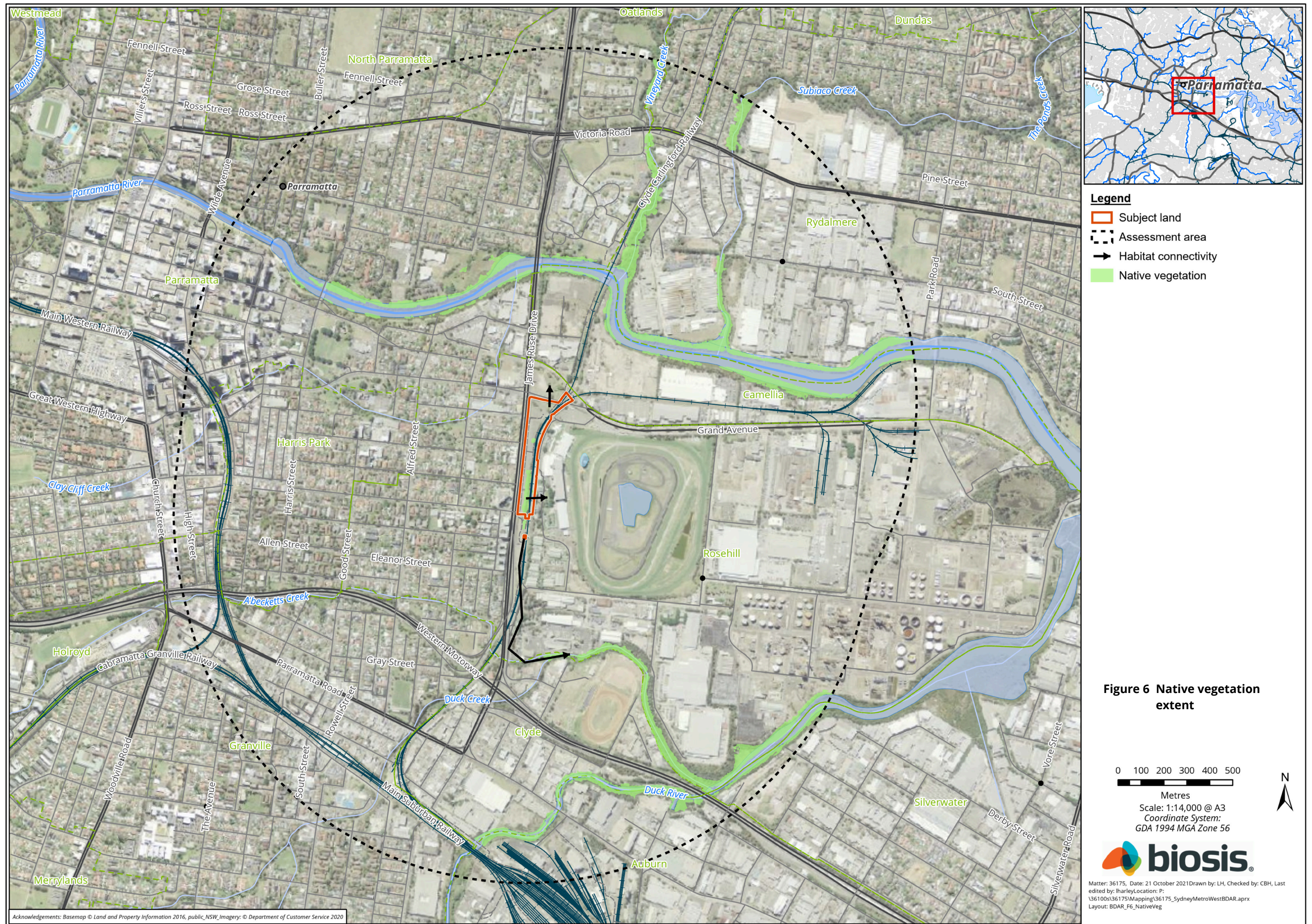
\*Benchmark (pristine) condition vegetation would receive a VI score of 100.

As outlined in Section 10.3.1 of the BAM, an offset is required for impacts on native vegetation where the vegetation integrity score is:

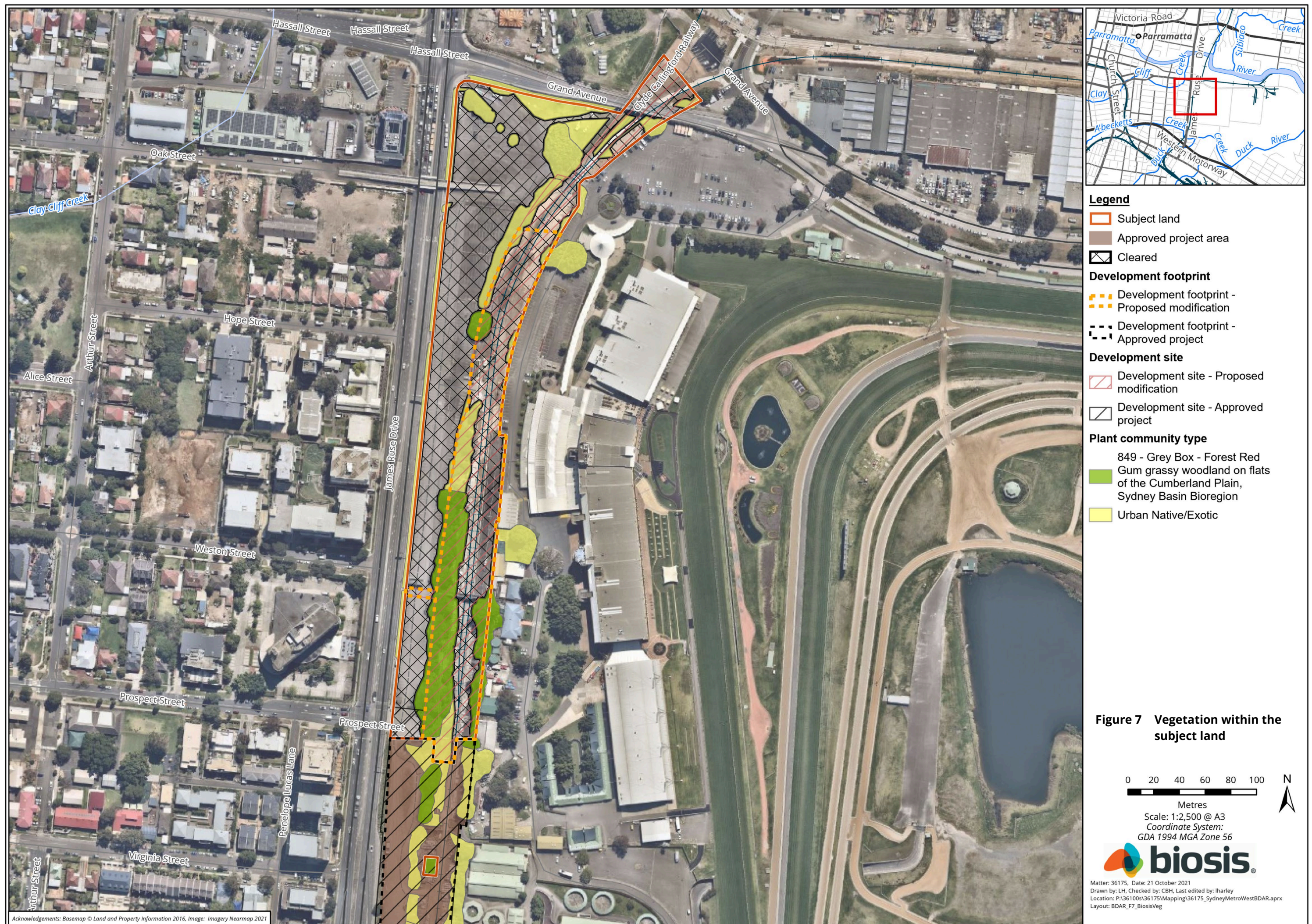
- $\geq 15$  where the PCT is representative of an endangered or critically endangered ecological community
- $\geq 17$  where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community
- $\geq 20$  where the PCT is not representative of a TEC or associated with threatened species habitat.

As such, ecosystem credit offsets are not required for vegetation zone 849\_Low due to its VI score of 14.2.

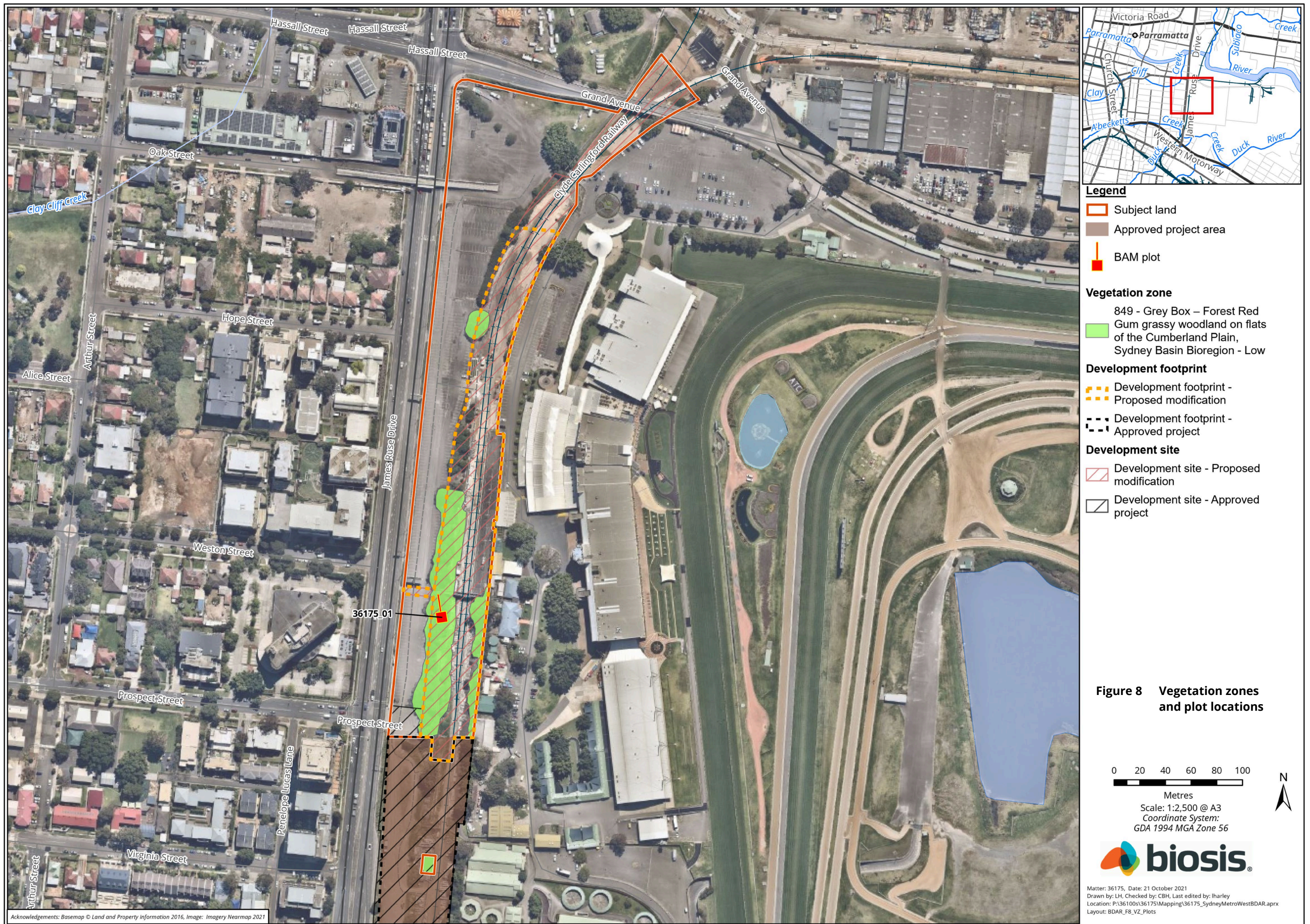




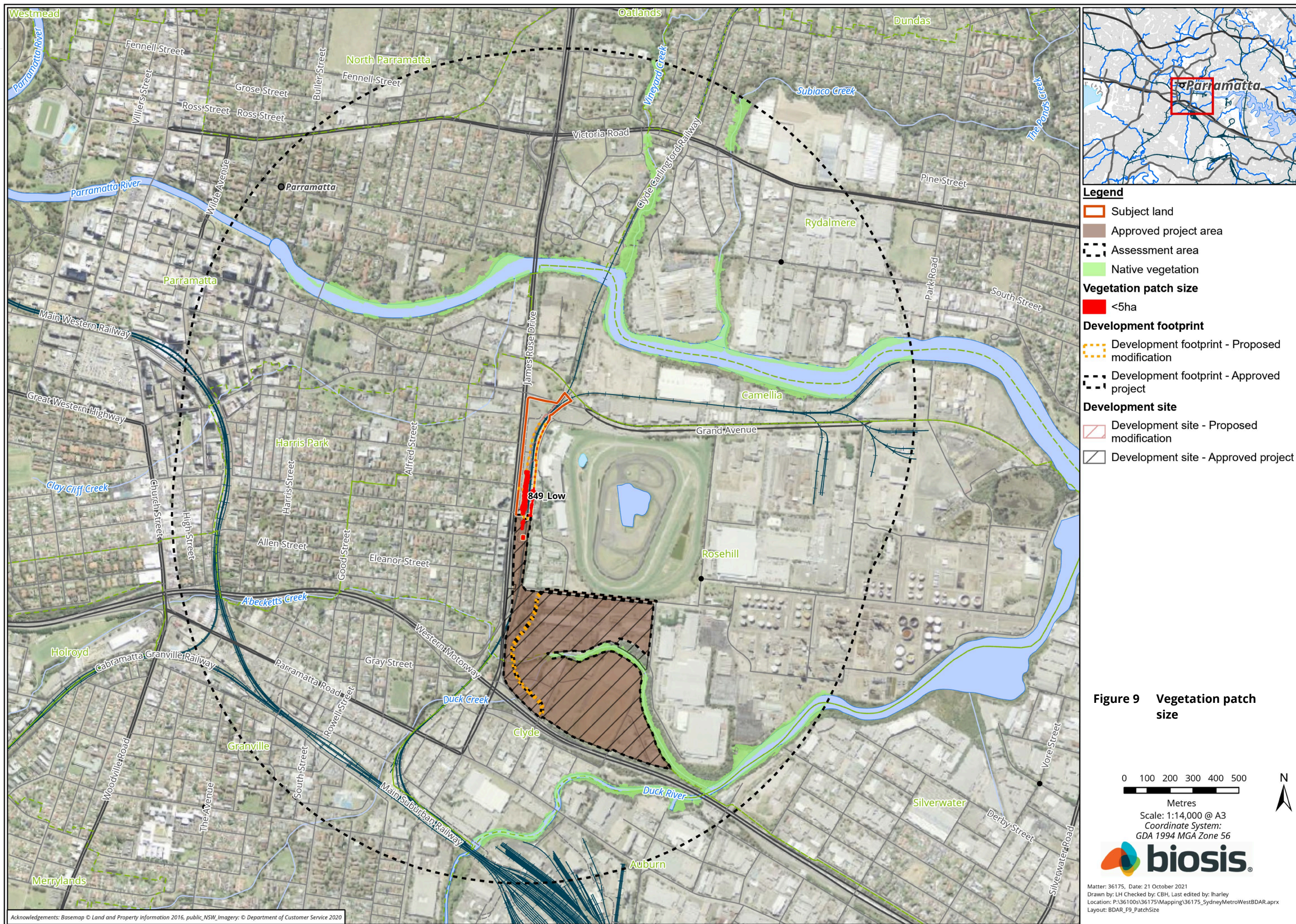














## 4 Threatened species

### 4.1 Ecosystem credit species

A list of predicted species (ecosystem credit species) expected to occur within the subject land was generated as per Section 5 of the BAM. Impacts to these species require assessment, however targeted survey is not required as these species are assumed to occur, based on the occurrence of the PCTs, habitat constraints, native vegetation cover in the landscape and calculated patch sizes. These species are identified as ecosystem credit species in the Threatened Biodiversity Data Collection. Following the precautionary principle, Table 7 lists the ecosystem credit species that could not be discounted, based on geographical restrictions or a lack of suitable habitat, from using the subject land on occasion.

These species were considered when prescribing management and mitigation measures for the proposed modification.

**Table 7 Ecosystem credit species (predicted species) with potential to occur**

Species name	Common name
<i>Artamus cyanopterus</i>	Dusky Woodswallow
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Lathamus discolor</i>	Swift Parrot
<i>Melanodryas cucullata</i>	Hooded Robin (south-eastern form)
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat
<i>Miniopterus australis</i>	Little Bent-winged Bat
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat
<i>Petroica boodang</i>	Scarlet Robin
<i>Petroica phoenicea</i>	Flame Robin
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Stagonopleura guttata</i>	Diamond Firetail

Ecosystem credit species were discounted from occurring within the subject land and justification is shown in Table 8 below. Due to the sensitivity to gain class for the species listed in Table 7, the removal of the species listed in Table 8 has negligible outcomes to the assessment.

**Table 8 Ecosystem credit species (predicted species) removed from assessment**

Species name	Common name	Justification
<i>Anthochaera phrygia</i>	Regent Honeyeater	Key habitat absent from the subject land
<i>Chthonicola sagittata</i>	Speckled Warbler	Key habitat absent from the subject land
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	Key habitat absent from the subject land



Species name	Common name	Justification
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Degraded habitat
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Key habitat absent from the subject land
<i>Phascolarctos cinereus</i>	Koala	Key habitat absent from the subject land

## 4.2 Species credit species

Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence, or components of their habitat. These candidate species are identified as species credit species in the Threatened Biodiversity Data Collection. A targeted survey or an expert report is required to confirm the presence of these species on the subject land, or alternatively the species can be assumed to be present (DPIE, 2020b).

Appendix 2 provides the lists of species credit species predicted to occur within the subject land based on the Interim Biogeographic Regionalisation of Australia subregion within which the proposed modification occurs, the native vegetation cover present within the 1500 metre buffer area, the PCTs present within subject land, and patch sizes listed in Table 4.

The potential for a species to occur within the subject land was assessed in accordance with Section 5.2 of the BAM and species with geographical restrictions, or habitat constraints not present, were not required to be assessed. A total of 15 predicted species credit species have been excluded from occurring within the subject land based on a lack of suitable habitat, substantial degradation of existing potential habitat and lack of required microhabitat features.

A detailed assessment of potential for occurrence, and potential for impact, for all species credit species predicted to occur within the subject land is provided in Appendix 2. Species credit species considered to potentially occur within the subject land, and thus considered 'candidate species credit species' have been assumed present, as no expert reports were utilised and no targeted survey were carried out.

All candidate species credit species considered as part of this assessment, and their associated method of assessment, are listed in Table 9 (flora species).

### Threatened flora

Habitats for threatened flora species within the subject land are considered degraded due to the high degree of management, clearing and degradation. Vegetation is heavily weed infested and provides limited habitat for native threatened flora species. This comprises the habitats associated with all of the PCT 849 vegetation within the subject land.

Table 9 provides a list of candidate flora species credit species considered in this assessment, each species' required survey period and the relevant method of assessment. Further detail of the targeted surveys carried out are provided below.

**Table 9 Candidate flora species credit species**

Species name	Common name	Survey period	Method of assessment
<i>Acacia pubescens</i>	Downy Wattle	Year-round	Targeted survey

## Threatened fauna

Fauna habitat assessment was carried out to determine whether the vegetation to be impacted by the proposed development contained microhabitats suitable to support the candidate fauna species credit species, as outlined in Appendix 2. The subject land is located within a highly urbanised area that does not possess large expanses of intact native vegetation with high biodiversity value. There is limited habitat for threatened fauna within the subject land.

There are no candidate fauna species credit species considered in this assessment, due to the degraded nature of the subject land. Southern Myotis *macropus* was assumed present during the assessment for the approved project (Sydney Metro, 2020a), however the subject land for the proposed modification lacks hollow-bearing trees and there are no waterways within 200 metres of the subject land. Therefore Southern Myotis is not considered a candidate species under the current modification assessment (Appendix 2).

### 4.2.1 Threatened species survey details

Targeted threatened species surveys of the subject land were carried out 11 October 2021. Weather observations are shown in Table 10.

**Table 10 Weather observations during targeted flora and fauna surveys (Sydney, NSW)**

Survey carried out	Survey date	Temperature (degrees Celsius)		Rain (millimetres)
		Minimum	Maximum	
Downy Wattle	11 October 2021	10.1	15.7	11.6

Information from the Australia Government Bureau of Meteorology website.

Details of surveys carried out as part of the current assessment are provided below.

## Threatened Flora

Targeted flora survey was carried out for candidate species in accordance with *Surveying threatened plants and their habitats* (DPIE 2020).

### Survey method and effort

Survey methods included:

- 15 metres separated transect searches of areas of potential habitat in October 2021.

### Justification of survey method and effort

Survey guidelines followed included:

- Section 5 of the BAM to determine the potential for threatened species identified under the BAM as 'ecosystem credit species' and 'species credit species' to occur (DPIE, 2020b)
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC, 2004)
- *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (DPIE, 2020d).

### Timing of survey

Survey was conducted in relation to requirements in the Threatened Biodiversity Data Collection survey guides in October 2021.

## Survey personnel and relevant experience

Targeted flora surveys were carried out by the Biosis ecologists outlined in Table 11.

**Table 11 Targeted flora survey personnel and relevant experience**

Staff member	Role	Relevant experience
Rebecca Dwyer	Team Leader – Ecology BAM Accredited Assessor	Over 15 years' experience undertaking targeted flora surveys in Western Sydney.

## Results

Table 12 provides a summary of the results of the targeted flora surveys completed. Figure 10 provides the location of threatened flora recorded.

**Table 12 Summary of targeted flora survey method and results**

Species name	Common name	Survey method	Survey results	Species Polygon (hectares)
<i>Acacia pubescens</i>	Downy Wattle	<ul style="list-style-type: none"> <li>15 metres separated transect searches of areas of potential habitat</li> <li>11 October 2021.</li> </ul>	Yes, recorded during surveys.	0.14

## Limitations

Field surveys were carried out in accordance with the BAM. Ecological surveys provide a sampling of flora at a given time and season. Factors influencing detectability of species during survey include species dormancy, seasonal conditions, ephemeral status of waterbodies and observer experience.

The field survey was conducted in spring during rainy and cool weather after a period of warm dry weather, which is a suitable time to determine the presence of most threatened flora species. The surveys were conducted by an experienced Botanists through all suitable habitat and are sufficient for the detection of the candidate species listed.

## Downy Wattle *Acacia pubescens* population assessment

### Survey method and effort

A survey of the Downy Wattle population was carried out on 19 October 2021 by Rebecca Dwyer (Team Leader – Ecology / BAM Accredited Assessor) to determine the size of the population and inform the Commonwealth Significant Impact Criteria assessment.

Survey methods included:

- a desktop review of all known NSW BioNet records of Downy Wattle within a 15 kilometre radius of the subject land
- a site inspection of 22 known record locations within publicly accessible land to verify the records from between Bankstown, Fairfield, Rookwood and Parramatta local government areas
- recording additional Downy Wattle observations, as well as condition
- confirmation of the number of stems within each location
- confirmation of the habitat type and condition of each location.

## Results

Table 13 provides a summary of the results of the Downy Wattle population surveys completed.

**Table 13 Summary *Acacia pubescens* population survey results**

Location	Confirmed Y/N	Habitat type and condition	Estimated number of stems
Vales Lane, Auburn	N	Highly developed unable to locate. Likely removed by development.	0
Adept Lane Reserve, Bankstown	Y	Cooks River Castlereagh Ironbark Forest. Intact remnant vegetation located within a fenced Council reserve. Recruitment observed.	100
Brancourt Reserve, Brancourt Avenue, Bankstown	N	Highly modified unable to locate. Likely removed or died.	0
Louisa Reserve, Johnston Road, Bass Hill	Y	Cooks River Castlereagh Ironbark Forest. Intact remnant vegetation located within a Council reserve. Recruitment observed.	500
Boggabilla Reserve, Johnston Road, Bass Hill	Y	Cooks River Castlereagh Ironbark Forest. Intact remnant vegetation located within a Council reserve. Recruitment observed.	50
Carysfield Park, Hume Highway, Bass Hill	Y	Cooks River Castlereagh Ironbark Forest. Intact remnant vegetation located within a Council reserve. Recruitment observed.	1,200
Thornton Reserve, Thornton Avenue, Bass Hill	Y	Cooks River Castlereagh Ironbark Forest. Intact remnant vegetation located within a Council reserve. Recruitment observed.	200
Corner of Johnston and Craysfield Road, Bass Hill	Y (new record)	Highly modified Cooks River Castlereagh Ironbark Forest. Located in Council reserve in managed garden surrounded by mown grass.	10
Corner of Fairfield Road and Foray Street, Condell Park	N	Highly developed unable to locate. Likely removed by development.	0
Fairfield Indigenous Flora Park, Christie Street, Fairfield	Y	Maintained garden within Fairfield Indigenous Flora Park. Currently protected and managed as part of the park.	25
Campbell Hill Reserve, Barbers Road, Guildford	Y	Cumberland Plain Woodland. Intact remnant vegetation located within a Council reserve.	10
Landsdowne Regional Park, Henry Lawson Drive, Landsdowne	Y	Cumberland Plain Woodland. Intact remnant vegetation located within a Council reserve. Recruitment observed.	1,500
Mirambeena Reserve, Henry Lawson Drive, Landsowne	Y	Cumberland Plain Woodland. Partially modified / intact remnant vegetation located within a Council reserve. Recruitment observed.	100

Location	Confirmed Y/N	Habitat type and condition	Estimated number of stems
Wonga Road, Prestons	Y	Cooks River Castlereagh Ironbark Forest. Intact remnant vegetation located within a Council reserve. Recruitment observed.	200
Rookwood Cemetery, East Street, Rookwood	Y	Cooks River Castlereagh Ironbark Forest. Intact remnant vegetation located within a fenced area on cemetery grounds. Recruitment observed.	200
Elizabeth Farm, Alice Street Rosehill	N	Unable to locate within reserve. Potentially within Elizabeth Farm building grounds, unable to access due to locked gate.	0
Smithfield Cemetery, Victoria Street, Smithfield	Y	Cooks River Castlereagh Ironbark Forest. Intact remnant vegetation located within vacant land adjacent to the cemetery. Recruitment observed.	50
114 Victoria Street, Smithfield	N	Highly developed, unable to locate. Likely removed by development.	0
Duck Reserve, Wellington Road, South Granville	Y	Cooks River Castlereagh Ironbark Forest. Intact remnant vegetation located within a Council reserve. Recruitment observed.	400
Golden Wattle Reserve, Biloela Street, Villawood	N	Highly modified waterway, unable to locate. Highly developed unable to locate. Likely removed or died.	0
Yagoona Railway Station, Yagoona	Y	Planted vegetation. Located within rail corridor, highly modified, and threatened by weeds.	10
Denhouston Avenue Yennora	Y	Cooks River Castlereagh Ironbark Forest. Intact remnant vegetation located within a Council reserve. Recruitment observed.	200
Total			4,655

### Fauna habitat assessments

Fauna habitat assessment was carried out to determine the presence of microhabitats and other critical habitat components (habitat constraints) suitable for all fauna species outlined in Appendix 2. Habitat assessments focussed on the presence of the following features within the subject land:

- habitat trees including large and/or hollow-bearing trees, stick nests, availability of flowering shrubs and canopy/understorey feed tree species
- soil type and presence of cliffs, overhangs and other rocky areas
- condition and type of native vegetation and the presence of exotic species
- presence and condition of pools and waterways
- quantity of ground litter and woody debris

- searches for indirect evidence of fauna (i.e. feathers, tracks and scats)
- general degradation of the site as a result of past and current disturbances such as vegetation clearing and industrial land management practices
- topography and landscape morphology
- presence of Flying-fox camps.

Several habitat features with potential to support threatened species credit species were identified during these habitat assessments. These features have been summarised in Table 14.

**Table 14 Habitat features with potential to support threatened species credit species**

Habitat feature	Presence within the development footprint
<b>Hollow-bearing trees</b>	Habitat trees supporting hollows were absent from the subject land.
<b>Feed tree species</b>	Tree species identified as Koala use trees within the Central Coast Koala management area, which includes the subject land, were detected during the assessment however the subject land is degraded and does not provide adequate foraging resources for Koala. Trees and shrubs providing food resources for transient foraging birds and mammals such as Swift Parrot and Grey-headed Flying-fox were also recorded.
<b>Caves and rocky overhangs</b>	There are no caves or rocky overhangs within the subject land.
<b>Rocky outcrops and sandstone crevices</b>	There are no rocky outcrops or sandstone crevices within the subject land.
<b>Major and minor watercourses and waterbodies (i.e. dams)</b>	Minor watercourses to the south of the development footprint include Duck Creek and A'Becketts Creek, with the Parramatta River occurring outside of the subject land to the north. The banks of these rivers and the supporting vegetation along these systems provide potential habitat for amphibians. Riparian areas also have the potential to support threatened fauna species in a fragmented landscape such as the one relevant to the proposed modification. Large old trees, more likely to support tree hollows, are more common in riparian corridors. No waterways are to be impacted as a result of the proposed modification. Impacts to waterways within the development footprint, outside of the subject land are detailed in the approved project BDAR (Sydney Metro, 2020a).
<b>Woody debris and leaf litter</b>	Woody debris and leaf litter recorded within the subject land occur in highly degraded, heavily weed infested, narrow, small and isolated patches of vegetation. These vegetation patches have also been subject to historical ground disturbance. These areas do not provide habitat for Cumberland Plain Land <i>Snail Meridolum corneovirens</i> or Dural Land Snail <i>Pommerhelix duralensis</i> as they do not provide suitable leaf litter or woody debris in a natural state, as the vegetation is degraded and isolated.

Field capture of detailed fauna habitat information allowed for confirmation of presence/absence of habitat features and microhabitats for a range of candidate threatened species across surveyed portions of the development footprint and impact assessment area. Fauna habitat assessments were captured using ArcGIS polygons attributed with specific habitat criteria that allowed for assumption of presence, or the exclusion of the potential for occurrence of various candidate species from the subject land.

No targeted fauna surveys were carried out as part of the current assessment, as there are no candidate fauna species credit species with suitable microhabitats.

#### **4.2.2 Incidental surveys**

No additional threatened species were recorded during incidental surveys carried out as part of the current assessment.







#### 4.2.3 Local data

No local data has been used for threatened species assessment.

#### 4.2.4 Expert reports

Sections 5.2 and 5.3 of the BAM outlines that an expert report may be obtained instead of undertaking a species survey, where the expert report is prepared by a person who, in the opinion of the Environment Agency Head, possesses specialised knowledge based on training, study or experience to provide an expert opinion in relation to the biodiversity values to which an expert report relates (DPIE, 2020b).

No expert reports were utilised for the current assessment.

#### 4.2.5 Threatened species summary and polygons

Table 15 provides details of threatened species impacted by the proposed modification and outlines the attributes that comprise the threatened species polygons. The presence of threatened species impacted by the proposed modification is shown on Figure 11.

**Table 15 Threatened species polygons within the development footprint and impact assessment area**

Threatened species	Impact (hectares)	Unit of measure	Biodiversity risk weighting	Polygon attributes
<b>Flora</b>				
<b><i>Downy Wattle</i></b> <b><i>Acacia pubescens</i></b>	0.14, including: <ul style="list-style-type: none"> <li>0.13 hectares within the additional area required for construction</li> <li>0.01 hectares within the approved project area.</li> </ul>	Area	2	30 metre buffer around individuals, applying to PCT 849 within the subject land.







## Stage 2 – Impact assessment (biodiversity values)

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## 5 Avoid and minimise impacts

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This section demonstrates the efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposed modification location in accordance with BAM, including an analysis of alternatives:

- modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology
- routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route
- alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location
- alternative sites within a property on which the proposed modification is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site
- efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through Concept design
- other site constraints that the proponent has considered in determining the location and design of the proposed modification.

### 5.1 Actions to avoid/minimise impacts

The principal means to reduce impacts on biodiversity values within the development site is to avoid and/or minimise the removal of native vegetation and fauna habitat.

Figure 12 shows the final development footprint, while Figure 13 shows alternative footprints considered to avoid or minimise impacts on biodiversity values, the final footprint (including construction and operation) as well as demonstrating indirect impact zones where applicable is shown in Figure 14.

The subject land is located within a highly urbanised area that does not possess large expanses of intact native vegetation with high biodiversity value. The vegetation is of poor quality and provides limited habitat for threatened species. Opportunities to avoid impacts are limited due to the small, isolated and nature of the biodiversity values present. As the majority of the works would be in pre-existing built-up areas, direct impacts to terrestrial biodiversity have been avoided and/or minimised. The proposed modification would result in minimal disturbance of native vegetation.

Where this disturbance cannot be avoided, impacts would be minimised through standard construction and environmental management mitigation measures (such as pre-clearance inspections, where appropriate).

The approved project was driven by the identified strategic need to improve connectivity between Greater Parramatta and the Sydney CBD. The process included consideration of alignment options, analysis of options for station locations, analysis of options for a stabling and maintenance facility, and analysis of options for the approach to tunnelling.

As per the approved BDAR and Environmental Impact Statement (Sydney Metro, 2020a), four strategic alignment and service alternatives were evaluated by Sydney Metro, including:

- four to five stations from Parramatta CBD to the Sydney CBD (inclusive) ('Metro Express'). This option would achieve a higher speed but service a small amount of stations. This option was found to be limited in its ability to service a large catchment due to a minimal number of stations
- nine to ten stations from Parramatta to the Sydney CBD (inclusive) ('Metro Rapid'), with anchor precincts at Parramatta, Sydney Olympic Park, The Bays and Sydney CBD. This option was found to achieve a balance between an efficient travel time between Greater Parramatta and Sydney CBD, and the ability to service a large catchment area and key precincts
- about 11 to 12 stations from Greater Parramatta to the Sydney CBD (inclusive) ('Metro Local South'). This option would service a large catchment due to a higher number of stations yet result in a higher travel time (greater than the optimum time of about 20 minutes) between Greater Parramatta and the Sydney CBD
- an 11 to 12 station option north of Parramatta River ('Metro Local North'). However this alignment would be unable to service key precincts including Sydney Olympic Park.

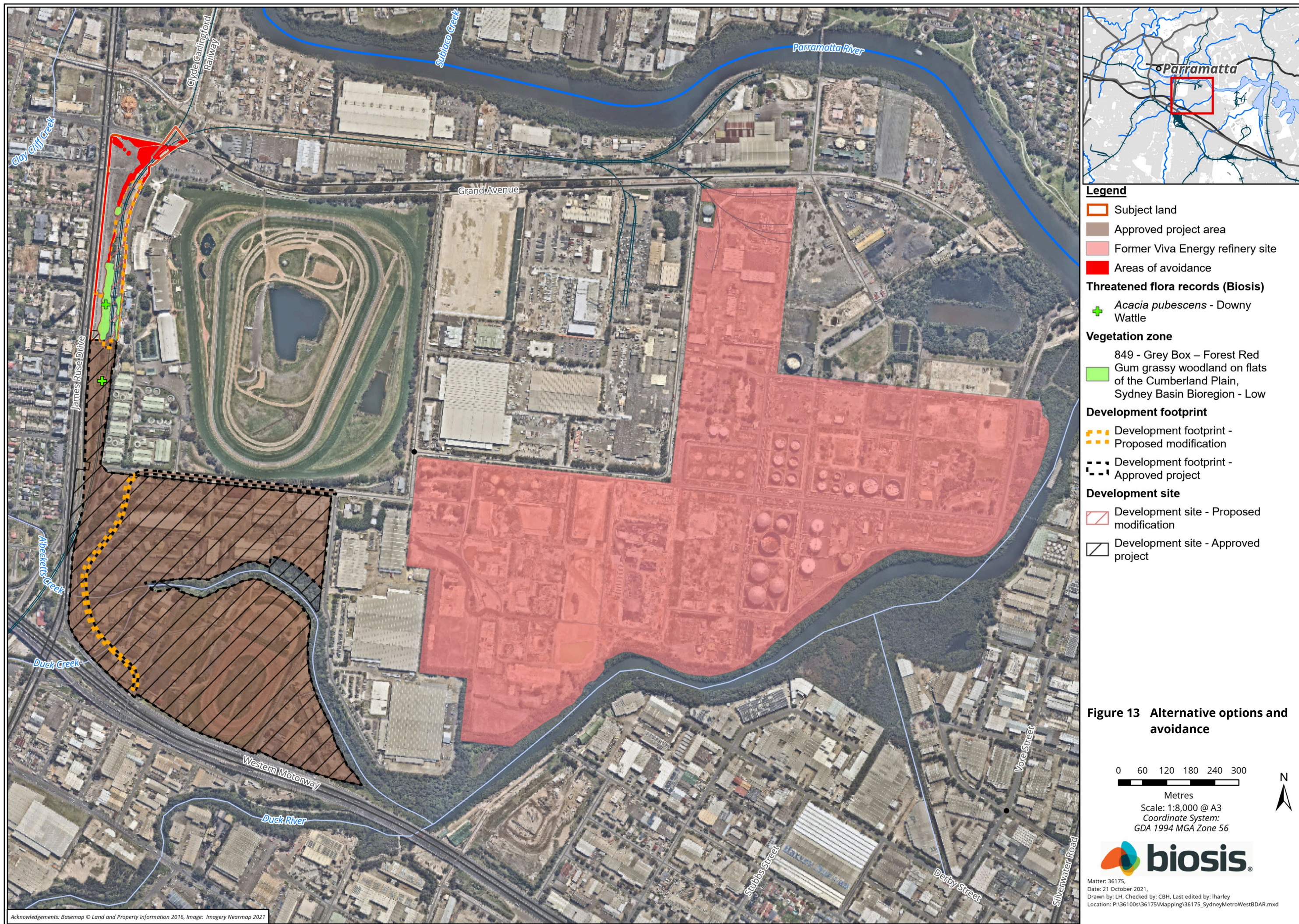
Measures taken to avoid and minimise impact for the broader Sydney Metro West project were outlined in The Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD (Sydney Metro, 2020a). In summary:

- the approved project as a whole is located within a highly urbanised area that does not possess large expanses of intact native vegetation with high biodiversity value. The majority of the approved project will be underground or in pre-existing built-up areas and therefore direct impacts to terrestrial biodiversity have been avoided and/or minimised. The approved project will result in minimal disturbance of native vegetation. Where this disturbance cannot be avoided, the vegetation is generally of poor to moderate quality and/or provides limited habitat for threatened species
- the alternative option considered for the stabling and maintenance facility included for former Viva Energy refinery site on the west bank of the Duck River at Rosehill. This option would have:
  - been directly adjacent to known habitat for the threatened Green and Golden Bell Frog Parramatta Key Population and would have potentially impacted non-breeding and movement habitat for this species
  - directly impacted on a patch of saltmarsh that is known to contain a population of the threatened plant *Wilsonia backhousei*
  - resulted in a larger direct impact to mangroves compared to the approved project.











## 6 Impacts that are unable to be avoided

Assessment of direct and indirect impacts unable to be avoided has been carried out in accordance with the BAM (DPIE, 2020b). The following direct and indirect impacts are unable to be avoided in progressing the proposed development.

### 6.1 Direct impacts

Direct impacts include vegetation clearing calculated from the area of proposed lot boundaries, roads and easements for service infrastructure.

Direct impacts arising from the proposed modification include:

- removal of 0.44 hectares of native vegetation comprising 0.44 hectares of low condition PCT 849
- removal of 0.14 hectares of Downy Wattle habitat (including 0.13 hectares within the additional area required for construction and 0.01 hectares within the approved project area), which is part of the 0.44 hectares of native vegetation
- removal of 0.44 hectares of Grey-headed Flying-fox and Swift Parrot sub-optimal foraging habitat, which is part of the 0.44 hectares of native vegetation.

These impacts would be permanent and would occur from the outset of the development. Mitigation measures outlined in Section 7 would help to minimise the potential impacts to biodiversity values that remain present within the subject land.

A summary of PCTs/zones directly impacted is demonstrated in Table 16 and species credit habitat or individuals in Table 17.

**Table 16 Summary of direct impacts to vegetation**

Zone	PCT	TEC	Area within subject land (hectares)	Area impacted development footprint (hectares)	VI Score
<b>Approved project</b>					
<b>849_Poor</b>	<i>Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion</i>	No	0.03	0.03	11.4
<b>920_Poor</b>	<i>Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion</i>	No	0.15	0.15	34.6
<b>Proposed modification</b>					
-	Urban Native/Exotic	No	0.67	0.18	-
<b>849_Low</b>	<i>Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion</i>	No	0.54	0.44	14.2

**Table 17 Summary of direct impacts species credit habitat or individuals**

Species	Sensitivity to gain class	Area (hectares)
<b>Approved project</b>		
<b>Southern Myotis</b>	High Sensitivity to Potential Gain	0.15
<b>Proposed modification</b>		
<b>Downy Wattle</b>	High Sensitivity to Potential Gain	0.14, including: <ul style="list-style-type: none"> <li>0.13 hectares within the additional area required for construction</li> <li>0.01 hectares within the approved project area.</li> </ul>

## 6.2 Indirect impacts

Potential indirect impacts arising from the proposed modification are outlined and addressed in Table 18 and shown in Figure 14. Native and Urban Native/Exotic vegetation adjacent to the development footprint within the subject land is considered to be subject to indirect impacts.

**Table 18 Avoidance and minimisation of impact**

Indirect impact	Assessment/likelihood of occurrence
<b>Inadvertent impacts on adjacent habitat or vegetation</b>	Impacts to adjacent vegetation can be prevented or minimised through appropriate exclusion fencing, implementation of the Sydney Metro Construction Environmental Management Framework detailing best practice environmental protection measures, strict water quality practices and stormwater controls, and by ensuring any lighting is directed towards the developed area, rather than towards the adjacent retained habitats.
<b>Reduced viability of adjacent habitat due to edge effects</b>	Adjacent habitats are currently subject to a high degree of edge effects due to prior clearing and surrounding existing urban industrial and residential land use. Since little (0.44 hectares) native vegetation is to be removed from the subject land, an increase to edge effects is not expected to occur to the remnant vegetation surrounding the subject land, as a result of the proposed development.
<b>Reduced viability of adjacent habitat due to noise, dust or light spill</b>	It is predicted that the adjacent habitat would be impacted in a small way by noise, dust and light spill, during construction and operation of the future development of the subject land. However, this would be managed via best practices outlined in the Sydney Metro Construction Environmental Management Framework. The subject land also already occurs as an urban industrial and residential area, and light and noise pollution is most likely moderate. This would likely not substantially increase due to the proposed future development. Any potential impacts are not considered significant as it is highly unlikely that species abundance would be diminished.

Indirect impact	Assessment/likelihood of occurrence
<b>Transport of weeds and pathogens from the site to adjacent vegetation</b>	Weeds occurring within the subject land are common with those occurring within adjacent vegetation to be retained. Increased transport of pathogens and weeds is unlikely to occur, however would be managed by biosecurity measures outlined in the Construction Environmental Management Framework.
<b>Increased risk of starvation, exposure and loss of shade or shelter</b>	The habitat present in the subject land considered marginal for most fauna species given the disturbed condition, however is potential foraging habitat for Grey-headed Flying-fox and Swift Parrot. The proposed future development would not result in an increased risk of starvation, exposure and loss of shade or shelter to native species due to the small total area of vegetation being removed, and is a very small proportion of commensurate habitats available in the immediate vicinity.
<b>Loss of breeding habitats</b>	No specialist breeding habitat would be impacted by the proposed future development. Retained vegetation in adjacent riparian corridors provides higher quality habitat and would not be reduced by the proposed modification.
<b>Trampling of threatened flora species</b>	Downy Wattle was recorded in the subject land, which would be removed as part of the proposed modification. No other threatened flora species were found, or are considered likely to occur, within the subject land, and thus trampling of threatened flora species is unlikely.
<b>Inhibition of nitrogen fixation and increased soil salinity</b>	Any future excavations or soil disturbance resulting from the future development of the subject land would be largely restricted to areas having undergone substantial previous disturbance through vehicular traffic. As such it is not considered likely that the future development of the subject land would result in substantial changes to the level of nitrogen fixation or soil salinity in the locality.
<b>Fertiliser drift</b>	The site has a long history of disturbance over its total extent as a result of industry. The proposed modification would not contribute to fertiliser drift into surrounding areas with future practices. No fertiliser is proposed to be used.
<b>Rubbish dumping</b>	Standard environmental controls for the development would ensure potential impacts are minimised. Works would follow an approved Waste Management Plan.
<b>Wood collection</b>	Future development proposed within the subject land is unlikely to increase access to any retained vegetation, beyond current access capacity. Based on the future industrial use of the subject land, future landholders are not expected to be likely to undertake wood collection within retained vegetation in adjacent lots.
<b>Removal and disturbance of rocks, including bush rock</b>	The subject land does not support bush rock.
<b>Increase in predators</b>	The subject land already occurs within an urbanised setting with pets, feral predators, and avian predators moderately common. The subject land is already largely cleared. The remaining vegetation clearance proposed by the development, and proposed land use, is unlikely to increase predatory species populations.

Indirect impact	Assessment/likelihood of occurrence
<b>Increase in pest animal populations</b>	The subject land occurs in an urbanised area with impacts including introduced domestic pets such as cats <i>Felis catus</i> currently occurring within the locality. Pest animals such as Rats <i>Rattus rattus</i> are also widely spread within the region and are likely to occur across the locality. The proposed modification would not result in an increase in available habitat for these species and is unlikely to lead to an increase in pest animal populations. Suitable waste disposal implemented during and post construction would further reduce the resources available for pest species.
<b>Changed fire regimes</b>	The proposed modification occurs in an urbanised area. Appropriate asset protection zones and fire mitigation systems would be implemented for the future development and the proposed modification would not result in an increased risk of fire.
<b>Disturbance to specialist breeding and foraging habitat, e.g. Beach nesting for shorebirds</b>	The proposed modification would impact 0.44 hectares of heavily fragmented sub optimal foraging habitat for Grey-headed Flying-fox and Swift Parrot. The proposed modification is unlikely to constitute substantial disturbance, as there are higher quality patches of foraging habitat in the locality. See Section 8.2 and Appendix 4 for further assessment of these impacts in the associated SIC assessment.
<b>Fragmentation of movement corridors</b>	Movement corridors are currently restricted in width and availability through the locality. The proposed modification would result in the removal of 0.44 hectares of native vegetation, from a heavily fragmented area, and is unlikely to further fragment movement corridors. Remnant vegetation exists along nearby riparian corridors which would remain intact and not be fragmented.

## 6.3 Prescribed impacts

Assessment of prescribed biodiversity impacts are outlined and addressed in Table 19 below and shown in Figure 15.

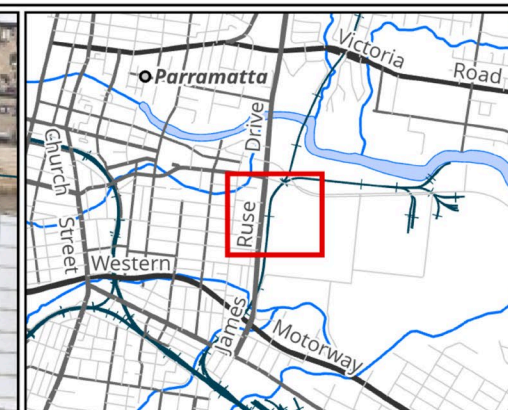
**Table 19 Assessment of prescribed impacts**

Prescribed impact	Assessment/likelihood of occurrence
<b>Karst, caves, crevices, cliffs, rocks and other geological features of significance</b>	There are no occurrences of karst, caves, crevices and cliffs or other geological features of significance within the subject land. There are no occurrences of rocks or rocky habitats within the subject land or threatened species or ecological communities associated with rocks.
<b>Occurrences of human-made structures and non-native vegetation</b>	Threatened species that can use human made structures as habitat that may be affected by the proposed modification include Large Bent-winged Bat, Eastern Coastal Free-tailed Bat, Little Bent-winged Bat and Southern Myotis. There are no human made structures in the subject land that would be suitable for these bats to use as roosting habitat. The buildings are subject to a high amount of human use so would be marginal at best roosting sites.  Due to the marginal, non-natural, structure of the vegetation present, non-native vegetation it is unlikely to be used as breeding habitat by any threatened species. Grey-headed Flying-fox and Swift Parrot are considered



Prescribed impact	Assessment/likelihood of occurrence
	likely to forage on the flowers and/or fruit of both planted and exotic trees within the subject land.
<b>Corridors or other areas of connectivity linking habitat for threatened entities</b>	<p>The subject land is located within a highly disturbed landscape where the majority of habitats have been cleared. The habitats that do remain are fragmented and highly isolated. The vegetated riparian zones of Duck Creek and A'Becketts Creek to the south of the subject land provide the most obvious movement corridors, however these are outside of the subject land and would only be impacted by the development footprint of the approved project.</p> <p>Urban Native/Exotic vegetation is present in the development footprint, which would be impacted by the proposed modification. Clearing of this Urban Native/Exotic vegetation is considered a prescribed impact, as removal of Urban Native/Exotic vegetation may constitute removal of foraging habitat for Swift Parrot and Grey-headed Flying-fox.</p>
<b>Water bodies or any hydrological processes that sustain threatened entities</b>	<p>There are no water bodies or hydrological processes that sustain threatened entities that are to be impacted within the subject land.</p> <p>Groundwater dependent ecosystems that may be impacted indirectly are discussed in the approved project BDAR and is of no further consequence following the modification assessment (Sydney Metro, 2020a).</p>
<b>Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community</b>	<p>Vehicle collision is a direct impact that reduces local population numbers and is a common occurrence in Australia. Mammals, reptiles, amphibians and birds are all at risk of vehicle strike, particularly those common species (e.g. birds) that are tolerant of disturbance and remain in the subject land.</p> <p>The risk of increased vehicle strike due to the proposed modification is low and would generally be limited to vehicle movements to and from the construction site, which would typically be on existing busy roads. Vehicle strike associated with the proposed modification is unlikely to affect any threatened species of animals or animals that are part of a TEC.</p>





- Legend**
- Subject land
  - Approved project area
  - Indirect impacts
- Development footprint**
- Development footprint - Proposed modification
  - Development footprint - Approved project
- Development site**
- Development site - Proposed modification
  - Development site - Approved project

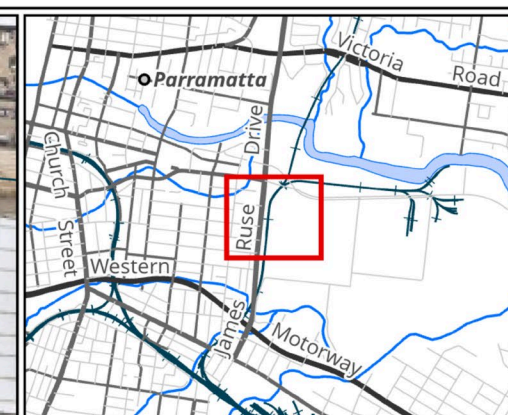
**Figure 14 Estimated zones of indirect impact**

0 20 40 60 80 100  
Metres  
Scale: 1:2,500 @ A3  
Coordinate System:  
GDA 1994 MGA Zone 56



Matter: 36175,  
Date: 21 October 2021,  
Drawn by: LH, Checked by: CBH, Last edited by: Iharley  
Location: P:\36100s\36175\Mapping\36175\_SydneyMetroWestBDAR.mxd





#### Legend

- Subject land
- Approved project area
- Prescribed impacts
- Development footprint**
- Development footprint - Proposed modification
- Development footprint - Approved project
- Development site**
- Development site - Proposed modification
- Development site - Approved project

**Figure 15 Prescribed impacts**

0 20 40 60 80 100

Metres

Scale: 1:2,500 @ A3  
Coordinate System:  
GDA 1994 MGA Zone 56



Matter: 36175,  
Date: 21 October 2021,  
Drawn by: LH, Checked by: CBH, Last edited by: lharley  
Location: P:\36100s\36175\Mapping\36175\_SydneyMetroWestBDAR.mxd



## 6.4 Key threatening processes

There are currently 39 KTPs listed under the BC Act, 21 KTPs under the EPBC Act, and eight listed under the FM Act. Several KTPs are listed under more than one Act. KTPs relevant to the proposed modification are discussed in Table 20. Mitigation measure to limit the impacts of these KTPs are detailed in Section 7.

**Table 20 KTPs potentially introduced or impacted by the proposed modification**

Key threatening process	Status	Proposed modification impacts
<b>Native vegetation and terrestrial habitat impacts</b>		
<b>Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners <i>Manorina melanocephala</i> (Latham, 1802)</b>	EPBC Act BC Act	The proposed modification is not likely to increase the effect of this KTP within the subject land due to the already fragmented nature of the landscape. No habitat modifications are proposed that would preferentially favour this species.
<b>Bushrock removal</b>	BC Act	The subject land does not currently support bushrock and therefore this KTP would not be increased by the proposed modification.
<b>Land clearance/Clearing of native vegetation</b>	EPBC Act BC Act	Clearing of native vegetation would occur as a result of the proposed modification. A total of 0.44 hectares of native vegetation is proposed to be cleared across one PCT, which is not considered a TEC. This is in addition to 0.15 hectares to be removed as part of the approved project (Sydney Metro, 2020a).
<b>Loss or degradation (or both) of sites used for hill-topping by butterflies</b>	BC Act	The landscape across the study area is predominantly flat lack of prominent hill-slopes. There is unlikely to be impacts to potential hill-topping sites. Topographical changes that would result in loss or degradation of hill-topping sites are unlikely.
<b>Loss of hollow-bearing trees</b>	BC Act	A small amount of native vegetation would be removed for the proposed modification (0.44 hectares), however no hollow-bearing trees were recorded within the study area.
<b>Removal of dead wood and dead trees</b>	BC Act	The vegetation to be removed contains dead wood. Mitigation measures are provided in Section 7 to limit the potential for impacts to native biota as a result of removal of dead wood.
<b>Biosecurity impacts</b>		
<b>Competition and grazing by the feral European Rabbit <i>Oryctolagus cuniculus</i></b>	EPBC Act BC Act	The proposed modification may lead to increased competition and grazing pressures exhibited by European Rabbit due to the decrease in native vegetation available for foraging habitat for native species.
<b>Competition and habitat degradation by Feral Goats <i>Capra hircus</i></b>	EPBC Act BC Act	The proposed modification is unlikely to result in a significant increase of this KTP due to the urban land use surrounding the subject land.
<b>Competition from feral Honey Bees <i>Apis mellifera</i></b>	BC Act	The proposed modification is unlikely to cause a significant increase in competition from feral Honey Bees.

Key threatening process	Status	Proposed modification impacts
<b>Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners <i>Manorina melanophrys</i></b>	BC Act	The proposed modification is unlikely to result in a significant increase in psyllid and Bell Miner activity that would result in this KTP.
<b>Habitat degradation and loss by Feral Horses (brumbies, wild horses) <i>Equus caballus</i></b>	BC Act	The proposed modification is unlikely to result in a significant increase of this KTP due to the urban land use surrounding the subject land.
<b>Herbivory and environmental degradation caused by feral deer</b>	BC Act	The proposed modification is unlikely to result in a significant increase of this KTP due to the urban land use surrounding the subject land.
<b>Infection by Psittacine Circoviral (beak and feather) disease affecting endangered psittacine species and populations</b>	EPBC Act BC Act	The proposed modification is unlikely to result in a significant increase of this KTP.
<b>Infection of frogs by amphibian chytrid causing the disease chytridiomycosis</b>	EPBC Act BC Act	Construction work has the potential to introduce amphibian chytrid to the subject land, which could lead to death of frogs and tadpoles. Biosecurity mitigation measures detailed in Section 7 would mitigate the risk of the introduction of this disease within the study area.
<b>Infection of native plants by <i>Phytophthora cinnamomi</i></b>	EPBC Act BC Act	Increased human visitation and movement as well as increased vehicle traffic around the study area has the potential to introduce or spread the pathogen <i>Phytophthora cinnamomi</i> . Mitigation measures, including the development of a pathogen management plan, are provided in Section 7.
<b>Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae</b>	BC Act	Biosecurity mitigation measures included in Section 7 would further prevent the risk of spread of this pathogen.
<b>Invasion and establishment of exotic vines and scramblers</b>	BC Act	Vegetation within the study area has the potential to be invaded by exotic vines and scramblers. Vehicles and plant have the potential to introduce propagules of exotic vines and scramblers, as could soil disturbance during construction work. Details of biosecurity measures are included in Section 7 to limit the spread of weeds.
<b>Invasion and establishment of Scotch Broom <i>Cytisus scoparius</i></b>	BC Act	The proposed modification is unlikely to result in a significant increase of this KTP. Biosecurity measures outlined in Section 7 would ensure this does not occur.
<b>Invasion and establishment of the Cane Toad</b>	EPBC Act BC Act	The KTP is not relevant to the proposed modification.

Key threatening process	Status	Proposed modification impacts
<b>Invasion, establishment and spread of Lantana</b>	BC Act	Lantana was not recorded within the subject land but is already prevalent within urban vegetation. This KTP is likely to be exacerbated on-site without the implementation of weed management. Biosecurity measures to mitigate the establishment and spread of weed species are made in Section 7.
<b>Invasion of native plant communities by African Olive <i>Olea europaea</i> subsp. <i>cuspidata</i></b>	BC Act	The proposed modification is unlikely to result in a significant increase of this KTP. Biosecurity measures in Section 7 would help mitigate this KTP.
<b>Invasion of native plant communities by <i>Chrysanthemoides monilifera</i></b>	BC Act	The proposed modification is unlikely to result in a significant increase of this KTP. Biosecurity measures in Section 7 would help mitigate this KTP.
<b>Invasion of native plant communities by exotic perennial grasses</b>	BC Act	Parts of the study area have been subject to previous disturbances (including existing road corridors, industrial work, and residential housing), as a result there are exotic weed species already present in the study area. Weeds may also be introduced due to an increase in edge areas as part of construction. Vehicles and plant could further spread exotic grass species, as could soil disturbance during vegetation clearing and construction. There is also the potential for perennial exotic grasses to invade retained and nearby native vegetation through proposed modification work. The implementation biosecurity mitigation measures outlined in Section 7 would limit the spread of weeds.
<b>Invasion of the Yellow Crazy Ant</b>	BC Act	The KTP is not relevant to the proposed modification.
<b>Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants</b>	EPBC Act BC Act	The proposed modification is unlikely to result in a significant increase in the effect of this KTP. The implementation of biosecurity mitigation measure outlined in Section 7 would mitigate the chance of garden plant escape and spread as a result of proposed modification work.
<b>Predation and hybridisation by Feral Dogs <i>Canis lupus familiaris</i></b>	BC Act	The proposed modification may lead to an increase in the incidence of this species by providing an increase in access routes through the subject land, but any increase is not expected to be significant relative to current levels.
<b>Predation by European Red Fox</b>	EPBC Act BC Act	The proposed modification may lead to an increase in the incidence of this species by providing an increase in access routes through the subject land, but any increase is not expected to be significant relative to current levels.
<b>Predation by the Feral Cat <i>Felis catus</i></b>	EPBC Act BC Act	The proposed modification may lead to an increase in the incidence of this species by providing an increase in access routes through the subject land, but any increase is not expected to be significant relative to current levels.
<b>Predation, habitat degradation, competition and disease transmission by Feral Pigs <i>Sus scrofa</i></b>	EPBC Act BC Act	The proposed modification is unlikely to result in a significant increase of this KTP due to the urban land use surrounding the subject land.



Key threatening process	Status	Proposed modification impacts
<b>Aquatic impacts</b>		
<b>Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands</b>	BC Act	The proposed modification is unlikely to result in this KTP as there are no waterways in the subject land. However, there are several waterways within the approved project development footprint that have been assessed in the Environmental Impact Statement (Sydney Metro, 2020a).
<b>Degradation of native riparian vegetation along New South Wales water courses</b>	FM Act	The proposed modification is unlikely to result in this KTP as there are no waterways in the subject land. However, there are several waterways within the approved project development footprint that have been assessed in the Environmental Impact Statement (Sydney Metro, 2020a).
<b>Installation and operation of instream structure and other mechanisms that alter natural flow regimes of rivers and streams</b>	FM Act	The proposed modification is unlikely to result in this KTP as there are no waterways in the subject land. However, there are several waterways within the approved project development footprint that have been assessed in the Environmental Impact Statement (Sydney Metro, 2020a).
<b>Introduction of fish to waters within a river catchment outside their natural range</b>	FM Act	The proposed modification is unlikely to result in this KTP as there are no waterways in the subject land.
<b>Predation by <i>Gambusia holbrooki</i></b>	BC Act	Construction and vegetation clearing adjacent to waterways both have the potential to introduce and/or spread Eastern Gambusia between waterways, however there are no waterways in the subject land. As such the proposed modification is unlikely to lead to an increase in predatory activity by this species.
<b>Removal of large woody debris from New South Wales rivers and streams</b>	FM Act	The proposed modification is unlikely to result in this KTP as there are no waterways in the subject land.
<b>Anthropogenic impacts</b>		
<b>Anthropogenic Climate Change</b>	EPBC Act BC Act FM Act	The proposed modification would be constructed utilising primarily diesel powered machinery and plant. While all machinery would be operated and maintained in good operational working order to reduce emission, the construction of the proposed modification would result in the emission of greenhouse gases and would therefore contribute to climate change. In the longer term, the potential mode shift from road to rail and Sydney Metro's commitment to offset 100 per cent of operational electricity emissions would potentially reduce greenhouse gas emissions.
<b>High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition</b>	BC Act	The proposed modification is unlikely to result in a significant increase of this KTP.

## 6.5 Impacts considered uncertain

There are no impacts considered uncertain for the current assessment.

## 6.6 Impacts to groundwater dependent ecosystems

Assessment of the potential for the subject land to support groundwater dependant ecosystems was carried out using the Commonwealth's Bureau of Meteorology Groundwater Dependant Ecosystems Atlas (BOM, 2019). The subject land is not mapped as supporting groundwater dependant ecosystems associated with an aquifer in Appendix 8 of the *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (DPI, 2012). Groundwater dependant ecosystems that may be impacted indirectly are discussed in the approved project BDAR (Sydney Metro, 2020a). The subject land is not mapped as having Groundwater Vulnerability (*Parramatta Local Environmental Plan 2011*).

## 6.7 Aquatic habitat impacts relating Fisheries Management Act matters

There are no aquatic habitat impacts relating to the *Fisheries Management Act 1994* for the proposed modification.

## 6.8 Impacts to Matters of National Environmental Significance (MNES)

An assessment of the impacts of the proposed development on Matters of National Environmental Significance (MNES), against heads of consideration outlined in Department of Agriculture, Water and the Environment's *Matters of National Environmental Significance, Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (DoE, 2013) was prepared to determine whether referral of the proposed development to the Commonwealth Minister for the Environment is required. MNES relevant to the proposed development are summarised in Table 21.

**Table 21 Assessment of the proposed development against the EPBC Act**

MNES	Proposed modification specifics	Impact
<b>Threatened species</b>	One EPBC Act listed threatened plant species, Downy Wattle, would be impacted by the proposed modification. 73 EPBC Act listed threatened fauna species have been considered as part of this assessment. Two species are likely to be impacted by the proposed modification. Targeted surveys for threatened fauna was not carried out during the assessment of the proposed modification.	A SIC has been prepared for Downy Wattle, Grey-headed Flying-fox and Swift Parrot (See Appendix 4). The SIC assessments concluded the proposed modification is not likely to have a significant impact on Downy Wattle, Grey-headed Flying-fox or Swift Parrot. Therefore, a Commonwealth referral is not required for impacts to Downy Wattle, Grey-headed Flying-fox or Swift Parrot.

MNES	Proposed modification specifics	Impact
<b>Threatened ecological communities</b>	None of the PCTs within the development site correspond to EPBC Act listed TECs. There would be no direct impacts to EPBC Act listed TECs. Indirect impacts to groundwater dependant ecosystems that are EPBC Act listed TECs outside the subject land may occur due to groundwater drawdown or reductions in baseflow to nearby creeks, as outlined in the approved project BDAR (Sydney Metro, 2020a). No additional impacts, beyond those for the approved project BDAR are considered likely to occur.	No significant impact likely.
<b>Migratory species</b>	Based on the results of the PMST, seven listed migratory species may occur in the broader locality (see Appendix 2). Migratory species are unlikely to occur within the subject land given the location in the landscape.	No direct impact is expected to any migratory listed species.
<b>National Heritage Places</b>	The subject land does not contain any National Heritage Places.	No significant impact likely.
<b>Wetlands of international importance (Ramsar sites)</b>	The subject land does not contain any wetlands of international or national importance.	No significant impact likely.



## 7 Mitigation and management of impacts

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Identification of measures to mitigate or manage impacts has been carried out in accordance with the BAM (DPIE, 2020b), including considerations such as:

- techniques, timing, frequency and responsibility
- identification of measures for which there is risk of failure
- evaluation of the risk and consequence of any residual impacts
- documentation of any adaptive management strategy proposed.

Identification of measures for mitigating impacts related to:

- displacement of resident fauna
- indirect impacts on native vegetation and habitat
- mitigating prescribed biodiversity impacts
- details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain.

Once all practicable steps to avoid or minimise impacts have been implemented at the detailed design phase, mitigation and management measures would be implemented to further lessen the potential ecological impacts of the proposed modification. Mitigation measures would be implemented during construction and would be outlined in a Flora and Fauna Management Plan (refer to Appendix D (Construction Environmental Management Framework) of the Environmental Impact Statement) (Sydney Metro, 2020a).

Mitigation measures for impacts outlined for the approved project (Sydney Metro, 2020a) and the proposed modification are detailed below. Mitigation measures B1 and B2 are not relevant to the proposed modification due to the absence of waterways.

**Table 22 Measures to mitigate and manage impacts**

Reference	Impact/issue	Mitigation measure	Applicable location(s)
<b>B1</b>	Impacts to fish passage.	During construction, sufficient flow and fish passage would be maintained similar to current conditions during in-stream works where feasible and reasonable.	Clyde stabling and maintenance facility.
<b>B2</b>	Impacts of proposed creek crossings.	<p>The A'Becketts Creek and Duck Creek crossings would be designed to:</p> <ul style="list-style-type: none"> <li>• provide sufficient fish passage in accordance with Policy and guidelines for fish habitat conservation and management (DPI, 2013)</li> <li>• incorporate suitable scour protection</li> <li>• avoid worsening of existing flow velocities downstream from the crossing locations</li> <li>• incorporate a vegetated riparian zone within the realigned open channel sections, where feasible and reasonable.</li> </ul>	Clyde stabling and maintenance facility.
<b>B3</b>	Impacts to groundwater dependent ecosystems.	Additional investigations and assessment would be completed to confirm the potential for impacts to groundwater dependent ecosystems due to groundwater drawdown, and to identify any required mitigation through design.	Westmead Metro Station, Parramatta Metro Station, Clyde stabling and maintenance facility, North Strathfield Metro Station, Burwood North Station, Five Dock Station.

## 7.1 Adaptive management strategy

Construction management plans would all contain an adaptive management component. Adaptive management strategies would be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and are key to the successful implementation of crucial objectives yet also allow flexibility to changing dynamics and ongoing feedback and results. This includes measures to monitor predicted and uncertain impacts which would trigger adaptive management actions and allow for effective and quick responses. The Sydney Metro Construction Environmental Management Framework would be implemented during works.



## 8 Impact summary

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### 8.1 TECs and threatened species

This section outlines the impact summary for the proposed modification which has identified and assessed impacts on TECs and threatened species that are at risk of a Serious and Irreversible Impact including:

- addressing all criteria for each TEC listed as at risk of a Serious and Irreversible Impact present on the subject land
- addressing all criteria for each threatened species at risk of a Serious and Irreversible Impact present on the subject land
- documenting assumptions made and/or limitations to information
- documenting all sources of data, information, references used or consulted
- clearly justifying why any criteria could not be addressed
- identification of impacts requiring offset
- identification of impacts not requiring offset
- identification of areas not requiring offset.

There are no TECs within the subject land.

Figure 16 shows the location of impacts requiring offset, impacts not requiring offset and areas not requiring assessment.

### 8.2 Serious and irreversible impacts

In accordance with Clause 6.7 of the BC Regulation an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

- a) principle 1: It will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline*
- b) principle 2: It will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size*
- c) principle 3: It is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution*
- d) principle 4: The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.*

There are no species or communities within the subject land considered to meet the above principles which would be impacted by the proposed modification. No further assessment is required.



## 8.3 Identification of impacts requiring offset

### 8.3.1 Impacts to native vegetation (ecosystem credits)

As outlined in Section 9.2.1 of the BAM, the assessor must determine an offset for all impacts of the proposed modification on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- a)  $\geq 15$ , where the PCT is representative of an EEC or a CEEC
- b)  $\geq 17$ , where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
- c)  $\geq 20$ , where the PCT does not represent a TEC and is not associated with threatened species habitat.

On this basis, offsets are not required for vegetation zone 849\_Low as it has a vegetation integrity score is less than 17.

The offset requirement for the proposed modification was calculated using the BAM Calculator. Table 23 provides a summary of the ecosystem credit offsets required for impacts from approved project and proposed modification.

**Table 23 Offsets required (ecosystem credits)**

Vegetation zone	Area (hectares)	Impact	VI score	Offset required	TEC	Hollow-bearing trees	Credit requirement
<b>Approved project</b>							
<b>920_Poor</b>	0.15	Clearance	34.6	Yes, 10:1 ratio, 1.5 hectares required	No	No	3
<b>Proposed modification</b>							
<b>849_Low</b>	0.44	Clearance	14.2	No	No	No	0
<b>Total</b>	<b>0.59</b>	-	-	-	-	-	<b>3</b>

### 8.3.2 Impacts to threatened species and their habitat

As outlined in Section 9.2.2 of the BAM an offset is also required for the impacts of the proposed modification on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score of  $\geq 17$ .



The offset requirement for the proposed modification was calculated using the BAM Calculator. Table 24 provides a summary of the species credit offsets required for impacts from proposed development at the subject land.

**Table 24 Offsets required (species credits)**

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (hectares)	Biodiversity risk weighting	Credit requirement
<b>Approved project</b>					
<b>920_Poor</b>	Southern Myotis	11.4	0.15	2	3
<b>Proposed modification</b>					
<b>849_Low</b>	Downy Wattle	14.2	0.14, including: <ul style="list-style-type: none"> <li>0.13 hectares within the additional area required for construction</li> <li>0.01 hectares within the approved project area.</li> </ul>	2	1
<b>Total</b>	-	-	<b>0.28</b>	-	<b>4</b>

Species polygons for the above one species credit species impacted by the proposed modification is shown in Figure 16 below.

## 8.4 Identification of impacts not requiring offset

Following assessment, the following impacts from the proposed modification do not require offsetting in accordance with BAM:

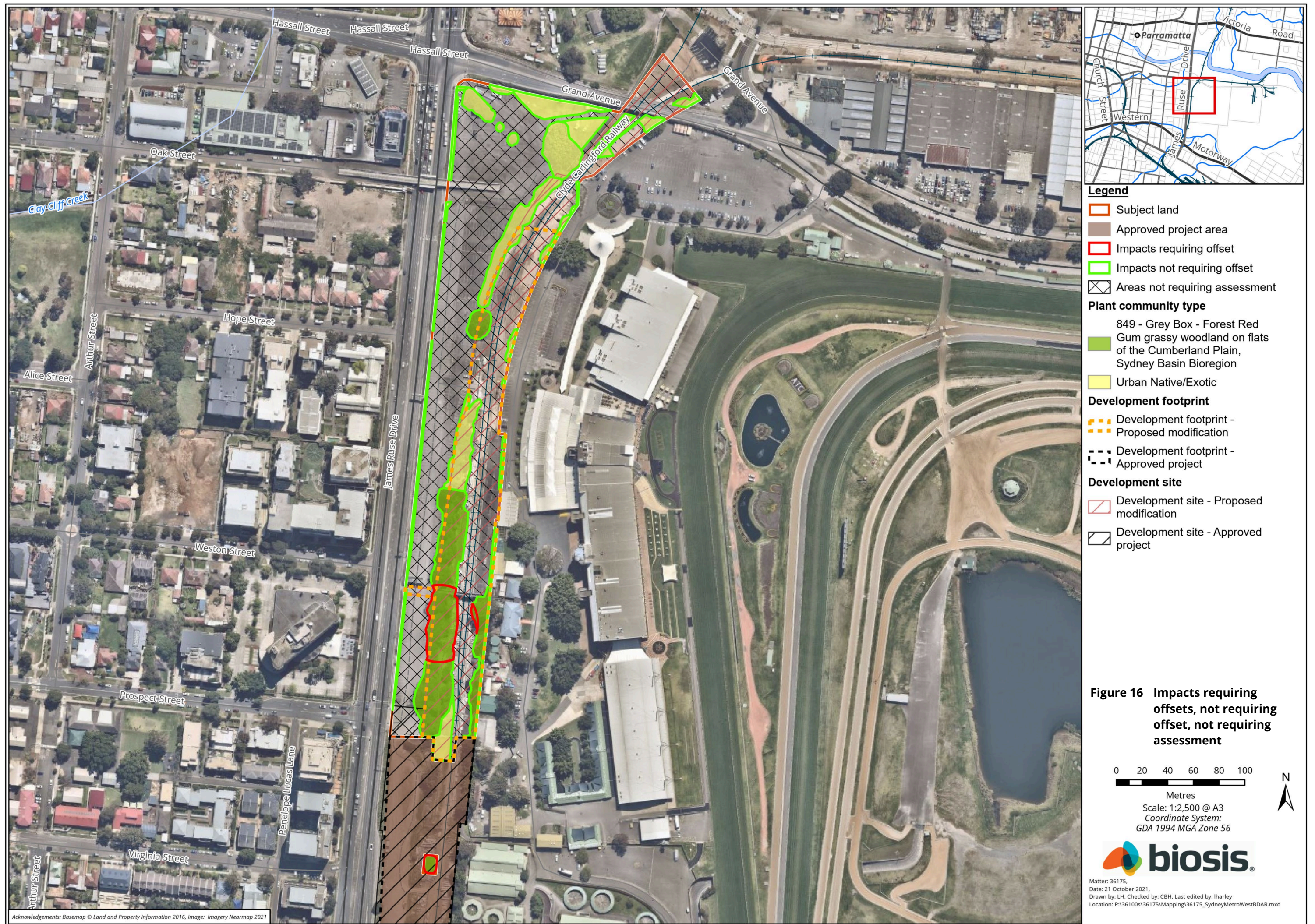
- removal of 0.48 hectares of vegetation, including:
  - 0.18 hectares of Urban Native/Exotic vegetation
  - 0.44 hectares PCT 849 in low condition as it has a vegetation integrity score of less than 17.

## 8.5 Identification of areas not requiring assessment

Following assessment, the following areas within the proposed modification do not require assessment in accordance with BAM:

- removal of 3.00 hectares of cleared land.







## 9 Biodiversity credit report

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Offsetting through the transfer and retirement of biodiversity credits, or paying into the BCT Offset Fund, is required for the current assessment for impacts to one vegetation zone at the subject land. A biodiversity credit report is provided on the following pages.



# BAM Credit Summary

## Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00028651/BAAS17067/21/00028652	36175 - Sydney Metro West Clyde Modification	10/06/2021
Assessor Name	Report Created	BAM Data version *
Rebecca E. Dwyer	22/10/2021	45
Assessor Number	BAM Case Status	Date Finalised
BAAS17067	Open	To be finalised
Assessment Revision	Assessment Type	
0	Major Projects	

\* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

## Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAIL	Ecosystem credits
<b>Cumberland shale plains woodland</b>											
1	849_Low	Not a TEC	14.2	14.2	0.44			High Sensitivity to Potential Gain	2.50		0
										<b>Subtotal</b>	<b>0</b>
										<b>Total</b>	<b>0</b>



### Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Species credits
<b><i>Acacia pubescens</i> / Downy Wattle ( Flora )</b>								
849_Low	14.2	14.2	0.15	Vulnerable	Vulnerable	2	False	1
<b>Subtotal</b>								<b>1</b>



## References

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## Appendices

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## Appendix 1 Survey methods

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### Appendix 1.1 Nomenclature

The flora taxonomy (classification) used in this report follows the most recent Flora of NSW (Harden, 1992, 1993, 2000, 2002). All doubtful species names were verified with the on-line Australian Plant Name Index (Australian National Botanic Gardens, 2007). Flora species, including threatened species and introduced flora species, are referred to by both their common and then scientific names when first mentioned. Subsequent references to flora species cite the common names only, unless there is no common name, for which scientific name would be used. Common names, where available, have been included in threatened species tables and the complete flora list in Appendix 3.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by the Department of Agriculture, Water and the Environment (DSEWPaC, 2009). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only.

### Appendix 1.2 Permits and licences

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by NSW Environment, Energy and Science Group (SL100758, expiry date 31 March 2022). The BAM Assessment and quality review of the BDAR was carried out by Accredited Assessor Rebecca Dwyer (#BAAS17067).

### Appendix 1.3 Limitations

Field surveys were carried out in accordance with the BAM. Ecological surveys provide a sampling of flora and fauna at a given time and season. Factors influencing detectability of species during survey include species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. In many cases, these factors do not present a substantial limitation to assessing the overall biodiversity values of a site.

The field survey was conducted in spring during rainy and cool weather after a period of warm dry weather, which is a suitable time to determine the presence of most threatened species. One candidate flora species credit species was considered in the current assessment due to the high level of disturbance to vegetation, the survey of which was carried out during the appropriate survey period. There were no candidate fauna species credit species, and no targeted fauna survey was carried out.

Surveys carried out, combined with habitat assessments and desktop analysis are considered sufficient to reach the conclusions herein in regards to this and all other species' likelihood of occurrence within the subject land.

Database searches, and associated conclusions on the likelihood of species to occur within the assessment area, are reliant upon external data sources and information managed by third parties.



## Appendix 2 BAM Candidate species assessment

Table A-1 Threatened flora species assessment

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Acacia bynoeana</i></b> <b>Bynoe's Wattle</b>	VU	EN	Yes	Semi prostrate shrub growing in central eastern NSW spanning from the Hunter District, west to the Blue Mountains and south to the Southern Highlands. Grows in a variety of communities including; Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Prefers open, slightly disturbed sites on sandy soils.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.
<b><i>Acacia pubescens</i></b> <b>Downy Wattle</b>	VU	VU	Yes	A spreading shrub primarily confined to the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows in Cooks/River Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland, usually within roadside and bushland remnants. Grows on shale, sandstone, alluvium and gravelly soils, often including ironstone.	High	Yes	Yes	Yes	Habitat within the subject land is suitable for this species due to it being known to grow in disturbed roadside vegetation or bushland and being primarily found in the Bankstown-Fairfield-Rookwood area. The species has been identified within the subject land.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Caladenia tessellata</i></b> <b>Thick Lip Spider Orchid</b>	VU	EN	Yes	Small orchid recorded from the Wyong, Ulladulla and Braidwood regions with the Kiama and Queanbeyan populations believed to be extinct. Found in a wide variety of communities including Central Gorge Dry Sclerophyll Forests, Cumberland Dry Sclerophyll Forests, Coastal Floodplain Woodlands and Subalpine Woodlands. Grows on clay loam or sandy soils.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.
<b><i>Callistemon linearifolius</i></b> <b>Netted Bottle Brush</b>	-	VU	No	Shrub recorded from the Georges River to the Hawkesbury River, north of the Nelson Bay area and south at Coalcliff in the Illawarra region. Grows on the coast and adjacent ranges in a variety of communities including Cumberland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Sydney Coastal Heaths and North Coast Wet Sclerophyll Forests.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.
<b><i>Cryptostylis hunteriana</i></b> <b>Leafless Tongue Orchid</b>	VU	VU	No	Orchid with a distribution spanning from Gibraltar Range National Park southwards to the coastal area near Orbost in Victoria. Grows in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Coastal Heath Swamps, New England Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows in sandy soils.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land. This species has not been recorded within 10 kilometres of the subject land.



Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Cynanchum elegans</i></b> <b>White-flowered Wax Plant</b>	-	-	Yes	Climbing vine restricted to eastern NSW from Brunswick Heads to Gerroa in the Illawarra region. Grows in rainforest gully scrub and scree slope on the edge of dry rainforests in a variety of communities including Coastal Floodplain Wetlands, Maritime Grasslands, Coastal Valley Grassy Woodlands and Northern Hinterland Wet Sclerophyll Forests.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land. This species has not been recorded within 10 kilometres of the subject land.
<b><i>Darwinia peduncularis</i></b>	-	VU	No	Spreading shrub growing in disjunct populations ranging from the Blue Mountains, Berowra, Hornsby and Glen Davis areas. Grows on or near rocky outcrops in a variety of communities including Central Gorge Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, and Sydney Coastal Heaths. Grows in well drained, low nutrient sand soils on sandstone substrates.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land. Habitat within the subject land is not suitable for this species due to its preference to grow in rocky areas.
<b><i>Dillwynia tenuifolia</i></b>	-	VU	Yes	Low, spreading shrub restricted to the Cumberland Plain in Western Sydney. Grows in scrubby or heathy areas within a variety of communities including Castlereagh Ironbark Forest, Shale Gravel Transition Forest, Castlereagh Scribbly	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
				Gum Woodland and Sydney Hinterland Dry Sclerophyll Forests. Grows on tertiary alluvium, laterised clays and in shale-sandstone transitions.					
<b><i>Eucalyptus benthamii</i> Camden White Gum</b>	VU	VU	Yes	Tall tree confined to the lower Nepean area with two major subpopulations located at Kedumba Valley in Blue Mountains National Park and at Bents Basin State Recreation Park. Grows along valley floors within riparian flood zones at elevations between 30 - 300m in Central Gorge Dry Sclerophyll Forests, Sydney Sand Flats Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Eastern Riverine Forests and Coastal Valley Grassy Woodland Grows in sandy, alluvial soils.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land. This species has not been recorded within 10 kilometres of the subject land.
<b><i>Eucalyptus camfieldii</i> Camfield's Stringybark</b>	VU	VU	No	Mallee tree restricted to a narrow band stretching from Raymond Terrace to the north and Waterfall in the south. Grows in scattered, localised distributions including sites at Norah Head, Terrey Hills, North Head, Menai, Mt Colah, Peats Ridge and Elvina Bay Trail. Grows in scattered stands near the boundaries of tall coastal heath and low open woodland in a variety of communities including	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.



Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
				Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, Sydney Coastal Heaths and Wallum Sand Heaths. Grows in sandy soils on Hawkesbury sandstone.					
<b><i>Genoplesium baueri</i></b> <b>Bauer's Midge Orchid</b>	EN	EN	No	Terrestrial orchid with 13 populations totalling 200 plants distributed between Ulladulla and Port Stephens. Grows on moss gardens in a variety of communities including Sydney Coastal Dry sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths, Southern Lowland Wet Sclerophyll Forests and Sydney Hinterland Dry Sclerophyll Forests. Grows on sandstone substrates	Low	No	No	No	Potential habitat within subject land highly disturbed and unsuitable for this species. Grows on moss beds in a variety of communities on sandstone substrates, which is not present within the subject land.
<b><i>Grevillea juniperina</i> subsp. <i>juniperina</i></b> <b>Juniper-leaved Grevillea</b>	-	VU	Yes	Spreading to erect medium sized shrub endemic to Western Sydney with a distribution spanning from Blacktown, Erskine Park, Londonderry and Windsor and outlying populations at Kemps Creek and Pitt Town. Grows at elevations <50 metres in Cumberland Plain Woodland, Castlereagh Ironbark Forest, Castlereagh Scribbly Gum Woodland, Shale/Gravel Transition Forest, Sydney Sand Flats Dry Sclerophyll Forests and Coastal Valley Grassy Woodlands. Grows in sandy to clay loam soils and red pseudolateritic gravels derived from Wianamatta Shale and Tertiary Alluvium.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Hibbertia spanantha</i></b> <b>Julian's Hibbertia</b>	CR	CR	No	Grows in forest with canopy species including Eucalyptus pilularis, E. resinifera, Corymbia gummifera and Angophora costata. The understorey is open with species of Poaceae, Orchidaceae, Fabaceae and Liliaceae. The soil is identified as a light clay occurring on a shale sandstone soil transition.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land. Forest habitat is not present within the subject land.
<b><i>Hibbertia superans</i></b>	-	EN	No	Low spreading shrub recorded from 16 sites with a distribution spanning from Baulkham Hills to South Maroota. Grows on sandstone ridgetops near shale/sandstone transitions in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Northern Hinterlands Wet Sclerophyll Forests, Coastal Valley Grassy Woodlands, and Sydney Coastal Heaths. Grows on sandstone substrates.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.
<b><i>Leptospermum deanei</i></b>	VU	VU	No	Medium sized shrub confined to the Hornsby, Warringah, Ku-ring-gai and Ryde Local Government Areas. Grows on forested or woodland slopes or near creeks in Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, and Sydney Coastal Heaths. Grows on sandy alluvial soil or sand soils over sandstone substrates.	Low	No	No	No	Potential habitat dominated by exotic vegetation within subject land. The species does prefer to grow in close proximity to waterbodies, however vegetation within the subject land is disturbed and therefore the species has a low likelihood of occurrence.



Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Macadamia integrifolia</i></b> <b>Macadamia Nut</b>	VU	-	No	Medium sized tree found growing from Mount Bauple, near Gympie to Currumbin Valley in the Gold Coast hinterland in south-east Queensland. Occurs in the Northern Rivers region of NSW in remnant rainforest, mixed notophyll forest and rainforest margins.	Low	No	No	No	Rainforest habitat not present within the subject land and the habitat is highly disturbed and degraded.
<b><i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population</b> <b>(<i>Marsdenia viridiflora</i> R. Br. subsp. <i>viridiflora</i> population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas)</b>	-	EN	Yes	A climber with twining stems to 4 metres high that grows in vine thickets and open shale woodland. Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Previously known north from Razorback Range.	Low	No	No	No	Possible habitat is highly disturbed and degraded within the subject land.
<b><i>Melaleuca deanei</i></b> <b>Deane's Paperbark</b>	VU	VU	No	Medium sized shrub found growing in two distinct populations in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas along with a few outliers at Springwood and in the Wollemi National Park, Yalwal and the Central Coast regions. Grows in ridgetop woodland in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, South East Dry Sclerophyll Forests, Sydney Hinterland Dry	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
				Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths. Grows on sandstone substrates in alluvial soils.					
<b><i>Persicaria elatior</i></b> <b>Tall Knotweed</b>	VU	VU	No	Erect herb found growing in south-eastern NSW at Mount Dromedary, Moruya State Forest near Turlinjah, Upper Avon River catchment north of Robertson, Bermagui and Picton Lakes. Also grows in northern NSW around Raymond Terrace near Newcastle and Cherry Tree and Gibberagee State Forests in the Grafton area. Grows in damp places usually on the margins of waterbodies and in swamp forests in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Eastern Riverine Forests, Coastal Freshwater Lagoons and Coastal Heath Swamps.	Low	No	No	No	Aquatic habitat is not present within subject land. This species has not been recorded within 10 kilometres of the subject land.
<b><i>Persoonia bargoensis</i></b> <b>Bargo Geebung</b>	VU	EN	Yes	Erect, bushy shrub restricted to a small area on the western edge of the Woronora Plateau and the northern edge of the Southern Highlands south-west of Sydney. Grows in woodland, forest and disturbed areas in transitional soils in Sydney Coastal Dry Sclerophyll Forests,	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land. This species has not been recorded within 10 kilometres of the subject land.



Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
				Sydney Hinterland Dry Sclerophyll Forests, Eastern Riverine Forests, Coastal Valley Grassy Woodlands and North Coast Wet Sclerophyll Forests. Grows in heavy well drained, loamy or gravelly soils derived from Wianamatta Shales and Hawkesbury Sandstone.					
<b><i>Persoonia nutans</i> Nodding Geebung</b>	EN	EN	No	Erect or spreading shrub with a disjunct distribution restricted to the Cumberland Plain between Richmond in the north and Macquarie Fields in the south with core distribution occurring in the Penrith and to a lesser extent, Hawkesbury regions. Grows in Cumberland Dry Sclerophyll Forests including Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland, Cooks River/Castlereagh Ironbark Forest and Shale-Sandstone Transition Forest as well as Sydney Sand Flats Dry Sclerophyll Forests and Coastal Valley Grassy Woodlands. Grows in sandy soils derived from aeolian or alluvial sediments as well as in tertiary alluviums to the south of its range.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.
<b><i>Pimelea curviflora</i> var. <i>curviflora</i></b>	VU	VU	Yes	Small to medium sized shrub restricted to the coastal areas of Sydney between northern Sydney and Maroota with an outlying population at Croom Reserve near Albion Park in the Illawarra region.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
				Grows on ridgetops and upper slopes amongst grasses and sedges in a variety of communities including Cumberland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Northern Hinterland Wet Sclerophyll Forests. Can be inconspicuous amongst grasses and sedges although easier to find in October to May when flowering. Grows on sandstone substrates in shale/lateritic soils and shale/sandstone transition soils.					
<b><i>Pimelea spicata</i></b> <b>Spiked Rice-flower</b>	EN	EN	Yes	Small erect or spreading shrub with populations occurring in two disjunct areas, one occurring on the Cumberland Plain from Marayong and Prospect Reservoir south to Narellan and Douglas Park, and the other occurring in the Illawarra from Landsdowne to Shellharbour and north Kiama. Grows in Maritime Grasslands and Coastal Valley Grassy Woodlands including Cumberland Plain Woodlands and Moist Shale Woodlands within the Cumberland Basin and in Coast Banksia Open Woodland Coastal Grasslands in the Illawarra region. Grows on well structured clay soils.	Low	No	No	No	Potential habitat highly disturbed and dominated by exotic vegetation within subject land.



Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Prostanthera marifolia</i></b> <b>Seaforth Mintbush</b>	CR	CR	No	Small erect straggly shrub restricted to a single population fragmented by urbanisation into three sites located in the northern Sydney suburb of Seaforth. Found growing on ridge tops in association with Silvertop-ash Eucalyptus sieberi and Red Bloodwood Corymbia gummifera within or in close proximity to Duffys Forest and in Sydney Coastal Dry Sclerophyll Forests. Grows in deeply weathered clay associated with ironstone nodules and scattered shale lenses.	Low	No	No	No	Potential habitat highly degraded and dominated by exotic vegetation within subject land.
<b><i>Pterostylis saxicola</i></b> <b>Sydney Plains Greenhood</b>	EN	EN	Yes	Deciduous terrestrial orchid restricted to a few small populations located in Western Sydney between Freemans Reach in the north and Picton in the south including Georges River National Park. Found growing near streams in depression on sandstone rock shelves above cliff lines faces, moist, sheltered ridges and creek banks on mossy rocks in Temperate Montane Grasslands, Northern Warm Temperate Rainforests, Southern Warm Temperate Rainforests and Southern Tableland Wet Sclerophyll Forests. Grows in small pockets of shallow shale or shale/sandstone transition soils over sandstone substrates.	Low	No	No	No	Potential habitat highly degraded and dominated by exotic vegetation within subject land. Species also prefers to grow near streams which are absent from subject land.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Pultenaea pedunculata</i></b> <b>Matted Bush-pea</b>	-	EN	Yes	Small prostrate, mat forming shrub restricted to three disjunct populations, in Villawood, Prestons and north-west of Appin in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn. Found growing in a variety of habitats including intact woodland, creeklines, broad valleys, headlands, rock crevices, disturbed sites such as road batters and coastal cliffs in a variety of communities including Central Gorge Dry Sclerophyll Forests, South Coast Sands Dry Sclerophyll Forests, Cumberland Dry Sclerophyll Forests, Temperate Montane Grasslands, Coastal Valley Grassy Woodlands and Southern Tableland Wet Sclerophyll Forests. Grows in a variety of soils including sandy clay soils, loam soils, transitional soils with ironstone nodule inclusions and soils derived from Wianamatta shale, laterite or alluvium.	Low	No	No	No	Species prefers intact woodland vegetation, however it is also known to grow in disturbed sites such as roadsides. Habitat is highly degraded and dominated by exotic vegetation within subject land.
<b><i>Rhodamnia rubescens</i></b> <b>Scrub Turpentine</b>	-	CR	No	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Low	No	No	No	Potential habitat highly degraded and dominated by exotic vegetation within subject land.
<b><i>Tetradlea juncea</i></b> <b>Black-eyed Susan</b>	VU	VU	No	Small shrub confined to the northern area of the Sydney Basin bioregion and the southern area of the North Coast	Low	No	No	No	Potential habitat highly degraded and dominated by exotic vegetation within subject land.



Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
				bioregion in the Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock Local Government Areas. Found growing at well drained sites which experience annual rainfall levels between 1000 and 1200 mm at elevations below 200 metres in swampy heath and moist forests. Usually found growing in soils from the Awaba soil landscape comprising of low nutrient sandy, skeletal soils, sandy loam soils and clay soils on sandstone or conglomerate substrates.					
<b><i>Thesium australe</i></b> <b>Austral Toadflax</b>	VU	VU	Yes	Small, straggling herb with a distribution comprising of small populations scattered along the coast of eastern NSW including the Northern and Southern Tablelands, Tasmania, Queensland and eastern Asia. A root parasite found growing on damp sites in grassland, grassy woodlands and coastal headlands often in association with Kangaroo Grass Themeda triandra in a variety of communities including New England Dry Sclerophyll Forests, Western Slopes Grasslands, Northern Tableland Wet Sclerophyll Forests, Brigalow Clay Plain Woodlands, Subalpine Woodlands and Maritime Grasslands.	Low	No	No	No	Potential habitat highly degraded and dominated by exotic vegetation within subject land. Grows often in association with Kangaroo Grass. This species has not been recorded within 10 kilometres of the subject land.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Wilsonia backhousei</i></b> <b>Narrow-leafed Wilsonia</b>	-	VU	No	Small, sprawling, matted shrub confined to the coastal between Mimosa Rocks National Park and Wamberal north of Sydney including Nelson's Lake, Potato Point, Sussex Inlet, Wowly Gully, Parramatta River at Ermington, Clovelly, Voyager Point, Wollongong and Royal National Park. Found growing on the margins of coastal saltmarshes and lakes in Coastal Floodplain Wetlands, Temperate Montane Grasslands, Mangrove Swamps and Saltmarshes.	Low	No	No	No	The subject land is in close proximity to estuarine rivers, however saline waterbodies are not present in subject land. Potential habitat is highly degraded and dominated by exotic vegetation within subject land.
<b><i>Zannichellia palustris</i></b>	-	EN	No	Submerged aquatic plant confined to the Hunter Valley as well as Sydney Olympic Park. Found growing in fresh or slightly saline stationary or flowing water in Coastal Freshwater Lagoons and Saltmarshes.	Low	No	No	No	Aquatic habitat is not present within subject land. This species has not been recorded within 10 kilometres of the subject land.



**Table A-2 Threatened fauna species assessment**

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Anthochaera phrygia</i></b> <b>Regent Honeyeater</b>	CR	CR	Yes	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nest in tall mature eucalypts and sheoaks.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	The subject land is not included on the Important Areas map for the species (DPIE, 2021a).
<b><i>Botaurus poiciloptilus</i></b> <b>Australasian Bittern</b>	EN	EN	N/A	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including <i>Typha</i> spp. and <i>Eleocharis</i> spp. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds.	Negligible	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	The habitat for this species is not present in the subject land, as it does not contain terrestrial or estuarine wetlands. There is an estuarine water body within 500m of the subject land, however observations are generally recorded from water bodies with dense tall rush and reed vegetation.
<b><i>Calidris canutus</i></b> <b>Red Knot</b>	EN	-	No	Typically located within intertidal mudflats, sandflats and sandy beaches of sheltered coasts. Occasionally found on sandy open beaches or shallow pools, or in saline wetlands close to the coast.	Negligible	No	No	Breeding habitat (direct impacts) – No Breeding	This species is a non-breeding migratory visitor from Arctic regions of Siberia. The habitat for this species is not present in the subject

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
								habitat (indirect impacts) – No Foraging habitat – No	land, however there is an estuarine water body within 500m of the subject land.
<b><i>Calidris ferruginea</i> Curlew Sandpiper</b>	CR	EN	No	Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.	Negligible	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	The habitat for this species is not present in the subject land as it does not consist of mudflats or swamps. However there is an estuarine water body within 500m of the subject land.
<b><i>Calidris tenuirostris</i> Great Knot</b>	CR	VU	No	Mainly found on intertidal mudflats, sandflats and sandy beaches.	Negligible	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	The habitat for this species is not present in the subject land as it does not contain coastal mudflats, sandflats or sandy beaches. However there is an estuarine water body within 500m of the subject land.



Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Chalinolobus dwyeri</i></b> <b>Large-eared Pied Bat</b>	VU	VU	Prior	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	The subject land has low topographic relief and there are no rocky areas containing caves within 2 kilometres of the subject land, therefore it is not considered to contain breeding habitat for the species. They forage in well-timbered areas containing gullies, under the forest canopy, therefore there is unlikely to be any suitable foraging habitat in the subject land.
<b><i>Charadrius leschenaultii</i></b> <b>Greater Sand-plover</b>	VU	VU	No	Entirely coastal in NSW, foraging on intertidal sand and mudflats in estuaries and roosting during high tide on sandy beaches or rocky shores. Individuals have been recorded on inshore reefs, rock platforms, small rocky islands and sand cays on coral reefs, within Australia. Occasional sightings have also occurred on near-coast salt lakes, brackish swamps, shallow freshwater wetlands and grassed paddocks.	Negligible	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	Habitat for this species is not present within the subject land. There is an estuarine waterbody within 500m of the subject land, however it is not suitable habitat.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Dasyurus maculatus</i></b> <b>Spotted-tailed Quoll</b>	EN	VU	N/A	Occurs along the east coast of Australia and the Great Dividing Range. Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage. Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1,000 hectares, while males have larger home ranges of between 2,000 and 5,000 hectares. Breeding occurs from May to August.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	Woody debris and rock outcrops were absent from the subject land, and no hollow-bearing trees were present. No evidence of latrines were recorded during the field survey.



Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Haliaeetus leucogaster</i></b> <b>White-bellied Sea-Eagle</b>	-	VU	Yes	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	The subject land is within 1 kilometres of waterways, however lacks suitable nesting trees. Field investigation was conducted during the required survey period and no large stick nests were recorded.
<b><i>Heleioporus australiacus</i></b> <b>Giant Burrowing Frog</b>	VU	VU	No	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks. Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the southern part range. Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends the majority of its time in non-breeding habitat 20-250m from breeding sites.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	This species is not known to occur within previously disturbed areas. It has also been reported as being potentially unwilling or unable to burrow into soil covered by grasses and crops (Penman et al., 2004). Whilst the species spends most of its time in heath, woodland and dry sclerophyll forest areas, these areas are typically within 300 metres of breeding sites (DPIE, 2019). There are no potential breeding sites located within 10 kilometres of the subject land.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Hirundapus caudacutus</i></b> <b>White-throated Needletail</b>	VU	-	No	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia.	Transient	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	The species has been recorded roosting in trees in forests and woodlands, though little is known about the species. The species does not breed in Australia and nearby sightings are likely vagrants.
<b><i>Lathamus discolor</i></b> <b>Swift Parrot</b>	CR	EN	Yes	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	The subject land is not included on the Important Areas map for the species (DPIE, 2021a).



Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Litoria aurea</i></b> <b>Green and Golden Bell Frog</b>	VU	EN	Yes	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC. The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks, although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take about 10-12 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	Semi-permanent wet areas associated with a first order creekline are not present within the subject land.
<b><i>Meridolum corneovirens</i></b> <b>Cumberland Plain Land Snail</b>	-	EN	Yes	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No	Habitat for this species includes Cumberland Plain Woodland, Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and River-flat Eucalypt Forest. These TECs are not present in the subject

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
								Foraging habitat – No	land. Potential habitat is highly disturbed and dominated by exotic vegetation.
<b><i>Miniopterus australis</i></b> <b>Little Bent-winged Bat</b>	-	VU	Yes	Occurs from Northern Queensland to the Hawkesbury River near Sydney. Roost sites encompass a range of structures including caves, tunnels and stormwater drains. Young are raised by the females in large maternity colonies in caves in summer. Shows a preference for well timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. The Little Bentwing bat forages for small insects (such as moths, wasps and ants) beneath the canopy of densely vegetated habitats.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	There are no habitat features suitable for roosting or breeding (i.e. caves, mines or tunnels).
<b><i>Miniopterus orianae oceanensis</i></b> <b>Large Bent-winged Bat</b>	-	VU	Yes	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	There are no habitat features suitable for roosting or breeding (i.e. caves, mines or tunnels).



Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Myotis macropus</i></b> <b>Southern Myotis</b>	-	VU	Yes	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	Breeding and foraging habitat is not present within the subject land due to the absence of hollow-bearing trees and no waterways within 200 metres of the subject land.
<b><i>Numenius madagascariensis</i></b> <b>Eastern Curlew</b>	CR	-	No	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.	Negligible	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	The breeding habitat for this species is not present in the subject land. There are rivers within 500 metres of subject land, however they are not present in subject land and are highly disturbed.
<b><i>Pandion cristatus</i></b> <b>Eastern Osprey</b>	-	VU	No	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 kilometres inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging	Breeding habitat for this species consists of dead trees or artificial structures that are located within 100 metres of a floodplain, with a preference for coastline. No nests or evidence of breeding were found during the field investigations.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
				up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.				habitat – No	
<b><i>Petauroides volans</i> Greater Glider</b>	VU	-	No	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	Habitat in the form of hollow-bearing trees are not present in the subject land.
<b><i>Petaurus norfolcensis</i> Squirrel Glider</b>	-	VU	Yes	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	This species prefers Blackbutt-Bloodwood forest with a heath understorey and an Acacia midstorey, which is absent from the subject land. The species requires hollow-abundant vegetation for refuge or breeding sites, however the subject land is lacking hollow-bearing trees.



Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Phascolarctos cinereus</i></b> <b>Koala</b>	VU	VU	Yes	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> . They are solitary with varying home ranges.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	Vegetation is dominated by exotic species and Koala food trees are of poor quality and few, being heavily degraded by disturbance and clearance. It is unlikely that the subject land is used by individuals for foraging habitat due to the poor-quality of the vegetation.
<b><i>Polytelis swainsonii</i></b> <b>Superb Parrot</b>	VU	VU	No	Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Forages primarily in grassy box woodland, feeding in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	Open riparian River Red Gum forest or woodland is absent in the subject land.
<b><i>Pommerhelix duralensis</i></b> <b>Dural Land Snail</b>	EN	EN	Yes	The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland Interim Biogeographic Regionalisation of Australia subregion on shale-sandstone transitional landscapes. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	Habitat for this species includes forested habitats with native ground cover and woody debris. Potential habitat is highly disturbed and dominated by exotic vegetation.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
				forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.				habitat – No	
<b><i>Pteropus poliocephalus</i> Grey-headed Flying-fox</b>	VU	VU	Yes	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.	Low	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – Yes	No camps (communal breeding/roosting sites) were identified within the subject land during the field investigations. The subject land contains vegetation that may be suitable for foraging.
<b><i>Rostratula australis</i> Australian Painted Snipe</b>	EN	EN	N/A	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, but have been recorded in brackish waters. Forages on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	Negligible	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	The habitat for this species is not present in the subject land, as it does not contain shallow inland wetlands. There are rivers and dams within 500m of subject land, however they are not present in subject land and are highly disturbed.



Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ carried out	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Thalassarche melanophris</i></b> <b>Black-browed Albatross</b>	VU	VU	No	Inhabits Antarctic, subantarctic and subtropical waters. Although generally pelagic the species also occurs on the continental shelf and can be seen from land.	Negligible	No	No	Breeding habitat (direct impacts) – No Breeding habitat (indirect impacts) – No Foraging habitat – No	Habitat is not suitable for this marine species.

## Appendix 3 Flora

### Appendix 3.1 BAM plot field data

**Table A-3 Flora species recorded in the subject land from BAM plots**

Family	Scientific name	Common name	36175_01			
			N. E or HTE	Cover	Abundance	Stratum
Fabaceae (Mimosoideae)	<i>Acacia decurrens</i>	Black Wattle	N	0.1	2	G
Fabaceae (Mimosoideae)	<i>Acacia pubescens</i>	Downy Wattle	N	1	2	M
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple	N	5	6	C
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	E	2	10	G
Pittosporaceae	<i>Bursaria spinosa</i>	Native Blackthorn	N	0.5	1	M
Myrtaceae	<i>Corymbia citriodora</i>	Lemon-scented Gum	E	10	5	C
Poaceae	<i>Cynodon dactylon</i>	Common Couch	N	2	10	G
Cyperaceae	<i>Cyperus gracilis</i>	Slender Flat-sedge	E	1	10	G
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	HTE	1	10	G
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush	N	1	10	G
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	HTE	50	1000	G
Fabaceae (Faboideae)	<i>Glycine tabacina</i>	Variable Glycine	N	1	10	G
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	False Sarsaparilla	N	1	2	G
Lomandraceae	<i>Lomandra gracilis</i>	-	N	0.1	3	G
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Meadow Grass	N	5	20	G
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	E	50	30	M
Poaceae	<i>Oplismenus aemulus</i>	Basket Grass	N	1	4	G
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	HTE	1	10	G
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	E	0.2	10	G
Poaceae	<i>Setaria parviflora</i>	-	E	1	10	G
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	E	5	50	G

\* G = Ground, M = Mid storey, C = Canopy



## Appendix 3.2 BAM plot data sheets

Table A-4 BAM plot data sheets

Category	36175_01
PCT	849
Area (hectares)	0.54
Patch size (hectares)	0.62 (< 5 hectares)
Condition class	Low
Zone	56
Easting	316930
Northing	6255681.0
Bearing	351
<b>Composition</b>	
Tree	2
Shrub	2
Grass	5
Forbs	1
Ferns	0
Other	2
<b>Structure</b>	
Tree	5.1
Shrub	1.5
Grass	9.1
Forbs	1.0
Ferns	0.0
Other	2.0
<b>Function</b>	
Large trees	0
Hollow trees	0
Litter cover	61.0
Length fallen logs	10.0
Tree stem 5-9	1
Tree stem 10-19	1

Category	36175_01
Tree stem 20-29	1
Tree stem 30-49	1
Tree stem 50-79	0
Tree regeneration	0
High threat exotic	52.0

## Appendix 3.3 Incidental flora

**Table A-5 Incidental flora species recorded at the subject land**

Status	Scientific name	Common name
<b>Native species</b>		
-	<i>Callistemon citrinus</i>	Crimson Bottlebrush
-	<i>Corymbia maculata</i>	Spotted Gum
-	<i>Eucalyptus tereticornis</i>	Forest Red Gum
-	<i>Grevillea robusta</i>	Silky Oak
-	<i>Lophostemon confertus</i>	Brush Box
-	<i>Pittosporum undulatum</i>	Sweet Pittosporum
<b>Exotic/non-indigenous species</b>		
-	<i>Araujia sericifera</i>	Moth Vine
-	<i>Avena fatua</i>	Wild Oats
	<i>Bidens pilosa</i>	Farmers Friend
-	<i>Bougainvillea</i> spp.	Bougainvillea
-	<i>Cestrum parqui</i>	Green Cestrum
-	<i>Cinnamomum camphora</i>	Camphor Laurel
-	<i>Corymbia citriodora</i>	Lemon Scented Gum
-	<i>Cyperus eragrostis</i>	Tall Flat Sedge
-	<i>Daucus carota</i>	Wild Carrot
-	<i>Eragrostis curvula</i>	African Love Grass
-	<i>Ehrharta erecta</i>	Panic Veldtgrass
-	<i>Galium aparine</i>	Goosegrass
	<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush
-	<i>Lantana camara</i>	Lantana



Status	Scientific name	Common name
-	<i>Lolium perenne</i>	Perennial Ryegrass
-	<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive
-	<i>Onopordum acanthium</i>	Scotch Thistle
-	<i>Paspalum dilatatum</i>	Dallis Grass
-	<i>Pennisetum clandestinum</i>	Kikuyu Grass
-	<i>Plantago lanceolata</i>	Plantain
-	<i>Ricinus communis</i>	Castor Oil
-	<i>Rumex crispus</i>	Curly Dock
-	<i>Sida rhombifolia</i>	Paddy's Lucerne
-	<i>Solanum linnaeanum</i>	Apple of Sodom
-	<i>Solanum nigrum</i>	Black Nightshade
-	<i>Verbena bonariensis</i>	Purpletop

## Appendix 4 Significant Impact Criteria assessments

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### Downy Wattle *Acacia pubescens*

#### Species background

Downy Wattle *Acacia pubescens* is listed as vulnerable under the EPBC Act and is restricted to the Sydney region of NSW. Its distribution is concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Although the distribution includes a large area, the extant sites are predominantly small and fragmented, surrounded by development. It is assumed that the species was once more common across its range, given it occurs in an area which has largely been developed (Threatened Species Scientific Committee, 2016).

Downy Wattle occurs in open woodland and forest, most sites are within Cooks River/Castlereagh Ironbark Forest, Shale Gravel Transition Forest or Shale Plains Woodland. Downy Wattle is a colonial species, so an individual (or genet) may occur as a number of clumps (or ramets). Based on a study by NSW National Park and Wildlife Service (NPWS, 2003), individual plants within 300 metres of each other are considered as the one sub-population, as dispersal may occur over this distance in *Acacia* species. The study also identified that a large percentage of populations had fewer than 20 plants (Threatened Species Scientific Committee, 2016).

The main threats to Downy Wattle are habitat loss and fragmentation, invasive species, habitat disturbance including illegal track creation by recreational activities and damage through maintenance activities, fire and hybridisation (Threatened Species Scientific Committee, 2016).

#### Occurrence in the study area

Downy Wattle occurs within two distinct locations within the subject land. An area within the former T6 Carlingford Line rail corridor to the south of the former Rosehill Railway Station, within the approved project area, contains an 'environmentally significant area'. This environmentally significant area was not considered as part of the BDAR for the approved project. As such, the species has been assessed as part of this assessment.

The exact number of individuals was not possible to discern due to the density of growth inside the fenced area, though it was estimated that there are about 20-25 individual stems present. Downy Wattle is a colonial species, so an individual may occur as a number of clumps, and it is likely that the stems in this location are of the same, or only a few individuals. The environmentally significant area also contains Black Wattle *Acacia decurrens*, and several exotic species, including Lantana, Moth Vine, Kikuyu and African Lovegrass.

Two further individuals were recorded within the planted native vegetation west of the former Rosehill Railway Station within the proposed development footprint Figure 10.

#### Downy Wattle populations within the study area

As outlined in the *Matters of National Environmental Significance – Significant impact guidelines 1.1* (DoE, 2013), a population of a species is:

- a geographically distinct regional population, or collection of local populations, or
- a population, or collection of local populations, that occurs within a particular bioregion.



In accordance with these guidelines any Downy Wattle individuals or clusters present within the subject land would be considered a local/sub-population and form part of the population between Bankstown and Parramatta area, within the Cumberland Interim Biogeographic Regionalisation of Australia sub-region.

Due to the Cumberland Interim Biogeographic Regionalisation of Australia subregion population being considered one (single) population, the sub-populations of Downy Wattle within the Bankstown - Parramatta area are considered to represent part of an 'important population' of the species.

**Table A-6 SIC assessment for Downy Wattle *Acacia pubescens*, EPBC vulnerable species - assessment against Significant Impact Criteria (DoE, 2013)**

SIC assessment for vulnerable species
<p><b>Lead to the long-term decrease in the size of an important population of a species.</b></p> <p>The proposed modification would remove up to 27 individual stems, and 0.14 hectares of known habitat for Downy Wattle within the subject land. Based on a study by NSW National Park and Wildlife Service (NPWS, 2003), individual plants within 300 metres of each other are considered as the one sub-population. Given, the nearest known records of the species are located 787 metres west and 1.9 kilometres east of the subject land, the individuals within the subject land are considered a single sub-population.</p> <p>Based on the Downy Wattle population survey undertaken as part of this assessment, there are at least 4,655 known individual/stems of the species within a 15 kilometre radius of the subject land, which are considered part of the same population within the Cumberland Interim Biogeographic Regionalisation of Australia sub-region. The majority of these records are located within intact remnant vegetation located within Council reserves, with high levels of recruitment observed. The individuals within the subject land, are highly isolated within urban development. The habitat within the subject land consists of urban native/exotic planted vegetation. The soil profile within the location of the species has also undergone historic disturbance from construction of the rail infrastructure, with limited recruitment observed. The removal of 27 stems from a population of at least 4,655, would result in the loss of 0.6 per cent of the population. Therefore, the proposed modification would not lead to a long-term decrease in the size of an important population.</p>
<p><b>Reduce the area of occupancy of an important population.</b></p> <p>Due to the Cumberland IBRA subregion population being considered one (single) population, the sub-populations of Downy Wattle within the Bankstown - Parramatta area are considered to represent part of an 'important population' of the species. The proposed modification would remove up to 27 individual stems, and 0.14 hectares of known habitat for Downy Wattle within the subject land, including 0.13 hectares (2 stems) within the additional area required for construction and 0.01 hectares (25 stems) within the approved project area.</p> <p>Based on a study by NSW National Park and Wildlife Service (NPWS, 2003), individual plants within 300 metres of each other are considered as the one sub-population. Given, the nearest known records of the species are located 787 metres west and 1.9 kilometres east of the subject land, the individuals within the subject land are considered a single sub-population. However, the individuals within the subject land, are highly isolated within urban development. The habitat within the subject land consists of urban native/exotic planted vegetation on unnatural substrates, with limited recruitment observed. Based on the Downy Wattle population survey undertaken as part of this assessment, there are at least 4,655 known individual/stems of the species within a 15 kilometre radius of the subject land, located within intact remnant vegetation located within Council reserves.</p> <p>The habitat within the subject land is highly modified, and the soil profile has undergone historic disturbance from construction of the former rail infrastructure, and is under threat from urban development and weed invasion. The surrounding area contains larger intact areas of suitable known habitat for the species, protected within Council reserves. Therefore, the proposed modification is unlikely to reduce the area of occupancy of an important population.</p>

## SIC assessment for vulnerable species

### **Fragment an existing important population into two or more populations.**

Due to the Cumberland IBRA subregion population being considered one (single) population, the sub-populations of Downy Wattle within the Bankstown - Parramatta area are considered to represent part of an 'important population' of the species. The proposed modification would remove up to 27 individual stems, and 0.14 hectares of known habitat for Downy Wattle within the subject land, including 0.13 hectares (2 stems) within the additional area required for construction and 0.01 hectares (25 stems) within the approved project area. Based on the Downy Wattle population assessment undertaken as part of this project, there are at least 4,655 known records of the species within a 15 kilometre radius of the subject land, which are considered part of the same population within the Cumberland Interim Biogeographic Regionalisation of Australia sub-region. The population is already small and highly fragmented, surrounded by development. The nearest known records of the species are located 787 metres west and 1.9 kilometres east of the subject land. Therefore, the proposed modification would not fragment an existing important population into two or more populations.

### **Adversely affect habitat critical to the survival of a species.**

Habitat critical to the survival of Downy Wattle has been identified given the clonal nature of the species and a lack of genetic information about this clonality. Downy Wattle occurs in open woodland and forest, with most sites within Cooks River/Castlereagh Ironbark Forest, Shale Gravel Transition Forest or Shale Plains Woodland (Threatened Species Scientific Committee, 2016). The proposed modification would remove 0.14 hectares of known habitat for Downy Wattle within planted native vegetation within the subject land, including 0.13 hectares (2 stems) within the additional area required for construction and 0.01 hectares (25 stems) within the approved project area. Although the habitat within the subject land has been assigned PCT 849 for the purposes of the BAM, the habitat within the subject land is not consistent with Shale Plains Woodland TEC given the vegetation community is dominated by planted non-indigenous species (consisting of only 2 of the 26 of the species listed in the BioNet Vegetation Classification database for PCT 849), and the soil profile has undergone historic disturbance from construction of the rail infrastructure, and does not consist of the original soil profile.

Therefore, the habitat within the subject land is not considered critical habitat for Downy Wattle, and the proposed modification is not considered likely to adversely affect habitat critical to the survival of the species.

### **Disrupt the breeding cycle of an important population.**

Due to the Cumberland IBRA subregion population being considered one (single) population, the sub-populations of Downy Wattle within the Bankstown - Parramatta area are considered to represent part of an 'important population' of the species.

Based on a study by NSW National Park and Wildlife Service (NPWS, 2003), individual plants within 300 metres of each other are considered as the one sub-population. Given, the nearest known records of the species are located 787 metres west and 1.9 kilometres east of the subject land, the individuals within the subject land are considered a single sub-population.

Based on the Downy Wattle population assessment undertaken as part of this project, there are at least 4,655 known individual/stems of the species within a 15 kilometre radius of the subject land, located within intact remnant vegetation located within Council reserves, with high levels of recruitment observed.

The individuals within the subject land, are highly isolated within urban development. The habitat within the subject land is highly modified, and the soil profile has undergone historic disturbance from construction of the rail infrastructure. Limited recruitment was observed within the subject land and the species is under threat from urban development and weed invasion. Therefore, the proposed modification is unlikely to disrupt the breeding cycle of an important population.



## SIC assessment for vulnerable species

### **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.**

Downy Wattle occurs in open woodland and forest, most sites are within Cooks River/Castlereagh Ironbark Forest, Shale Gravel Transition Forest or Shale Plains Woodland (Threatened Species Scientific Committee, 2016). The population of Downy Wattle is already small and highly fragmented, surrounded by development. The proposed modification would remove 0.14 hectares of known habitat for Downy Wattle within planted native vegetation within the subject land, and the soil profile has undergone historic disturbance from construction of the rail infrastructure, and is not considered high quality habitat for the species. Therefore, the proposed modification is not considered likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

### **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.**

The known habitat for Downy Wattle within the subject land consists of planted vegetation and is subject to existing weed invasion as a result of historic disturbance from construction and operation of the rail infrastructure. The proposed modification is unlikely to result in an increase of invasive species within the known habitat for Downy Wattle. Construction work would be managed through standard practices to avoid new introductions and further spread of existing weeds.

### **Introduce disease that may cause the species to decline.**

The proposed modification would not result in the introduction of a disease that is harmful to Downy Wattle.

### **Interfere substantially with the recovery of the species.**

The specific objectives of the Recovery Plan for Downy Wattle (NPWS, 2003) are:

- to ensure that a representative sample of *Acacia pubescens* populations occurring on public and private lands are protected from habitat loss and managed for conservation
- to reduce the impacts of threats at sites across the species' range
- to ensure that any planning and management decisions that are made which affect the species, are made in accordance with the recovery objectives of this plan
- to understand the biology, ecology, health and distribution of the species including the range of genetic variation
- to develop the awareness and involvement of the broader community in the species and its conservation
- to re-assess the conservation status of the species.

Based on the Downy Wattle population assessment undertaken as part of this project, there are at least 4,655 known individual/stems of the species within a 15 kilometre radius of the subject land, which are considered part of the same population within the Cumberland Interim Biogeographic Regionalisation of Australia sub-region. The majority of these records are located within intact remnant vegetation located within Council reserves, with high levels of recruitment observed. The individuals within the subject land, are highly isolated within urban development. The habitat within the subject land consists of urban native/exotic planted vegetation. The soil profile within the location of the species has also undergone historic disturbance from construction of the rail infrastructure, with limited recruitment observed.

The removal of 27 stems from a population of at least 4,655, would result in the loss of 0.6 per cent of the population. The proposed modification would remove up to 27 individual stems, and 0.14 hectares of known habitat for Downy Wattle within the subject land, including 0.13 hectares (2 stems) within the additional area required for construction and 0.01 hectares (25 stems) within the approved project area.

Considering the above factors, the proposed modification is unlikely to interfere substantially with the recovery of the species.

## SIC assessment for vulnerable species

### Conclusion.

Based on the above assessment, the proposed modification is considered unlikely to have a potential significant impact on Downy Wattle given the following:

- based on the Downy Wattle population survey undertaken as part of this assessment, there are at least 4,655 known individual/stems of the species within a 15 kilometre radius of the subject land, which are considered part of the same population within the Cumberland Interim Biogeographic Regionalisation of Australia sub-region
- the majority of records within the population are located within intact remnant vegetation located within Council reserves, with high levels of recruitment observed
- the individuals within the subject land, are highly isolated within urban development. The habitat within the subject land consists of urban native/exotic planted vegetation. The soil profile within the location of the species has also undergone historic disturbance from construction of the rail infrastructure, with limited recruitment observed
- the removal of 27 stems from a population of at least 4,655, will result in the loss of 0.6 per cent of the population.

Therefore, a Commonwealth referral is not required for impacts to Downy Wattle.

## Grey-headed Flying-fox *Pteropus poliocephalus*

### Species background

Grey-headed Flying-fox is listed as vulnerable under the Commonwealth EPBC Act. The Grey-headed Flying-fox trends with the distribution of plants with similar flowering and fruiting times, support regular annual cycles of migration (Eby & Lunney, 2002). It can be associated with flowering eucalyptus dependant on seasonality. Key threats to the Grey-headed Flying-fox include habitat fragmentation and habitat degradation, low levels of mortality, exploitation and competition. The species is largely impacted by urban growth displacing individuals.

### Occurrence in the subject land

Previous records of the Grey-headed flying fox exist in the surrounding locality (1,005 nearby records within 10 kilometres of the subject land with closest record being 180 metres from the subject land). Given the nearby resources and Flying-fox camps located 2.5 kilometres to the west of the subject land and 1.6 kilometres to the south of the subject land, the species may use the subject land for occasional foraging resources (DAWE, 2021). No camp sites were detected within the subject land or subject land during the field investigation.

The proposed modification would result in the removal of up to 0.44 hectares of PCT 849 Cumberland Shale Plains Woodland, which constitutes foraging habitat for the species. An assessment of whether the proposed modification is likely to lead to a significant impact Grey-headed Flying-fox is provided below.

**Table A-7 SIC assessment for Grey-headed Flying-fox *Pteropus poliocephalus*, EPBC vulnerable species - assessment against Significant Impact Criteria (DoE, 2013)**

## SIC assessment for vulnerable species

### Lead to the long-term decrease in the size of an important population of a species.

While the proposed modification would result in the removal of potential foraging resources for Grey-headed Flying-fox, the total area of habitat being removed is considered low quality, non-breeding habitat.

The species prefers large consolidated vegetation communities that produce significant foraging resources. Given the scale of the impact, and amount of low quality foraging habitat to be removed (0.44 hectares), it is unlikely that it would lead to a long-term decrease in the size of an important Grey-headed Flying-fox population.



## SIC assessment for vulnerable species

### **Reduce the area of occupancy of an important population.**

The species is highly mobile and relatively widespread, roosting and maternity sites are well documented and conspicuous. No roosting or breeding habitat was recorded during field assessment, however there are two known camps within 10 kilometres of the subject land, including one located 2.5 kilometres to the west of the subject land and 1.6 kilometres to the south of the subject land (DAWE, 2021).

Due to the small area and limited number of potential feed trees to be removed the overall area of occupancy of the species is likely to remain unchanged.

The species would continue to forage in retained habitat either side of the construction footprint and the development would not represent a barrier to the movement of individuals.

### **Fragment an existing important population into two or more populations.**

The national population of the Grey-headed Flying-fox is considered a single population as it is a highly mobile species. The subject land contains low condition PCT 849 and is surrounded by urban development. The species would utilise other larger patches of vegetation in the assessment area as it prefers large intact vegetation communities.

No camps have previously been recorded within the subject land and no roosting flying-foxes were present during field investigation. The closest Grey-headed Flying-fox camp is located 2.5 kilometres to the west of the subject land and 1.6 kilometres to the south of the subject land (DAWE, 2021). Given the highly mobile nature of the species (known to travel up to 50 kilometres whilst foraging]), the removal of 0.44 hectares of potential foraging habitat would not fragment an existing important population into two or more populations.

### **Adversely affect habitat critical to the survival of a species.**

Habitat critical to the survival of the Grey-headed Flying-fox includes important breeding and foraging resources.

Breeding occurs within camps and there are two camps within the locality, including one located 2.5 kilometres to the west of the subject land and 1.6 kilometres to the south of the subject land.

Foraging resources may constitute habitat critical for the survival of Grey-headed Flying-fox and may include areas with highly productive winter flowering tree species. It is considered unlikely that low condition PCT 849 within the subject land would constitute habitat critical to the survival of the Grey-headed Flying-fox for the following reasons:

- no camps would be impacted by the proposed development
- low condition vegetation within the subject land is considered unlikely to be selected as a roosting site in the future as the vegetation patch is relatively small and heavily fragmented.

### **Disrupt the breeding cycle of an important population.**

While the proposed modification may result in the removal of vegetation utilised for foraging by the species, the proposed modification would not result in the disruption to the breeding cycle of any local Grey-headed Flying-fox population or the species as a whole. The proposed modification would not provide further disturbance from existing noise or lighting pollution that would substantially interfere with the species' ability to reproduce successfully as the subject land is not within close proximity to breeding areas. Grey-headed Flying-foxes would continue to breed in camps unaffected by vegetation loss and as a result the breeding cycle of the population would not be disrupted.

## SIC assessment for vulnerable species

### **Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.**

Grey-headed Flying-foxes are assumed to utilise the subject land on occasion for foraging. The proposed modification would only impact a small area (0.44 hectares) of PCT 849 which may provide foraging resources at certain times of the year. The proposed modification would not impact on any existing camps and is unlikely to have an impact on nearby camps as this small patch is unlikely to produce sufficient foraging resources to support a large number of Flying-foxes. The subject land is surrounded by higher-quality resources within the locality (along vegetated riparian corridors), therefore the proposed modification would only impact a very small number of resources within the broader landscape. The subject land is considered unlikely to be suitable for future camps as the subject land is already partially fragmented and too small to support a camp. The species prefers intact vegetation inclusive of foraging resources within close proximity. The surrounding urban development and lack of habitat features associated with Flying-fox camps, means the subject land is not considered suitable.

The proposed development would remove up to 0.44 hectares of native vegetation. This would not fragment or isolate the population as it is a small area, and vegetation within the locality is largely intact and native. While the proposed modification would result in the removal of trees, some of which may be used by the species, this level of loss is not likely to result in the decline of the species at a national scale.

### **Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.**

There are a moderate number of feral animals and plants that are known or likely to be well established in the subject land. Some of these have potential to negatively impact Grey-headed Flying-fox, including foxes and dogs. However it is unlikely that the proposed modification would result in the establishment of new species. The proposed action is unlikely to exacerbate the current level of invasive species threat operating within the subject land.

### **Introduce disease that may cause the species to decline.**

The proposed modification is unlikely to result in the introduction of a disease that could reduce the reproductive output of Grey-headed Flying-foxes in or near the subject land.

### **Interfere substantially with the recovery of the species.**

Actions considered likely to substantially interfere with the recovery of the Grey-headed Flying-fox as determined by key threats to the species (DPIE, 2021d) are as follows:

- habitat loss and fragmentation including important foraging species such as Forest Red Gum
- winter Foraging resources are limited to a narrow coastal strip in QLD and northern NSW
- spring foraging resources are considered critical to the survival of the species
- exploitation – shooting of Grey-Headed Flying-foxes to protect fruit crops involves death of the individual and indirect death as a result of shooting of pregnant and lactating females
- competition and hybridisation – indirect competition by Black Flying-fox which has had a range expansion in the past
- pollutants, electrocution and pathogens. A disproportionately higher number of lactating females are killed by electrocution on power lines.

The proposed modification would not fragment habitat for the Grey-headed Flying-fox and would not significantly contribute to the loss of habitat as it would result in the removal of up to 0.44 hectares of native vegetation.

The proposed development would not result in work likely to result in exploitation of the species as the proposed modification consists of development of infrastructure, rather than crops. The proposed development is not likely to increase incidence of competition or hybridisation.

The proposed modification is therefore unlikely to substantially interfere with the recovery of the Grey-headed Flying-fox.



## SIC assessment for vulnerable species

### Conclusion.

In consideration of the above Significant Impact Criteria, the proposed activity is not likely to significantly impact Grey-headed Flying-fox within the subject land or wider locality, as:

- the native vegetation within the subject land is limited to foraging resources only
- a small area (0.44 hectares) is proposed to be removed as part of the proposed modification.

A Commonwealth referral is not required for impacts to this species.

## Swift Parrot *Lathamus discolor*

### Species background

Swift Parrot is listed as critically endangered under the EPBC Act. It breeds in Tasmania during spring and summer, migrating in the autumn and winter months (March to October) to south-eastern Australia from Victoria and eastern parts of South Australia up to south-east Queensland. In NSW it occurs mostly on the coast and south west slopes (DPIE, 2021g, 2021e).

Whilst on the mainland they are typically found in areas where eucalypts are flowering profusely or where there is abundant lerp (from sap-sucking bugs) infestations. Their favoured trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum, Red Bloodwood *Corymbia gummifera*, Mugga Ironbark *Eucalyptus sideroxylon* and White Box *Eucalyptus albens*. Commonly used lerp infested trees include Inland Grey Box *Eucalyptus microcarpa*, Grey Box *Eucalyptus moluccana* and Blackbutt *Eucalyptus pilularis*. Individuals are known to return to some foraging sites on a cyclic basis depending on food availability (DPIE, 2021g, 2021e).

### Occurrence in the subject land

No targeted survey was carried out due to seasonal absence, however there are known records of the species within 10 kilometres of the subject land (DPIE, 2021b). The subject land is not mapped within the Important Areas map for the species (DPIE, 2021a). The proposed modification would result in the removal of up to 0.44 hectares of PCT 849 Cumberland Shale Plains Woodland, which constitutes foraging habitat for the species. There is potential for the subject land to be used occasionally by this species for foraging, although it is unlikely that individuals rely upon resources in the subject land. An assessment of whether the proposed modification is likely to lead to a significant impact Grey-headed Flying-fox is provided below.

**Table A-8 SIC assessment for Swift Parrot *Lathamus discolor*, EPBC critically endangered species - assessment against Significant Impact Criteria (DoE, 2013)**

SIC assessment for critically endangered or endangered species
<p><b>Lead to a long-term decrease in the size of a population.</b></p> <p>The vegetation within the subject land does not include any key tree species for Swift Parrot but does include <i>Eucalyptus</i> sp. and <i>Angophora</i> sp., however it is not considered to be highly productive due to the disturbed nature and small size of the site. There are high quality resources located nearby as part of the vegetated riparian corridors to the south and north of the subject land. It is unlikely that the proposed modification within the subject land would lead to a long-term decrease in the size of a population.</p>
<p><b>Reduce the area of occupancy of the species.</b></p> <p>The Swift Parrot is a migratory species that occurs over a large range from Tasmania to south-east Queensland. The proposed modification has potential indirect impacts of 0.44 hectares of Cumberland Shale Plains Woodland situated in a heavily fragmented urban landscape. It is likely that if the species uses the site, it also utilises other patches of vegetation within the locality, including riparian corridors to the south and north. Given the large range of the species and the availability of nearby habitat it is unlikely the proposed modification would result in a decrease in the area of occupancy for this species.</p>



## SIC assessment for critically endangered or endangered species

### Fragment an existing population into two or more populations.

The national population of the Swift Parrot is considered a single population as it is a highly mobile species. The subject land contains low condition PCT 849 and is surrounded by urban development. The species is highly mobile and individuals can move freely through areas of unsuitable and marginal habitat to seek out and exploit favourable habitat patches. Therefore it is likely that species would utilise other patches of vegetation in the assessment area, including intact riparian corridors. Given the highly mobile nature of the species, the removal of 0.44 hectares of potential foraging habitat would not fragment an existing important population into two or more populations.

### Adversely affect habitat critical to the survival of a species.

The quality of this habitat is poor due to its highly degraded nature and small size such that it is unlikely to be providing critical habitat for this species. The removal of 0.44 hectares of low quality foraging habitat is unlikely to adversely affect critical habitat that would likely have an impact on the survival of Swift Parrot.

### Disrupt the breeding cycle of a population.

This species breeds in Tasmania and therefore there is no breeding habitat within the subject land.

### Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The proposed modification would impact 0.44 hectares of Cumberland Shale Plains Woodland, which may be potential foraging and roosting habitat for Swift Parrot. Eucalypts within the subject land are commonly infested with lerp (sap-sucking insects), which are a food source for this species. There are minimal preferred winter flowering feed trees in the subject land, including Spotted Gum. It is likely that if the species uses the site for foraging, it also utilises the riparian corridors to the north and south of the subject land. Similarly with roosting habitat the species is more likely to use larger intact forested areas along the riparian corridor. Given the small scale of the habitat located in the subject land, within an area containing larger continuous areas of more suitable habitat, it is considered unlikely that the removal of 0.44 hectares of foraging habitat would impact the species to the extent that it would cause a decline in the population.

### Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.

The proposed modification is unlikely to exacerbate the current level of invasive species threat operating within the subject land to the point that they become harmful to the Swift Parrot.

### Introduce disease that may cause the species to decline.

The proposed modification is unlikely to introduce a disease that causes the Swift Parrot to decline.

### Interfere with the recovery of the species.

The National Recovery Plan for Swift Parrot outlines four recovery actions:

- identify the extent and quality of habitat
- manage and protect Swift Parrot habitat at the landscape scale
- monitor and manage the impact of collisions, competition and disease
- monitor population and habitat.

The subject land contains potential foraging and roosting habitat for this species. However this habitat is degraded and higher quality habitat is located nearby. It is unlikely therefore that potential indirect impacts to this vegetation would interfere with the recovery of Swift Parrot.

## SIC assessment for critically endangered or endangered species

### Conclusion.

Based on the assessment, it is concluded the proposed modification is unlikely to lead to a significant impact to Swift Parrot, as:

- a small numbers of individuals may occasionally forage within the vegetation within the subject land, however impacts are not considered significant
- there are higher quality resources located nearby and the removal of vegetation from the subject land is not likely to constitute a significant impact to an important population.

A Commonwealth referral is not required for impacts to this species.